MOODY'S
INVESTORS SERVICE

RATING METHODOLOGY

Moody's Approach to Rating SF CDOs

This rating methodology replaces the *Moody's Approach to Rating SF CDOs* methodology published in June 2021. In this update, we have edited section 2.2 "Managed vs. Static" to provide more information on our modeling approach. These updates do not change our methodological approach.

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1. Introduction

This report summarizes our approach to rating collateralized debt obligations backed by structured finance assets (SF CDOs). The methodology describes the asset class, an outline of our modeling approach, and the primary factors that we consider when assigning ratings to SF CDO notes. The analysis includes modeling the expected losses borne by investors in the CDO notes, consideration of the unique characteristics of the SF CDO's assets and liabilities, the particular structure defined by the SF CDO's documents, a review of legal opinions, as well as an evaluation of the ability and willingness of the SF CDO manager and other parties to fulfill their roles. We may also run additional analyses, such as testing the impact on the rated Notes from changes in the ratings of underlying assets, correlation, recovery, or average life.

As with all rating methodologies, in applying this methodology, where appropriate, we consider all factors that we deem relevant to our analysis. In addition to these quantitative assessments, our rating committees also consider other various qualitative and quantitative factors in our analysis. If actual performance or performance trends are not in line with the assumptions described in this methodology, we may consider or reflect that in our analysis. For example, if certain assets reported as defaulted by the trustee carry Moody's rating of Caa3 (sf) or above or have been generating significant cash flows that we assess to be sustainable, we may treat them as performing or assume they will produce cash flows in the near term. In other cases, for certain diverse portfolios, we may consider anchoring the rating of a CDO tranche relative to the rating of the lowest-rated asset among the performing collateral assets whose par fully collateralizes the tranche's outstanding balance. In addition, we may adjust our assumptions for the collateral assets' average life and amortization profile based on available data as well as factors such as asset type and legal maturity. A rating committee ultimately assigns our ratings, taking into account the unique characteristics of each rated security.

2. Types of SF CDOs

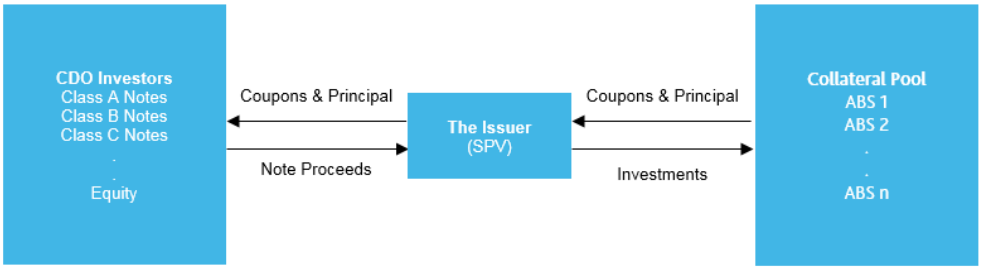
2.1. Cash Flow vs. Synthetic vs. Hybrid

There are three main types of SF CDO structures:[1] a cash SF CDO, synthetic SF CDO, and hybrid SF CDO.

In cash transactions, the CDO holds SF assets/tranches in physical form, and all CDO liabilities are issued in funded form (see Exhibit 1).

EXHIBIT 1

Schematic of Typical Cash SF CDO

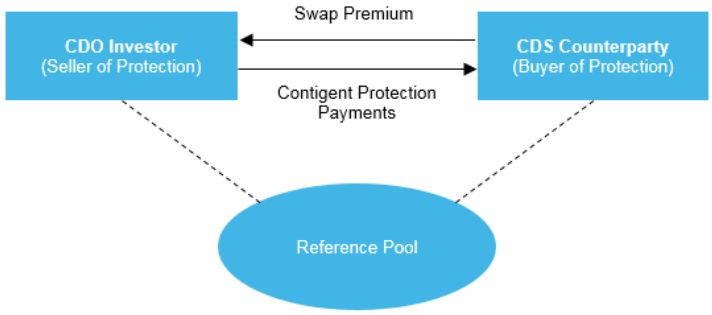


Source: Moody's Investors Service

In purely synthetic transactions, the CDO is exposed to SF assets via credit default swaps (CDS) between the special purpose vehicle (SPV) and the swap counterparty, which reference SF assets. The CDO liabilities may take either funded (note) or unfunded (CDS) form (see Exhibits 2 and 3, respectively).

EXHIBIT 2

Schematic of Typical Unfunded Synthetic SF CDO

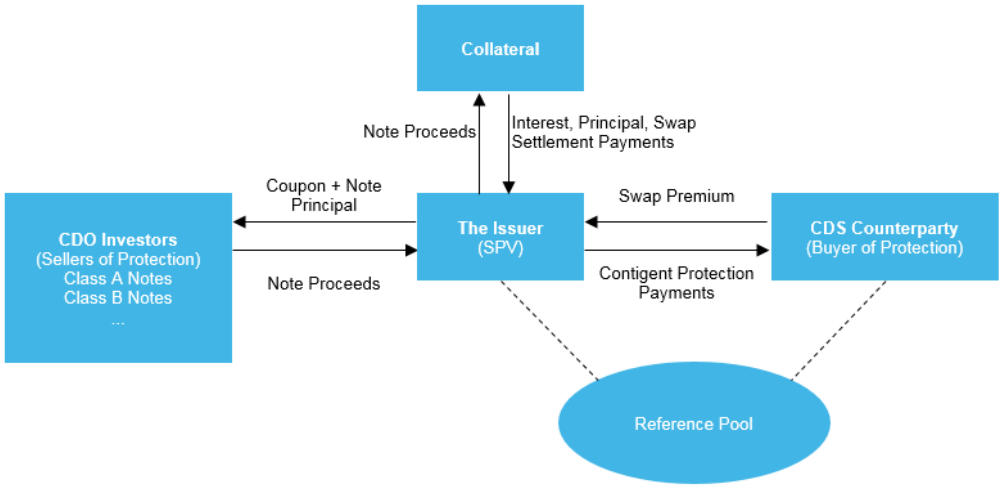


Source: Moody's Investors Service

[1] Structures that consist primarily of commercial real estate (CRE) collateral are typically referred to as CRE CDOs; see Appendix 9. All references to asset-backed securities collateral herein should be referred to as CRE collateral in the context of a CRE CDO.

EXHIBIT 3

Schematic of Typical Funded Synthetic SF CDO

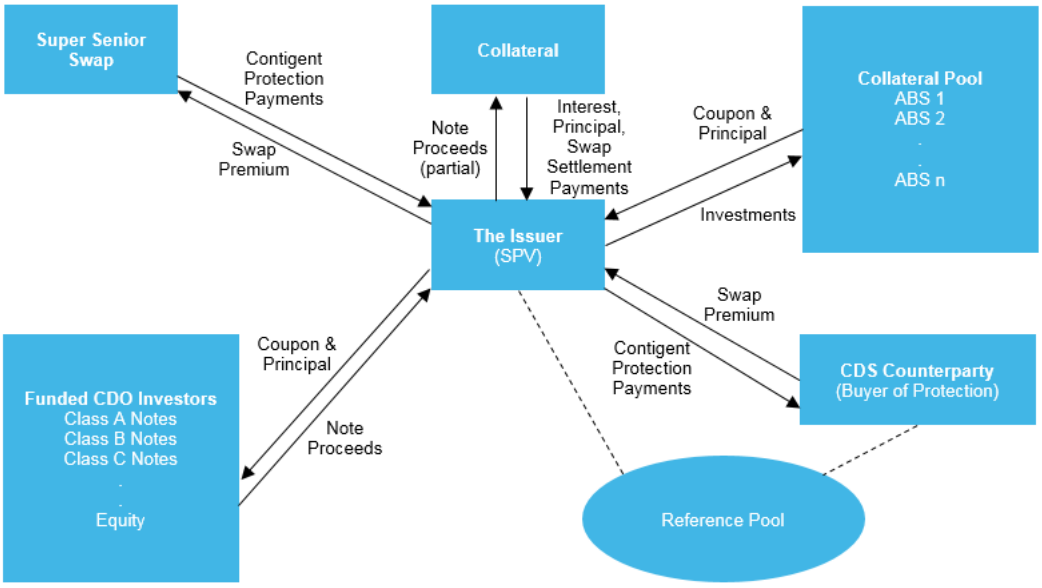


Source: Moody's Investors Service

Hybrid SF CDOs may incorporate both cash and synthetic assets and funded and unfunded liabilities (see Exhibit 4).[2]

EXHIBIT 4

Schematic of Typical Hybrid SF CDO



Source: Moody's Investors Service

In Exhibit 4, the CDO holds cash asset-backed securities (ABS) instruments, cash/eligible investments (i.e., collateral) in connection with funded synthetics, and enters into unfunded CDS with the CDS counterparty. On the liability side, the CDO issues funded notes, including equity, and enters into a super senior swap or some other unfunded or revolving agreement such as a variable funding note.

In most cases, the CDS and super senior counterparties are the same entity.

[2] Even cash flow SF CDOs typically include a bucket for synthetic assets. We generally use the term "hybrid" to refer to transactions with a synthetic bucket that exceeds 50%.

2.2. Managed vs. Static

SF CDOs may be either static or managed transactions. Static transactions do not permit reinvestment into new assets and have restrictions on asset sales. In static transactions, we model the collateral pool based on the actual composition of the pool.

In managed SF CDOs, the collateral manager (the manager) can buy and sell assets subject to a set of covenants spelled out in the SF CDO governing documents (an indenture, for example). For this reason, our modeling of managed cash flow SF CDOs is based on assumptions derived from the transaction covenants, rather than the SF CDO's current portfolio. Moreover, the initial ratings of cash flow SF CDOs are based on these covenants since the portfolios may not be fully ramped up at closing and can change over time. Should the portfolio deteriorate over time, we typically model the transaction assuming the more conservative of the actual portfolio characteristics and the transaction covenants. Once the CDO reinvestment period has expired (so that the transaction effectively becomes static), our modeling will instead reflect the actual characteristics of the collateral pool unless reinvestment is permitted after the end of the reinvestment period. We typically use a Monte Carlo simulation model called CDOROM™ (CDOROM) to derive default or loss distributions for asset portfolios when we rate SF CDO transactions.

For managed synthetic transactions, we typically use CDOROM to model the actual portfolio. There are typically covenants in the transaction documents related to CDOROM results that are designed to ensure that trades do not increase the credit risk borne by investors above pre-defined limits.

3. Modeling Approach for SF CDOs

3.1. Overview

3.1.1. Recovery Rate

3.1.1.1. THE UNADJUSTED RECOVERY RATE

We begin our analysis of SF CDO collateral by first estimating recovery rates based on the sector type, tranche thickness, and rating of each instrument. Given the assumed recovery rate and the rating of the collateral, we then infer a default probability for use in its models.

To estimate recovery rates, we first determine a mean recovery rate for each instrument according to Appendix 1. We derive the mean recovery rate assumption based on the current rating of the instrument and the initial proportion of the capital structure of the underlying SF transaction accounted for by the instrument. For example, one can infer from Exhibit 5 of Appendix 1 that a residential mortgage-backed security (RMBS) with a current rating of A2 and an initial tranche thickness equal to 7% of the total capital structure of the transaction would have a mean recovery rate of 20%. The higher the rating of the instrument and the larger its proportion of the transaction capital structure, the higher the assumed mean recovery rate.

We recognize that for a given instrument category (as defined by its sector type, current rating, and tranche thickness within the underlying transaction capital structure), the actual recovery upon default may vary a great deal around the assumed mean recovery rate. Thus, in addition to the mean recovery rate, we also associate a measure of recovery rate volatility (standard deviation) for each SF asset (with a non-zero mean recovery rate value) based on the following formula:

FORMULA 1

$$\text{St. Dev} = \sqrt{RR * (1 - RR)} * 70\% \ (RR \text{ stands for the recovery rate mean assumption})$$

Source: Moody's Investors Service

For the A2 RMBS in our example above, the assumed standard deviation of the recovery rate is approximately 28%. Based on the assumption that the recovery rate follows a beta distribution with parameters reported in Appendix 1, we simulate recovery rates using CDOROM.[3]

3.1.1.2. ADJUSTMENTS TO ASSUMED RECOVERY RATES IN SYNTHETIC SF CDOS

For cash-settled CDS, we apply haircuts to the mean recovery rate assumptions depending on the liquidity of the instrument and on the specific settlement procedure, which applies following the occurrence of a credit event. These haircuts are indicated in Appendix 2. These haircuts are intended to capture both the lack of liquidity following the event and the fact that the cash settlement process is controlled by the protection buyer.

3.1.1.3. RECOVERY TIMING

We assume that recoveries for both cash and synthetic instruments occur immediately after default.

3.1.1.4. CORRELATION BETWEEN RECOVERIES

We assume that recoveries on defaulted instruments are correlated with each other. Using a Gaussian copula framework to generate random recovery values within CDOROM, a correlation of 10% between all pairs of defaulted instruments is assumed. However, our rating committees may adjust this assumption based on either the market environment or the particulars of the collateral portfolio.

3.1.2. Default Probability

3.1.2.1. MOODY'S RATING

For SF assets that we rate, the rating used in the analysis will be the current rating adjusted for watch status (see paragraph 3.1.2.4 below).

