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RATING METHODOLOGY

US and Canadian Conduit/Fusion Commercial Mortgage-Backed Securitizations Methodology

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This rating methodology replaces *US and Canadian Conduit/Fusion Commercial Mortgage-Backed Securitizations Methodology* published in November 2021. In the update, we added a new appendix that describes our analysis of exchangeable securities, and we made limited editorial updates to improve readability. The updates do not change our methodological approach.

Scope

This rating methodology applies to securities backed by commercial mortgage loans originated in the US and Canada and issued by conduit and fusion transactions.

In this methodology, we explain our approach to assessing credit risks for conduit and fusion commercial mortgage-backed securities (CMBS) in the US and Canada, including quantitative and qualitative factors that are likely to affect rating outcomes in this sector.

We discuss the asset and liability analysis, including associated modeling, as well as other considerations. We also describe our monitoring approach.

Rating Approach

In this section, we describe the key characteristics of conduit/fusion transactions backed by commercial mortgage loans and summarize our approach to assessing credit risks for conduit/fusion securities, including quantitative and qualitative factors that are likely to affect rating outcomes in this sector.

Conduit CMBS transactions are backed by commercial mortgage loans primarily originated for securitization. The pools typically contain 25 to 100 loans, generally with moderate to high leverage and collateralized either by a single property or a group of properties of average quality.

The collateral in fusion CMBS transactions is similar to conduit transactions, but fusion transactions often include a small number of loans with low leverage which are assigned an investment-grade structured credit assessment (SCA).¹ The properties securing such loans are often of higher quality than those securing the conduit portion of the loan pool. Also, we generally consider loans comprising more than 10% of the pool balance to be fusion loans, given their impact on collateral pool concentration.

Our conduit/fusion CMBS methodology combines fundamental commercial real estate (CRE) analysis with structured finance analysis. As part of our analysis, we consider, among other things, the sustainable future performance and value of the collateral securing the mortgage loan or pool, the credit quality of the loans in the pool, portfolio-level benefits like diversification, and structural and legal risks and mitigants.

Our assessment of diversity in conduit/fusion transactions considers factors that affect correlation, such as loan concentration, as well as credit dispersion and exposure concentrations by borrower, tenant, employment by industry sector, and geographic location. Our measure of pool diversity is the Herfindahl (Herf) score, which measures the effective pool size by reducing a pool of loans of uneven size to an equivalent pool of equal-size loans. The Herf score provides a good approximate measure of diversification in a loan pool when the underlying loans have relatively similar leverage and are otherwise well-diversified, as is often the case in conduits. Our analysis may include the fusion approach discussed below when a pool contains loans of widely varying quality.

We capture the impact of the concentration and the credit quality of fusion loans in the simulation process we use to determine our baseline fusion loan contributory credit enhancement matrix. This procedure analyzed diversity by simulating a pool of equal-size loans based on the Herf score of the conduit pool with the fusion loan included, assuming that each reference loan has the credit quality of the fusion loan.

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 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. Rating committees assign ratings, taking into account the characteristics of each transaction.

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

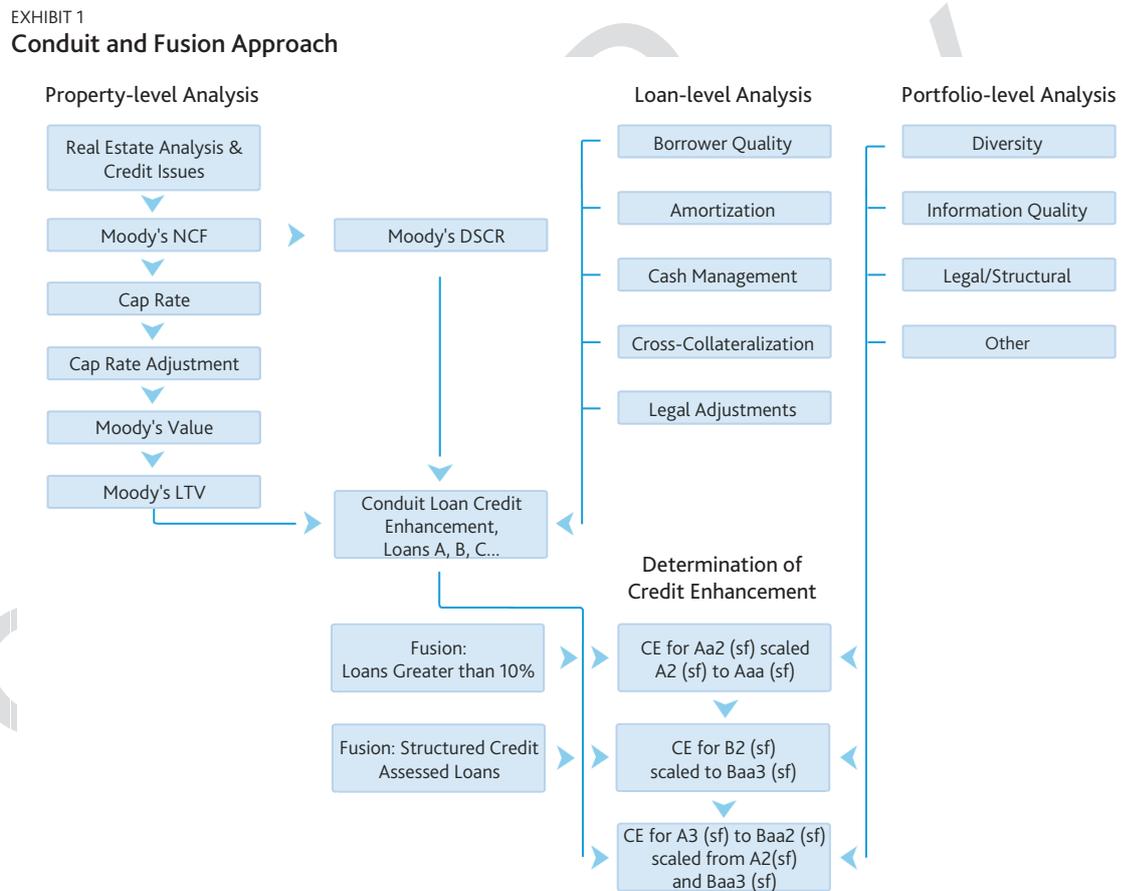
¹ For more information, see the discussion on structured credit assessments in *Rating Symbols and Definitions*. A link can be found in the "Moody's Related Publications" section.

Asset-level Analysis and Related Modeling

In this section, we explain how we analyze the underlying assets that back US and Canadian conduit/fusion CMBS and how we estimate potential losses on those assets.

Conduit and Fusion Approach

Exhibit 1 illustrates how property, loan, and portfolio analysis fit together in our rating approach by focusing on the loan to value (LTV) and the net cash flows (NCF). We derive our Aa2 (sf) and B2 (sf) benchmark levels from these elements and then scale them to assess credit enhancement for other rating levels. Also, credit tenant lease loans² and defeased loans,³ if any, are fused in with credit-appropriate enhancement.



Source: Moody's Investors Service

Property-level Analysis

To assess the credit risk of a loan backing a conduit/fusion transaction, we first analyze the property or properties securing the loan to derive the sustainable net cash flow (Moody's NCF) and corresponding sustainable value (Moody's value). The following sections summarize how we determine Moody's NCF and

² Credit tenant lease loans are backed by a property under a long-term lease to a creditworthy tenant, usually rated investment grade. These leases are typically long term and the debt often has a matching term, eliminating the refinance risk that is present in loans with balloon maturities. As the lease is written with few if any conditions under which the tenant can exit sooner than the loan amortizes, the rating of the credit tenant lease loan often mirrors that of the tenant.

³ A defeased loan is a loan with respect to which the related real estate collateral originally securing the mortgage has been released and replaced with a portfolio of US government, GSE, or other Moody's highly rated securities. The loan documents for most commercial loans do not permit prepayment to investors, but allow the real estate collateral to be released through defeasance.

Moody's value. For more details, see our cross-sector methodology that describes our approach to deriving sustainable net cash flow and value for major property types in the Americas and Asia-Pacific.⁴

Moody's Net Cash Flow

We base our loan credit metrics on NCF, which provides a more complete and accurate picture of a property's sustainable economics than the net operating income (NOI) formulation widely used by property market participants. This is because NCF incorporates capital expenses whereas NOI does not.

Moody's NCF is our estimate of sustainable net cash flow for a commercial property collateralizing a loan. It represents our base case expectation through the economic cycle. The goal is to identify a level of NCF that a property can reliably produce, which may be higher or lower than actual NCF in any given year.

For most property types, a basic property-level financial analysis requires estimates of income, vacancy and collection loss, operating expenses, and capital expenses. We take this analysis a step further by incorporating the concept of sustainability when we derive Moody's NCF. As a result, we look to long-term trends to see how current income and expense levels compare to market figures and make positive or negative adjustments as needed.

Typically, our adjustments entail reducing income, increasing vacancy and collection losses, and normalizing operating and capital expenses compared to underwritten NCF. Adjustments to these factors in the opposite direction would be exceptions because we consider the sustainability of NCF from a debt rather than equity perspective.

We directly calculate net cash flow for collateral representing the majority of the aggregate loan balance of CMBS transactions. We may impute net cash flow haircuts for the remaining loans in the pool based on the collateral we reviewed and other collateral information available to us. The imputed haircuts are adjusted to address the impact of reviewed loans we believe to be outliers. The imputed cash flow haircuts typically range from 5% to 20%. For asset types with low cash flow margins, such as hotels, the range can be wider.

Capitalizing Net Cash Flow to Determine the "V" in Moody's LTV

After determining the net cash flow, we assign a grade to each property securing the loan. As each CRE property type has its own unique set of credit quality considerations, we pair property grades and property use categories to determine the corresponding capitalization (cap) rate. The relationship between property grades, property use categories, and cap rates is detailed in our cross-sector methodology mentioned above.

We then apply the cap rate to Moody's NCF to derive our assessment of the property value that we use to determine Moody's loan-to-value ratio (MLTV). Our cap rates are typically higher than existing market cap rates as they consider more than 50 years of historical cap rate data.

Loan-level Analysis

After we conclude our property-level analysis and determine Moody's NCF and Moody's value for each property in the pool, we focus on the loan characteristics to determine the term and refinancing default risk and the loss upon default for each loan in the pool.

For non-recourse loans, typical of US conduit/fusion CMBS transactions, we view the expected probability of default and expected severity of loss as highly dependent on the debt service coverage ratio (DSCR) and the LTV ratio associated with each underlying mortgage loan. In our approach, the loan's DSCR is the primary

⁴ A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

determinant of default risk during the loan term, while its LTV ratio at loan maturity is the primary determinant of balloon default risk, as well as the potential severity of loss given default.

We examine the ability of the collateral to cover debt service payments using two variations of DSCR, in each case with our assessment of net cash flow as the numerator:

- 1) **Actual Moody's DSCR (MDSCR):** Calculated at the loan's contractual scheduled principal and interest payment; our key indicator of term default risk.
- 2) **Stressed MDSCR:** Calculated at a stressed benchmark rate of 9.25%. This analysis places each loan on equal footing regarding potential refinancing coupon rates at the balloon date and supplements our analysis of refinancing risk. While we expect this rate to be applicable in most interest rate scenarios, we may modify it in certain circumstances.

We calculate MLTV for each loan as the ratio of the loan amount at origination to Moody's value. MLTV can be significantly higher than underwritten LTV when market cap rates are below their long-term average. MLTV serves as our primary indicator of refinancing risk and as an additional indicator of term default risk. Even if the DSCR is below 1.00x, the sponsor is not likely to default if the LTV is below 100% and the sponsor has equity behind the loan.

Our approach to LTV and DSCR enables us to more easily compare the risk profile of loans and transactions through the credit cycle despite differences in underlying property composition or quality, approaches among underwriters and appraisers, or cap rates.

Once we have determined the MDSCR and MLTV, we assess the loan-level credit enhancement needed for each loan in the pool.

For conduit transactions (relatively granular transactions with moderate to high leverage), we map the MDSCR and MLTV for each loan, as adjusted for certain loan characteristics, to benchmark levels described in section A below. For fusion transactions, we analyze the fusion loans separately to derive a probability of default and recovery rate for each (as we describe in section B below). We then further adjust the model-based credit enhancement levels to account for loan-specific attributes such as floating rate exposure, crossing (cross-collateralized and cross-defaulted), subordinated debt, etc. (as we describe in section C below).

Section A: Conduit Loans

CONDUIT LOAN TERM DEFAULT RISK

We assess conduit loan term default risk using MDSCR and, to a lesser extent, MLTV. We calculate MDSCR as Moody's NCF divided by the loan's actual debt service.

