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RATING METHODOLOGY

Moody's Approach to Rating RMBS Using the MILAN Framework

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This rating methodology replaces *Moody's Approach to Rating RMBS Using the MILAN Framework* published in December 2020. We added a section that mentions our approach to evaluating risk from environmental, social and governance considerations, and we transposed an appendix into this methodology from our cross-sector methodology, *Global Structured Finance Data Quality Evaluation Approach*, that describes originator assessments in EMEA and Asia-Pacific. We also made limited editorial updates. These updates do not change our methodological approach.

Executive Summary

This rating methodology describes our global[1] approach to rating residential mortgage-backed securities (RMBS). Under our approach, we first perform a portfolio analysis, including a loan-by-loan assessment of the securitized collateral pool. The results of this analysis are the portfolio's expected losses (Portfolio EL) and Moody's Individual Loan Analysis Credit Enhancement (MILAN CE). The Portfolio EL captures our expectations of performance considering the current economic outlook, while the MILAN CE captures the loss, we expect the portfolio to suffer in the event of a severe recession scenario.

We use the two outputs from our portfolio analysis to determine a probability loss distribution. The probability loss distribution associates a probability with each potential future loss scenario for the portfolio.

In our structural analysis, we use a cash flow model in order to assess the structural features of the RMBS transaction. The structure is assessed using each scenario in the loss distribution. Finally, we assess the counterparty default risk and assess the legal risk to derive the final ratings.

Our ratings on RMBS tranches are based on the expected losses (Tranche EL) posed to investors. The Tranche EL considers both the probability and the severity of credit losses that investors may suffer.

We do not apply this methodology approach rigidly in all circumstances; our rating committees will, where appropriate, consider all other factors that they deem relevant to the analysis, which could affect the rating outcome. As transactions season, some of the methodology criteria, such as the originator assessment, could become less relevant or not relevant to the analysis, while others, such as realized collateral performance, could become more relevant.
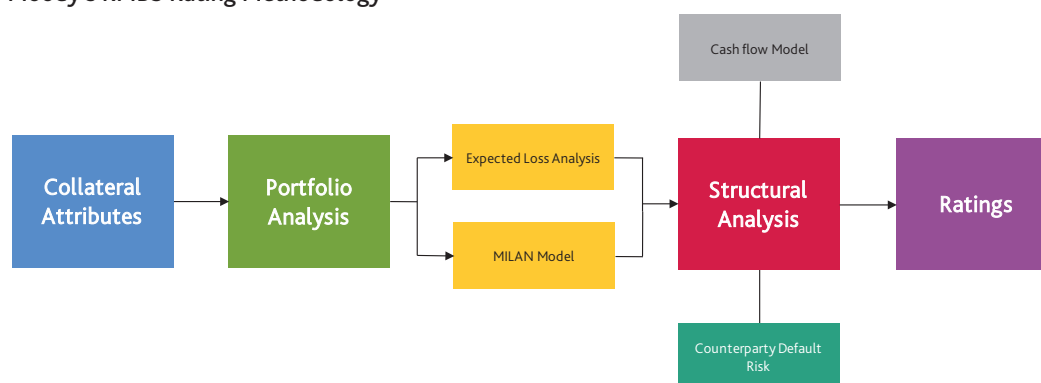
> THIS METHODOLOGY WAS UPDATED ON MARCH 16, 2022. WE REMOVED OUTDATED TEXT ON PAGE 47 FOR APPENDIX 4.

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[1] Excludes US.

EXHIBIT 1
Moody's RMBS Rating Methodology

Source: Moody's Investors Service

Portfolio Analysis

Overview

When rating RMBS, we first perform a portfolio analysis. The results of the portfolio analysis are the Portfolio EL and the MILAN CE assumptions.

» **Portfolio EL:** captures the expected loss on the portfolio considering our current economic outlook. We carry out a performance analysis to determine the Portfolio EL assumption, incorporating historical performance and expectations of future performance.