3.1.2.2. INFERRING THE UNADJUSTED DEFAULT PROBABILITY FROM THE RATING AND RECOVERY RATE

We use the collateral instrument's mean recovery rate, as determined using the procedure in the previous section, rating and average life to infer an unadjusted default probability. The unadjusted default probability may be calculated from the following relationship:

FORMULA 2

$$DP = EL/(1 - RR)$$

Where:

» *EL* = Expected Loss
» *DP* = Default Probability
» *RR* = Recovery Rate

Source: Moody's Investors Service

We infer the instrument's EL from its current rating and weighted average life (WAL), based on our idealized expected loss rates.[4]

[3] Note that the assumed standard deviation of the recovery rate is a function of its assumed mean value.

[4] 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.

3.1.2.3. NON-MOODY'S RATED INSTRUMENTS

In the absence of default probabilities and recovery rates inferred from our ratings, the analysis may be based on our credit estimates.[5]

In the case where some assets have neither Moody's ratings, credit estimates, or structured credit assessments, depending on the concentration percentage of such assets, we will run a sensitivity analysis to determine the potential impact on the stability of assigned SF CDO ratings under different assumptions for such non-Moody's rated instruments.

If the concentration percentage for such non-Moody's rated instruments in the collateral pool reaches or exceeds 20% of the Moody's-defined performing par amount, we would not assign ratings due to our inability to reliably assess the credit risk of the transaction. Moody's-defined performing par amount includes the notional balance of all performing assets in the portfolio, as reported by the trustee,[6] minus the notional balance of any assets assumed to be defaulted by Moody's.

3.1.2.4. INSTRUMENTS ON REVIEW FOR UPGRADE/DOWNGRADE

Our research has shown that instruments that we place on review for upgrade/downgrade do indeed have a substantially higher likelihood of actually being upgraded/downgraded than similarly rated instruments that are not on review. To reflect this finding, we will treat instruments on review for upgrade/downgrade as if they have already been upgraded/downgraded by two notches in the indicated direction. An exception is made at the Aaa level, where the adjustment for instruments on review for downgrade is one notch.

These adjustments affect the EL value in Formula 2 above since the EL is inferred from the adjusted rating. They will also affect the assumed recovery rate should the unadjusted and adjusted ratings indicate different columns in the exhibits in Appendix 1.

3.1.2.5. RESECURITIZATION STRESS FACTORS: ADJUSTMENTS TO THE ASSUMED DEFAULT PROBABILITIES

SF CDOs, by their highly leveraged nature (i.e., securitization of a securitization), are very sensitive to the volatility of the credit performance of the underlying assets. A small shift in the credit quality of the underlying assets could lead to large changes in the ratings of the SF CDO liabilities. We apply a stress to the default probability of the underlying collateral in its SF CDO models (Resecuritization Stress) to create a fatter tail in the default distribution.

We group the resecuritization stress factors into two categories depending on the assets underlying the CDO that is being rated (Appendix 3).

The first category includes highly volatile CDO securities such as CDO of RMBS, CDO of SF, CRE CDO, and market value CDO & CDO^2. For securities in this first category, a multiplier of 4 will be applied to the default probability for all rating categories except Aaa, for which a factor of 12 will be applied.

The second category consists of asset classes that have only one level of securitization, such as ABS backed by auto loans, credit card receivables, student loans, RMBS, CMBS, and CLOs. For this second category, a stress multiplier of 2 will be applied to all rating categories except Aaa, for which a factor of 6 will be applied. Generally speaking, asset classes not mentioned above will be classified in the second category. Moreover, as determined by a rating committee, we may choose to apply higher or lower resecuritization stresses depending on market conditions.

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

[6] This includes the notional balance of assets that are treated as defaulted by the Trustee but are rated Caa3 or higher.

Because real estate investment trusts' (REITs) ratings are more similar to corporate ratings than SF ratings, no resecuritization stress is applicable for REITs.

3.1.3. Asset Correlation

When rating SF CDOs, we employ a "tree" framework for asset correlations and assign each asset into one of the branches on the "tree." The branches of the "tree" represent sectors and sub-sectors within the universe of SF assets. We assign each instrument to sectors with varying levels of refinement (Appendix 4).[7] The more narrowly defined the sector to which two credits belong, the higher the assumed asset correlation between the credits. We also assume that asset correlations depend on the extent to which any pair of credits share regional, vintage, or "key agent" characteristics.

3.2. Calculating Expected Loss for Each Tranche

3.2.1. Components of the Model

The default and recovery characteristics of the SF CDO collateral are incorporated into a model that calculates the EL for each rated SF CDO liability. Any such model consists of two primary components: 1) a mechanism for associating collateral loss scenarios with the likelihood that each scenario will occur (a collateral loss distribution) and 2) a cash flow (or a simple capital structure) component that relates each collateral default scenario to the cash that flows to the rated liability classes within the scenario. Once such collateral default scenarios have been applied to the cash flow model, we can then calculate the EL for each rated tranche.

The final step is to compare the computed EL for each tranche to Moody's Idealized Expected Loss rates.[8]

3.2.2. Modeling Approach Depends on the Complexity of the CDO Waterfall and Other Considerations

The approach we take to define the default distribution for the SF CDO collateral depends on the structure of the CDO itself. For example:

- Synthetic SF CDO: For SF CDOs that have no significant complexity in the priority of payments (e.g. waterfall, over-collateralization (OC) tests) and premium/coupon payments that are not directly related to defaults within the collateral pool,[9] we model the loss distribution and the flows to each liability tranche using CDOROM.
- Static cash SF CDO: For static SF CDOs with a cash flow waterfall (i.e., for which interest proceeds available are directly linked to the coupon paid by the underlying assets), we model the portfolio loss distribution using CDOROM in combination with a cash flow model (in which the resulting flows to each liability tranche are modeled).
- Managed cash SF CDO: For managed SF CDOs with a cash flow waterfall, we mainly rely on the correlated binomial expansion technique (CBET) in conjunction with a cash flow model.
- Performing cash SF CDOs: For CDOs backed by structured finance securities, if the individual cash flows from the credit rating modeling for those securities are available, we may use these cash flows in conjunction with a cash flow model, assuming a correlation appropriate for the underlying assets.

[7] Note, as determined by a rating committee, we may adjust correlation assumptions outlined in Appendix 4 depending on market environment or other relevant factors.

[8] For more information, see the "Loss Benchmarks" section.

[9] Thus, the payments come from the CDS counterparty.

3.2.3. Defining the Collateral Loss Distribution

3.2.3.1. USING CDOROM SIMULATION MODEL TO CDOS THAT LACK COMPLEX WATERFALLS AND TO STATIC TRANSACTIONS

In the absence of a complex priority of payments or for static portfolio transaction, we apply the Monte Carlo simulation framework within CDOROM to model the loss distribution for SF CDOs. Within this framework, defaults are generated so that they occur with the frequency indicated by the adjusted default probability for each credit in the reference pool (i.e., the default probability associated with the current rating as adjusted according to section 3.1.2.1 and multiplied by the Resecuritization Stress). Specifically, correlated defaults are simulated using a normal (or Gaussian) copula model that applies the asset correlation framework described in section 3.1.3 above.

Recovery rates for defaulted credits are generated by applying within the simulation the distributional assumptions – including the correlation between recovery values – described in section 3.1.1 above.

Together, the simulated defaults and recoveries across each of the Monte Carlo scenarios define the loss distribution for the reference pool.

3.2.3.2. APPLYING CORRELATED BINOMIAL TO MOST MANAGED CDOS WITH A WATERFALL

For most managed cash flow and hybrid SF CDOs, we apply the CBET approach. We might also apply the CBET to a managed synthetic CDO that is managed via transaction covenants on portfolio characteristics. However, nearly all managed synthetics have been managed via covenants on CDOROM results. The CBET is a variation on the Binomial Expansion Technique (BET) that we have traditionally applied to cash flow CDO modeling. Within the traditional BET, a model portfolio of idealized assets – identical to and uncorrelated with each other – is used to mimic the default distribution of the actual collateral pool. Under the CBET, the idealized assets remain identical but are assumed to be correlated with each other. This allows the pool to be represented by a larger number of assets than would be considered under the BET, resulting in more precisely defined loss distribution tails. The single factor that describes the pair-wise asset correlations among the instruments in the collateral pool is known as Moody's Asset Correlation (MAC).[10]

To produce the best possible fit of the CBET loss distribution to the actual loss distribution of the collateral pool (which reflects the distributions of both defaults *and* recoveries), we apply a two-step procedure:

1) Simulate defaults and recovery rates for the collateral pool using CDOROM (as in section 3.2.3.1 above) and derive a loss distribution
2) Determine the value of the MAC that best fits the simulated loss distribution[11]

Once the MAC has been estimated, we can use the CBET to associate a probability with each possible collateral loss scenario. Because the MAC is chosen to match a loss distribution generated by CDOROM in which both defaults and recoveries are simulated – and thus reflects the uncertainty in recovery rates – in the cash model, a single fixed recovery rate can be applied to each idealized asset default within the CBET loss scenarios. The resulting CBET loss distribution will closely match the CDOROM loss distribution.[12] The fixed recovery rate that is used in the analysis is the weighted average recovery rate (WARR), which is the par-weighted average of the mean recovery values for the collateral assets.

[10] In rare cases where the collateral pool is distinctly heterogeneous by some characteristic (e.g., by rating or par amount), we may instead apply a multi-CBET approach in which the pool is broken down into two or more components. However, because the loss distribution simulated via CDOROM already reflects much of the heterogeneity in the pool, this approach is usually unnecessary.

[11] In addition to the MAC, the analyst must choose a "representative number of assets" in the idealized pool; this exhibit is normally set at 100.

[12] More precisely, the CBET loss distribution will exhibit the same first moment (mean) and third moment (skewness) as the CDOROM loss distribution.

As discussed in section 3.1.2.2, the probability of default applied in the CBET depends on, among other things, the WAL of the pool. We use the covenanted WAL for this purpose.

3.2.4. Complex Waterfall Transactions: The Cash Flow Model

Once the loss distribution for the collateral has been calculated, each collateral loss scenario, derived through either the CDOROM loss distribution for a static deal or CBET for managed deals, is associated with the interest and principal received by the rated liability classes via a cash flow model. The cash flow model takes account of:

- collateral cash flows
- the transaction covenants
- the priority of payments (waterfall) for interest and principal proceeds received from portfolio assets (as defined in the transaction documents)
- reinvestment assumptions
- the timing of defaults
- interest-rate scenarios
- foreign exchange risk (if present).

For SF CDOs, these features are incorporated into Moody's Analytics CDOEdge™ software.

3.2.4.1. COLLATERAL CASH FLOWS

Our cash flow modeling begins with assumptions about the cash flows generated by the collateral pool. As described in section 3.2.4.2 immediately below, we use the weighted average spread (WAS) of the portfolio for static deals or the WAS covenant[13] for managed transactions to model the interest flows from the SF CDO assets. Interest proceeds from the floating-rate collateral also reflect an assumed path for Libor/Euribor[14] (section 3.2.4.6 below).

We model principal proceeds from collateral maturities based on the weighted average life (WAL) (actual for static deals, the covenant for managed) and the assumed amortization profile (base, fast or slow) of the pool. The "base" case is the speed used to price the instrument for new assets, or the observed prepayment speed over the previous six months for seasoned securities. The "fast" and "slow" cases generally reflect a doubling and halving of the base case speed, respectively. Alternative amortization profiles can be used too if we find them appropriate. Defaults and corresponding recoveries are part of principal proceeds and are modeled as further described in section 3.2.4.5.

In (rare) cases where additional risks that require analysis on a period-by-period basis (e.g., FX risk) must be taken into account, we may choose to overlay simulated paths for FX and/or interest rates with the cash flow scenarios derived from the CBET (see Appendices 6 and 7).[15]

Modeled interest proceeds and principal proceeds are each associated with a particular due period. If the transaction documents do not restrict reinvestment between SF CDO payment dates, then reinvestment is assumed to occur immediately (section 3.2.4.4 below). At the end of each due period, interest proceeds and

[13] The vast majority of collateral in SF CDOs is floating rate, so that a weighted average coupon covenant is unnecessary. If a small basket for fixed-rate assets is incorporated in the CDO, we will generally assume a conservatively low average coupon rate for the basket.

[14] Note that any references to Libor also apply to other applicable benchmark reference rates, or Euribor.

[15] Alternatively, for cash deals, "perfect" asset swaps may be used to mitigate any potential FX risk. By perfect asset swaps, we refer to asset-by-asset 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.

principal proceeds flow through the interest and principal waterfalls defined by the transaction documents (section 3.2.4.3 below).

3.2.4.2. THE TRANSACTION COVENANTS

For managed transactions, in addition to the covenants that determine the default probabilities and recovery rates used in the model (WARF, WAL, WARR, and MAC), the cash flow model takes account of other covenants, such as the WAS.

3.2.4.3. THE PRIORITY OF PAYMENTS

We endeavor to model cash flows received by each liability tranche that accurately reflect the waterfall specified in the transaction documents. Payments are either sequential or *pro rata,* and the scheme may vary if certain tests are violated. Flows to or from hedge counterparties are included. The modeled waterfall incorporates any OC or interest coverage (IC) tests that divert cash flows to more senior classes upon a violation. Sometimes there are "reinvestment" OC tests in managed transactions, which upon a violation, usually require interest proceeds, otherwise available to be paid to the equity noteholders, to be set aside for the purchase of new collateral. OC and IC tests are satisfied first using either interest proceeds or principal proceeds. Any relevant fees, expenses, and accounts are reflected in the waterfall as well. The waterfall may also change when the reinvestment period ends.

3.2.4.4. REINVESTMENT ASSUMPTIONS

In managed CDOs, when amortizations are received from the collateral pool, or when recoveries occur with respect to defaulted assets (both normally classified as principal proceeds), the proceeds may or may not be reinvested in new collateral. In general, we assume that reinvestment will take place whenever it is permitted. Thus, for example, if the transaction documents do not prevent the manager from reinvesting cash received between the SF CDO payment dates, we will model the transaction as if such reinvestments occur immediately (see section 7.5.2).