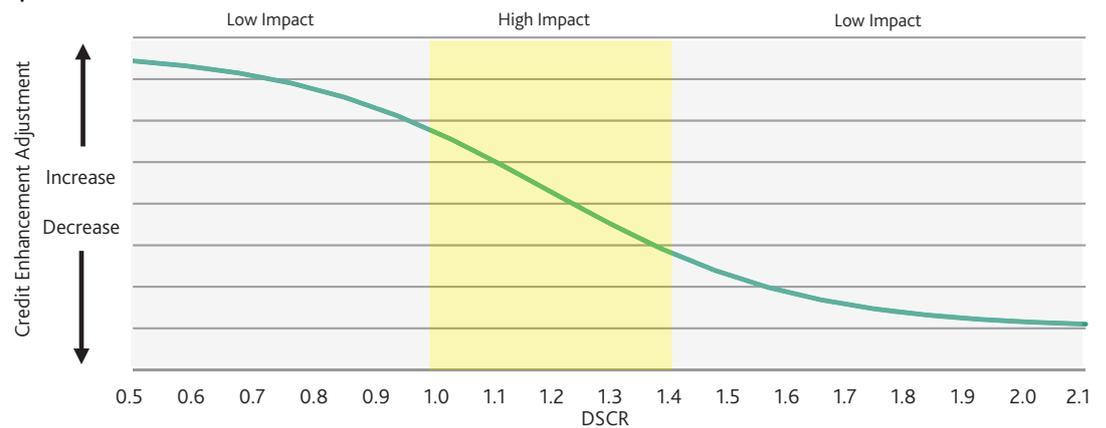
Loans with MDSCRs below 1.00x have a high risk of term default because borrowers, to remain current, may themselves need to fund the difference between available cash flow and debt service. Assuming a constant recovery rate, a higher risk of default would require a higher level of credit enhancement to mitigate.

Exhibit 2 illustrates the relationship in our analysis between credit enhancement and debt service coverage. The default curve illustrates three risk zones in relation to DSCR: high, transitional, and low. Loans with a DSCR of less than 1.00x have a high risk of default, although we have no "cliff" at 1.00x DSCR below which we assume all loans will default. Above 1.40x DSCR loans have a progressively lower risk of default. At these levels, additional DSCR, although helpful to reduce term default risk, has diminishing benefits, and the marginal reduction in the probability of default is commensurately smaller. The area on the default curve

between DSCRs of 1.00x and 1.40x is a transitional zone in which small changes in DSCR can significantly affect the probability of default. For example, a DSCR increase to 1.20x from 1.10x doubles the cushion against default on a high-risk loan, while an increase to 2.00x from 1.90x has less impact on reducing an already-low probability of default.

We review both DSCR and LTV metrics to assess default risk as either one independently could produce an incomplete assessment.

EXHIBIT 2

Impact of DSCR on Credit Enhancement

Source: Moody's Investors Service

CONDUIT LOAN REFINANCE RISK

Loans backed by CRE typically require a substantial balloon payment at maturity, often 85% to 100% of the original loan balance. The borrower typically funds the balloon payment by refinancing the loan, although selling the collateral is another option.

If the borrower fails to pay off the loan at maturity, a loan default occurs. At that juncture, the servicer has several options, including extending the loan, selling the loan, or foreclosing on the loan and selling the collateral.

MLTV is the primary measure we use to assess the probability of a loan defaulting at maturity. We also calculate a stressed DSCR by dividing Moody's net cash flow by implied debt service using a "hurdle" rate of 9.25%. This provides an additional assessment of the default risk at maturity and distinguishes credit quality between loans with the same DSCR but based on different interest rates.

However, for loan pools with loan sellers where we have historically observed superior loan performance, the refinance risk is less than implied by the "hurdle" rate previously defined, which was calibrated for typical conduit CMBS collateral. This has been especially true for loans originated or purchased by government-sponsored enterprises (GSEs) and certain life insurance companies and pension fund lenders. We may lower the refinance test "hurdle" rate of 9.25% by up to 50 basis points for loan sellers with strong performance track records and continuity of commercial or multifamily debt funding, with loan coupons consistently at or below conduit market levels. This indicates that their loan sponsors have superior access to debt capital markets and thus lower refinance risk.

MLTV is also our key determinant of potential loss given default because it measures the borrower's equity in the property, if any, after taking repayment of the loan into account. Loans with bigger equity

cushions/lower LTVs are better able to absorb losses from market downturns and more likely to have lower losses in the event of default.

CONDUIT LOAN-LEVEL CREDIT ENHANCEMENT

We set credit enhancement at two rating levels, Aa2 (sf) and B2 (sf), and from these levels, we tranche to rating levels between Aaa (sf) and B1 (sf). We base the Aa2 (sf) benchmarks on property type, property quality, and MDSCR, while the B2 (sf) benchmarks are based on adjusted MLTV. The credit enhancement for classes rated below B2 (sf) is based on progressively higher adjusted MLTV thresholds than the B2 (sf) benchmark. Because commercial mortgage loan pools have complex underlying credit and correlation factors, we chose these two points to represent high and low stress levels relative to our expected case.

In cases where we recognize the significant potential for a sizable near-term loss, we may treat the loan as troubled by applying the results of a "blow up" analysis to derive the credit enhancement. This procedure typically involves assigning a probability of default and loss severity for the troubled loan. Third-party data (e.g., payment status, appraisal reductions, historical property and market data) often inform the loan's probability of default and loss severity assessment.

As we assess property and capital markets risk at multiple points in our analysis – including the determination of net cash flows, property grades, and cap rates – having two benchmarks for credit enhancement helps us align and balance the cumulative effect of the adjustments. For example, MLTV and MDSCR are more closely aligned with the Aa2 (sf) level, given that they use cap rates and interest rates that are typically much higher than market levels. This stress level is less appropriate for ratings that are well below investment grade, necessitating an additional calibration specific to that level.

Aa2 (sf) BENCHMARK

We have developed Aa2 (sf) benchmark credit enhancement matrices that map MDSCR, property grade, and asset type to a specific credit enhancement. The matrices provide a credit support level for each loan based on the following factors:

- » Property type, which addresses the cash flow and value volatility of each asset class
- » Property quality, which addresses cash flow and value volatility based on the quality of an asset within its asset class
- » MDSCR

Our Aa2 (sf) benchmark matrices reflect our judgment about the enhancement necessary at that level for a loan as if it were part of a pool with a loan Herf score of 40; a typical geographic, borrower, employment by industry sector, and tenant diversity profile; and a benchmark set of loan characteristics which include (i) a 25-year amortization schedule for hotels and a 30-year amortization schedule for all other property types and (ii) appropriate reserves.

We examine the risk for each loan over its term and at maturity. To assess each loan's term risk, we identify on the matrix the appropriate MDSCR according to the asset class and property quality as calculated using the loan's contractual coupon. To assess refinancing risk, we follow the same procedure using MDSCR recalibrated with a hurdle rate of 9.25%. We blend the two results, with a 75% weight placed on the refinance-oriented hurdle level, to estimate each loan's Aa2 (sf) enhancement. We may vary the approach depending on the interest rate environment. We may adjust loan-level Aa2 (sf) enhancement if (1) loans have characteristics that depart from our benchmark assumptions and/or (2) other loan-level characteristics are present, which we detail in section C below. We may also make further adjustments for sponsor quality and legal/structural issues related to the borrowing entity.

In cases where we recognize little potential for loss during the loan term, we may align the term risk component of credit enhancement with the strength of the underlying tenancy instead of the loan's MLTV or MDSCR. This alignment occurs in such cases where the tenant fully occupies the building, is investment-grade rated, and operates subject to a lease extending beyond the loan term.

In cases where we recognize significant idiosyncratic risk, we may apply a dollar-for-dollar increase in credit enhancement above the pool's average Aaa (sf) credit enhancement for every additional dollar of loan leverage present above the pool's average MLTV. This alignment may occur in such cases where the loan is of very high MLTV and/or represents a significant share of the pool balance (e.g., a top 15 loan).

In addition, we use minimum Aa2 (sf) loan-level credit enhancements for loans across the leverage spectrum. Notwithstanding the additive nature of collateral-specific adjustments, credit enhancement is available if the loan defaults.

We may further adjust the pool-level Aa2 (sf) benchmark to reflect the underwriter's track record, with such adjustments falling within a range of plus or minus two percentage points. We may reduce credit enhancement for underwriters with track records demonstrating above-average performance while increasing credit enhancement for originators with short-term or below-average track records.

Exhibit 3 illustrates a potential range of loan-level adjustments to the Aa2 (sf) benchmark credit enhancement for various considered factors. Of note, some factors not shown in the exhibit that affect the Aa2 (sf) benchmark enhancement include amortization, our Red-Yellow-Green™ (RYG) short-term market scoring system (which we describe in Appendix 2), unique structural features (e.g., tax abatement expiring during the loan term), and uncommon features from section C below (e.g., floating rate).

EXHIBIT 3

Benchmark Aa2 (sf) Credit Enhancement Adjustments

Factor	Range		
	Weak	Average	Strong
Cross-Collateralization	0.00% to -0.25%	-0.25% to -1.00%	-1.00% to -3.00%
Small vs. Major Market	1.00% to 0.25%	0.00%	-0.25% to -3.00%
Borrower Quality	1.00% to 0.25%	0.00%	-0.25% to -3.00%
CapEx Reserve Structure	0.00%	0.00% to -1.00%	-1.00%
TI/LC Reserve Structure	0.00%	0.00% to -1.00%	-1.00%
Type of Ownership Interest	2.00% to 1.00%	1.00% to 0.00%	0.00%
Subordinate Debt	2.00% to 1.00%	1.00% to 0.00%	0.00%

Source: Moody's Investors Service

In most cases, we apply a standardized loan-level legal adjustment of 1% to the Aa2 (sf) credit enhancement for all non-credit-assessed loans included in the pool. In certain transactions with weaker legal provisions, this adjustment may be 2% or higher.

We may also adjust Aa2 (sf) credit enhancement by up to 2% based on lender track record.

B2 (sf) BENCHMARK

Our B2 (sf) benchmark level focuses on LTV. It considers the significant gap that can occur between our cap rates and market cap rates, as our cap rates align more closely with stress levels such as those in our Aa2 (sf) analysis. We establish an expected B2 (sf) loss level based partly on our analysis of the pool's LTV dispersion, as the weaker loans in the pool are those more likely to default and result in losses.

We recalculate LTV for each loan using a value that reflects cap rates between our sustainable cap rates⁵ and market rates, with the lower cap rates we apply in our B2 (sf) analysis.

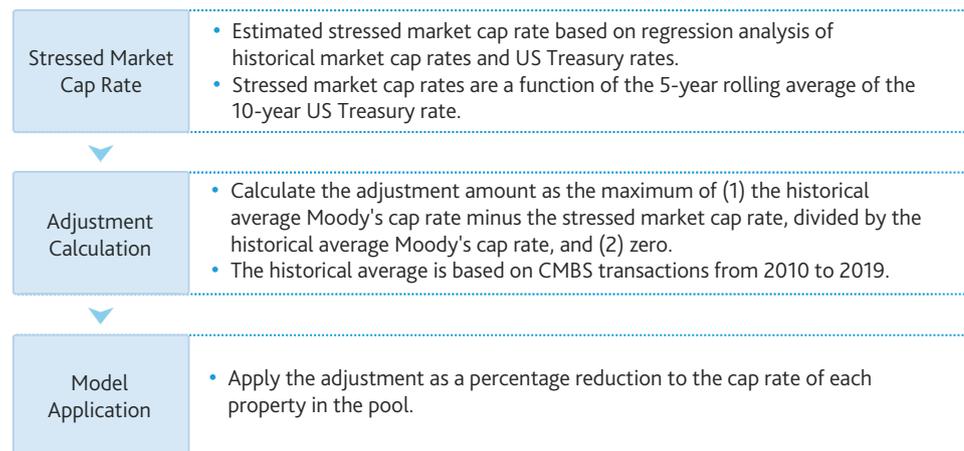
We typically adjust cap rates used for the B2 (sf) benchmark level during periods of sustained low interest rates, i.e., when the 5-year average of the 10-year US Treasury rate falls to 3.5% or below. The interest rate adjustment calculation starts with our estimate of an appropriately stressed market cap rate given the interest rate environment. This "stressed market cap rate" is a function of the 10-year US Treasury rate and is estimated using a regression analysis of historical market cap rates and US Treasury rates.⁶ The estimate is based on a weighted average across property types and is stressed at the 75th percentile.

We determine the interest rate adjustment amount by comparing the stressed market cap rate to the historical average unadjusted cap rate (Moody's cap rate) used in Moody's ratings. To the extent that the historical average Moody's cap rate is greater than the stressed cap rate, we adjust cap rates downward for properties in the pool. We apply the adjustment as a percentage reduction. The percentage amount equals the greater of (1) the historical average Moody's cap rate minus the stressed market cap rate, divided by the historical average Moody's cap rate and (2) zero.

We describe the adjustment further in the exhibit below.