» **MILAN CE:** captures the stressed loss we expect the portfolio to suffer in the event of a severe recession scenario. We use the MILAN model to help determine the stressed loss assumption. Under our structural analysis, the MILAN CE defines the credit enhancement consistent with the highest rating achievable in the country.

To help determine the Portfolio EL and MILAN CE, we supplement the portfolio analysis with (1) an originator and servicer assessment; (2) a data quality assessment; and, specifically for the MILAN CE; (3) a sovereign risk assessment. Some of these analytical areas, such as originator assessment, could also be less relevant as transactions season and performance data becomes available.

We use the two outputs from our portfolio analysis to determine a probability loss distribution. The probability loss distribution associates a probability with each potential future loss scenario for the portfolio. For RMBS portfolios, we typically assume the loss distribution is lognormal. We use the Portfolio EL and MILAN CE assumptions to define a lognormal loss distribution for the portfolio.[2]

Our portfolio analysis assesses the range of possible losses the portfolio will ultimately suffer, assuming transaction parties perform as intended. However, a counterparty default may cause additional portfolio losses. We include those additional losses in our counterparty default risk analysis, described in the structural analysis section below. We also assess the impact of the timing of portfolio losses as part of our structural analysis.

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[2]   For details, see Appendix 2.

EXHIBIT 2
Portfolio Analysis
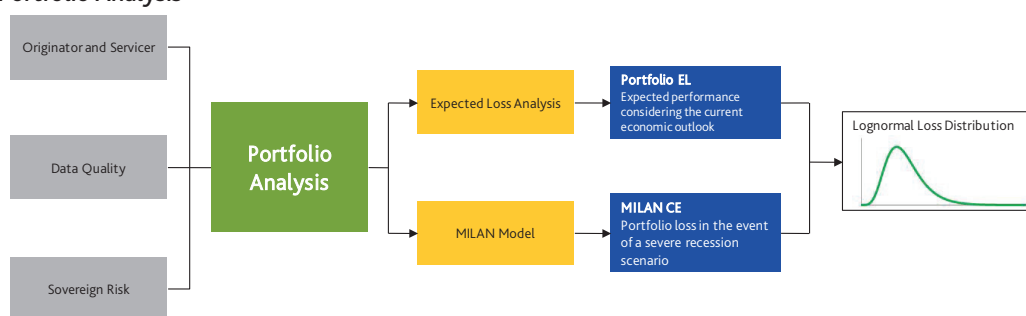
Source: Moody's Investors Service

Deriving the MILAN CE

We use the MILAN model to help evaluate the collateral and determine the MILAN CE. MILAN is a scoring model that we use to assess the credit risk of residential mortgage loan portfolios. It involves an assessment of individual loans as well as overall portfolio diversification, estimating the portfolio's loss in a severe recession scenario. Appendix 1 contains a step-by-step guide of our collateral analysis, which incorporates the MILAN model as one of the main tools to determine the portfolio's MILAN CE assumption.

The MILAN model relies on country-specific assumptions regarding loan characteristics and their impact on default probability and loss severity in a severe recession scenario. Appendix 4 contains details of these assumptions per country.

The final MILAN CE takes into account the calculated model result and any other qualitative and quantitative aspects of the portfolio analysis.

Deriving the Portfolio EL

We carry out a performance analysis to determine the Portfolio EL assumption, incorporating expectations of future performance considering the current economic outlook and benchmarking against comparable portfolios.

The analysis of historical performance data allows us to extrapolate portfolio losses into the future. We consider forecasts of economic variables, evaluating how changes in these variables will affect the future performance of various types of loans in the portfolio.

We review the historical performance of the type of loans included in the securitized collateral pool, other performance data from the same or comparable originators/servicers, and any other data available in the mortgage market or other comparable markets. The reviewed performance data includes delinquencies, defaults, loss severities, and prepayment rates.