Some CDOs permit limited reinvestment even after the reinvestment period has ended. Reinvestment after the end of the reinvestment period is normally limited to unscheduled principal receipts and the proceeds of credit-impaired or credit-improved sales. Typically, such reinvestment is only permitted if the SF CDO is performing adequately. To the extent that such protections are not in place, we may assume that the WAL of the assets is extended, effectively increasing the default probability used in the CBET.

Many managed SF CDOs incorporate a "reinvestment" OC test. Violation of this test is cured through the purchase of additional collateral using interest proceeds otherwise available to be paid to the equity. We will typically model the SF CDO to reflect such a test. However, in cases where consistency between the model and actual operation of the test may be compromised (e.g., when there are uncapped expenses just above the test in the payment waterfall), analysts model the transaction either as if the test were not present or by assuming a stress on such uncapped expenses.

3.2.4.5. THE TIMING OF DEFAULTS

The CBET does not determine the profile of defaults over time. Instead, we apply several scenarios for assumed default timing. Typically, we consider cases in which the defaults within a given CBET scenario occur over the first six years of the SF CDO, with, for example, 50% of scenario defaults occurring in one year and 10% in each of the other years. The 50% default spike, which is intended to mimic the clustering of defaults in a recession, is moved through each of the first six years for a total of six default-timing scenarios.

For static transactions with complex waterfalls, the loss distribution is generated by CDOROM rather than the CBET. We nonetheless use the same default timing scenarios – with the 50% spike in a single year – as in the case of managed complex waterfall transactions.[16]

3.2.4.6. INTEREST-RATE SCENARIOS

For cash flow SF CDOs, a discrete number of interest-rate scenarios are assumed to reflect the potential for shifts in short-term rates over time. Specifically, we consider the forward Libor curve at the time the transaction is rated as a base case. Additionally, one- and two-standard-deviation perturbations to the Libor curve are considered, for a total of five interest-rate scenarios. That is, Libor t years into the future is modeled as:

FORMULA 3

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

Where:

» $\omega \in \{-2, -1, 0, 1, 2\}$,

» $\widetilde{L}_t$ represents the forward Libor curve

» σ: the annualized volatility of Libor.[17]

Source: Moody's Investors Service

For transactions with relatively long lives, or in which interest-rate risk is particularly important (e.g., in the case of dynamic hedging or where there are different buckets of currencies modeled), we may instead simulate the evolution of the yield curve. In doing so, analysts assume a mean-reverting process for interest rates (see Appendix 6).[18]

Swap counterparty risk is addressed in our cross-sector methodology.[19] Collateralization and/or replacement of the hedge counterparty are usually provided if the counterparty is downgraded below a specified threshold rating.

When an SF CDO enters into an interest-rate swap to hedge a basket of fixed-rate assets, the swap may sometimes be struck at a swap rate that exceeds the market rate. In this case, the SF CDO will receive an upfront payment that is effectively a loan. Typically, this upfront payment is treated as principal proceeds rather than interest proceeds.

Some SF CDOs may enter into asset-specific hedges on or after the closing date. For these transactions, we consider whether there are any risks associated with entering into or terminating such hedges. Transactions have mitigated these risks through various provisions, including the exact matching of assets with hedges, the use of excess interest for any upfront payments, and either preventing the SF CDO from making termination payments should events of default occur with respect to the specific hedges or subordinating termination payments to all rated notes.

[16] Though CDOROM also associates a period with each default, the resulting timing profile is fairly linear. This modeled result is inconsistent, however, with the observed bunching of defaults in high-stress periods.

[17] 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%..

[18] Specifically, analysts assume that rates evolve according to a Cox, Ingersoll, Ross process. The parameters are estimated using a Maximum Likelihood approach.

[19] See our cross-sector methodology for assessing counterparty risks. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

3.2.5. The Expected Loss Calculation

3.2.5.1. MANAGED CDOS WITH A WATERFALL

The EL for each tranche is simply the weighted average of losses to each tranche across all the scenarios, where the weight is the likelihood of the scenario occurring.

FORMULA 4

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

Where:

» P_j = the probability that scenario j will occur, as given by the CBET

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

Source: Moody's Investors Service

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. Thus

FORMULA 5

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

Source: Moody's Investors Service

In Formula 5, the present values (PVs) are calculated using the promised tranche coupon rate as the discount rate. For floating-rate tranches, the discount rate is based on the promised spread over Libor and the assumed Libor scenario. For promised payments that are either "off-market" or are path-dependent, we may instead apply an alternative approach. See Appendix 8.

3.2.5.2. CDOS WITH SIMPLE WATERFALL AND STATIC TRANSACTIONS

For simple synthetic SF CDOs, the capital structure is incorporated into CDOROM simply by specifying the attachment point (or pool loss level at which the tranche begins to suffer losses) and the thickness of the tranche (which effectively defines the pool loss level at which the tranche suffers a 100% loss). Both are expressed in terms of the percentage notional of the capital structure. For static cash SF CDOs, the capital structure and payment waterfall are incorporated in the cash flow model used in conjunction with CDOROM.

Under the Monte Carlo simulation approach of CDOROM, the likelihood of each simulated scenario is the same so that Formula 4 becomes:

FORMULA 6

$$EL = \frac{1}{N} \sum_{j=1}^{N} L_j$$

In this case, the loss is given by

$$L_j = \max(0, \frac{Tranche\_Notional - PV\_Cash\_Flow_j}{Tranche\_Notional})$$

Source: Moody's Investors Service

For synthetic SF CDOs modeled with CDOROM, the discount rate used to present value is the current swap rate plus the promised spread on the tranche based on its remaining maturity. Therefore, the final expected loss of the synthetic SF CDO tranche is simply the discounted average of the tranche loss across all the scenarios simulated in CDOROM.[20]

For a managed cash SF CDO, the discount rate used is as described in section 3.2.5.1 above.

3.2.6. Associating Expected Losses with Ratings

In this section, we relate the calculated tranche EL to a model output. The model output is considered in conjunction with a variety of qualitative inputs for the rating committee to assign a rating to an SF CDO liability.

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, we select the relevant EL benchmark from our Idealized Expected Loss Rates table. We then compare the tranche's EL results to the EL benchmarks.[21]

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 associated with a given tranche and compare it to the EL benchmark we describe above.[22]

3.2.7. Special Considerations for Hybrid SF CDOs

Hybrid CDOs allow considerable flexibility concerning both the mix of synthetic vs. cash assets and the proportions of different classes within the liability structure. Because the funded rate paid on the super senior tranche after it has been drawn down is significantly higher than the unfunded rate, the most conservative modeling assumption for the liability side is that the super senior class (see Exhibit 4 above) is fully funded. However, since the super senior tranche is very unlikely to be fully funded, analysts may consider the likelihood of funding in the analysis.

3.2.8. Modeling of Event of Default (EOD)

In analyzing an SF CDO, we assess the likelihood of an EOD and the potential outcomes following such an event. To the extent that the EOD can be triggered by a loss of OC or failure to pay interest, we may incorporate this trigger into our modeling analysis. The severity of an EOD is dependent on the specific remedies in the transaction documents. For a discussion of the issues and potential modeling implications, see section 7.6.

3.3. Complementary Analysis

In addition, we may run various scenarios to test the impact on the rated notes of various events, including the following:

» Widespread multi-notch rating changes of all or some of the assets in the portfolio

» Higher pairwise asset correlation

[20] Since the EL for synthetic SF CDOs is based on a simulation process, the convergence of the simulation will depend, in part, on the number of iterations chosen. We apply a 99% confidence interval adjustment to the EL result using a standard error equal to the square root of the EL variance divided by the number of Monte Carlo simulations. If this confidence interval adjustment is significant, a larger number of iterations may be used to reduce the standard error.

[21] 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 the "Loss Benchmarks" section.

[22] The weights we apply to each of the six default-timing scenarios and each of the five interest-rate scenarios are in Appendix 11.

» Stressed recoveries: e.g. 0% recovery on all non-senior tranches in the portfolio and/or 25% haircut on the assumed recovery for senior tranches, or giving some recovery values to Ca rated tranches

» Higher recovery rate correlation: increase correlation assumptions for the stochastic recovery rates

» Various scenarios for WAL of underlying securities

In addition, the largest exposures in the underlying portfolio are further analyzed by further stressing the corresponding default probabilities in some scenarios.

The rating committee considers this complementary analysis together with the model output to reach a conclusion.

3.4. Alternative Analysis for a homogeneous pool of assets

In certain cases, we directly use the cash flows of the underlying assets obtained from a credit rating model to derive the EL of the SF CDO tranches. Instead of using the approach described in the other sections, we apply a "look-through approach." This approach is used only when the underlying pool of assets is homogeneous, i.e., the pool consists of assets that belong to the same asset class, and of similar characteristics and geographic location (US RMBS for example). Furthermore, we utilize this analysis only for SF CDOs that are overcollateralized, i.e., there is no certainty on losses on any of the SF CDO tranches being analyzed. In these cases, each of these cash flows is originated from a credit rating model associated with the analytical framework applicable to the underlying asset class, as described in the relevant methodology. When rating for example an SF CDO backed by US mortgages for which loan by loan information is available we would use the US MILAN and the relevant cash flow models for US RMBS.

4. Additional Considerations for Synthetic SF CDOs

4.1. Funded Synthetic Tranches and Collateral

4.1.1. The Function of Collateral

Collateral plays an important role for funded synthetic tranches. It is used to meet credit protection payments following credit events with respect to the reference pool and to repay principal on the funded tranches at maturity. Earnings from the collateral provide a portion (in addition to the CDS premium) of the coupon paid to investors in the funded tranches.

4.1.2. Additional EL That May be Posed by Collateral

The incremental EL posed to funded tranche investors by the collateral is generally limited by restricting eligible collateral to highly rated and highly liquid instruments and/or mitigated through specific structural features that shift the collateral risks to the CDS swap counterparty (usually with rating triggers to limit counterparty risk). Among the instruments/contracts that have been used as collateral are bank deposits, ABS securities (typically credit card securities), covered bonds, guaranteed investment contracts, repurchase agreements, and total return swaps.

Depending on the extent to which such provisions limit collateral risk, we may model the incremental risk associated with the collateral. In general, the higher the rating of the CDO liability, the more creditworthy and liquid the collateral has to be such that the additional risk is marginal.

Normally, a collateral default would result in an additional termination event under the terms of the CDS and require that any early termination payment due to the counterparty be paid senior to the noteholders. Any recovery amount remaining after such payment would be left to the noteholders. We model the likelihood and consequences of such termination payments.

The loss associated with a senior-ranking termination payment is generally a function of the market's perception of the credit drift of the portfolio and the remaining tenor of the transaction and may exceed our estimation of the protections payments that would otherwise have become payable by the issuer. If for any transaction, there were a material likelihood that the issuer would be required to make a material senior termination payment following collateral default, we would likely cap the rating of the transaction to the rating of the collateral.

Interest-rate and basis swaps have been used when the collateral is denominated in the same currency as the liabilities, but the interest paid on the collateral differs in basis (e.g., fixed vs. floating, government bill rate vs. Libor, 1-month Libor vs. 3-month Libor) from the interest paid on the SF CDO liabilities. In rare cases, the collateral could also be denominated in a different currency from that of the SF CDO liabilities. In this case, the SF CDO normally hedges any currency risk through a foreign exchange swap with a counterparty.

Market value risk associated with the collateral may arise as a result of the liquidation of the collateral, if required to (1) make a credit protection payment, (2) make a payment upon an early redemption of the notes, or (3) make a payment upon the stated maturity of the notes. If the market value risk is not fully hedged or mitigated, then we assess an additional EL, taking into consideration the characteristics of the collateral.

4.2. Counterparty Risk

Any counterparty risk associated with any derivative agreements, including the CDS counterparty, is generally modeled as an additional EL in the same manner as that described for the collateral risk. However, in this case, we take into consideration the severity to the SF CDO from the counterparty defaulting depending on the nature and type of exposure. For example, if the only counterparty risk is that associated with the loss of premium from the CDS counterparty, then the additional EL would reflect the default probability of the counterparty and the loss of accrued premium.

In funded synthetic SF CDOs, the default of a counterparty may also result in a senior-ranking termination payment that is payable by the issuer. We determine the likelihood of such a payment for each transaction given all relevant factors, including (1) the rating and domicile of the counterparty and (2) the existence and enforceability of the priority of payments (including a "flip clause" by which payments to the counterparty are to be subordinated following counterparty default). The loss associated with a senior-ranking termination payment is generally a function of the market's perception of the credit drift of the portfolio and the remaining tenor of the transaction and may exceed our estimation of the protection payments that would otherwise have become payable by the issuer. If for any transaction, there were a material likelihood that the issuer would be required to make a material senior termination payment following counterparty default, we would likely cap the rating of the transaction to the rating of the counterparty as described in section 4.1.2 for collateral risk.

In most cases, structural features are incorporated into the derivative agreements to mitigate such counterparty risks. These are typically in the form of a rating downgrade trigger provision requiring the counterparty to take some action (e.g., collateralize, replace itself, or obtain a guarantee) when the counterparty does not meet the minimum counterparty rating requirement. Our analysis of such structural features takes into consideration, among other factors, the nature of the exposure to the counterparty, the potential for credit migration rates, as well as the type of derivative agreement.