EXHIBIT 4

Cap Rate Adjustment for US and Canadian CMBS Transactions



Source: Moody's Investors Service

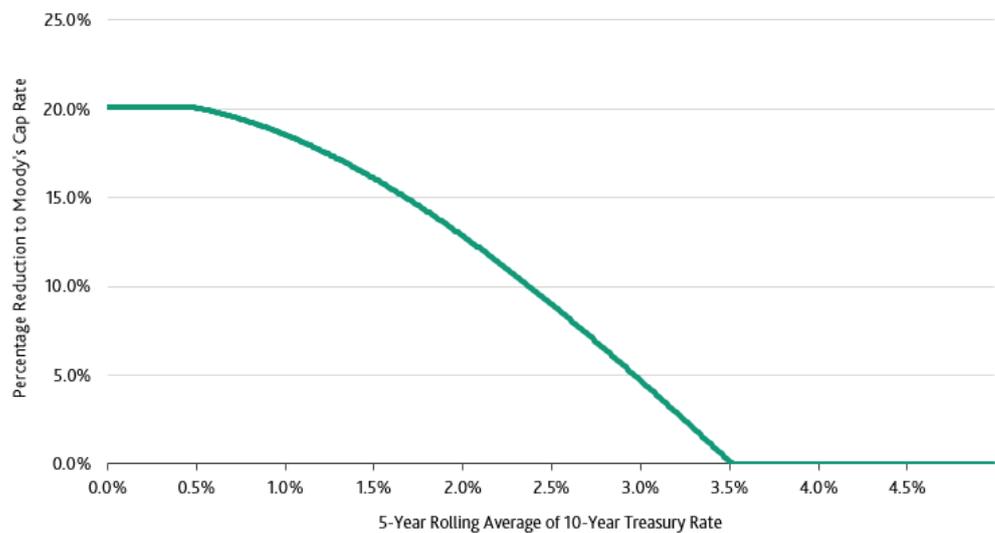
The magnitude of the adjustment increases as the 5-year rolling average US Treasury rate declines, as shown in the exhibit below. The magnitude of the adjustment reaches a maximum of 20.1% when the 5-year rolling average of the 10-year US Treasury rate equals 0.5% or less.⁷

⁵ For more information, see our cross-sector methodology that describes our approach to deriving sustainable net cash flow and value for major property types in the Americas and Asia-Pacific. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

⁶ For more information, see "Moody's Related Publication" section.

⁷ See Appendix 7 for a list of adjustment values as a function of 5-year rolling average US Treasury rates

EXHIBIT 5

Cap Rate Adjustment for Sustained Low Interest Rates

Source: Moody's Investors Service

We may reduce or eliminate this Treasury-based adjustment to cap rates when a property's cash flow volatility has increased for a sustained period beyond what is observed in a typical real estate cycle. For example, we may not apply this adjustment to a hotel property that is either closed or experiencing depressed occupancy due to imposed travel restrictions and/or lack of travel during periods of war, terrorism, pandemic, or any other extreme scenarios. Nor would we apply this adjustment to a regional mall showing very poor tenant rent collections and/or experiencing strong re-tenanting headwinds due to corporate bankruptcies and store closures. The decision to reduce or not apply the adjustment is based on our view of whether the distressed property's cash flow will normalize in the foreseeable future. We base our assessment on evidence of a durable normalization of property and market performance.

For loans with a short remaining term to maturity, we may apply cap rates closer to existing market levels to reflect the greater likelihood that market conditions will be unchanged during a refinancing period.

We may also decrease the cap rates used in our B2 (sf) analysis to assign a Moody's value to collateral in major markets like New York and San Francisco. This reflects their deep base of tenant and investor demand, which lowers the likelihood of default and the potential loss given default.

We may also adjust the cap rate at the B2 (sf) level when there is an unusually large difference between the appraised value and the value we initially determine if additional property or location-specific variables are present that would have a positive impact on credit. For loans contributed by loan sellers with superior underwriting, backed by collateral with access to the capital markets and liquidity superior to that of typical, equivalent conduit collateral, we may increase the cap rate adjustment we apply at the B2 (sf) level by up to one percentage point. Notwithstanding potential adjustments, we do not use an adjusted cap rate at B2 (sf) below market levels at the time of securitization.

We also use an adjusted loan balance that reflects each loan's amortization profile. The amortization profile considers the risk of an early term default, which would reduce the deleveraging that occurs through amortization. The adjusted MLTV (adjusted loan balance divided by adjusted Moody's value) identifies all loans with an adjusted MLTV greater than 95%.

We may further adjust loan-level enhancement if (1) loans have characteristics that depart from our benchmark assumptions and/or (2) other loan-level characteristics are present, which we detail in section C below. We may also make further adjustments for sponsor quality and legal/structural issues related to the borrowing entity.

Exhibit 6 illustrates a potential range of cap rate adjustments for various considered factors. Of note, common factors not shown in the exhibit that affect the recalculated MLTV include amortization, non-traditional property interest (e.g., leased fee position), and certain structural elements (e.g., subordinate debt).

EXHIBIT 6

Benchmark B2 (sf) Cap Rate Adjustments

Factor	Range		
	Weak	Average	Strong
Market Quality	0.00%	0.00%	-0.25% to -1.50%
Borrower Quality	0.00%	0.00%	-0.25% to -1.50%
Cross-Collateralization	0.00% to -0.25%	-0.25% to -0.50%	-0.50% to -1.50%
Lit/Dark Value Stress Removal	0.00%	0.25 to 0.75%	0.50% to 1.00%

Source: Moody's Investors Service

We may also adjust B2 (sf) cap rates by up to 1% based on lender track record and up to 2.5% based on a significant difference between Moody's value and market value.

Section B: Fusion Loans

We base our fusion approach on a detailed performance analysis of more than 36,000 commercial mortgage loans in our rated US CMBS transactions. Appendix 3 includes further details on the development of our fusion approach.

We assign a probability of default and recovery rate to each fusion loan. We assign a probability of default in two different ways, depending on whether the fusion loan has low leverage (and therefore may be credit-assessed investment grade) or high leverage (and therefore is below investment grade). We assign recovery rates in the same way for both loan categories.

STRUCTURED CREDIT ASSESSED (SCA) LOANS

For loans with SCAs, we assign PDs following our large loan framework. The MLTV targets for credit-assessed loans, depending on leverage and other characteristics, are consistent with those we use in our large loan and single asset/single borrower approach.⁸

Recovery rates for investment-grade loans are based on the loan's MLTV, MDSCR, amortization profile, and size.

LOANS REPRESENTING A LARGE SHARE OF THE POOL

For loans that represent greater than 10% of the pool balance, we assign default probabilities using a function that maps loan-level credit characteristics to default probabilities based on Moody's CMBS loan

⁸ For more information, see our large loan and single asset/single borrower methodology. A list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

performance data. As with credit-assessed fused loans, we assign recovery rates using a recovery rate function that is calibrated to our loan performance data.

CALIBRATION

The following loan-level characteristics are inputs in our probability of default and recovery rate assumptions: MLTV, MDSCR, interest-only profile, and in the case of recovery rate, loan size. The relationships between the various input factors and the assigned default probabilities and recovery rates were calibrated using our loan performance database, which pairs our credit metrics for conduit and fusion loans at origination with statistical analysis of their subsequent performance.

Our calibration of the probability of default and recovery rate functions follows a two-step process. In step one, we estimated, based on historical performance data, the impact of loan-level characteristics on default frequency and recovery rates in the event of loan default.

In step two, we apply the probability of default and recovery rate assumptions to our benchmark for fusion portfolios, considering loan-level performance data. The calibration exercise involved determining expected and stressed losses for CMBS 2.0 portfolios with certain features, then adjusting the PD functions as needed to match expected losses implied by the model with those of the benchmark portfolios.

The loan's DSCR determines the probability of default. The amortization profile is an additional factor, particularly at loan maturity, when amortizing loans have a distinct credit advantage due to their reduced balances.

Loss given default is determined by the loan's MLTV. The loan's amortization profile is also a factor in loss given default as the portion of the loan paid back through amortization is no longer exposed to loss.

The PD and LGD are key inputs, together with the transaction-specific Herf score, to derive each fusion loan's contributory enhancement level using a Gaussian copula framework. In some cases, attributes of the loan or the collateral may preclude us from assigning credit enhancement consistent with our highest rating levels.

Section C: Other Factors Affecting Loan-Level Credit Enhancement

Structural features can affect the probability of default and loss severity for both conduit and fusion loans. The following loan features may significantly impact credit quality, and therefore we adjust loan-level credit enhancement to account for these features.

AMORTIZATION

We view amortization favorably from a credit perspective, as the portion of principal returned through amortization is no longer exposed to default risk. Further, amortization helps build up an equity cushion behind a loan, increasing the likelihood of refinancing at maturity.

To assess the likelihood of a loan successfully amortizing, we consider its seasoning, overall leverage, debt service coverage, tenancy, borrower creditworthiness, and the position of its collateral in the real estate cycle. For example, we factor more amortization into our analysis for a loan secured by a property that is substantially leased to a highly rated tenant than for one leased to a poorly rated tenant. We also factor in more amortization for loans with high DSCRs, given their lower term default risk.

To reflect whether there is a benefit from amortization during the loan term, we may adjust the credit enhancement for a loan. We do this by comparing the scheduled loan balance at maturity for a given loan

to the maturity loan balance that would result assuming the loan had an 8.5% coupon rate and a specified amortization term (e.g., 300 months for hotel and 360 months for other asset classes).

CROSS-COLLATERALIZATION

Cross-collateralized and cross-defaulted (crossed) loans are common in conduit/fusion CMBS transactions. A pool of crossed loans is typically secured by properties owned by a single borrower or by related borrowing entities, and all properties are effectively bundled to support the aggregate loan amount.

We consider crossing to be a valuable mechanism for credit risk reduction because the risk of default may be reduced to the extent that the performance of the properties is not perfectly correlated. Excess cash flow from a strong property can augment a weak property's cash flow, maintaining the overall DSCR. Therefore, for a pool of crossed loans, we consolidate NCF and debt service to arrive at a consolidated DSCR. We adjust loan-level enhancement to reflect the risk mitigation benefits of crossing the loan pool.

We use a similar approach to assess the credit quality of crossed and uncrossed loans, except for an additional step to assess the incremental benefit of crossing. The benefit stems from the reduction of volatility in cash flow and value to the extent the performance of the properties is not perfectly correlated.

When assessing crossed loans, we first examine if the loans are both cross-defaulted and cross-collateralized. Cross-defaulting allows a lender to foreclose on all the properties in a crossed pool of loans, even if only one loan defaults. This feature reduces the frequency of default, as the borrower puts the entire pool at risk by defaulting on a single loan. If loans are only cross-defaulted, the equity in any one property is not available to repay deficiencies of other loans in the pool unless the loans are cross-collateralized.

We then examine the property locations and tenant diversity. Loans for properties in the same region, or even the same development, receive less benefit because the properties are subject to the same underlying economic and real estate fundamentals. We also examine diversity by tenant because, in certain instances, the default of a major tenant common to multiple properties could cause multiple defaults.

In general, crossed loans with lower leverage receive greater crossing benefits. This is because they have more equity available to help support each other. For loans with greater than 100% MLTV, crossing has a limited effect on the probability of default, although it may mitigate the volatility of loss severity.

We review the release provisions of crossed loans to ascertain the extent to which early payment on certain loans reduces the equity available to support the entire pool and compensates for reduced diversity. We consider both the allocated loan amount (in some cases, the underwriter's allocation of value can meaningfully differ from ours) as well as the premium (over the allocated loan amount) that must be paid before the property is released from the mortgage lien. Our analysis considers that release provisions in some cases embed an option for the borrower to engage in "cherry-picking," allowing it to release the properties that performed better than expected while leaving as collateral the properties that performed more poorly than expected.

We undertake a similar analysis in the case of a pooled loan, a single loan that is secured by multiple properties.

FLOATING RATE LOANS

Our approach to assessing floating rate loans is similar to fixed-rate loans, except for an additional step to assess the credit risk associated with floating interest rates.

Floating rate loans have additional credit risk associated with potential interest rate increases during the loan term. We stress interest rates to assess the credit enhancement adjustments necessary to compensate for floating rate risk. This adjustment incorporates the impact of both higher interest advancing costs as well as additional term default risk associated with interest payment volatility. In our analysis, the default risk at maturity is essentially the same as for otherwise comparable fixed and floating rate loans due to the stress factors we build into our rate assumptions when assessing refinance risk.

Our analysis of floating rate loans takes into account the following considerations:

- » Higher-leveraged floating rate loans require more enhancement as there is less equity available to help absorb interest rate increases.
- » Longer-term loans have greater uncertainty and require more enhancement given the increased possibility of interest rate increases.

Interest rate caps during the loan term help offset floating rate risk but do not eliminate it. Our assessment of interest rate caps considers the following factors:

- » The lower the cap's strike rate, the greater the credit benefit.
- » The credit benefit of a cap is greater for high-leverage loans than for low-leverage loans. Lower leverage loans have a greater equity cushion to absorb rate increases, and we expect defaults for such loans to occur later in the term or at balloon payment.
- » Interest rate caps covering the tail period post loan maturity are not common. However, it is possible to substantially eliminate post maturity interest rate risk via a mechanism that caps interest rates, such as a contractual limitation on the coupon.
- » The counterparty risk of the cap provider affects the strength of the cap. Rate caps that are part of the loan agreement do not present this issue but can limit the cash flow available to the trust to pay rated securities.⁹ We typically do not give any credit benefit to the cap if the rate cap provider is not rated investment grade.