Originator Quality

Our originator quality analysis consists of a review of the originator's past loan performance and its policies and practices, all of which may affect future loan performance. We typically focus on the following areas:

» loan performance

» originator ability: sales and marketing practices; underwriting policies and procedures; property valuation policies and procedures; closing policies and procedures; and credit risk management.

» originator stability: financial stability; quality control and audit; management strength and staff quality; and technology.

We use the results of the originator quality analysis to adjust our assumptions when appropriate. Characteristics not addressed elsewhere in the portfolio analysis, along with originator-specific practices, may influence loan performance, positively or negatively. Average originators in a specific country would typically not attract any adjustment. See Appendix 4 for details of our approach to originator assessments in certain countries.

Servicer Quality

Our servicer quality analysis addresses the expected impact that servicer practices will have on the performance of mortgage loans. We separate the analysis of servicing from that of origination, even if both capacities are handled by the same entity. Strong originators are not necessarily good servicers and vice versa.

We typically assess the quality of servicing with regard to the following servicing function areas:

- » staff, management, and strategy
- » loan administration
- » arrears management
- » loss mitigation
- » asset management
- » IT systems and reporting
- » financial stability

We use the results of the servicer quality analysis to adjust our assumptions when appropriate. Characteristics not addressed elsewhere in the portfolio analysis, along with servicer-specific practices, may influence loan performance, positively or negatively. Average servicers would typically not attract any adjustment.

Data Quality

A key element of our portfolio analysis is an evaluation of the mortgage loan characteristics. In assessing those characteristics, we typically rely on data provided by the originator of the transaction. Consequently, our assessment depends on the extent to which the data are likely to provide an accurate representation of the asset characteristics. We perform a data quality assessment to evaluate the quality of the data provided, including a review of third-party verification reports and representations and warranties for the transaction.[3]

Sovereign and Redenomination Risk

The country in which the transaction's assets, originator, or issuer is located could introduce systemic economic, legal and political risks to the transaction that could affect its ability to pay investors as promised. We usually incorporate such risks into the analysis by applying our local currency country ceilings (LCC) in accordance with our sovereign ceiling methodology.[4] In particular, when generating our assumed portfolio loss distribution, we typically define the MILAN CE as the credit enhancement consistent with the highest rating achievable in the country (i.e., the LCC). A rating committee may also consider modifying appropriate assumptions or defining minimum credit enhancement levels required to achieve a particular rating.[5]

Additionally, mortgage loans denominated in a currency that is different from the country's local currency face redenomination risk. We may therefore put a cap on the maximum rating achievable for notes backed

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[3]   For details see our cross-sector methodology to evaluating data quality in structured finance under the "Moody's Related Publications" section.

[4]   For details, see our cross-sector methodology for assessing local currency country ceilings under the "Moody's Related Publications" section.

[5]   For details, see Appendix 2.

by foreign currency denominated mortgage loans in a particular jurisdiction. In case of the significant depreciation of the local currency, the government may choose to redenominate the foreign currency loans into the local currency. However, the redenomination may occur at unfavorable exchange rates for the transaction, resulting in an immediate significant loss and an ongoing loss associated with the unhedged nature of the transaction.

Structural Analysis

Overview

In our structural analysis of a transaction, we use a cash flow model to assess the impact of the characteristics of the transaction's assets and liabilities on the potential losses to investors. The model calculates each tranche's expected loss, which we use in conjunction with the tranche's average life as the basis for a model-implied assessment. Our final rating adjusts the model-implied assessment, as necessary, to incorporate counterparty default risks that are not explicitly modeled in the cash flow model, as well as the legal risks of the transaction. We also typically consider the sensitivity of the model-implied assessment to alternative Portfolio EL and MILAN CE assumptions.