4.3. Settlement and Valuation Procedures

The recovery rate assumptions that we discussed in section 3.1.1 are based on, among other things, the procedures that are applied to value obligations that have been subject to credit events. We check to see that the assumptions used in modeling the recovery rates terms are in line with the terms and conditions in the ISDA confirmations to ensure that the assumptions are indeed warranted by the procedures chosen. We are naturally concerned about valuation and settlement mechanisms that would either add to the volatility of recoveries or bias downward the anticipated recovery rate. A downward bias in recovery could result, for example, from the presence of a cheapest-to-deliver option.

Pay As You Go (PAUG) settlement procedures for an SF CDO's underlying assets are designed to closely mimic the cash flows associated with the holding of physical SF assets within a synthetic framework. That is, the payments under the PAUG CDS can be tailored to match, as closely as possible, payments on a specific reference obligation. Payments may be made by either party to the swap reflecting failures to pay interest or principal, actual or implied write-downs (and their reversals), etc. Thus, under PAUG, multiple settlements are possible.

We believe that it is possible to document CDS referencing SF assets under PAUG settlement in such a way that we need not modify its default and recovery rate assumptions appropriate for the physical holding of SF assets.[23] In other cases (e.g., when "soft" credit events such as a downgrade to Caa2 apply), we may adjust its modeling assumptions to reflect the additional risks coming from the specific transaction documentation.

Despite the almost universal application of PAUG settlement in CDS referencing ABS, most earlier synthetic SF CDOs relied on cash settlement procedures. For these SF CDOs, we still apply the haircuts discussed in section 3.1.1.2 in our monitoring of synthetic SF CDOs.

4.4. Early Redemption of Funded Synthetic SF CDOs

We assess the risk posed to the rated tranches as a result of any potential loss caused by an early redemption of the notes. This may be caused either by an early termination of the CDS under the terms of the schedule to the ISDA master agreement or an EOD under the terms of the transaction documents governing the notes. Any non-negligible incremental EL posed to the rated tranches caused by such early redemption events is added in the same manner described above by taking into consideration the likelihood and severity of the event.

The ISDA schedule contains certain early termination events that would normally include a CDS counterparty default, collateral default, or early redemption of the notes. Also, in particular, any "soft" triggers that would result in a loss to the rated tranches caused by the right of the CDS counterparty to terminate the CDS could either be mitigated or, to the extent quantifiable, included as an additional EL.

In the case of synthetic SF CDOs, an EOD is most likely to occur because of either an early termination of the CDS (that would include a default by the CDS counterparty) or a default of the collateral securing the notes.

For funded SF CDO tranches, if the CDS counterparty is the defaulting party or sole affected party under the terms of the schedule, an early termination payment (excluding pending credit protection payments) owed to the CDS counterparty is generally subordinated to payments due to the rated notes in the transaction's

[23] For a discussion of the issues, see the reference in the previous footnote.

priority of payments. However, we consider the potential shortfall associated with the liquidation of the collateral to pay the outstanding principal plus accrued interest due.[24]

An additional EL reflecting the collateral default risk would be added as described in section 4.1.2.

4.5. Inclusion of Synthetic Assets in Primarily Cash Flow SF CDOs

As we indicated earlier, even primarily cash flow SF CDOs typically include a basket for synthetic securities. In general, we analyze the synthetic basket limitations to see whether it is being used as a mechanism for purchasing collateral that would otherwise be inappropriate for the SF CDO, because of either the nature of the reference obligation or the manager's expertise. The reference obligation typically satisfies the definition of a collateral debt security, though perhaps with some modification of payment frequency, basis, or maturity. Also, any deliverable obligation should satisfy the criteria for a collateral debt security (apart from the fact that the instrument may be defaulted if delivered).

For collateral quality tests and concentration tests, we generally look at the characteristics of the underlying reference assets. However, as described earlier, we may apply default probability and/or recovery rate stresses depending on the credit events and settlement mechanisms applicable. For the WAL, we consider the minimum of the expected maturity of the underlying asset and the synthetic exposure maturity. The payment characteristics (frequency, reference index, and currency) of the asset reflect the terms of the synthetic contract.

A synthetic exposure is generally treated as defaulted if either a credit event has occurred or the counterparty to the synthetic transaction has defaulted.

The adoption of "form-approved" documentation to govern the use of synthetics in primarily cash flow CDOs facilitates both our analysis and CDO management. Form-approved synthetic documentation will set out the process to determine the rating factor and recovery rate to be used in conjunction with such form-approved synthetics. For other synthetics, without form-approved documentation, the issuers typically request a rating factor and recovery rate from rating agencies upon entering into the contract. The SF CDO notifies us when it enters into contracts using form-approved documentation.

Excessive CDS counterparty exposures could pose additional risks to the CDOs. We believe that counterparty concentration limits of the type listed in Appendix 5 would limit the risks posed to the SF CDO from potential synthetic counterparty defaults. Additional exposure would need to be modeled or mitigated. When a default by the synthetic exposure's counterparty triggers a termination payment due by the SPV, such payment is generally junior in the waterfall to any payment due to the rated notes. If such termination payment is not junior, the additional risk would have to be modeled. Any collateral posted by the SPV under a CDS contract should satisfy the definitions of eligible investment, and be redeemable on demand at par.

5. Liability Tranches with Special Characteristics

We have so far addressed the modeling of typical cash SF CDO liability tranches and synthetic tranches that may be funded or unfunded. The ratings of some special liability types require additional discussion.

[24] This calculation is performed outside CDOROM and is manually input into CDOROM.

5.1. Short-Term (or Money Market) Tranches

The short-term ratings that we assign to short-term SF CDO tranches rest primarily on the presence of a counterparty committed to purchasing the instruments if the debt cannot be fully sold at a spread below the maximum contractual level. We analyze the transaction documents for any "outs" to funding that may be inconsistent with the target rating.

5.2. Unfunded and Revolving Liabilities

As we observed earlier, the super-senior tranches of hybrid CDOs may have funded and unfunded components. In general, unfunded liabilities provide flexibility to the manager for asset purchases, particularly during the SF CDO's ramp-up period. We commonly assign ratings to unfunded liabilities upon the closing of the SF CDOs. We analyze such tranches (which may affect the ratings of other SF CDO tranches) by considering cases in which the tranches are fully funded.[25]

Revolving notes are often issued to provide funding for revolving assets. If there are circumstances under which the SF CDO has to rely on such funding, rather than cash reserves, to avoid liquidity shortfalls, SF CDO documents will include provisions that purchasers of revolving notes have high ratings. If the rating of the purchaser falls to P-1 under review for 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 drawdown of the facility by the SF CDO.

5.3. SF CDO Liabilities That Mature before Other Tranches

In some cases, SF CDOs may issue liabilities that mature before some of the assets in the pool, while other liabilities are scheduled to mature after all assets. We will then test the potential for an EOD that may occur if the principal on the shorter-term liabilities cannot be paid in full by their maturities. One mitigant to such risk that is used by some CDOs is the inclusion of OC tests that assess whether there is sufficient par coverage for shorter-lived tranches when considering only the par value of assets that mature before these shorter-lived liabilities.

5.4. Wrapped Liabilities

Some SF CDO liability tranches are guaranteed by a third party, typically a monoline insurer. To the extent that the guarantee is irrevocable, first demand[26] and unconditional (or can only be revoked under extremely unlikely circumstances), the tranche will be rated according to the cross-sector methodology for wrapped tranches, mainly at the higher of the guarantor's rating and the "rating" of the underlying tranche without the benefit of the guarantee. See Moody's Related Publications for our methodology on credit substitution.

5.5. Instruments That Combine SF CDO Secured Debt and Equity

We are sometimes asked to rate instruments that are backed by one or more of the SF CDO's debt tranches, and sometimes also the equity tranche. Detailed discussions on the quantitative approach to rate these types of securities appear in Appendix 8.

5.6. SF CDO Pass-Through Instruments

Some SF CDOs issue instruments that simply pass through all the cash flows of two or more SF CDO 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

[25] The fully funded case is normally the more stressful assumption. See the discussion for funded vs. unfunded super-senior tranches in section 3.2.7 above.

[26] "First demand" means that the guarantor must pay on demand by the guaranteed party; in particular, the guarantor has no right to check first whether the amount requested by the guaranteed corresponds to what should actually be paid. Rather, the guarantor must pay first and may make claims only after doing so.

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 Cumulative Expected Loss Rates table, based on the instrument's WAL, to determine if the EL results are consistent with the target rating.[27]

6. Assets with Special Characteristics

In the modeling approach that we have described so far, we have distinguished primarily between synthetic and cash collateral types. Within these broad categories, an SF CDO may purchase instruments that require particular treatment.

Note that the concentration limitations and other provisions discussed in this section are standardized; any transactions with concentration allowances greater than those presented in the following subsections, or that otherwise fail to conform to the provisions discussed later, may be analyzed to account for any additional risks.

6.1. Lower-Rated Obligations

SF CDOs were typically structured to purchase investment-grade credits. We look for par haircuts in OC test calculations for lower-rated credits for it to be able to give full modeling credit to the cash diversions triggered by the OC test.

SF CDO market practice typically entailed concentration limits on the purchase of such lower-rated securities. Par haircuts are typically imposed for buckets that exceed these limits.

For synthetics that include OC tests, these rating-based concentration limits generally apply to the reference instruments in the same way.

As mentioned above, if we believe that the risks associated with lower-rated instruments have not been adequately addressed, analysts will consider modeling the SF CDO as if the OC tests are not present during all or part of the life of the CDO.

6.2. Defaulted or Impaired Securities

The SF CDO may at times hold defaulted assets. Defaulted assets are typically excluded from the SF CDO's collateral quality and concentration tests.

For the SF CDO's OC tests, the par value of a defaulted security is its assumed recovery rate, which is normally the lesser of the relevant Moody's recovery rate and its current market value. Market value should be defined such that it is arms-length and at fair market value. Typically, it is based on either a poll of dealers' bid-side quotes or a bid price from an independent pricing service. However, some SF CDO indentures allow for a par value equal to the lesser of Moody's recovery rate and a self-marked value for a period of up to 30 days after default. After this period, the par value of the defaulted security is reflected at zero in the OC tests until the market value is available from objective sources.

Some SF CDOs permit the purchase of defaulted securities (as well as Caa-rated collateral and credit-impaired securities) on a strict replacement basis. As long as any such purchases are subject to certain

[27] 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 the "Loss Benchmarks" section.

criteria, including percentage and credit quality limitations, they would not necessarily introduce incremental risk.

On a case-by-case basis, committees will evaluate additional scenarios for the assumed recovery rate for defaulted and Ca-rated assets when they generate interest or principal cash flows.

6.3. Long-Dated Assets

"Long-dated assets" that mature beyond the maturity dates of the (cash flow or hybrid) SF CDO liabilities present liquidation risk to the SF CDO. Depending on the duration of the assets and the extent to which they are scheduled to mature beyond the rated liabilities, we usually assume some liquidation values for these assets. The value may be as low as or lower than Moody's recovery rate for the relevant instrument type.

Long-dated assets may also be subject to par haircuts within the SF CDO's OC tests. If so, we will generally conduct a sensitivity analysis by modeling cases in which the long-dated asset basket is full throughout the reinvestment period, only at the end of the reinvestment period, or is less than full.

We consider both the likelihood that long-dated assets will remain outstanding at the maturity of the CDO's liabilities and the range of prices at which they are likely to be liquidated.

6.4. PIKable, Step-Up/Step-Down, and Less Frequently Paying Assets

Assets that are pay, or are payable, "in-kind" (PIK or PIKable), or pay interest at a lower frequency than the frequency at which the SF CDO pays its liabilities present potential liquidity concerns. SF CDOs are generally unable to purchase assets that are paying in kind at the time of purchase, but there is typically no prohibition against acquiring assets – including, especially, tranches from other CDOs – that may subsequently PIK. Interest paid in kind is usually given no credit toward satisfaction of the WAS test; in effect, the potential shortfall in the spread on these assets has to be offset by additional spread on the SF CDO's other assets. Once an instrument begins to PIK, it is generally treated as defaulted in the OC tests if it is rated Baa3 or higher and has paid in kind for the lesser of a year and two payment periods, or if it is rated Ba1 or lower and has paid in kind for the lesser of six months and one payment period. If this provision is not included in the transaction documents, we will consider modeling the SF CDO as if the OC tests were not present.

The risks associated with PIKable assets should be either mitigated or modeled. Because it is very difficult to model PIKing of the underlying assets, the typical approaches to minimizing the risk are (1) to limit the basket for PIKable instruments while we assume for modeling purposes that the entire basket will indeed PIK from the outset of the transaction or (2) include a liquidity swap from a highly rated counterparty that will cover any shortfall in payments to the CDO.

Less frequently paying assets are those that are scheduled to pay interest less frequently than the SF CDO's liabilities. Like PIKable instruments, they present a risk that the assets will not generate sufficient interest to pay coupons on the CDO's non-PIKable liabilities. The liquidity risk that such assets present needs to be modeled or mitigated. Some transactions have used mitigants that include a small basket limitation for these assets, the maintenance of cash reserve/interest smoothing accounts, a timing swap, and/or a limitation on the proportion of interest payments due in any single SF CDO payment period.

"Step-up" and "step-down" instruments have coupons or spreads that are scheduled to increase or decrease over time, respectively. We typically model step-up instruments as if they are treated at their current

coupons or spreads in the WAC and WAC tests and will model the assets in this way. By contrast, step-down instruments are treated as if their coupons or spreads are always at the minimum scheduled values.