MARKET DYNAMICS AND FUNDAMENTALS

Credit enhancement for a given rating level may be lower for properties in New York, San Francisco and other major metropolitan areas. This reflects the greater diversity of tenants available to occupy buildings upon re-leasing, as well as the greater amount of capital available for properties in such markets from lenders and investors. As a result, we expect properties in several major metro areas to have a lower probability of default and a lower loss given default than properties with comparable DSCR and MLTV metrics outside these metros.

We may increase pool-level credit enhancement in cases in which the transaction has a disproportionate share of loans in secondary and tertiary markets, for which we expect the probability of default and severity of loss to be higher as a result of reduced tenant diversity and liquidity. We use the portion of the pool not covered by our RYG scores as a proxy for the portion of the pool outside of major metro areas, as RYG covers 50 or more of the largest metro areas for each major asset class.

We also adjust credit enhancement using RYG to consider the fundamentals of the market in which the collateral is located. RYG considers a market's supply and demand profile, as well as other variables that can cause NCF to increase or decrease over the near term. Markets with supply well above anticipated demand have a greater risk of near-term income and credit metric declines. We may adjust credit enhancement

⁹ For more information, a link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

higher or lower by up to 10% to reflect property market strengths or weaknesses (i.e., an initial Aa2 (sf) credit enhancement of 10% could range from 9% to 11% post-adjustment).

SUBORDINATE DEBT

A subordinate debt behind a securitized loan increases the likelihood of default on the senior loan and, in some cases, increases the loss severity on the senior loan when a default occurs. The borrower has less equity in the property and less incentive to maintain or create value. In stress scenarios, they may choose to divert resources to other properties with lower leverage.

Our benchmark credit enhancement levels assume there is no subordinate debt behind the senior loan. In case of subordinate debt, we increase the senior loan's benchmark credit enhancement levels and MLTV based on these factors:

- » **The amount and type of the subordinate debt:** Common types of subordinate debt in CMBS are debt-like preferred equity, mezzanine loans, B notes, and second mortgages. The credit enhancement and MLTV adjustments we apply are typically (1) for debt-like preferred equity or mezzanine loans: one-third of what the adjustment would be if the subordinate debt was part of the senior loan; and (2) for B notes or a second mortgage: two-thirds of what the adjustment would be if the subordinate debt were part of the senior loan. This reflects that debt-like preferred equity or mezzanine loans are, in general, weaker interests with fewer rights on default or in bankruptcy than B notes or second mortgages. The aggregate adjustment applied for subordinate debt is generally capped at 3% for the MLTV adjustment and 2% for the benchmark credit enhancement adjustment.
- » **Total leverage:** Loans with higher leverage might receive a smaller adjustment as they move closer to the point where we assume a default. The incremental adjustment relates primarily to the potential for additional loss severity. Similarly, we apply a smaller adjustment to loans with very low leverage as they typically have a very low probability of default, including any subordinate debt.

We distinguish "debt-like" preferred equity from "true" preferred equity by these characteristics: (i) a hard coupon and/or (ii) a hard maturity date, with (iii) consequences for failure to meet (i) or (ii), such as a change in control or triggering of buy-sell mechanisms. We do not apply any leverage penalty for "true" preferred equity.

TRAPPING RESERVES FOR CAPITAL EXPENSES, TENANT IMPROVEMENTS, AND LEASING COMMISSIONS

Reserves for capital replacement, tenant improvements, and leasing costs improve the stability of the cash flow from the collateral backing a loan. Commercial properties are often under the most stress and have the highest risk of default when cash flow does not cover the cost of such items. Provided the reserves are held at an appropriately rated institution, we may reduce the Aa2 (sf) credit enhancement for loans with appropriate reserves to account for the additional support available to help preserve the collateral's value.

LOAN-LEVEL LEGAL CONSIDERATIONS

For credit-assessed loans, we analyze loan-level legal issues in accordance with our large loan framework.

We typically apply a standard credit enhancement adjustment at the Aa2 (sf) level to every non-credit-assessed loan in the pool. The loan-level legal adjustment will generally be 1% or, for transactions and sponsors which we consider to generally have weaker legal documentation, 2%. In addition, on a case-by-case basis, we may apply a penalty greater than 2% to account for transactions with exceptionally higher loan-level legal risks, for instance in the case of a new platform with substandard legal documentation.

For both credit-assessed and non-credit-assessed loans secured by ground leases, we review the relevant ground leases and estoppels to ascertain that they do not present a material risk to the lender of losing the

collateral securing the loan. If we identify a severe deficiency with respect to a ground lease or other legal issue, we will apply a credit enhancement penalty that can range up to 100% of the loan amount.

Pool Analysis and Tranching

Conduit Pool

To derive the initial Aa2 (sf) enhancement level for the entire pool, we calculate the weighted average (by loan balance) of the individual loan enhancements. We then adjust it to reflect the rated certificate's class thickness, the loan pool's Herf score to the extent it differs from our credit neutral benchmark of about 40, and information quality.

To derive the initial B2 (sf) enhancement level for the entire pool, we calculate the aggregate amount by which any loan exceeds 95% of our B2 (sf) scenario adjusted value (the "paydown" amount) and adjust pool enhancement accordingly. This reflects an orderly liquidation if needed, with the haircut to the B2 (sf) scenario adjusted MLTV of 95% allowing for transaction costs associated with the resolution.

We increase the "paydown" level of 95% of adjusted Moody's value by up to 10 percentage points (i.e., this value could be increased to as high as 105% of adjusted Moody's value) for loan sellers that demonstrate underwriting quality and recovery rates on their defaulted loans that are consistently superior to that observed for similar conduit loans. This increase recognizes the buffer built into our MLTV-based paydown assessment concerning well-underwritten loan pools.

The ultimate B2 (sf) enhancement level reflects the B2 (sf)-rated certificate's class thickness, an allowance for negative pooling characteristics (typically around 2%), and our assessment of pool correlations.

For loan sellers with track records superior to those of similar conduit loans, we lower by up to 50 basis points the minimum floor loss level to which the paydown amount is added. For example, the minimum floor loss level of 2.0% that is typically applied could be reduced to as low as 1.50%.

Our framework for tranching the conduit portion of credit enhancement across our rating spectrum uses the Aa2 (sf) and B2 (sf) credit enhancement levels as key reference points. We calculate credit enhancement for classes between Aaa (sf) and A2 (sf) by scaling from the Aa2 (sf) reference point and for classes between Baa3 (sf) and B1 (sf) by scaling from the B2 (sf) reference point. Classes between A3 (sf) and Baa2 (sf) are derived by blending the enhancement levels arrived at from scaling down from the Aa2 (sf) reference point with those arrived at from scaling up from the B2 (sf) reference point.

To scale Aaa (sf) enhancement from the Aa2 (sf) reference point, we multiply the Aa2 (sf) level by a factor ranging from 1.05 to 1.40. To scale between Aa2 (sf) and A2 (sf), we divide the Aa2 (sf) enhancement by a factor ranging between 1.05 and 1.60. Intermediate classes are linearly interpolated from pairs of these reference points. For most transactions, we typically multiply the Aa2 (sf) reference point by 1.20 for Aaa (sf) and divide the reference point by 1.30 for A2 (sf).

To scale enhancement for classes between the B2 (sf) reference point and Baa3 (sf), we use non-linear multipliers that vary depending on the amount of B2 (sf) enhancement. For most transactions, we typically multiply the B2 (sf) reference point by a multiplier close to 2.0 for Baa3 (sf). Intermediate classes are non-linearly interpolated between these two reference points. The enhancement for classes between A2 (sf) and Baa3 (sf) is typically calculated by linear interpolation between the A2 (sf) and Baa3 (sf) reference points.

The specific factors we employ in our analysis depend on the overall collateral quality of the pool, as well as the dispersion of collateral quality. Pools with uneven quality may receive factors that result in higher

enhancement to address the greater potential performance volatility that may result from idiosyncratic risk present in one or more loans.

For classes rated below B2 (sf), we follow a procedure similar to the one described above to determine the B2 (sf) credit enhancement level, except that the threshold by which we determine credit enhancement in relation to MLTV is progressively higher than 95% MLTV, commensurate with the greater risk associated with classes rated B3 (sf) and below. For classes rated B2 (sf) and below, we also establish minimum credit enhancement levels to account for idiosyncratic risk, even when all loans in the pool have leverage lower than the MLTV threshold level commensurate with the rating, although these levels are rarely binding.

The tranching formulas apply to tranches whose class sizes are consistent with at least two notches of "thickness." For example, the formula for Baa2 (sf) is applicable assuming the immediately most-senior tranche is sized with credit enhancement not less than that determined by the formula for A3 (sf).

Fusion Pool

Our fusion approach involves joining a conduit loan pool (a large number of loans of below investment-grade quality) with one or more loans that are (1) of investment-grade quality or (2) represent more than 10% of pool balance (collectively called fusion loans). Defeased loans are also fused, typically with 0% credit enhancement, since they are supported by government securities.

On a standalone basis, each component has its strengths and weaknesses. The conduit component is typically well-diversified, which helps mitigate some of the concentration risk associated with the fusion loan portion. The investment-grade loan segment improves the average credit quality of the overall transaction.

Some of the key factors that affect the credit enhancement required for fusion transactions include (1) loan credit quality, (2) composition and correlation of the fusion loan pool, and (3) conduit diversity.

FUSION LOAN CREDIT QUALITY

The credit quality of the fusion loans is a significant credit risk factor in fusion transactions. Typically many, but not all, of the fusion loans have investment-grade SCAs, but these loans can run the spectrum between baa3 (sca.pd) and aaa (sca.pd). Also, large below-investment-grade fusion loans can add significantly to pool concentration.

COMPOSITION AND CORRELATION OF THE FUSION LOAN SUB-POOL

The relative size and composition by asset type and geography of the fusion loan sub-pool is an important determinant of credit within fusion transactions. In some cases, the fusion loan component may comprise more than half of the transaction pool, with one or more loans exceeding 10% of the transaction. In some cases, the largest loans have credit quality consistent with that of the conduit pool but happen to be much larger. We consider the correlation among the largest loans, which can include sponsor, tenant, and markets. For example, a fusion loan component that consists only of offices in financial centers would be highly correlated. In contrast, a fusion loan component backed by a mix of property types and regions would be less.

CONDUIT DIVERSITY

The third important risk factor is the diversity of the conduit portion of the pool to which the fusion loans are added. The conduit portion consists of numerous smaller loans, most of which would be below investment grade in credit quality. The inclusion of the fusion loan(s) renders the conduit loan pool less diverse. Despite better credit quality, the size of the fusion loans can introduce a remote but significant

event risk not present in the diversified conduit pool. Pooling investment-grade fusion loans with conduit loans can more than offset the reduced diversity, depending on the quality of the fused loans.

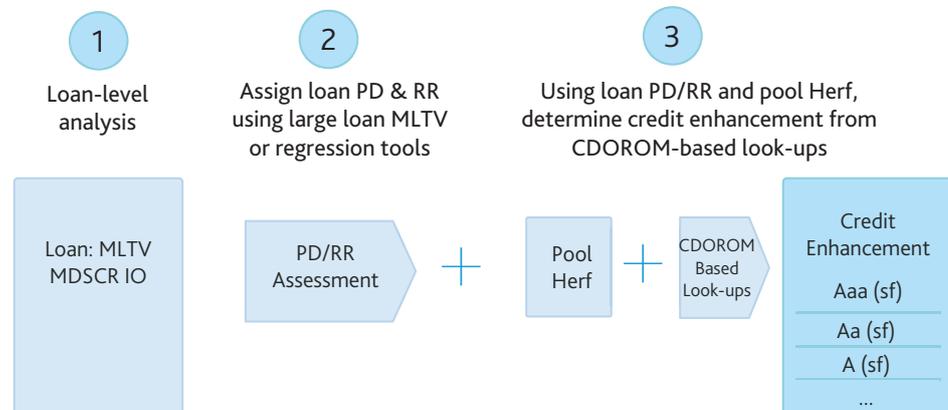
The diversity analysis in a fusion transaction incorporates two important considerations:

- » **Diversity of the conduit pool**
- » **Concentration of the large loans**

Exhibit 7 illustrates how we use loan-level credit attributes to assess loan-level credit enhancement for each fusion loan which we then blend proportionately with conduit pool credit enhancement to arrive at overall transaction-level credit enhancement.¹⁰

EXHIBIT 7

Credit Enhancement Assessment for Investment-Grade and Below-Investment-Grade Fusion Loans



Step 1: We quantify the key credit metrics of the fusion loan (MLTV, MDSCR, amortization type, loan size), and any additional attributes are referenced.