EXHIBIT 3
Structural Analysis
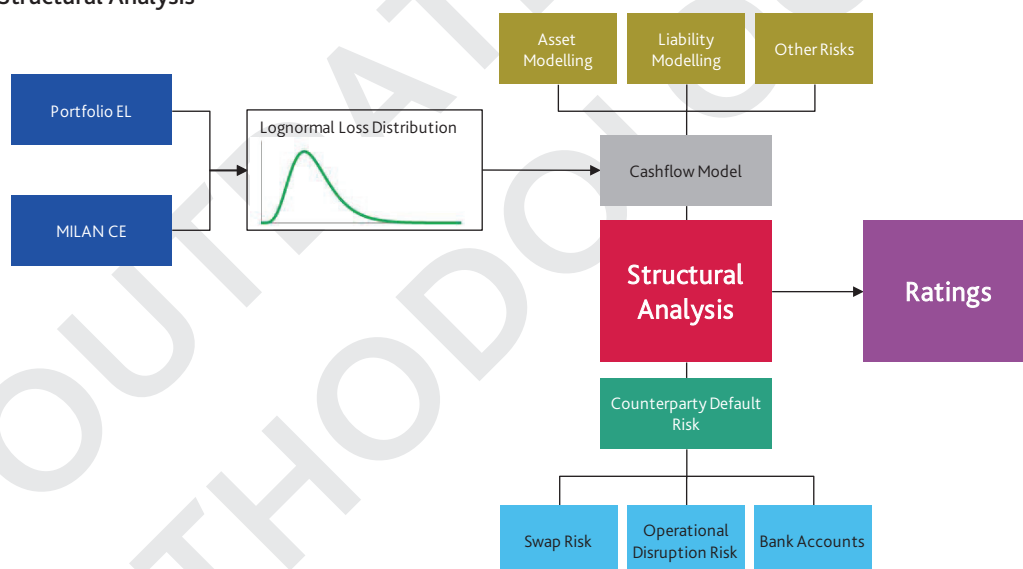
Source: Moody's Investors Service

Cash Flow Model

We use a cash flow model to assess the major features of the liability structure of the transaction, as well as various characteristics of the assets, including the possible portfolio loss scenarios described in the derived probability loss distribution. See Appendices 3 and 4 for details of country-specific assumptions that may supplement or replace the typical assumptions described here.

Our ratings on RMBS tranches are based on the expected losses (Tranche EL) posed to investors by the legal final maturity. The Tranche EL considers both the probability and the severity of credit losses that investors may suffer.

To determine the Tranche EL, the cash flow model calculates the loss to investors resulting from each portfolio loss scenario of the lognormal distribution. The model then weights each loss with the corresponding probability of the loss scenario to calculate the tranche's expected loss. We combine the

Tranche EL with an estimate of the average life of the tranche to derive the model-implied assessment from Moody's Idealized Expected Loss Table.[6]

Asset Cash Flow Modeling

The cash flow model incorporates assumptions regarding assets, such as the following:

» **Loss timing:** The cash flow model includes assumptions on the timing of losses. For each loss scenario on the lognormal curve, derived under the portfolio analysis, the cash flow model allocates the losses over time. While as a base case, losses would typically be assumed to peak after three years, we may analyze transactions using various loss timing scenarios. For example, we may assume portfolios with significant seasoning will suffer losses earlier.

» **Recovery rate and arrears modeling:** When appropriate, the cash flow model incorporates assumptions regarding the level of arrears that the portfolio will suffer for each unit of loss. The amount of loans assumed to be in arrears at each point in time, along with the ultimate recovery rate, affects the interest and principal receipts on the portfolio.

» **Prepayment rate and amortization:** We use both the scheduled amortization of the portfolio and a prepayment rate assumption in our cash flow modeling.

» **Interest rates and swaps:** If a transaction is not fully hedged and there are no other structural mitigants, we generally stress the interest payable on the notes or haircut the available cash flows from the assets. For this purpose, we typically size the stress or haircut in accordance with the principles in our approach to assessing the impact of linkage to swap counterparties,[7] with adjustments as necessary to address the nature of the unhedged risk.