7. Other Structure and Documentation Issues

7.1. Cash Flow and Hybrid SF CDO Issues Relating to Closing Date, Effective Date, and Ramp-Up Provisions

7.1.1. Pool Criteria and Interim Tests

The various structural features discussed later give us comfort that our modeling can reasonably reflect the risks borne by SF CDO investors. In the extreme, deviations from the practices discussed here could make it impossible for us to rate an SF CDO because it may become impossible to adequately analyze the resulting risks. In other cases, adjustments to our modeling assumptions may compensate for the different handling of these structural issues.

On the closing date of the SF CDO, an accountant's certificate listing the schedule of collateral debt securities (i.e., the obligations acquired by the SF CDO during ramp-up) and indicating whether coverage and quality tests are satisfied at closing should be provided. A certificate should also be provided on the effective date, referencing the effective date criteria.

Depending on the length of the ramp-up period and the proportion of collateral assets purchased relative to the target par by the closing date, interim ramp-up tests are typically incorporated into the transaction documents. We will assess the risk that the effective date covenants may not be met considering any interim tests that may mitigate this risk. Other factors that are considered are any significant differences between the closing date and effective date collateral quality criteria and the absence of a successful history of ramping up CDOs by the manager.

Such interim tests typically address the purchase price paid for collateral acquired, asset par acquired, WARF, MAC, WAS, etc. During the ramp-up period, we may take rating action if the interim tests or the effective date covenants are not met or if the issuer does not take any action to cure the test violation.

7.1.2. Distribution of "Excess" Cash on the Effective Date

Managers may choose to distribute unused offering proceeds to equity investors at the end of the ramp-up period. SF CDO indentures typically include certain criteria to avoid premature distributions that might introduce unmodeled risks to holders of rated notes.

These criteria may include the following: (1) Collateral quality tests (particularly the WARF and rating-basket concentration covenants) are met before and (on a *pro forma* basis) after the first payment date; (2) the most junior OC test ratio is at least as great as on the effective date after giving effect to the distribution; and (3) the amount of such distribution should be limited to a very small percentage of the deal total amount.

7.2. Defining Interest and Principal Proceeds

Because interest proceeds and principal proceeds are usually treated differently in SF CDO waterfalls, their definitions may have important impacts on the distribution of cash flows. In general, interest proceeds to the SF CDO are derived from interest and CDS premia received from the SF CDO assets, while principal

proceeds are derived from prepayment, repayment, and redemption of principal from the SF CDO assets.[28] The paragraphs below reflect our views on some potential issues that can arise concerning these definitions.

7.2.1. Interest Proceeds

For defaulted securities, only recovery proceeds in excess of par are usually classified as interest proceeds. Any interest received is typically considered principal proceeds unless and until 100% of par has been recovered.

Some transactions seek to treat "trading gains" as interest proceeds instead of principal proceeds. There is a concern that if trading gains do not remain in the transaction as principal proceeds and are flushed out through the waterfall as interest proceeds, there may be an incentive for the purchase of assets trading significantly below par. By the time these obligations deteriorate or default, any trading gains that could offset their losses would no longer be available. Most transactions include provisions to mitigate such risk. In particular, trading gains are usually measured as the sale price minus the greater of par and the purchase price. Other typical mitigants generally incorporated in the transaction documents are the following: (1) Trading gains are not classified as interest until one year after the effective date, so that they cannot be distributed during that period; (2) there are typically collateral quality tests (at a minimum, the WARF test) that must be met after the release of the gains through the interest waterfall; (3) the rating-related basket concentration limits should be in compliance post release; (4) the junior-most OC test should equal or exceed its effective date level post release; and (5) release of proceeds do not occur if the senior-most notes have been downgraded or the mezzanine notes have been downgraded by more than one notch.[29]

7.2.2. Principal Proceeds

If the manager uses principal proceeds to purchase accrued interest, the amounts are typically not be classified as interest proceeds. When interest is received on such assets, the amounts usually continue to be classified as principal proceeds.[30] If the asset defaults before making its interest payment, or if the next payment is due after the SF CDO's next payment date, excess interest is typically reclassified as principal proceeds to the extent of principal proceeds used to purchase accrued interest on the instrument.

7.3. Eligible Investments

The SF CDO may, from time to time, place uninvested cash in eligible investments. We believe that the criteria for eligible investments should minimize the deal's exposure to credit, market value, and counterparty risk. See Related Research for our methodology on eligible investments.

7.4. Fees and Expenses

7.4.1. Uncapped Senior Fees

We are concerned whenever fees to third parties (e.g., managers, trustees, hedge counterparties, and insurers) are uncapped. Open-ended expenses, especially related to indemnification, could threaten the interests of holders of rated notes to the extent that the fees are senior in the waterfall to payments on rated notes. It is also almost impossible to accurately model the potential fees without a cap. SF CDOs usually address this risk by stipulating a cap on any fees that are senior to the rated note payments. If the transaction includes a cap, we model the fees/expenses at the capped amounts in our cash flow model. Nonetheless, a typical SF CDO waterfall provides for payment of expenses that exceed the cap. These

[28] Generally, interest proceeds may also include 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 may 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.

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

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

payments are generally junior to payments that directly affect the rated notes but are senior to payments to the equity.

7.4.2. Management Fees

Fees paid to SF CDO managers are typically two-fold: a senior and a subordinated management fee. For cash SF CDOs, the senior management fee is generally senior to the rated notes in the payment waterfall, while the junior management fee is normally subordinated to the rated notes. For synthetic SF CDOs, the management fees can take one of several forms. A typical arrangement is the payment of senior fees based on the outstanding rated notes, while junior fees are paid on a theoretical tranche junior to the rated notes.

Should the SF CDO perform poorly, the subordinated fees will most likely be cut off. Should this occur, the ability of the SF CDO to attract a replacement manager will depend on the adequacy of the senior fees. Most transactions mitigate this risk by including a "springing" senior fee that would be paid only if a replacement is needed, generally with the consent of noteholders. This type of arrangement is usually documented in the original transaction documents.

7.5. Trading and Reinvestment Issues

7.5.1. Trading

SF CDO indentures normally give the manager discretion to classify assets as credit improved or credit impaired. An objective standard typically applies if any senior notes have been downgraded, or any mezzanine notes have been downgraded by more than one notch. Objective criteria commonly include a change in rating (including placement on rating review) or a price/spread change that is consistent with at least a one-notch change in rating.[31] With noteholder approval, the manager's ability to use its discretion may be restored. A further downgrade of the rated notes typically stops the manager from using its discretion, unless noteholders vote to reinstate it again.

Since the full ability to designate instruments as credit improved or credit impaired effectively provides complete discretionary trading, similar rules normally apply to discretionary trading itself. That is, the manager usually can undertake discretionary sales, typically up to 20% per year, unless a senior note has been downgraded or a mezzanine note has been downgraded by at least two notches. Discretionary trading may be restored with noteholder approval, but another vote should take place if the notes have been downgraded by a further two notches.

Some managers have sought the ability to enter into "basket trades," in which the criteria that apply to individual trades instead apply to groups of collateral assets. If such a provision is incorporated in an SF CDO indenture, then a "maintain or improve" condition is normally attached. To preserve the "maintain or improve" concept for basket trades, (1) the period for a given basket trade is typically limited to one day; (2) the percentage of the portfolio that may be sold and reinvested in a single basket trade is limited (to, say, 5% of total par), and the period limit for a given basket trade is limited to 20 days; and (3) there is usually a suspension of further basket trading if a prior basket trade fails the "maintain or improve" objective.

7.5.2. Reinvestment

We want to ensure that our modeling of SF CDO risks is consistent with the rules that govern trading and reinvestment.

For example, if the SF CDO indenture permitted reinvestment of principal proceeds between payment dates, then it would be inconsistent for our cash flow model to assume that all principal proceeds (including

[31] The spread change is typically measured vis-à-vis an appropriate, widely used index.

amortization and recovery amounts) are available in the waterfall for on each payment date. Rather, the model would assume that all principal proceeds have been reinvested immediately upon receipt.

Under our standard modeling framework, reinvestments of principal proceeds from sales and unscheduled principal proceeds are assumed not to deteriorate the various measurements of the portfolio (e.g., collateral quality tests). Also, reinvestment of sale proceeds from credit-improved security sales or discretionary sales or unscheduled or scheduled principal proceeds are expected not to deteriorate par. Additionally, proceeds from sales of credit-impaired securities are expected to be reinvested such that the par amount of the reinvestment collateral is no less than the amount of the sale proceeds. If any of the above does not hold, our analysis considers these exceptions.

As we noted in section 3.2.4.4 above, some SF CDOs permit limited reinvestment of unscheduled principal proceeds and proceeds of credit-impaired/credit-improved sales after the reinvestment period ends. Such reinvestment is typically restricted to cases in which, after giving effect to the proposed reinvestment, the WARF test and junior-most OC test would be met. Also, we check to see whether the reinvestment would result in a lengthening of the SF CDO's remaining WAL. Finally, these post-reinvestment period reinvestments are typically only allowed by the SF CDO indenture if the SF CDO's senior notes have not been downgraded and the junior notes have not been downgraded by more than one notch.

7.6. Treatment of Events of Default

Upon an EOD, the controlling parties as defined by the SF CDO indenture (e.g., one or more classes of senior noteholders or sometimes each class of noteholders voting separately) may choose to do nothing, to accelerate the transaction (so that all the notes become due and payable and reinvestment ends), or to liquidate the collateral portfolio. In most cases, this amounts to full control of the transaction by the most senior class.

In analyzing an SF CDO, we assess the likelihood of an EOD and the potential outcomes following such an event. To the extent that the EOD can be triggered by a loss of OC or failure to pay interest, we may incorporate this trigger into our modeling analysis. The severity of an EOD is dependent on the specific remedies in the indenture.

Committees have the discretion to assign a rating no higher than A1 if EOD risk appears meaningful in a given transaction, no higher than Baa1 if EOD risk is material, and no higher than Ba1 once the transaction has experienced an EOD but has yet to elect a liquidation of assets. Another cap would limit ratings to no greater than B1 if liquidation were to be chosen as a remedy. Caps may be modified or not applied based on a committee's review of the particular facts of a given transaction under its review. These factors include structural features that are specific to the transaction, type and thickness of senior tranches, nature, and type of collateral underlying the portfolio, and the type of deal.

7.7. Domicile of Obligor

The domicile of the obligor associated with a collateral asset may have important impacts on asset correlation assumptions and concentration calculations. For SF CDOs, the transaction documents refer to the country in which the assets backing the SF tranches are located.

7.8. Documentation and Legal Opinion Review

Our overall assessment of the legal structure of the SF CDO typically includes a review of numerous documents, including, as applicable, the indenture, collateral management agreement, trust deed, swap documentation, other transactional agreements, and several legal opinions provided by various law firms to the issuer and the arranger. The standard legal opinions delivered in almost every SF CDO 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 SF CDO.

In our review of the SF CDO's documents and opinions, we seek to identify any features, ambiguities, or incentives that could result in the SF CDO 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 an SF CDO, as the legal documentation describes. If the documentation language is vague, we generally will adopt a more conservative reading of the document to ensure that alternative interpretations do not render its analysis inadequate.

8. Assessing the Roles of the Collateral Manager and Other Parties to the SF CDO

8.1. Collateral Manager

8.1.1. Collateral Manager Review

We assess the potential impact of the manager on SF CDO performance by considering the ability of the firm to manage a CDO and its underlying assets by evaluating the performance of the manager's previously rated SF CDOs and by considering the documents that define the manager's role for the proposed SF CDO.

We normally conduct an operations review of the manager, which may include a discussion with the manager of their staffing, history, credit policies and procedures, systems, and their understanding of the SF CDOs they have under management, among other things. We also consider the presence or absence of any "key man" issues and whether the manager (if a U.S. entity) is a Registered Investment Advisor[32] (and, if so, any questions posed by the manager's Form ADV). Also, we consider whether or not the manager has been audited and if any irregularities have been discovered in such audits. Any outstanding matters of controversy that could affect the ability of the manager to perform its duties will be discussed in a rating committee, including the potential for changes in staffing and incorporate control of the managing firm.

We normally present the performance record of the manager in previous SF CDOs to the rating committee. The focus will be on the manager's adherence to the management agreements that governed earlier transactions, the manager's handling of the conflicting interests of equity and debt investors, and the manager's adherence to the "spirit" of previous SF CDO indentures (e.g., observance or circumventing of transaction tests).

8.1.2. Collateral Management Agreement

How the manager will carry out its duties for the SF CDO depends, in part, on the provisions of the collateral management agreement (CMA). We believe that the following elements in the CMA are relevant in its analysis of a CDO transaction:

» The standards of care and liability of the manager

» The conditions governing termination of the manager

» The provisions for dealing on an arms-length basis

[32] A Registered Investment Advisor (RIA) is an entity that advises others with respect to the valuation of securities and advisability of investing in securities. RIAs receive management fees, rather than commissions on trades. In accordance with the Investment Advisors Act of 1940, RIAs must register with the US Securities and Exchange Commission annually.

A strong CMA would generally include the provisions described below.

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 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 is prompted by the resolution of a single class of noteholders, rather than effected through the votes of several classes of noteholders, to avoid delay in or blocking of such removal. There may also be circumstances under which the noteholders can remove the manager without showing cause, subject to a majority/super-majority vote. The manager (or any of its affiliates and any accounts for which the manager holds a discretionary mandate) is not allowed to vote on its termination for cause or on naming a replacement manager following such termination.

In any case, the replacement process of the manager is resolved with a prevailing decision of the controlling class or the trustee or, provided sufficient trials have been given to the controlling class, to court.