Step 2: We use the credit metrics and attributes of the fusion loan to determine the loan-level probability of default in one of two ways. For investment-grade fusion loans, we use our large loan approach to determine the probability of default. For below-investment-grade fusion loans, we use a regression-based model to derive the probability of default based on explanatory variables of performance from our loan database, such as MLTV, MDSCR, and amortization profile. For both investment-grade and below-investment-grade fusion loans, we use a regression-based tool to assign recovery rates based on the explanatory variables in step 1.

Step 3: The outcomes for loan-level credit enhancement are determined by reference to a matrix derived from a simulation analysis that took as its inputs the loan probability of default, recovery rate, and pool diversity. For pool diversity purposes, we typically assume the loan Herf score is that of the collateral pool as a whole, including the fusion loan.

Source: Moody's Investors Service

INSURANCE STANDARDS

Property and casualty insurance protect the lender's security from possible impairment in case of damage to the property.

We do not apply any negative adjustments when the loan agreements require the borrower to carry property insurance for the full replacement value of the asset under "special causes of loss" forms, in addition to general liability, umbrella and rent interruption insurance in adequate amounts, and other customary coverages (e.g., boiler and machinery). We also assess whether adequate insurance coverage is provided against climate risks, including windstorm, earthquake, and flood perils for properties in special hazard zones, and terrorism insurance for assets comprising a large portion of the pool. In some cases, we

¹⁰ The surveillance process may also include recognition of losses and recoveries from troubled loans.

may deem credit-neutral insurance coverage for certain risks, such as windstorm or earthquake perils, that are less than replacement costs after review of satisfactory probable maximum loss or other specialized studies or data. We examine blanket insurance for concentrations of properties in special hazard zones to determine the adequacy of coverage and policy limits. For a loan to be credit neutral, the borrower also covenants to carry such insurance as prudent lenders reasonably require.

If we determine that loan documents include inadequate insurance standards, we may adjust the advance rates of the Aaa and the Aa certificates.

Master servicers are typically required to carry "force-placed" insurance on properties whose owners failed to obtain property and casualty insurance. We view this arrangement as credit neutral.

Structural Analysis and Liability Modeling

In this section, we explain how we analyze the structural features of a conduit/fusion CMBS transaction, including how we model and allocate cash flows to different classes of securities, taking into account asset cash flows and available credit support.

Cash Flow Analysis

The principal and interest cash flow waterfalls in conduit/fusion CMBS transactions are typically straight senior-sequential. Our benchmark credit enhancement levels for Aa2 (sf) and B2 (sf) assume that both principal and interest payments are allocated sequentially. The most senior outstanding tranche receives all principal payments until it is paid off in full. We further assume that realized principal losses and interest shortfalls are allocated in reverse sequential order, beginning with the most junior outstanding tranche. This pure senior-subordinate structure helps mitigate the impact of reductions in pool diversity and loan quality as higher-quality loans may be refinanced out of the pool at a faster rate. With a senior-subordinate structure, the remaining exposure of the more senior security holders is reduced most rapidly and the percentage enhancement available to support repayment of these security holders increases, thereby partially offsetting the diminished pool characteristics resulting from repayment.

We examine the credit implications of any variations from the standard waterfall and adjust credit enhancement as needed to mitigate the effect of these variations. Increases in credit enhancement are realized through the application of scheduled and unscheduled principal distribution amounts. Decreases in credit enhancement are realized through actual losses.

Volatility can arise from how certificates are tranches, given the concentration typical in CMBS pools. A combination of large loans and thinly sliced tranches may result in those tranches that do default having a high percentage loss given default. Our benchmark assumption is that a transaction's class sizes are the equivalent of at least two notches thick, except at Aaa (sf). We expect additional subordination for thinner tranches to reduce their probability of default in order to achieve a comparable expected loss, given that they have a higher loss given default.

The bulk of a CMBS transaction tends to be rated Aaa (sf). Structural variations at Aaa (sf) include carving out senior-subordinate classes and carving out pari passu time-tranched classes and carving out floating rate classes. Subordinate Aaa (sf) classes, which have a higher loss given default given their thinner class size, usually benefit from additional enhancement to reduce the probability of default to match the Aaa expected loss.

If interest on transaction classes is not capped at the weighted average coupon or sized to rates below that of the lowest loan coupon, we conduct scenario analysis to ascertain the potential credit impact. In this analysis, we default loans in descending order of coupon from highest to lowest to derive additional credit enhancement, if any, commensurate with the proportion of loans assumed to default for each rated class.

Other Considerations

Along with our asset, structural, and liability analysis, we consider other quantitative and qualitative factors in our credit analysis such as transaction counterparties, legal risks, reliability and completeness of historical and portfolio data, country ceilings, and environmental, social and governance (ESG) considerations.

Counterparty Risks

We consider and integrate various counterparty-related risks at different stages throughout our credit analysis. More specifically, we consider operational risks, hedge counterparties, commingling risk, and account banks.¹¹ Based on our review, we may adjust our assumptions, inputs, or model results. If information is limited, we may also adjust the rating level.

Operational Risk

Operational risks can arise from various potential sources, including disruption to cash flows caused by the financial distress of a service provider to the conduit/fusion CMBS transaction. As part of our analysis, we consider the financial disruption risk and the roles of the master servicer, special servicer, certificate administrator, and trustee.¹²

SERVICING

Our analysis accounts for the impact of servicing arrangements on the performance of the transaction. CMBS transactions typically have both a master servicer for loan administration and a special servicer for underperforming or non-performing loans. We review the qualifications and experience of the master and special servicers. If a servicer's qualifications and experience are inadequate, we may be unable to assign ratings to or maintain ratings on the transaction.

We typically consider servicing arrangements and the servicing fee structure and adjust our assumptions when appropriate. We will apply adjustments in our analysis on a case-by-case basis if the servicing agreement permits potential conflicts of interest between the special servicer and borrower.

Servicing Agreement Provisions

- » **Servicing Standard:** We review the servicing agreement to determine the scope of the servicer's obligations and the servicing standard which governs a servicer's decisions. To the extent the servicing standard is not sufficiently exacting, we may increase credit enhancement levels.
- » **Servicer Termination Events and Replacement Mechanisms:** We qualitatively consider servicer termination events and related enforcement mechanisms in our analysis. CMBS servicing agreements

¹¹ For more information, see our methodology for assessing counterparty risks in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

¹² In some transactions, the trust assets include pari passu loans that are serviced by CMBS transactions that are not rated by us. Alternatively, the trust assets may include pari passu loans that will ultimately be serviced by a CMBS transaction not rated by us and by a master servicer or special servicer that is, as of the closing date of the transaction, undetermined. We review these circumstances on a case-by-case basis, and in each case, we consider as a key factor the percentage of the pool represented by loan balance of such pari passu loan.

typically provide that a servicer or special servicer can be terminated upon any unremedied failure of such servicer to perform its obligations.

We expect servicer termination events to be more effective if a transaction party or group of investors act upon them. We view it as credit neutral for servicing agreements to provide that if any servicer termination event occurs, the trustee is required to replace the servicer at the written direction of the investors entitled to 25% (or less) of the voting rights. We view a minimum threshold set at not more than 25% as credit neutral.

- » **Standard for liability and indemnification:** Servicing agreements in CMBS typically exempt servicers and other transaction parties from liability to the trust, other than the liability arising from any breach of warranties or representations or any liability due to willful misconduct, bad faith or negligence or because of negligent disregard of such party's obligations and duties. Servicing agreements typically apply a similar limitation to the transaction parties' entitlement to indemnification from the trust and require the transaction parties to indemnify the trust for such liabilities. We view this arrangement as credit neutral and consider deviations from this standard on a case-by-case basis.

Hedge Counterparties

We analyze the rating impact of exposures to hedge counterparties, assessing the probability of a transaction becoming unhedged and deriving additional potential losses.¹³ We may conclude that we adjust the ratings to reflect the linkage and additional loss as part of our analysis.

Commingling Risk

In conduit/fusion CMBS transactions, the risk of commingling with the funds of another transaction party before the funds' transfer to the issuer's account is typically addressed by using accounts for collection and distribution that are always separate, identifiable, and deal-specific. However, should commingling risk exist in a transaction, we will determine the credit quality of the party and the exposure and incorporate the additional loss.

Account Banks and Investments

Generally, our analysis of account banks and temporary investments consists of three steps: (1) we assess the "rating uplift" based on transfer triggers (if any) to the account bank's rating obtaining an "adjusted" rating; (2) if the adjusted rating is below a certain threshold, we assess the exposure of the transaction and categorize the risk into either "standard" exposure or "strong" exposure; and (3) we determine maximum achievable ratings.¹⁴

Liquidity Analysis

CMBS transactions commonly incorporate a liquidity mechanism (often in the form of servicer or trustee advances) to ensure timely payment of interest on the rated securities and pay amounts necessary to protect the collateral. This includes payments for real estate taxes, insurance, and ground rent. In transactions with advancing, the master servicer typically has primary advancing responsibility, typically backed up by the trustee or other entity. In the absence of advancing, we evaluate other structural features such as liquidity facilities or reserve funds.

Without a satisfactory liquidity mechanism, we are unlikely to assign investment-grade ratings. We take account of the credit quality of the servicer (in case of servicer advancing) or any other liquidity provider.

¹³ For more information, see our cross-sector methodology for assessing counterparty risks in structured finance, including swap linkage. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

¹⁴ For more information, see our cross-sector methodology for assessing counterparty risks in structured finance. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

In a transaction with servicer advances, shortfalls can arise when servicers recover amounts previously advanced plus interest on a priority basis at the top of the waterfall. To protect the highly rated classes from sudden interest shortfalls due to reimbursement of advances, servicing agreements typically provide that upon the determination that an advance is nonrecoverable, to the extent that the reimbursement thereof would exceed the amount of the principal portion of general collections deposited in the collection account, the advancing party may elect to refrain from reimbursing itself for up to 12 months. We view this arrangement as credit neutral and consider the rating impact of alternative arrangements on a case-by-case basis.

In addition, servicing agreements that permit reimbursement of recoverable advances that are workout-delayed reimbursement amounts typically limit such reimbursements to principal collections. We view this arrangement as credit neutral.

Transaction-level Legal Risks

We assess legal risks that may affect the expected losses posed to investors. At closing, we review legal opinions to inform our views on the key legal risks identified in a transaction. For transaction-level legal issues, we apply adjustments to credit enhancement or other components of our analysis on a case-by-case basis, considering the likelihood and potential impact of the legal issue. In certain cases, such issues may raise ratability concerns.

Bankruptcy Remoteness of the Issuer and True Sale Considerations

We analyze whether the issuer is bankruptcy remote such that the likelihood of (1) a bankruptcy filing by or against it; or (2) substantive consolidation – that is, the pooling of the issuer's assets and liabilities with those of a bankrupt affiliate – is so low that it has no rating impact.¹⁵ If we determine that the issuer is not bankruptcy remote, we assess the potential rating impact on a case-by-case basis according to the likelihood of bankruptcy and the possible negative consequences for investors.

As part of our analysis, we will also review true sale opinions to confirm that in a bankruptcy proceeding of the loan seller or the depositor, the loans would not be considered property of the seller's or depositor's, as applicable, bankruptcy estate, nor that the automatic stay would attach to loan payments. Similar considerations and analysis may apply to pre-securitization transfers by affiliated entities that owned the mortgage loans before the mortgage loan seller.

We expect securitizations also to have a backup security interest in the collateral that discourages creditors from challenging the transaction's structure. Even if a challenge is successful and the securitized loans are considered part of the seller's or depositor's bankruptcy estate, the creditors would accomplish little because they would be in an unsecured position.

Tail Period

CMBS transactions commonly include a tail period beyond the maturity date of the longest-dated loan. Special servicers are also typically allowed to extend the term of troubled loans. In the relevant legal system, we assess whether a special servicer has sufficient time to gain control of a property and dispose of it as both can be important to maximize recoveries.

¹⁵ For more information, see our cross-sector methodology for assessing bankruptcy remoteness in structured finance. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

We generally consider as credit neutral a tail period of at least 12 years, comprised of seven years after the maturity date, followed by a further period of five years during which no extensions by the servicer are permitted. We assess the impact of shorter periods on a case-by-case basis.

Some loans are structured with an anticipated repayment date of, for instance, 10 years from origination, but with a legal maturity date of, for instance, 30 years, fully amortizing (with stepped-up interest) by year 30. We generally use a relatively abbreviated tail period of three years for such loans. Thus, for example, for a pool with a 10-year anticipated repayment date loan and a 30-year legal maturity, the credit neutral rated final distribution date generally would be 33 years from the origination of such a mortgage loan.