» **Substitution:** For substituting[8] transactions, we take into account the length of the substitution period and any anticipated changes to the asset yield, which may result from new assets being added to the pool. If we expect a significant worsening of the quality of the assets as a result of loose substitution criteria, then we may model an increase in assumed losses for the substituted assets.

Liability Cash Flow Modeling

The cash flow model incorporates the transaction-specific structural features, such as tranching, priority of payments, performance triggers, and servicing fees.

The assessment of certain transaction features may include stressed assumptions to account for potential future deviations from contractual terms. For example, when the servicer in the transaction is not a highly rated entity, we may assume the modeled servicing fee is higher than the actual contracted servicing fee, especially if the contractual fee is less than the market rate for servicing that asset. The modeled servicing fee reflects servicing fees observed in the country and may increase further if the portfolio of loans backing the transaction has any unique features, making it difficult or expensive to service if a replacement servicer was necessary.

For certain RMBS originated in Canada, we use a generic, relatively simple model, Multi-Class. Multi-Class uses portfolio-related assumptions in the form of a portfolio expected loss and a loss equivalent to a Aaa stress to calibrate a lognormal collateral loss distribution. We use Multi-Class to derive the potential losses for the different bonds, taking into consideration the relevant capital structure. We sometimes supplement our modeling with additional analysis of special features.[9]

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[6] For details, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* under the "Moody's Related Publications" section and section "Loss Benchmarks".

[7] For details, see our cross-sector methodology to assessing counterparty risks in structured finance including swap linkage under the "Moody's Related Publications" section.

[8] Also known as revolving transactions in some countries.

[9] For more information, see the discussion of Internal Rate of Return (IRR) Reduction in *Rating Symbols and Definitions*. A link can be found in the "Moody's Related Publications" section and in the section "Loss Benchmarks."

Modeling of Counterparty Default Risks

In our cash flow analysis and modelling, we may incorporate assumptions regarding certain risks relating to counterparty default.

» **Set-off**: Deposit set-off risk arises, for example, when a borrower sets off a deposit balance against an outstanding loan amount following a default of the originating bank. For retail depositors, we typically do not factor into our analysis any incremental loss from deposit set-off as deposit insurance protects deposits to a very large extent.[10] If transactions are exposed to other types of set-off risks, we will evaluate the risks and consider them as part of our analysis.

» **Commingling:** For a securitization transaction, commingling risk occurs when the servicer of the securitized assets becomes insolvent, and asset sale proceeds or payments made by the underlying borrowers are held by the servicer at the time of insolvency (or continue to be received by it) and are not passed on to the issuer in full.[11] This creates a loss when payments are not recovered for the transaction.[12]

Risks not considered directly within the cash flow model are separately assessed, as described in the following section.

Counterparty Default Risk Assessment Applied Outside the Cash Flow Model[13]

We assess some counterparty default risks in separate analytical steps. As a result of the analysis, rating committees may adjust model-implied assessments and may include transaction-specific rating caps. Our assessment incorporates structural mitigants, such as counterparty replacement triggers. The key elements of our counterparty default risk assessment typically include swap counterparty risk, financial disruption risk, and the risk of default of a bank account or temporary investment.

Swap Risk

Our approach to assessing the rating impact of exposures to swap counterparties in structured finance transactions depends on various factors, broadly including (1) the rating on the counterparty; (2) the rating trigger provisions in the swap documents; (3) the type and tenor of the swap; (4) the amount of credit enhancement supporting the notes; (5) the size of the relevant tranche; and (6) the rating on the notes before accounting for the effect of linkage.