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

8.2. Trustee and Collateral Administrator

Our analysis looks to whether or not the trustee/collateral administrator (the trustee) is capable of carrying out its responsibilities for the SF CDO. The answer will depend, in part, on the experience of the trustee in handling assets of the type to be held by the SF CDO and its experience in playing the same role in other SF CDOs.

The trustee should be able to independently make its judgments in determining whether or not an action is materially prejudicial to noteholders.

One of the most important responsibilities of the trustee is to report on compliance of the SF CDO with the many requirements of the SF CDO indenture. At a minimum, noteholders should expect to receive the report monthly from the trustee, including:

- measured levels vs. covenanted levels for all coverage tests, collateral quality and concentration criteria, 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 collateral pool, including trading history
- notional amounts of any hedges
- account balances
- note balances
- the "rated balance" for any combination securities

For each payment date, noteholders should receive all the items listed above plus details of payments applied following the waterfall.

We also ask to receive prompt written notice of any redemption so that ratings can be withdrawn on a timely basis.

8.3. Auditor

As noted in section 7.1.1, the auditor typically certifies compliance with SF CDO indenture covenants on the closing date, the effective date, and any interim test dates. The auditor should audit the accounts of the SF CDO issuer on at least an annual basis and provide the results to the trustee.

The auditor will also perform certain agreed-upon procedures (such as closing date/effective date confirmations). We do not make any judgments as to the sufficiency of auditing procedures. Rather, that responsibility rests with the parties to the SF CDO indenture.

9. Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of securities backed by structured finance assets. We evaluate the risk following our cross-sector methodology that describes our general principles for assessing ESG issues[33] and may incorporate it in our analysis.

10. Monitoring

Our approach to monitoring the ratings of outstanding SF CDO transactions is generally similar to the approach we use to assign initial ratings, except for those elements of the methodology that become less relevant over time or are not expected to change. Certain components, such as reviews of legal structures of existing transactions or true sale opinions, are static and will generally not be re-reviewed unless circumstances warrant.

We track the transaction's performance trends (e.g., significant credit migration, change in par coverage) as well as the actual development and characteristics of the deal (e.g., pay down amounts, portfolio trading, or changes in waterfall resulting from the declaration of EOD, acceleration or liquidation). A meaningful change in any transaction feature or performance may trigger a review of the transaction. We may also incorporate additional scenario runs, such as examining the impact of potential sales of assets and the associated deleveraging, as alternative scenarios to consider for our assessment of SF CDO ratings. Alternatively, we may focus our analysis on asset coverage ratios for transactions with undercollateralized tranches or transactions with few remaining performing assets.[34]

We will not maintain ratings on an SF CDO transaction if the principal balance of performing assets in the collateral pool without a Moody's rating, a credit estimate, or a structured credit assessment exceeds 20% of the Moody's-defined performing par amount.

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

[34] 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.

11. Loss Benchmarks

In evaluating the model output for SF CDOs, we select loss benchmarks referencing the Idealized Expected Loss table[35] 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 7

$$[1]\ Rating\ Lower\ Bound_R = Idealized\ Expected\ Loss_{R-1}$$
$$[2]\ Initial\ Rating\ Upper\ Bound_R = Idealized\ Expected\ Loss_R$$
$$[3]\ Current\ Rating\ Upper\ Bound_R = exp\{0.5 \cdot log(Idealized\ Expected\ Loss_R) + 0.5 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

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-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

[35] 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.

Appendix 1: Moody's Recovery Rate Assumptions for SF CDO and CRE CDO Collateral

EXHIBIT 5

All SF Categories (excluding CMBS and SF CDOs*)

	Min %	Max %	Aaa	Aa	A	Baa	Ba	B	Caa	Ca/C**
Most Senior Tranches	50.0%	100.0%	65.0%	60.0%	60.0%	60.0%	45.0%	45.0%	30.0%	0.0%
Non-most Senior Tranches	10.0%	50.0%	40.0%	35.0%	35.0%	25.0%	25.0%	25.0%	0.0%	0.0%
	5.0%	10.0%	25.0%	20.0%	20.0%	15.0%	15.0%	15.0%	0.0%	0.0%
	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Moody's Investors Service

EXHIBIT 6

CMBS

	Min %	Max %	Aaa	Aa	A	Baa	Ba	B	Caa	Ca/C**
Most Senior Tranches	70.0%	100.0%	85.0%	80.0%	65.0%	55.0%	45.0%	30.0%	30.0%	0.0%
Non-most Senior Tranches	10.0%	70.0%	75.0%	70.0%	55.0%	45.0%	35.0%	25.0%	0.0%	0.0%
	5.0%	10.0%	65.0%	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	0.0%
	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Source: Moody's Investors Service

EXHIBIT 7

CRE B-Notes and Junior Participations

	Min %	Max %	Aaa	Aa	A	Baa	Ba	B	Caa	Ca/C**
Tranche as % of Capital Structure***	70.0%	100.0%	85.0%	80.0%	65.0%	55.0%	45.0%	30.0%	0.0%	0.0%
	10.0%	70.0%	75.0%	70.0%	55.0%	45.0%	35.0%	25.0%	0.0%	0.0%
	5.0%	10.0%	65.0%	55.0%	45.0%	35.0%	25.0%	15.0%	0.0%	0.0%
	2.0%	5.0%	55.0%	45.0%	35.0%	30.0%	20.0%	10.0%	0.0%	0.0%
	0.0%	2.0%	45.0%	35.0%	25.0%	20.0%	10.0%	5.0%	0.0%	0.0%

Source: Moody's Investors Service

EXHIBIT 8

CRE Mezzanine Interests and Preferred Equity

	Min %	Max %	Aaa	Aa	A	Baa	Ba	B	Caa	Ca/C**
Tranche as % of Capital Structure***	70.0%	100.0%	80.0%	75.0%	60.0%	50.0%	40.0%	25.0%	0.0%	0.0%
	10.0%	70.0%	70.0%	65.0%	50.0%	40.0%	30.0%	20.0%	0.0%	0.0%
	5.0%	10.0%	60.0%	50.0%	40.0%	30.0%	20.0%	10.0%	0.0%	0.0%
	2.0%	5.0%	50.0%	40.0%	30.0%	25.0%	15.0%	5.0%	0.0%	0.0%
	0.0%	2.0%	40.0%	30.0%	20.0%	15.0%	5.0%	0.0%	0.0%	0.0%

Source: Moody's Investors Service

EXHIBIT 9

CRE Second Mortgages

	Min %	Max %	Aaa	Aa	A	Baa	Ba	B	Caa	Ca/C**
Tranche as % of Capital Structure***	70.0%	100.0%	90.0%	85.0%	70.0%	60.0%	50.0%	35.0%	0.0%	0.0%
	10.0%	70.0%	80.0%	75.0%	60.0%	50.0%	40.0%	30.0%	0.0%	0.0%
	5.0%	10.0%	70.0%	60.0%	50.0%	40.0%	30.0%	20.0%	0.0%	0.0%
	2.0%	5.0%	60.0%	50.0%	40.0%	35.0%	25.0%	15.0%	0.0%	0.0%
	0.0%	2.0%	50.0%	40.0%	30.0%	25.0%	15.0%	10.0%	0.0%	0.0%

* For assets in the portfolio that are SF CDOs, we will assume a recovery rate mean of 15% for the most senior tranches rated Baa and above and 0% recovery for other tranches.

** Ca/C rated assets can be subject to ad hoc adjustments in their recovery rate analysis depending on the observed evolving cash flow patterns.

*** Tranche includes any interest that is pari-passu and secured either (1) by the same commercial mortgage, (2) by an interest in an entity related to the same commercial property, or (3) by the same property.

Source: Moody's Investors Service

EXHIBIT 10

CRE Whole Loans and Whole Loan Participations

Property Type	RR
Industrial, Multifamily, and Anchor Retail Properties:	60.0%
Office and Unanchored Retail Properties:	55.0%
Hospitality and Healthcare Properties:	45.0%
All other property types:	40.0%

Source: Moody's Investors Service

EXHIBIT 11

REIT

Rating difference between obligation and SU	RR
+2 or more	60.0%
+1	50.0%
0	45.0%
-1	40.0%
-2	30.0%
-3 or less	15.0%
Obligation = C/Ca	25.0%

Source: Moody's Investors Service

Appendix 2: Recovery Rate Stresses for Synthetic SF Collateral When Cash Settlement Applies

For synthetic SF collateral, we apply the following liquidity adjustments to our mean recovery rate assumptions in cases where cash settlement (rather than PAUG) applies:

EXHIBIT 12

Liquid Adjustments (1-Haircut) as a % of Cash Resecuritization Recovery Rates

Time to Settlement	Liquid Securities	Illiquid Securities
3 Months	25%	15%
6 Months	75%	50%
1 Year	95%	65%
2 Years	100%	90%

Source: Moody's Investors Service

The liquid/illiquid categories are shown in the table below:

Liquid securities

Only the senior-most funded tranches* of the following asset types:

- automobile ABS**
- cash flow corporate CLOs
- CMBS (all categories)
- credit card ABS**
- European consumer loan ABS*
- government ABS***
- RMBS (all categories)
- REITs (all categories)
- student loan ABS**

* Unfunded super senior tranches of synthetic transactions may also be considered liquid.

** Securitizations of subprime assets in the above categories should not be considered as liquid.

*** Government ABS include most government guaranteed ABS as well as most ABS where the selling entity of the asset is a government (e.g., Italian Government ABS).

Appendix 3: Resecuritization Stress Factors

EXHIBIT 13

Resecuritization Stress Factor (Applied to Default Probabilities)

Moody's Sector Code	Sector Name	Aaa	Non-Aaa
136	ABS - Consumer - Cons.ABS - Auto	6	2
137	ABS - Consumer - Cons.ABS - Credit Card and other Consumer Unsecured Loans	6	2
138	ABS - Consumer - Cons.ABS - Student Loans	6	2
139	ABS - Consumer - RMBS - Prime	6	2
140	ABS - Consumer - RMBS - Subprime	6	2
141	ABS - Consumer - RMBS - CDO of RMBS	12	4
142	ABS - Consumer - RMBS - Manufactured Housing	6	2
143	ABS - Consumer - Div.SF.CDO - CDO of SF - Diversified	12	4
152	ABS - Corporate - CRE - CMBS - Credit Tenant Lease	6	2
153	ABS - Corporate - CRE - CRE CDO	12	4
154	ABS - Corporate - CRE - CMBS - Diversified	6	2
155	ABS - Corporate - CRE - CMBS - Office	6	2
156	ABS - Corporate - CRE - CMBS - Retail	6	2
157	ABS - Corporate - CRE - CMBS - Hotel	6	2
158	ABS - Corporate - CRE - CMBS - Industrial	6	2
159	ABS - Corporate - CRE - CMBS - Nursing Home	6	2
160	ABS - Corporate - CRE - CMBS - Residential/Multi-Family	6	2
161	ABS - Corporate - CRE - CMBS - Warehouse / Self-storage	6	2
162	ABS - Corporate - CRE - CMBS - Healthcare	6	2
163	ABS - Corporate - Specific - Tax Lien	6	2
164	ABS - Corporate - Specific - Mutual Fund Fees	6	2
165	ABS - Corporate - Specific - Structured Settlement	6	2
166	ABS - Corporate - Specific - Utility Stranded Cost	6	2
167	ABS - Corporate - Specific - Big Ticket Lease	6	2
168	ABS - Corporate - Specific - IP (including Entertainment Royalties)	6	2
169	ABS - Corporate - Specific - Dealer's Floorplan	6	2
170	ABS - Corporate - Specific - Tobacco Bonds	6	2
171	ABS - Corporate - Corp.CDO - Market Value CDO & CDO^2	12	4
172	ABS - Corporate - Corp.CDO - CDO exposed to IG	6	2
173	ABS - Corporate - Corp.CDO - CDO exposed to HY	6	2
174	ABS - Corporate - Corp.CDO - CDO exposed to EM	6	2
175	ABS - Corporate - Corp.CDO - ABS or CDO exposed to SME risk	6	2
176	ABS - Corporate - Corp.CDO - CDO - Franchise Loans	6	2