Representations, Warranties, and Covenants

Our analysis of a transaction's representations and warranties (R&W) framework includes an evaluation of the scope of the R&Ws, their enforcement mechanisms, and the financial strength of the entity that provides them. We also review the document delivery provisions in the mortgage loan purchase agreement and the servicing agreement to confirm that the mortgage loan documents are delivered to the trust within an appropriate period after the closing date. We will consider the R&W framework and the document delivery provisions to be credit neutral if:

- » The R&Ws are generally in line with market standards as of the date hereof, for example, as published in our 17g-7 reports for US markets, subject to internal considerations.
- » Adequate and timely mechanisms are in place in case of a material breach of R&Ws or a material document defect, such as an obligation to cure such breach or defect, repurchase the loans from the trust at par plus accrued interest and expenses, or an obligation to indemnify the trust, with agreement of the special servicer, in case of any loss to the transaction. We generally view an R&W breach or document defect as "material" if it materially and adversely affects either the value of the mortgaged property, the value of the mortgage loan, or the investors' interests in the certificates.
- » The R&Ws and the repurchase obligation are provided by a reputable and financially strong entity or its subsidiary.

We may adjust credit enhancement levels to account for weak R&W frameworks or weak document delivery provisions, and we consider the presence of structural mitigants in making this determination.

Appraisal Reduction

For troubled loans, the servicer typically orders a new appraisal. It applies an appraisal reduction if estimated recoveries (subject to customary adjustments) are less than the outstanding loan balance plus accrued interest and other amounts. Appraisal reduction mitigates the risk of over-advancing to junior investors. Because the servicer or liquidity provider has a super-priority claim on the loan collateral for the reimbursement of advances, advancing more than amounts that are ultimately recovered can result in the most-subordinate securities receiving distributions that otherwise would be paid to senior-ranking securities. To the extent the mortgage loan has become corrected and the appraisal reduction amount has been reduced to zero, servicing agreements also provide for the calculation of a collateral deficiency amount for any mortgage loan that has been subject to a modification that includes the creation of a hope note.

We will consider a transaction's appraisal reduction framework to be credit neutral if:

- » Appraisal reductions and collateral deficiency amounts notionally reduce the balances of the control-eligible classes of certificates. Applying appraisal reductions and collateral deficiency amounts to control-eligible classes prevents controlling classes that are "out of the money" from controlling servicing decisions and replacements.

- » Liquidation or other recovery proceeds are allocated to unpaid interest, excluding any interest not advanced because of appraisal reductions, which portion is then paid to fully reduce unpaid principal before going to repay such appraisal reduced interest. The servicing agreement accords similar treatment for accrued and unpaid interest on any hope note.

We may apply adjustments in our analysis case-by-case to account for weak appraisal reduction frameworks.

Controlling Class Rights

In a typical CMBS securitization, one or more subordinate classes of certificates are designated as "control eligible certificates." These entitle the majority of the holders of each such class to designate a representative (sometimes referred to as the controlling class representative or CCR) that often has the right to terminate the special servicer without cause and to approve and/or direct certain servicing actions to be taken by the master servicer or special servicer. We assess if the transaction documents include provisions to mitigate potential risks stemming from the exercise by the CRR of these rights. We consider that the following provisions in the servicing agreement sufficiently mitigate these risks:

- » The servicer may disregard the CRR's refusal to provide consent, direction or advice if the servicer determines that the CRR decision would otherwise cause the servicer to violate the loan documents, applicable law, or the servicing agreement.
- » A CCR is deemed to have approved a request for consent following a specified period. To address emergency situations that arise during that specified period, the servicer is authorized to take immediate action that the servicer determines is required to protect the interests of the certificate holders.
- » The CCR's consent, direction, and replacement rights terminate when the certificate balance of the most senior class of control eligible certificates (taking into account the application of appraisal reduction amounts and collateral deficiency amounts for such class) is less than 25% of the initial certificate balance of such class.¹⁶

We will apply adjustments in our analysis on a case-by-case basis if the servicing agreement permits potential conflicts of interest between the controlling class certificate holders and the borrower.

We apply similar considerations when evaluating B note or participation control rights outlined in an A/B co-leader or participation agreement.¹⁷

Tax Issues

We review transactions to consider the risk of entity-level taxation, which for US conduit/fusion CMBS transactions is typically remote when the transaction is structured as a REMIC. We review legal opinions on REMIC tax eligibility and other tax matters.

Data Quality Evaluation

We assign ratings to securities issued by a conduit/fusion CMBS transaction when we determine the information provided by reliable sources is sufficient. Data quality is also important throughout the life of a conduit/fusion CMBS transaction, as described in the "Monitoring" section.¹⁸

¹⁶ For more information, see the "Appraisal Reduction" section.

¹⁷ See discussion on A/B notes.

¹⁸ For more information, see our approach to evaluating data quality in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of securities backed by a portfolio of commercial mortgage loans. We evaluate the risk following our cross-sector methodology that describes our general principles for assessing these ESG issues¹⁹ and may incorporate it in our analysis.

Monitoring

In this section, we describe our approach when monitoring transactions.

We generally apply the key components of the approach described in this report when monitoring transactions, except for those elements of the methodology that could be less relevant over time. The typical conduit or fusion CMBS transaction has a lifespan of at least 10 years. As such, a variety of credit-related events may occur after issuance. Although our initial analysis anticipates varying degrees of collateral performance volatility, changes in pool composition or collateral performance can affect our initial ratings.

The surveillance of US and Canadian CMBS transactions generally relies on the same models and methodologies we use to assess new issuance. However, less updated loan-level information may be available for surveillance, such as updated appraisals for all loans. To compensate for this gap in information quality, we may employ more conservative assumptions in our surveillance analysis.

Transaction Performance

We monitor performance data published by the trustees and third parties to determine if transaction performance is in line with our expectations and perform more detailed analysis as needed.

Our performance analysis may consider, among other factors, (1) loan amortization and payoffs, (2) defaulted loan recoveries and losses, (3) change in share of defeased loans, (4) loan transitions from performing to another category, (5) updated loan-level financial reporting, (6) interest shortfalls, (7) appraisal reductions and (8) changes in credit enhancement relative to estimated losses. We may also consider other factors evidencing credit drift or potential credit drift as warranted. Furthermore, credit issues involving a specific borrower or tenant, such as a bankruptcy filing, may result in our identifying all transactions with significant exposure to that credit issue for a more detailed analysis.

Our surveillance analysis assesses property and loan performance drift over time as evidenced by changes in actual or expected property-level NCF and market dynamics compared to our initial analysis at new issuance. We may refresh SCAs on individual loans to reflect any material changes in performance that cause us to deviate from the net cash flow or property grade utilized at securitization. If sustainable performance fundamentally changes, we may remove credit assessments from individual loans and treat them as a conduit loan in our analysis. We also consider changes in collateral quality (e.g., defeasance), credit quality dispersion (e.g., distribution of loan-level LTV and DSCR ratios), and loan concentration (e.g., Herf score, new loans constituting more than 10% of the pool balance). Our analysis considers the probability of default and loss given default for loans in special servicing and loans we deem troubled. For these loans, we recognize estimates of losses and recoveries in our analysis. We may also consider the likelihood of loans paying off at maturity over the next three years by analyzing current debt yields versus market debt yields.

¹⁹ A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Although our analytical approaches for rating new issuance and monitoring transactions are consistent, changes in pool composition or loan performance may require a different modeling approach than initially used.²⁰ For example, defeased loans no longer contribute to effects arising from loan pooling. We do not analyze these loans as part of the larger conduit pool but instead typically fuse defeased loans with 0% credit enhancement as they contribute minimal credit risk to the transaction. Conversely, if the performance of a loan to which we initially assigned an investment-grade SCA declined significantly, we may remove the SCA and analyze that loan as part of the conduit pool.

As transactions season, diversity may change as calculated by the Herf score or otherwise. When the Herf score is below 20, we generally apply a large loan approach and our conduit/fusion approach and blend the results. Transactions may ultimately consist of a mix of conduit loans, structured credit-assessed loans (including defeased loans), credit tenant lease loans, and troubled loans. In such cases, we apply the appropriate analysis for each of the components and blend the results. When only one loan remains, we employ a single asset analysis for a performing conduit and/or credit-assessed loan, a loss and recovery analysis for a non-performing loan, or a credit tenant lease analysis for a credit tenant lease loan, as appropriate.

Exhibit 8 shows some of the more common factors that can lead to changes in CMBS ratings, although we consider any factors that can affect CMBS credit during the surveillance period.

EXHIBIT 8

Factors Leading to Credit Drift in CMBS Transactions

Changes in credit enhancement (due to payoffs, amortization, and/or losses)

Credit quality dispersion and changes in anticipated losses

Share of watch-listed, specially serviced, and delinquent loans

Share of defeasance

Weighted average LTV ratio and DSCR

Loan concentration (Herf score, loans > 10% of the pool balance)

Change in SCAs on loans

Negative or positive real estate news

Significant changes in the 5-year rolling average of 10-year US Treasury rates

Source: Moody's Investors Service

Property-level Data and Analysis

The quality of the information provided during the surveillance process is generally not as strong as the information provided at issuance. Financial information may be dated, and its quality and timeliness varies among borrowers. After the closing of a transaction, the servicer rarely updates third-party reports, such as appraisals, property condition reports, and environmental reports for performing loans. The servicer provides performance data based on information provided by the borrowers. Certain loans, such as those backed by credit tenant leases, are generally not required to report financial information. Exhibit 9 shows the loan- and property-level data we typically review during the surveillance process.

²⁰ 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.

EXHIBIT 9

Loan/Property Data

 Standardized financial statements prepared by the servicer – commercial operating statement analysis report (OSARs)

 Borrower submissions, including financial statements, budgets, rent rolls, sales reports, and occupancy cost reports

 Servicer's commentary on loans on watch* and specially serviced loans**

 Smith Travel Research reports for hotel properties

* These include loans that meet certain portfolio review guidelines established as part of the CREFC monthly reporting package. Some of the watch-listed loans may have material issues that could impact future performance.

** A specially serviced loan is generally in default (i.e., payment or maturity default), or the master servicer has determined that it is at risk of imminent default. The loan is transferred to the special servicer responsible for developing a workout strategy for the loan, such as a loan modification, forbearance, or liquidation.

Source: Moody's Investors Service

Surveillance generally uses the same methodology as at new issuance to analyze property cash flows and to derive Moody's NCF, DSCR, and LTV. We base our NCF analysis on a review of reported property data supplemented with market information as needed. Cash flow adjustments are based on historical property performance, a review of comparable properties as needed, expected leasing rollover, and our judgment. We then apply a cap rate to each property's NCF to derive a Moody's value.

Generally, these cap rates align with the cap rates we used when we assigned our initial rating at issuance with an adjustment to account for changes in the interest rate environment since closing. Also, we may adjust cap rates up or down based on changes in property performance, real estate market conditions, or capital market requirements. In our monitoring, we consider the rating impact of changes in the 5-year rolling average of 10-year Treasury rates in conjunction with aggregate commercial property price movements, updated property net cash flows, final alignment adjustments, the term to maturity and associated refinance risk, and other surveillance considerations described in this section.

For any loss and recovery analysis, we apply our estimate of a market cap rate. We may also apply market cap rates to loans approaching their maturity dates.

Some differences exist between the analytical processes we use for new issuance and surveillance. During an in-depth surveillance review, we typically conduct a detailed analysis of the three largest loans in each reviewed transaction, all loans assigned a credit assessment, all loans in special servicing, and any loans we deem to be troubled. We adjust the most recently reported full-year or annualized NOI for loans not fully reviewed to approximate our NCF for each property.

Cash flow adjustments vary by property type and are intended to account for capital reserves and tenant leasing costs along with adjustments for vacancy, above-market rent, and other factors. Typical cash flow adjustments, which we show in Exhibit 10, range from 10% to 25%. However, we may increase or decrease the adjustment for loans with specific market or property-level issues, such as significant near-term lease expirations, declining market rents, or increased market vacancy rates.

EXHIBIT 10

Examples of Haircuts to Servicer-Reported NOI to Approximate Moody's NCF During Surveillance

Property Type	Haircut
Multifamily	10%-15%
Manufactured Housing	10%-15%
Industrial and Self-Storage	10%-15%
Regional Mall	15%-25%
Anchored and Unanchored Retail	12%-18%
Office	10%-15%
Full and Limited Service Hotel	15%-25%
Healthcare	15%-20%
Other	0%-50%

Source: Moody's Investors Service

During the surveillance process, there may be instances where recent financial information for a limited sample of properties is not available, or the reported NOI for these properties does not reflect their forward sustainable income potential due to a temporary cash flow disruption. In these instances, we may base our property-level analysis on market comparables, market research, or analyst judgment.

Pool Analysis

We generally evaluate conduit/fusion transactions using the same loan and transaction models as those we use for newly issued ratings. During the early stages of a transaction, loan diversity and the dispersion of underlying loan credit frequently resemble the pool characteristics at securitization. However, as transactions season, loan diversity and credit dispersion characteristics change. When necessary, we adjust the original modeling approach to reflect significant changes in transaction collateral quality and composition. For example, we may analyze loans that no longer merit an investment-grade credit assessment as part of the conduit pool. Additionally, we remove defeased loans from the conduit pool as they contribute minimal risk to the transaction. For all non-troubled loans that represent greater than 10% of the pool balance, we assign default probabilities using a function that maps loan-level credit characteristics to default probabilities based on Moody's CMBS loan performance data. As with credit-assessed fused loans, we assign recovery rates using a recovery rate function that is calibrated to our loan performance data.