Financial Disruption Risk

The strength of a securitization depends not only on the creditworthiness of the underlying pool of assets but also on the effective performance of transaction parties such as the servicer, cash manager, and trustee. A disruption of servicing may result in a weakening of collections activities, leading to increased delinquencies, lower recoveries, and ultimately higher losses on the securitized pool. Alternatively, disruption of the operations of a cash manager or trustee could result in a payment default despite adequate collections. We consider the transaction parties, their roles, and mitigating factors as part of our analysis.

Bank Accounts and Investments

Transactions in which a bank holds or has invested a substantial amount of the transactions' cash relative to the bond liabilities are potentially subject to ratings volatility if the bank or temporary investment defaults. The cash or the investments would not be recoverable quickly, with ultimate recoveries uncertain, and credit enhancement could decline substantially or even fully disappear. We consider these structural components, rating thresholds, and mitigating factors as part of our analysis.

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[10] For details, see our cross-sector methodology to assessing counterparty risks in structured finance under the "Moody's Related Publications" section.

[11] Commingling risk could also arise in instances where cash collections are made into the originator's account and the originator defaults. This tends to occur in deals where the servicer is an independent third party.

[12] For details, see our cross-sector methodology to assessing counterparty risks in structured finance, including commingling risk under the "Moody's Related Publications" section.

[13] For details, see our cross-sector methodology to assessing counterparty risks in structured finance under the "Moody's Related Publications" section.

Legal Risk

Our analysis of the legal aspects of the transaction ensures that assumptions regarding asset quality and transaction structure are appropriately reflected in the transaction documentation. As part of the legal analysis, we also review legal opinions to ensure that they adequately address any concerns regarding the assignment of the assets to the special purpose vehicle (SPV), bankruptcy remoteness of the SPV, or other jurisdiction-specific issues.[14]

Environmental, Social and Governance Considerations

Environmental, social and governance (ESG) considerations may affect the ratings of securities backed by a portfolio of residential mortgage loans. We evaluate the risk following our cross-sector methodology that describes our general principles for assessing ESG issues[15] and may incorporate it in our analysis.

Monitoring

We will 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 (for example, originator assessments, some elements of legal risk, and certain representations and warranties).

A material change in any transaction feature prompts a reassessment of the transaction. Absent any material change, we typically reassess each transaction annually.

For the portfolio analysis, we usually receive extensive data on transaction-specific performance that we use to help revise our Portfolio EL assumption during the life of the transaction. In the early months of a transaction's life, we normally maintain our initial Portfolio EL assumption unless we observe immediate signs of a material deviation in the transaction's performance, like, for example, early payment defaults. We generally give more weight to the performance data as the transaction seasons because this becomes a better indicator of a transaction's future performance. When significant transaction-specific performance data is available, the portfolio's payment patterns can be more reliable performance predictors than loan-level or portfolio characteristics, in particular when forecasting future defaults considering our baseline projected economic outlook for the country where the assets were originated.

For the performing part of the portfolio, we analyze the performance data to help extrapolate future defaults. For loans that are delinquent or have been delinquent in the recent past, we calculate the probability of default on the delinquent loans by applying roll rates (probabilities of default) to the loans based on their delinquency status: the more severe the loan's delinquency status, the higher the probability of default. We then obtain the loss estimates by multiplying the total probability of default by our loss severity expectation considering transaction-specific data. We estimate future defaults, roll rates, loss severity and loss timing, prepayment rates and timing, and, where applicable, modification adjustments by taking into account projections from our Macroeconomic Board and other available sources. The final future loss estimate is a combination of both the performing and delinquent loans analysis. We will typically maintain[16] our existing Portfolio EL assumption if the future loss estimate does not deviate[17] significantly.

We typically expect the MILAN CE stressed loss assumption to remain unchanged over time, absent any material changes in portfolio composition, e.g., through prepayments or material deterioration in performance. When we reassess a transaction, normally on an annual basis, we consider the MILAN model

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[14]   See our approach to assessing bankruptcy remoteness for special purpose vehicles in structured finance in "Moody's Related Publications" section for details.