Source: Moody's Investors Service

Appendix 4: Asset Correlation Framework

EXHIBIT 14

Definition of Sectors, Key Agents, and Corresponding Asset Correlation Factors

						Correlation 'Tree'				Additional Factors	
Moody's Sector Code	Sector Name	Map to, for correlation only	Key Agent	Key Agent Penalty (same broad cat)	Assume Managed unless specified?	Global	Meta Consumer	Broad Consumer ABS	Narrow 5.00%	CLO	Real Estate
136	ABS - Consumer - Cons.ABS - Auto	136	Originator/ Servicer	15%	FALSE		5.00%	5.00%	7%	0%	0%
137	ABS - Consumer - Cons.ABS - Credit Card and other Consumer Unsecured Loans	137	Originator/ Servicer	15%	FALSE			Same Country	7%	0%	0%
138	ABS - Consumer - Cons.ABS - Student Loans	138	Originator/ Servicer	15%	FALSE			5.00%	7%	0%	0%
139	ABS - Consumer - RMBS - Prime	140	Originator/ Servicer	15%	FALSE		Same Country	RMBS	0%	0%	5%
140	ABS - Consumer - RMBS - Subprime	140	Originator/ Servicer	15%	FALSE	from above	10.00%	7.00%	0%	0%	5%
141	ABS - Consumer - RMBS - CDO of RMBS	140	Arranger	15%	FALSE	3.00%		Same Country	0%	0%	5%
142	ABS - Consumer - RMBS - Manufactured Housing	140	Originator/ Servicer	15%	FALSE			5.00%	0%	0%	5%
143	ABS - Consumer - Div.SF.CDO - CDO of SF - Diversified	143	Manager/ Arranger if static	20%	TRUE			Div.SF. CDO	7%	0%	5%
144	ABS - Corporate - CRE - REIT - Hotel	144	NA	0%	FALSE			5.00%	12%	0%	5%
145	ABS - Corporate - CRE - REIT - Multi family	145	NA	0%	FALSE			Same Country	12%	0%	5%
146	ABS - Corporate - CRE - REIT - Office	146	NA	0%	FALSE			5.00%	12%	0%	5%
147	ABS - Corporate - CRE - REIT - Retail	147	NA	0%	FALSE				12%	0%	5%
148	ABS - Corporate - CRE - REIT - Industrial	148	NA	0%	FALSE				12%	0%	5%
149	ABS - Corporate - CRE - REIT - Healthcare	149	NA	0%	FALSE			CRE	12%	0%	5%
150	ABS - Corporate - CRE - REIT - Self-storage	150	NA	0%	FALSE			5.00%	12%	0%	5%
151	ABS - Corporate - CRE - REIT - Diversified	151	NA	0%	FALSE			Same Country	2%	0%	5%
152	ABS - Corporate - CRE - CMBS - Credit Tenant Lease	152	NA	0%	FALSE			5.00%	12%	0%	5%
153	ABS - Corporate - CRE - CRE CDO	153	Manager/ Arranger if static	20%	FALSE		Corporate Related		12%	0%	5%
154	ABS - Corporate - CRE - CMBS - Diversified	154	NA	0%	FALSE		5.00%		2%	0%	5%
155	ABS - Corporate - CRE - CMBS - Office	155	NA	0%	FALSE				12%	0%	5%
156	ABS - Corporate - CRE - CMBS - Retail	156	NA	0%	FALSE		Same Country		12%	0%	5%
157	ABS - Corporate - CRE - CMBS - Hotel	157	NA	0%	FALSE		0.00%		12%	0%	5%
158	ABS - Corporate - CRE - CMBS - Industrial	158	NA	0%	FALSE				12%	0%	5%
159	ABS - Corporate - CRE - CMBS - Nursing Home	159	NA	0%	FALSE				12%	0%	5%

EXHIBIT 14

Definition of Sectors, Key Agents, and Corresponding Asset Correlation Factors

Moody's Sector Code	Sector Name	Map to, for correlation only	Key Agent	Key Agent Penalty (same broad cat)	Assume Managed unless specified?	Correlation 'Tree'			Additional Factors		
						Global	Meta Consumer	Broad Consumer ABS	Narrow 5.00%	CLO	Real Estate
160	ABS - Corporate - CRE - CMBS - Residential/Multi-Family	160	NA	0%	FALSE				12%	0%	5%
161	ABS - Corporate - CRE - CMBS - Warehouse / Self-storage	161	NA	0%	FALSE				12%	0%	5%
162	ABS - Corporate - CRE - CMBS - Healthcare	162	NA	0%	FALSE				12%	0%	5%
163	ABS - Corporate - Specific - Tax Lien	163	Servicer	20%	FALSE			Specific	27%	0%	0%
164	ABS - Corporate - Specific - Mutual Fund Fees	164	Manager/ Servicer	20%	FALSE	Same region add-on		0.00%	27%	0%	0%
165	ABS - Corporate - Specific - Structured Settlement	165	Servicer	20%	FALSE	(regard-less of sector)		Same Country	27%	0%	0%
166	ABS - Corporate - Specific - Utility Stranded Cost	166	NA	0%	FALSE	5.00%		0.00%	27%	0%	0%
167	ABS - Corporate - Specific - Big Ticket Lease	167	Servicer	20%	FALSE	(halved for Global vs. non-Global exposure)			27%	0%	0%
168	ABS - Corporate - Specific - IP (including Entertainment Royalties)	168	Originator/Servicer	20%	FALSE				27%	0%	0%
169	ABS - Corporate - Specific - Dealer's Floorplan	169	Seller	20%	FALSE				27%	0%	0%
170	ABS - Corporate - Specific - Tobacco Bonds	170	NA	0%	FALSE				100%	0%	0%
171	ABS - Corporate - Corp.CDO - Market Value CDO & CDO^2	171	NA (but check Manager)	0%	TRUE			Corp. CDO	100%	17%	0%
172	ABS - Corporate - Corp.CDO - CDO exposed to IG	172	Manager/ Arranger if static	20%	TRUE			5.00%	17%	0%	0%
173	ABS - Corporate - Corp.CDO - CDO exposed to HY	173	Manager/ Arranger if static	20%	TRUE			Same Country	0%	17%	0%
174	ABS - Corporate - Corp.CDO - CDO exposed to EM	174	Manager/ Arranger if static	20%	TRUE			5.00%	17%	0%	0%
175	ABS - Corporate - Corp.CDO - ABS or CDO exposed to SME risk	175	Manager/ Originator	20%	TRUE				17%	0%	0%
176	ABS - Corporate - Corp.CDO - CDO - Franchise Loans	176	Originator	20%	TRUE				17%	0%	0%

Source: Moody's Investors Service

Key Agent

Exposures in the same broad sector (not specific sector as before) that have the same key agent, as defined in the table above, are given an additional correlation add-on as shown.

EXHIBIT 15

ABS Vintage Penalty Add-Ons

		Same Meta Sector	Same Broad Sector	Same Narrow Sector	Real-Estate
	Global		Cons.ABS		
Global	2%	3%	0%	0%	
Same Region	0%	0%	5%	5%	
Same Country	0%	5%	5%	5%	
			RMBS		
Global			0%	0%	5%
Same Region		Consumer	0%	0%	0%
Same Country			5%	5%	5%
			Div.SF.CDO		
Global			0%	0%	
Same Region			0%	0%	Real-Estate
Same Country			5%	5%	
			CRE		
Global		3%	0%	0%	
Same Region		0%	5%	5%	
Same Country		0%	5%	0%	
			Corp.CDO		
Global		Corporate	0%	0%	
Same Region			10%	5%	
Same Country			5%	5%	
			Specific		
Global			0%	0%	
Same Region			10%	5%	
Same Country			5%	5%	

Source: Moody's Investors Service

The total Vintage Penalty add-on is then multiplied by a factor based on the difference in years between the issue dates of the two transactions.

EXHIBIT 16

Vintage Penalty Roll-Off

	Decrease per Year
Static	25.00%
Managed	16.67%

Source: Moody's Investors Service

Variation with Rating

The final pair-wise correlation value between a pair of exposures is then modified on the basis of the rating of the exposures.

EXHIBIT 17

ABS Correlation Variation with Rating

	Scaling
Aaa-Aa	100.00%
A	93.33%
Baa-Ca	86.67%

Source: Moody's Investors Service

Appendix 5: Typical Concentration Limits for Third-Party Risks

The limits below are typical for exposures to third parties, which include synthetic security counterparties, participating institutions, synthetic letter of credit counterparties, and securities lending counterparties.

EXHIBIT 18

Typical Concentration Limits for Third-Party Risks

Rating of Institution	Individual Third-Party Limits	Aggregate Third-Party 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%	10.0%
A3 or below	0	0

* Only if entity also has a Moody's short-term rating of P-1

Source: Moody's Investors Service

Appendix 6: Simulation of Interest-Rate Curves

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

FORMULA 8

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

Where:

» α, β and σ 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:

EXHIBIT 19

Cox-Ingersoll-Ross Parameters for USD, GBP, and Euro 3-month Interest Rates

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

Source: Moody's Investors Service

Correlations between white noises of each interest-rate curve:

EXHIBIT 20

Correlations between "White Noise" Components of the Cox-Ingersoll-Ross Models for USD, GBP, and Euro

	U.S. $	£	€
U.S. $	1	62%	31%
£		1	51%
€			1

Source: Moody's Investors Service

Appendix 7: Simulation of Foreign Exchange Rates

The stressed standard deviations of FX rates to be used are:

EXHIBIT 21

Stressed Standard Deviations of FX Rates for Typical Currency Couples

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 8: Approach to Rating SF CDO Instruments That Are Backed by SF CDO Secured Debt Tranches and Equity, and SF CDO Instruments with Non-Standard Promises

In this appendix, we describe our quantitative approach to evaluating instruments that are backed by one or more SF CDO tranches, including possibly equity, and our approach to evaluating SF CDO-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 SF CDO Debt Tranches and Equity

Securities that are backed by a combination of one or more SF CDO tranches and equity are exposed to the risks associated with SF CDO equity cash flows and potential refinancing.[36] of the SF CDO 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 SF CDO equity tranche to address the specific risks associated with SF CDO equity.[37] As Exhibit 22 shows, our equity-tranche cash flow haircuts vary with the target rating of the SF CDO repack.

EXHIBIT 22

Equity Cash Flow Haircuts by SF CDO Repack Rating

SF CDO 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 SF CDO debt tranches. As such, we include a SF CDO refinancing scenario in our analysis to account for the risks associated with potential refinancing of the SF CDO 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 SF CDOs 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 SF CDO refinancing scenario. For SF CDOs 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 SF CDO refinancing scenario. For SF CDOs evaluated at any time after the end of the reinvestment period, we assume that refinancing is

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

[37] We apply these haircuts to address the risks affecting equity cash flows which include expenses exceeding the cap that SF CDOs 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

unlikely to occur, and thus we typically assign a 0% probability to the occurrence of a SF CDO 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, following the probabilities discussed above. When the SF CDO 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 SF CDO 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 SF CDO 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

In this appendix, we describe our quantitative approach to evaluating SF CDO-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.

As with SF CDO notes with standard promises, our quantitative analysis for instruments with non-standard promises focuses on the 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.[38] 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 SF CDO method in its calculation of loss, discount factor, exposure period, and benchmark rate, as we summarize in Exhibit 23. We use this approach to analyze combo notes and SF CDO repacks.

EXHIBIT 23

Comparison of Non-Standard Promise and SF CDO Approaches

	Non-Standard Promise	SF CDO
Promise	Path-dependent promise	Par
Loss (%)	(Promise – NPV CF[39]) / 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 rate[40]

Source: Moody's Investors Service

[38] For a discussion of the modeling approach for SF CDOs, see section 3.

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

[40] 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 the "Loss Benchmarks" section.

Quantitative Analysis - Step-by-Step Approach

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

1) Generate cash flows to the combo/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 SF CDO combo/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 3.2.4. In each default scenario, we allocate the cash flow to the combo/repack note according to the note structure.

Step 2: Calculate the 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 9

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

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 an SF CDO combo note or repackaged security, we calculate the promise, which is path-dependent and varies in each default scenario, as described in the following equation

FORMULA 10

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

Where:

» NPV Unpaid Interest and Principal when Due = (PIK Balance[41] + Principal Loss) * Discount Factor at Maturity[42]

Source: Moody's Investors Service

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 11

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

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 SF CDO combo/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 12

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

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

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

[41] 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.

[42] We allow for the possibility that the SF CDO combo/repack note is PIKable 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 PIKable, we would use the present value of the unpaid interest for each period using the appropriate discount factors for the relevant periods.

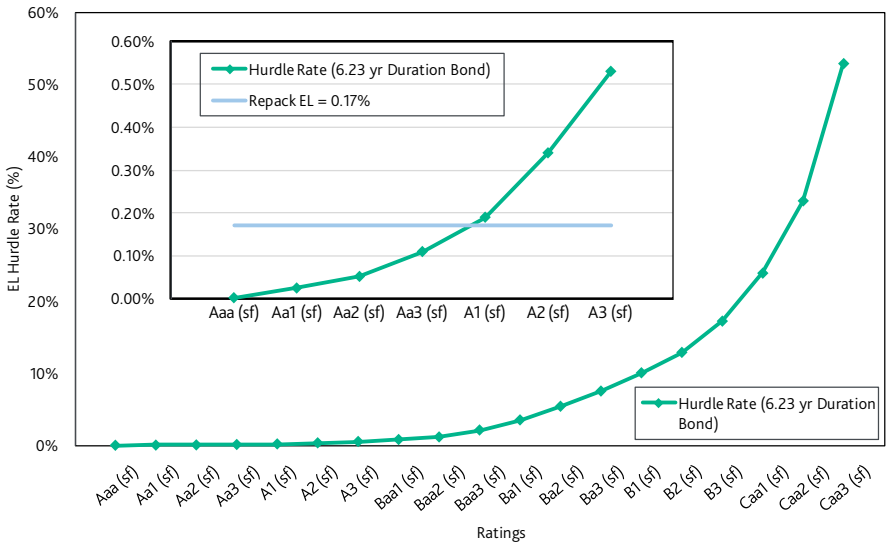
Step 6: Compare the EL of the SF CDO combo/repack to that of a same-duration benchmark bond

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 24). We calculate the EL hurdle rate of the benchmark bond based on several 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.[43]

Exhibit 24 shows the procedure for a note with an EL of 0.17% and an expected duration of 6.23 years.

EXHIBIT 24

Comparison of the EL of the SF CDO Combo/Repack to the EL Hurdle of the Benchmark Bond



Source: Moody's Investors Service

[43] While we use the loss boundaries in the "Loss Benchmarks" section of this report, we select loss benchmarks as set forward in Exhibit 25.

EXHIBIT 25

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 periods *1* to *t*
- *PV(CFs(t) | default in time t)* : the present value of all cash flows received from 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 9: Approach to Rating CRE CDO Instruments

Summary

In this appendix, we describe our approach to evaluating SF CDO-related instruments backed primarily by CRE collateral. We focus on how we apply and adjust the general methodology for SF CDOs to rate CRE CDOs.