We may need to perform additional modeling to capture the effects of credit migration or as a transaction becomes more concentrated owing to loan payoffs and defeasance. For example, we may use both the conduit/fusion and large loan and single asset/single borrower modeling approach when a loan's Herf score falls below 20.

We will determine the expected loss severity for loans that have defaulted and transferred to special servicing or that have a high probability of default given poor property performance. We base loss estimates on discussions with the master or special servicer, market data, comparable sales, and analyst judgment, as recent financial statements for these loans are frequently unavailable.

We may model specially serviced loans in various ways depending on the projected magnitude and timing of the expected loss. If we do not anticipate that there will be a material loss from a specially serviced loan, we often analyze these troubled loans as part of the conduit pool with an LTV that reflects their estimated loss. However, if we expect the loss will be material, we frequently assume these loans will liquidate. In our analysis, we apply net liquidation proceeds to the senior security classes and losses to the lowest-rated classes in the capital structure according to the transaction's cash flow waterfall. We compare the loss

severity on these classes against the expected recovery assumption associated with the current rating of the classes.

We closely monitor loans with near-term balloon maturity dates as market conditions affect a borrower's ability to refinance. Surveillance analysts may engage in discussions with the transaction's master or special servicer to discuss refinancing strategy or other loan-specific issues.

Interest Shortfalls

Liquidity concerns affecting rated securities are an important component of our surveillance analysis. Interest shortfalls can be caused by temporary or permanent interruptions of interest payments to specific classes of securities. The interruptions may be caused by special servicing fees, trust expenses associated with specially serviced loans, appraisal subordinated entitlement reductions, and non-recoverability determinations.

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Appendix 1: General Information Typically Provided for Conduit/Fusion Transactions

Framework

- » Selection criteria for presented loan or pool of loans
- » Description of applicable underwriting criteria and origination process

Property Level

- » Underwriter's property description
- » Underwriter's valuation approach and credit decision
- » Third-party appraisal (discussion of market rents, concessions, vacancy, sales and rent comparables, expenses, taxes, tenant improvements and leasing commissions, reserves, capital expenditures, net cap rates, land value, income/expense ratios)
- » Third-party engineering/property condition reports
- » Insurance coverage/earthquake risk (Probable Maximum Loss)
- » Third-party environmental assessment
- » Tax assessment
- » Current rent roll and historical financials
- » Financial underwriting analysis
- » Description of due diligence process
- » Loan characteristics
- » Recourse information
- » Loan seasoning and performance/modifications
- » Borrower information and organizational chart
- » Nature of leases (terms, summaries)/ground lease summaries
- » Subordinate financing/preferred equity
- » Release prices/provisions/allocated loan amounts for crossed and blanket mortgages
- » Purchase price/construction cost/previous debt financing
- » Sales history and disclosure regarding co-tenancy, kick-out, and go-dark provisions for major retail properties

Structure and Legal

- » Overview and term sheet
- » Structure: bankruptcy remoteness, SPE, true sale opinions
- » Servicing: identification of master and special servicers
- » Overview of advancing for liquidity and property protection
- » Tail period
- » Overview of interest and currency risks
- » Proposed transaction timing

Market Studies and Valuations

The following market and property characteristics are relevant to our rating analysis of CRE transactions. Please note that additional information might be helpful for our review of a specific property.

Market

- » General market overview
- » Detailed submarket description
- » Submarket vacancy rates - discussion of supply and demand conditions (history and expectations)

Property vs. Market

- » Competitive positioning of subject property - discussion of relevant property characteristics
- » Discussion of typical lease terms and covenants
- » Detailed discussion of market rents and relevant trends (subject and comparable properties)
- » Discussion of concessions and credit loss rates
- » Anticipated downtime to release vacant space in submarket and subject property
- » Review of ongoing property expenses (actual vs. market ratios)
- » Discussion of appropriate third-party management fees
- » Review of property taxes (actual vs. readjustment after sale)
- » Property ownership
- » Discussion of appropriate tenant improvements
- » Discussion of standard leasing commissions (new and renewal)
- » Capital expenditure requirements (deferred maintenance and ongoing)
- » Discussion of appropriate cap rates (based on NOI) for subject property in relevant submarket (recent sales of comparable properties)
- » If appropriate, discussion of redevelopment opportunities, alternative use, land value (after conversion costs)

Value

- » Current value based on net income approach and sales approach - supported by cost approach
- » Open market value at loan maturity
- » Additional value based on vacant procession / go-dark approach for properties leased to one or a small number of tenants on a long-term and net basis. Such valuation should discuss anticipated downtime after tenant default, current market rents, concessions, leasing commissions, tenant improvements, and conversion costs.

Supporting Information

- » Detailed listing of applicable sales and rent comparables used to determine the value and market rents in the relevant submarket
- » Detailed tenancy schedule
- » If available, photographs and location plans
- » Basis of valuations and assumptions

Appendix 2: Red-Yellow-Green Description

Red-Yellow-Green™

We use our Red-Yellow-Green™ diagnostic tool to complement our cash flow analysis.

Scoring

We score each market for each property type on a scale of 0-100. Markets with a score of 0-33 are Red, 34-66 are Yellow, and 67-100 are Green. Red markets with a score of less than 16 typically fare poorly on all the criteria incorporated in this analysis. Likewise, strong Green markets are those with scores over 84 and usually perform well on all criteria.

Color Description

Red is for markets that are already under stress. The growth in supply in these markets is markedly higher than the expected growth in demand, and vacancy rates are high or rising sharply, often both. These are "tenant's markets."

Yellow is for markets that are on the cusp of imbalance and are therefore fragile. Either an increase in the pace of construction OR a slowdown in demand growth could tip these markets into a higher level of stress. Supply is growing somewhat more than demand, and vacancy rates are somewhat above average or have risen somewhat in the last year. Such markets warrant caution.

Green is for markets in which demand is outpacing the growth in supply, or the ratio is within one percentage point. These markets also have low and stable to falling vacancy rates. These are "landlord's markets."

Variables

Forward-Looking

Upcoming supply growth: This term refers to additions to inventory as a percentage of current inventory. The metric takes into account buildings already under construction and scheduled to open in the next four quarters. Supply-side risk is thus based on the most concrete measure possible: actual construction in progress or "dug dirt."

Supply-demand ratio: We compare the supply pipeline to the expected growth in demand, which we typically measure by projected absorption for the same four quarters. We measure projected demand growth in the hotel sectors as growth in revenue per available room (RevPAR) over the next year.

Current Conditions

Current market well-being: We examine the ratio between supply-demand growth in the context of the current market, typically, existing occupancy/vacancy levels. Even if supply in the pipeline exceeds expected growth in demand slightly, a market with extremely low vacancy rates could still need additional capacity.

The variables that define market well-being differ for the hotel sector. We measure hotel markets by the change in RevPAR, a variable that incorporates both occupancy and the average daily rate (ADR) relative to a baseline target and adjusted for inflation and seasonality. From the average RevPAR for the baseline years, we use an inflation factor from the Consumer Price Index to adjust to a "normal" RevPAR for today. We use the baseline RevPAR to isolate sector aberrations that persist for several years. For example, if RevPAR of \$100 is the norm, and if over the last year RevPAR increased from \$60 to \$75, we acknowledge the 25%

growth in RevPAR over the last year, but also take into account that the growth is coming off an abnormally low base and is still 25% below a sustainable level.

Market momentum: We consider the market's momentum, which we measure by the change in occupancy levels over the past year. A market with high but decreasing vacancies has positive momentum, while a market with low but increasing vacancies has negative momentum. Also, for hotels, we measure market momentum by the growth in RevPAR over the last one-year period. Comparing the same quarter year by year to the next captures the inherent seasonality of the hotel industry.

Parameters

In defining the parameters for each of the variables, we attempted to identify reasonable bands that, in our judgment, marked excesses based on the dynamics of each property type. In general, supply growth that is only slightly greater than demand growth is tolerable, within an acceptable margin of error, because the rate at which new space comes to market does not exactly synchronize with the absorption of space in real time.

Similarly, the definition of "high" or "moderate" vacancy rates varies by property type. We have chosen the bands based on long-term averages for each product, in keeping with what we consider a reasonable balance. Likewise, we identify changes in vacancy that could be market-threatening, based on our assessment of the volatility inherent in each property type.

The scale for each of the four variables is 0-100. For each, a score of 50 would be for a market with performance in the middle range. For example, for multifamily, the high range for vacancy is greater than 10%, the middle band is for markets with vacancy between 6% and 10%, and the lowest band is for markets with vacancy under 6%. For this variable, an 8% vacancy rate (in the middle of the middle band) would receive a score of 50. By extension, a 6% vacancy, which is the boundary between moderate and low vacancy, would receive a score of 66.7, and 10% vacancy, the boundary between moderate and high vacancy, would receive a score of 33.3. The scale is linear, so we would attribute the highest score of 100 to markets with vacancy of 2% or less and a score of zero to markets with vacancy of 14%. We apply the same principle to all four variables.

Exhibit 11 outlines the specific parameters and their corresponding scores for each factor for each property type.

EXHIBIT 11

Property Type Scores Parameters

Score	Multifamily			
	Supply	Supply vs Demand	Vacancy	Vacancy Change
100	1.0%	0.0%	2.0%	0.0%
83	2.0%	-0.5%	4.0%	0.5%
67	3.0%	-1.0%	6.0%	1.0%
50	4.0%	-1.5%	8.0%	1.5%
33	5.0%	-2.0%	10.0%	2.0%
17	6.0%	-2.5%	12.0%	2.5%
0	7.0%	-3.0%	14.0%	3.0%

Retail				
Score	Supply	Supply vs Demand	Vacancy	Vacancy Change
100	2.0%	0.0%	2.0%	0.0%
83	3.0%	-0.5%	4.0%	0.5%
67	4.0%	-1.0%	6.0%	1.0%
50	5.0%	-1.5%	8.0%	1.5%
33	6.0%	-2.0%	10.0%	2.0%
17	7.0%	-2.5%	12.0%	2.5%
0	8.0%	-3.0%	14.0%	3.0%

Office				
Score	Supply	Supply vs Demand	Vacancy	Vacancy Change
100	2.0%	1.0%	4.0%	-1.0%
83	3.0%	0.0%	6.0%	0.0%
67	4.0%	-1.0%	8.0%	1.0%
50	5.0%	-2.0%	10.0%	2.0%
33	6.0%	-3.0%	12.0%	3.0%
17	7.0%	-4.0%	14.0%	4.0%
0	8.0%	-5.0%	16.0%	5.0%

Industrial				
Score	Supply	Supply vs Demand	Vacancy	Vacancy Change
100	0.0%	0.0%	2.0%	0.0%
83	1.0%	-0.5%	4.0%	0.5%
67	2.0%	-1.0%	6.0%	1.0%
50	3.0%	-1.5%	8.0%	1.5%
33	4.0%	-2.0%	10.0%	2.0%
17	5.0%	-2.5%	12.0%	2.5%
0	6.0%	-3.0%	14.0%	3.0%

Hotel				
Score	Supply	Supply vs. Demand	Y-O-Y RevPAR	RevPAR vs. Base
100	2.0%	10.0%	8.0%	7.0%
83	3.0%	6.7%	6.5%	3.5%
67	4.0%	3.3%	5.0%	0.0%
50	5.0%	0.0%	3.5%	-3.5%
33	6.0%	-3.3%	2.0%	-7.0%
17	7.0%	-6.7%	0.5%	-10.5%
0	8.0%	-10.0%	-1.0%	-14.0%

Source: Moody's Investors Service

If a variable score is a negative number, for example, a multifamily market with a vacancy rate of more than 14%, we incorporate the negative number into the final score as an additional penalty. However, the obverse is not true. A favorably performing variable does not accumulate extra benefit for a score greater than 100. The rationale for nonparallel treatment is that a super-tight market is, in fact, at risk of market-distorting rent spikes and, therefore, should not be progressively rewarded.

Weighting

We weight the forward-looking variables and the current condition variables 50-50 in the total score, but we do not weight the two variables by category. For the forward-looking dimension that measures supply-demand and supply alone, we assign the worse of the two variables a 75% weight and the better variable, a 25% weight. Because we assign the forward-looking dimension a 50% weight in the total score, the worse variable thus has a 37.5% weight in the total score, the better variable, 12.5%.

For current conditions variables, vacancy always accounts for 75% of the score or 37.5% of the total score, and we assign a change in vacancy a 25% weight, or 12.5% of the total score. For the hotel sectors, we weigh both current conditions variables equally.

National Average

For each property type, we calculated a national average to provide a relative assessment of the well-being of each product. We weigh that score according to the size of the individual markets, not on a raw average of the individual market scores. As a result, if many large markets have earned a high score, the national average will shift disproportionately higher.

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Appendix 3: Fusion Approach Details

We partly base our fusion approach on a regression analysis of the historical performance of real estate loans in Moody's-rated US CMBS transactions and use simulation technology to derive diversity-dependent credit enhancement levels for each fusion loan.

Our CMBS loan database includes more than 36,000 loans in transactions with securities that we rate dating from 2002, combined with subsequent performance data reported by Trepp, LLC. This data includes frequency of default (defined as loans that are 60-days or more delinquent) and loss given default (for those loans resolved with a loss). We have compared our original credit opinions on these loans with their actual performance and conducted a regression analysis on this database to determine the probability of default and recovery rate for fusion loans.

Our calibration of the probability of default and recovery rate functions follows a two-step process. In the first step, based on historical performance data, we estimate the impact of loan-level characteristics on default frequency and recovery rates in the event of loan default. We have identified MLTV, MDSCR, and the amortization profile of the loan (for example, interest only) as the key loan-level characteristics that impact the default frequency and the recovery rate in the event of loan default. Also, loan size is a key input for the recovery rate.

In the step two, we apply the probability of default and recovery rate functions against our benchmark for fusion portfolios. Therefore, we estimate any marginal effects stemming from our default probability and recovery rate assumptions from our loan-level performance data, which was used to calibrate the absolute performance and recovery rate performance of benchmark CMBS 2.0 portfolios.

Our SCA matrix is based upon a simulation analysis of the probability of default and recovery rates. This analysis established diversity-dependent credit-assessed loan tranching for purposes of fusing their credit enhancement levels with those produced for the conduit portion of the pool. The simulation is a single period model based on a Gaussian copula using a 35% asset correlation.

With this approach, we developed a matrix from which we reference loan-level credit enhancement. The credit enhancement levels for each loan so determined are then blended on a pro rata basis with the conduit pool credit enhancement. In this way, the credit enhancement for a fusion loan will reflect the probability of default and recovery rate for the loan and the all-in pool diversity as reflected by the Herf score.

Appendix 4: Canadian Conduit/Fusion CMBS Transactions

Overview

Our approach to rating Canadian conduit/fusion CMBS transactions generally follows the US approach detailed above, but with some adjustments to reflect the unique attributes of Canada's lending practices and legal system. Major credit positives of the Canadian CMBS market include a creditor-friendly legal environment and recourse lending. Given the less competitive market, underwriting standards are typically better than in the US. These positives are partially offset, however, by the concentration of loans in comparatively few markets.

To analyze the sustainability of cash flows, we look to Canadian-specific property market data and analysis as Canada can have cycles that differ from the US in terms of duration and magnitude. Similar to the US, we look to the balance of new supply and expected demand for near-term impact on property cash flow. However, loan terms are long, and supply and demand can become unbalanced, particularly in smaller metropolitan areas with limited demand drivers.

To determine value, we use a set of cap rates that is generally consistent with those we apply to US collateral. However, in our property grades, we typically consider the strong track record of Canadian CMBS transactions. Given the close historical correlation between US and Canadian interest rates, we adjust cap rates based on US Treasury rates as described above. The major Canadian markets have the same range of property quality, including assets we consider trophy quality with extremely high ability to retain tenants and attract capital. While Canada's CRE capital markets may not be as deep as those of the US, there is ample portfolio lender participation to help assure an exit for a CMBS loan.

Recourse Lending

Recourse loans are debt agreements secured by real property. The lender has the right to seek payment from a borrower in default and typically a guarantor beyond the property pledged as collateral.

Our approach to analyzing a pool of recourse loans shares the same methodology we use for non-recourse loans, except for the additional step of assessing the incremental benefit derived from recourse. To quantify the value of the recourse commitment, we analyze the amount of recourse, recourse exposure coverage, and the recourse provider credit profile.

The recourse benefit stems from a potential reduction in both the frequency and severity of default. Recourse loans have a lower probability of default because borrowers will make great efforts to avoid putting their non-pledged assets at risk. Severity may be lower as defaulting recourse borrowers are less inclined to engage in litigation with the lender, reducing the length and cost of the foreclosure process. Also, the cash recovered from the borrower beyond the real estate collateral diminishes severity. Further, recourse borrowers are less inclined to defer capital expenses and allow the property to deteriorate because they can be held accountable for any reduction in property value below the loan balance.

Creditor-Friendly Environment

Canadian laws are generally considered to be more favorable to real estate lenders than those in the US, usually resulting in a short time frame between loan default and the resolution of the issue. If a borrower is perceived to be in trouble, the lender can petition the court and secure the right to collect rents directly from the tenants. Although it is not a right the lender may choose to immediately pursue, it nonetheless has the right to do so. We view this environment favorably and take it into account when sizing credit enhancement.

Portfolio Diversity

We review the diversity of Canadian CMBS transactions by geographic location, property type and loan concentration. Geographic diversity can be a mitigant against the risk of market decline, serving to smooth out variability around expected loss, to the extent there is no significant concentration.

Canada has a relatively high degree of concentration within a few metropolitan areas. The three largest metro areas (Toronto, Montreal and Vancouver) comprise more than one-third of Canada's population.

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Appendix 5: Herfindahl Score

Summary

Conduit/fusion CMBS transactions are rarely highly diverse, and in some cases, their lack of diversity is addressed with additional subordination.

When differentiating conduit/fusion CMBS transactions by diversity, we use the Herfindahl (Herf) score.²¹ The Herf score measures pool concentration as a function of loan size. Other dimensions of diversity (such as geographic, borrower, and property type concentration) are also reviewed in the course of our analysis and reflected in our credit enhancement levels.

Transactions with a high Herf score indicate less loan concentration than those with a low Herf score. Loan concentration has an important bearing on potential rating volatility, including the risk of multiple-notch downgrades under adverse circumstances, unless addressed by extra credit enhancement.

Delinquency rates have the potential to increase much more quickly in low Herf transactions. The performance of low Herf transactions can meaningfully depart from that of the overall market: While frequently cited industry-wide delinquency statistics are based on a universe of tens of thousands of securitized loans, many CMBS transactions have fewer than 50 loans as measured by the Herf score.

Although aggregate CRE performance is largely driven by broad market forces such as liquidity and the supply of and demand for space, on the level of individual properties there are material idiosyncratic risks, including tenant credit, borrower performance and trends within a property's submarket. Even when pools have more of the same property type in the same market, such as Dallas office, reduced exposure to property-level idiosyncratic risk can be highly beneficial. This is especially so for investment-grade investors, who seek protection from scenarios far greater than the expected case. A more diverse pool has greater protection from extreme scenarios.

Our ratings reflect protections provided through structure. Subordination levels help shield senior certificate holders from delinquency and rating volatility. Higher subordination levels are often structured for low Herf transactions due to their increased exposure to extreme scenarios. Other common transaction features, such as servicer advancing, also reduce delinquency events.

Herf Defined

We derive the Herf score from a calculation that measures diversity by determining the effective number of loans in a CMBS transaction as if all loans were equally sized. It proves helpful given that CMBS are among the more concentrated securitizations, with the loan count typically running from the dozens to the low hundreds. There can be significant variation within a pool by loan size, with the balances of loans in a CMBS transaction running from under \$2 million to over \$200 million, and from a fraction of a percent of overall pool balance to 10% or more. Tools like the Herf score help us differentiate the diversity profile of transactions, an important step toward ensuring that they are properly enhanced.

²¹ The Herfindahl score is the inverse of the Herfindahl-Hirschman Index or HHI.

The formula for the Herf score is as follows:

EXHIBIT 12

$$H = 1 / \sum_{i=1}^n (S_i^2)$$

Where:

» S_i is the share of loan i in the transaction, and n is the number of loans.

Source: Moody's Investors Service

On a standalone basis, each component has its strengths and weaknesses. The conduit component is typically well-diversified, which helps mitigate some of the concentration risk associated with the large loan portion. The large loan segment improves the average credit quality of the overall fusion transaction. As a result, there are generally credit synergies associated with assembling a fusion transaction instead of having two separate securitizations: one a standalone conduit and the other, a large loan transaction. The Herf score for CMBS can range from as little as one (for a single asset transaction) to 250 or more (most frequently seen in small balance loan pools). For conduit/fusion transactions, it typically runs between 20 and 70.

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Appendix 6: Country Risk Analysis for CMBS or Collateral in Countries with Local Currency Country Ceilings Below Aaa

US conduit/fusion CMBS transactions may include collateral from other countries with our local currency country ceilings below Aaa. To analyze collateral in non-Aaa ceiling countries, we apply our approach but adjust it for country risk using the procedures outlined below, consistent with the procedures we use to rate transactions backed by CRE collateral in Europe.

Local Currency Country Ceilings and Sensitivity Analyses Accounts for Country Risk

To account for the impact of severe stress scenarios in a given country, we consider as additional factors in our analysis: (1) our local currency country ceiling of the countries in which the underlying properties are located and (2) sensitivity analyses assuming reduced recoveries for loans in multi-country pools. The country ceiling indicates the highest achievable rating for single-country pools. For more information, see our country ceilings cross-sector methodology.²²

For Multi-Country Pools, We Assess the Impact on Tranches Rated Higher than the Country Ceiling of Included Countries

In the case of multi-country exposures within a CMBS pool, we consider stressed scenario analyses for the tranches that we rate higher than the country ceiling of the countries in which the underlying properties are located. In our stressed scenarios where we consider a severe country event, we generally assume materially reduced recovery proceeds for the loans secured by properties in countries with a country ceiling below the highest targeted ratings in the respective transaction. We weigh these stressed scenarios with the probability indicated by the country ceiling of these countries. In a final step, we test whether the resulting blended rating of our base case (no country event occurs) and stressed case scenarios is lower than the targeted rating.

²² A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Appendix 7: Cap Rate Adjustment Values

The exhibit below shows the corresponding percentage reduction to Moody's cap rate as a function of 5-year rolling average of the 10-year Treasury rate.

EXHIBIT 13

Adjustment to Moody's Cap Rate for Sustained Low Interest Rates

5-Year Rolling Average of 10-Year Treasury Rate	% Reduction to Moody's Cap Rate	5-Year Rolling Average of 10-Year Treasury Rate	% Reduction to Moody's Cap Rate
0.00%	20.1%	2.50%	9.1%
0.25%	20.1%	2.75%	7.0%
0.50%	20.1%	3.00%	4.8%
0.75%	19.5%	3.25%	2.5%
1.00%	18.6%	3.50%	0.2%
1.25%	17.5%	3.75%	0.0%
1.50%	16.1%	4.00%	0.0%
1.75%	14.6%	4.25%	0.0%
2.00%	12.9%	4.50%	0.0%
2.25%	11.0%		

Source: Moody's investors Service

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Appendix 8: Exchangeable Securities

Analysis

In some CMBS transactions, specified liability classes (called reference classes) may be exchanged for an exchangeable class, and the exchangeable class subsequently may be exchanged for its respective reference classes. The exchangeable class is entitled to receive the sum of interest and principal distributable on its reference classes that are exchanged for the exchangeable class. The holder of the reference classes would receive the same cash flow as a holder of the related exchangeable class. The initial certificate balance of the exchangeable class is equal to the aggregate of the initial certificate balances of its reference classes.

Because exchangeable classes are a combination of the component reference classes, we rate exchangeable notes using the Weighted Average Expected Loss (Wael) of the reference classes. We use the results of the Wael calculation in conjunction with the loss benchmarks as described below. In cases where the rating that we determine on the basis of the Wael of the reference classes is more than three notches higher than the rating on the lowest-rated reference class, we would rate the exchangeable class three notches higher than the lowest-rated reference class.

Loss Benchmarks

In rating exchangeable securities in which a model is used to derive an expected loss, we select loss benchmarks referencing the Idealized Expected Loss table²³ using the Symmetric Range, in which the lower bound of loss consistent with a rating category is the midpoint (strictly, the geometric mean) between the Idealized Expected Loss of the rating category and the Idealized Expected Loss of the next higher rating category. The upper-bound of loss is analogously determined as the geometric mean between the Idealized Expected Loss of the rating category and the Idealized Expected Loss of the next lower rating category. Mathematically, the benchmark boundary is computed as an equal 50/50 weighting on a logarithmic scale. That is, the benchmark boundaries of loss appropriate for evaluating rating category R are given by:

EXHIBIT 14

$$\begin{aligned}
 [1] \text{Rating Lower Bound}_R &= \exp\{0.5 \cdot \log(\text{Idealized Expected Loss}_{R-1}) + 0.5 \cdot \log(\text{Idealized Expected Loss}_R)\} \\
 [2] \text{Rating Upper Bound}_R &= \exp\{0.5 \cdot \log(\text{Idealized Expected Loss}_R) + 0.5 \cdot \log(\text{Idealized Expected Loss}_{R+1})\}
 \end{aligned}$$

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;
- » Rating Upper Bound_R means the highest Idealized Expected Loss associated with rating R 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

²³ 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.

Moody's Related Publications

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

A comprehensive description of our approach to forecasting capitalization rates can be found in the following technical supplement: [*US Commercial Mortgage-Backed Securities: Capitalization Rate Forecast Model*](#).

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 is available [here](#).

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Report Number: 1332114

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