The CRE CDO sector consists of three main deal types: cash resecuritizations (re-secs), synthetic resecuritizations (synthetics), and collateralized loan obligations (CRE CLOs). Re-sec collateral consists of CMBS and REIT debt, whereas in the case of CRE CLOs a significant portion of the collateral consists of direct debt interests backed by commercial real estate, including whole loans, B-notes, mezzanine interests, and second mortgages. A CRE CDO transaction can include a mix of CMBS, REIT debt, and direct loan interests. Synthetics typically reference a pool of CMBS and REIT debt.

We base our CRE CDO analysis on the same approach for SF CDOs as described in the standard methodology herein.

Our modeling approach for CRE CDOs primarily differs from the standard SF CDO method in the following two ways:

1) CRE CDOs often include direct commercial real estate debt interests, such as whole loans, B-notes, mezzanine interests, and second mortgages. Typically, these debt interests do not have a public rating. To determine the probability of default for such assets, we assign credit assessments to such collateral using our CMBS large loan rating methodology.[44]
2) We assume an asset correlation between direct commercial real estate interests of 35%.

CRE Modeling Approach – Adjustments to SF CDO

Recovery Rate (section 3.1.1)

Recovery Timing (section 3.1.1.3)

Since direct commercial real estate debt interests do not have a liquid secondary trading market, we assume a 12-24 month lag to recovery in our cash flow model for such assets, but we may adapt the lag in recoveries on such assets depending on market environment or other relevant factors. For example, we may assume a shorter lag time (i.e. 6 months) for collateral managers and asset types that have a track record of resolving non-performing loans in a shorter timeframe.

Default probability (section 3.1.2)

Non-Moody's rated Instruments (section 3.1.2.3)

Commercial real estate collateral that is not rated by us is typically assigned a structured credit assessment, although in some cases a credit estimate may also be used.

[44] See our methodology for rating large loans. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Asset correlation (section 3.1.3)

We assume an asset correlation between direct commercial real estate debt interests of 35%, although if commercial real estate assets lack diversity in tenants, property types, or geographic location, we consider higher asset correlations.

Calculating EL for each tranche and determining the model output (section 3.2)

For static and managed cash flow and hybrid CRE CDOs, we derive a default distribution with CDOROM and generate expected losses by capital structure with our cash flow model after considering cash flow and other structural features. We do not apply the CBET in conjunction with our cash flow model for purposes of rating CRE CDOs. All references to CBET in section 3.2 should be replaced by reference to the simulated correlated default curve generated by CDOROM for purposes of understanding the modeling approach applied by us in rating CRE CDOs.[45]

Most commercial real estate loans in CMBS transactions and CRE CDO transactions do not have prepayment risk, owing to structural features such as defeasance, yield maintenance, and lock-out provisions. Accordingly, we generally assign less weight to the "fast pay" case amortization profile in our cash flow model.

The transaction covenants (section 3.2.4.2).

Managed CRE CDOs are often subject to the transaction covenants described in section 2.2. In addition, however, managed CRE CDOs may reference other metrics, such as the Herfindahl (Herf) Score, which represents the concentration of assets within a pool, the tranched WARF, which represents the weighted average of the rating factors associated with each tranche category for the asset, and the actual collateral rating distribution.

Trading and reinvestment issues (section 7.5.)

Trading (section 7.5.1).

For CRE CDO collateral consisting of direct commercial real estate loan interests, such as whole loans, B-notes, mezzanine interests, and second mortgages, objective trading criteria most commonly include the length of time an asset is in special servicing or is delinquent on interest payments for credit risk collateral or the improvement in loan-to-value (LTV) ratio and/or our credit assessment for credit-improved collateral. Other objective trading criteria commensurate with our rating analysis may sometimes be used.

[45] Exceptions may apply, such as in the case of a transaction where a material portion of the collateral is not identified or expected to materially revolve in a short time frame.

Appendix 9a: CRE CDO Future Funding Obligations

Future funding loans are loans that are fully committed on the initial funding date, but which provide for fundings to be made in one or more installments over time. Future funding obligations appear in earnout loans and transition loans.

Earnout loans provide that the borrower has the right to receive additional advances following the initial closing of the loan, subject to specified conditions, such as LTV, debt service coverage ratio, or occupancy thresholds. Future funding amounts in earnout loans are sometimes referred to as "good news money" in that there is no obligation to fund unless and until the performance of the property has improved. Transition loans are secured by properties in the process of transitioning to stabilized status. Transition loans are generally more risky than earnout loans in that they do not require the property to achieve a specified level of performance before future funding amounts must be advanced; advancing is based on the timing of the loan sponsor's business plan. Transition loans do not typically contain any ground-up construction as is typically the case in construction loans.[46]

We are concerned that the failure to fund such loans as and when due can undermine the collateral valuation assumptions made by us in rating the transaction and could lead to lender liability claims against the CDO issuer. Additionally, in the case of material renovations such as rehabilitations, there may be reduced cash flow generated by the property to fund the CRE CDO interest payments until the renovations are complete and the building is leased.

In most cases, we approach the value of future funding on a stabilized, as-built basis, assuming that the contemplated future fundings are made available for the project and that the proposed work is completed in a timely manner. Credit assessments for the loans in a CRE CDO are based on this as-built value, subject to an additional rehabilitation and lease-up discount relative to stabilized assets. The future fundings necessary to complete a project, therefore, become integral to our analysis. We are particularly concerned with the availability of future advances to the borrower when the party retaining the future funding obligation is not highly rated or is unrated.

CRE CDO transactions may include one or more provisions that mitigate such funding risks. For example, CRE CDOs may require that the future funding obligations be held by a highly rated entity or fully reserved in a trust-controlled account. CRE CDOs may create revolving Aaa-rated classes to cover all future funding obligations over the life of the deal or initiate match term and evergreen letters of credit covering the entire expected future funding obligation. In other cases, CRE CDOs may fund into the trust rolling forward estimated future funding requirements over a specified time horizon. Such estimates are typically certified by an officer and the greater of the related party and a specified third party's estimates of such rolling requirements.[47] CRE CDOs may also incorporate concentration limits on future funding loans as well as the future funding portion of the overall commitment amount.

If present, we will assess the risks associated with such future funding loans as well as mitigants present to address the associated risks. The failure to mitigate such risk may result in additional expected losses attributable to such transactions.

[46] Construction loans bear an element of forward market risk that is not found in other types of future funding loans, which is due to the fact that a newly constructed building is scheduled to be delivered into the market as the market exists some number of months or years in the future. Markets can change rapidly, and such changes may adversely affect the viability of a project. This introduces a greater level of uncertainty around cash flow and valuation projections for the property.

[47] If the trust does not control the future funding, the third party responsible for the future funding may indemnify the trust, the borrower may waive right of set off against the trust, and separate notes can be created for the future funding amounts; all of which protect the trust against claims for future fundings advanced by the third party.

Appendix 10: Approach to Monitoring Spanish Multi-Issuer Covered Bonds

Summary

This appendix describes our approach to monitoring Spanish multi-issuer covered bonds (SMICBs). We focus on how we apply and adjust the general methodology for SF CDOs in analyzing the distinctive characteristics of SMICB structures. Our monitoring approach also incorporates the assessment of the underlying covered bonds backing SMICBs, which is based on our general methodology for rating covered bonds.[48]

New rating assignments, if any, would be subject to supplementary analysis beyond the surveillance approach described herein.

An SMICB structure issues bonds backed by a pool of Spanish covered bonds (Cédulas), often mortgage-backed covered bonds (Cédulas Hipotecarias).[49] The issuer is a limited-liability SPV incorporated under Spanish law[50] and typically acquires bonds issued by financial institutions under the Spanish legal framework for covered bonds.[51] The structure may issue a one-time series of SMICBs, with a fixed pool of Cédulas (i.e., a "stand-alone" fund), or maybe a "master program," in which multiple series may be issued over time, backed by a changing pool of Cédulas.

Our rating of an SMICB is based primarily on the EL of the SMICB, which, in turn, is based on the EL of the Cédulas backing the SMICB and the size of the reserve fund in the transaction, if any. However, we may limit the rating based on two additional considerations: (1) the liquidity of the SMICB and (2) the risk that defaults by the issuers of the Cédulas may interfere with the timely payment on the bonds.

The Expected Loss of the SMICB

For transactions in which there is no reserve fund, we calculate the EL of the SMICB from the weighted average credit strength of the underlying pool, which is typically based on the EL of the Cédulas, weighted by the outstanding amounts of each underlying asset. The EL of the Cédulas takes into account both the probability that the issuer[52] will cease making payments under the covered bonds (i.e., a "CB anchor event") and, in the event the issuer stops making payments, the value of the cover pool. Our analysis of the value of the cover pool incorporates the cover pool collateral's credit quality, any interest rate or currency mismatches between the cover pool assets and the covered bond liabilities, and the market risk of the underlying assets if the issuer needs to sell the assets in the cover pool to make the payments required under the Cédulas.

For transactions that have a reserve fund, we calculate the EL of the SMICB as a weighted average expected loss of the pool, net of the reserve fund. The weights are the probabilities of the various loss scenarios of the pool. Those probabilities are calculated using the same approach for SF CDOs as described in the body of

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

[49] There have also been limited issuances of SMICBs backed by Spanish public-sector covered bonds (Cédulas Territoriales).

[50] Royal Decree 926/1998, of 14 May, by which the Asset Securitisation Funds and the Fund Management Companies are regulated.

[51] Law 2/1981, of 25 March, regulating the Mortgage Market (Mortgage Market Law). Royal Decree 716/2009, of 24 April, which develops certain aspects of Law 2/1981 (secondary regulations on the Mortgage Market Law) and Law 22/2003, of 9 July, Insolvency Law.
Amendments to the Mortgage Market Law came into force on 8 December 2007. Please see Special Report entitled "Spanish Mortgage Market Law Amendments to Strengthen Position of Covered Bond Holders" dated 27 November 2007.

[52] The term "issuer" may not always refer to the issuer of the covered bonds itself. It may refer to an entity that has guaranteed, or otherwise directly supported, payment on the covered bonds. Such an entity would typically also be part of the issuer group.

this methodology above with two simplifying assumptions. These assumptions are (i) a single asset correlation of 50% across the Cédulas and (ii) a fixed recovery assumption for each Cédulas.[53]

Sufficiency of the Liquidity Fund

If a Cédula defaults, it may take some time to liquidate the cover pool assets following the insolvency of the Cédula issuer potentially reducing the cash flow available to the SMICB, at least temporarily. Consequently, as part of our analysis, we assess the extent to which the SMICB has sufficient liquidity – typically in the form of a liquidity fund - to make its required payments to investors.

To assess the liquidity, we assume that, upon a Cédula default, no interest payments will be made to the SMICB from the defaulted Cédula for two years. Given that assumption, we assess whether the liquidity fund is large enough so that the likelihood that the SMICB will have sufficient funds to make its required payments is consistent with a rating of up to four notches lower than the SMICB's target rating. For example, if the SMICB has a likelihood of being able to make timely payments that is equal to the probability of non-default by an A3-rated security, then we may cap the rating of the SMICB at Aa2.

We use a single-factor time-to-default model[54] to estimate the default probability distribution of the Cédulas until the scheduled maturity of the SMICB. In that model, the default probability of each Cédula is based both on the probability of a CB anchor event for the Cédula issuer (taken from our Idealized Expected Default table) and on the probability that, in the event of a CB anchor event, the Cédula backing the SMICB will default (taken from our "Timely Payment indicator" assessment).[55],[56] In our modeling, we incorporate an assumption of a 50% asset correlation among the underlying Cédulas in the SMICB.

Timely Payment Rating Cap on the SMICB

Our rating on an SMICB includes an assessment of the risk that defaults by the issuers of the Cédulas may interfere with the timely payment of the SMICB's obligations. To incorporate the assessment of that risk, we limit (i.e., place a cap on) the SMICB rating based on the weighted average CB anchor (i.e., the rating representing the probability of issuer default on the Cédulas) and our assessment of the likelihood of timely payment on the Cédulas following a CB anchor event.

We base our projection of the likelihood of timely payment on our timely payment indicator (TPI) framework for rating covered bonds. However, in the special case of SMICBs, we adjust how we use the TPIs, to incorporate benefits attributable to the SMICB's liquidity fund and to a typical provision in the structure that extends the maturity of the SMIBC if any of the underlying Cédulas is in default at the scheduled maturity of the SMIBC program. That is, instead of using TPI restrictions applied to each of the underlying Cédulas, we impose a somewhat less restrictive rating cap on the SMICB rating, one that is typically two levels above the cap that would be indicated by the weighted-average TPI of the underlying Cédulas. For example, if the weighted-average TPI assigned to the underlying Cédulas is "Probable," the TPI used to determine the rating restriction on the SMICB would be "High."

Cédulas on Review for Upgrade/Downgrade

If the rating of an underlying issuer or Cédulas is on review for upgrade/downgrade, we do not typically assume they have already been upgraded/downgraded in the indicated direction when assessing SMICBs.

[53] Derived for each Cédulas as 1 – (Cédulas EL/ Cédulas default probability)

[54] For a detailed discussion on time-to-default models, please refer to Bluhm, Christian and Overbeck, Ludger, Structured Credit Portfolio Analysis, Baskets & CDOs, Chapman & Hall/CRC, 84, 2007.

[55] P(Cédulas default)= (1-TPI)* P(CB Anchor Event)

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

Appendix 11: 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.[57] We then follow the process described in section 11 to associate the model EL with a rating output.

EXHIBIT 26

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

		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

[57] 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 the "Loss Benchmarks" section.

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.

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.

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