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

[16]   Maintaining our existing assumption means this specific transaction feature would be considered unchanged as part of our ongoing surveillance.

[17]   For example, in EMEA RMBS a future loss estimate within a 30% deviation of the current assumption may be considered to be performing within expectations given the volatility of such number.

result[18] when reliable and updated loan-level information is available. For loans that are delinquent or have been delinquent in the recent past, the MILAN CE assumption incorporates a delinquent loan analysis similar to that described above. When performance deviates significantly from our expectations, there is a higher likelihood that the expected loss multiples approach, outlined in Appendix 1 below, will apply and drive the MILAN CE.

We typically perform a structural analysis that considers the cash flow model result using the updated capital structure. However, the monitoring of certain transactions may not always warrant updated cash flow model analysis.[19] For example, model results would not normally change if the portfolio analysis is in line and the transaction's capital structure has not materially deleveraged. Alternatively, if the transaction's bond ratings are limited to the lowest rating levels, due to very weak performance or sovereign risk, for instance, we may instead perform a more ad hoc analysis comparing our Portfolio EL assumption to each bond's total credit enhancement ("loss coverage ratio analysis"). On occasion, we may instead perform a loss coverage ratio analysis in instances where tranches are rated at the maximum achievable rating (or below, considering any applicable counterparty-related rating caps) and benefit from strong loss coverage multiples.

Pool Size

In addition, during the life of the transaction, as pool sizes decrease to a small fraction of their initial sizes, credit risk exposure to individual borrowers may increase significantly. As part of our continuous monitoring of RMBS transactions, we track the evolution of borrower concentration risk and verify that the amount of credit enhancement under a given class of notes always protects this class from the risk of a default by the largest borrowers. If we estimate that the exposure of notes to the largest borrowers is not consistent with their ratings, we will downgrade these ratings accordingly and may withdraw them. The borrower concentration adjustment section under Appendix 1 contains details of our approach to small residual pools.[20]

Loss Benchmarks

In evaluating the model output for RMBS, we use two methods for determining loss benchmarks.

In evaluating the model output for certain RMBS originated in Canada, we use an Internal Rate of Return benchmark. Modelled IRR reductions are associated with benchmark ratings in Moody's IRR Reduction Rates table,[21] which indicates the internal rate of return reduction interval associated with each given rating level.

In evaluating the model output for all other RMBS subject to this methodology, we select loss benchmarks referencing the Idealized Expected Loss table[22] using the Standard Asymmetric Range, in which the lower-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the next higher rating category and the Idealized Expected Loss of the given rating category, respectively. For initial ratings and upgrade rating actions, the upper-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the given rating category and the Idealized Expected Loss of the next lower rating category, respectively. When monitoring a rating for downgrade, the upper-

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18   We may reassess the MILAN model result using (and performing a data quality assessment on) the latest loan-level information for certain key dynamic mortgage loan characteristics; such as current loan balance and arrears status. The majority of the mortgage loan characteristics would typically be considered as static and therefore unchanged from the information provided when initial ratings are assigned.

19   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.

20   For details, see Appendix 1, "Step 14 – Borrower Concentration".

21   For details, see the discussion of Internal Rate of Return (IRR) Reduction in *Rating Symbols and Definitions* under the "Moody's Related Publications" section.

22   For details, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* under the "Moody's Related Publications" section.

bound of loss is computed as a 50/50 weighted average on a logarithmic scale. That is, the benchmark boundaries of loss appropriate for evaluating rating category *R* are given by:

[1] $Rating\ Lower\ Bound_R$
$$= exp\{0.8 \cdot log(Idealized\ Expected\ Loss_{R-1}) + 0.2 \cdot log(Idealized\ Expected\ Loss_R)\}$$

[2] $Initial\ Rating\ Upper\ Bound_R$
$$= exp\{0.8 \cdot log(Idealized\ Expected\ Loss_R) + 0.2 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

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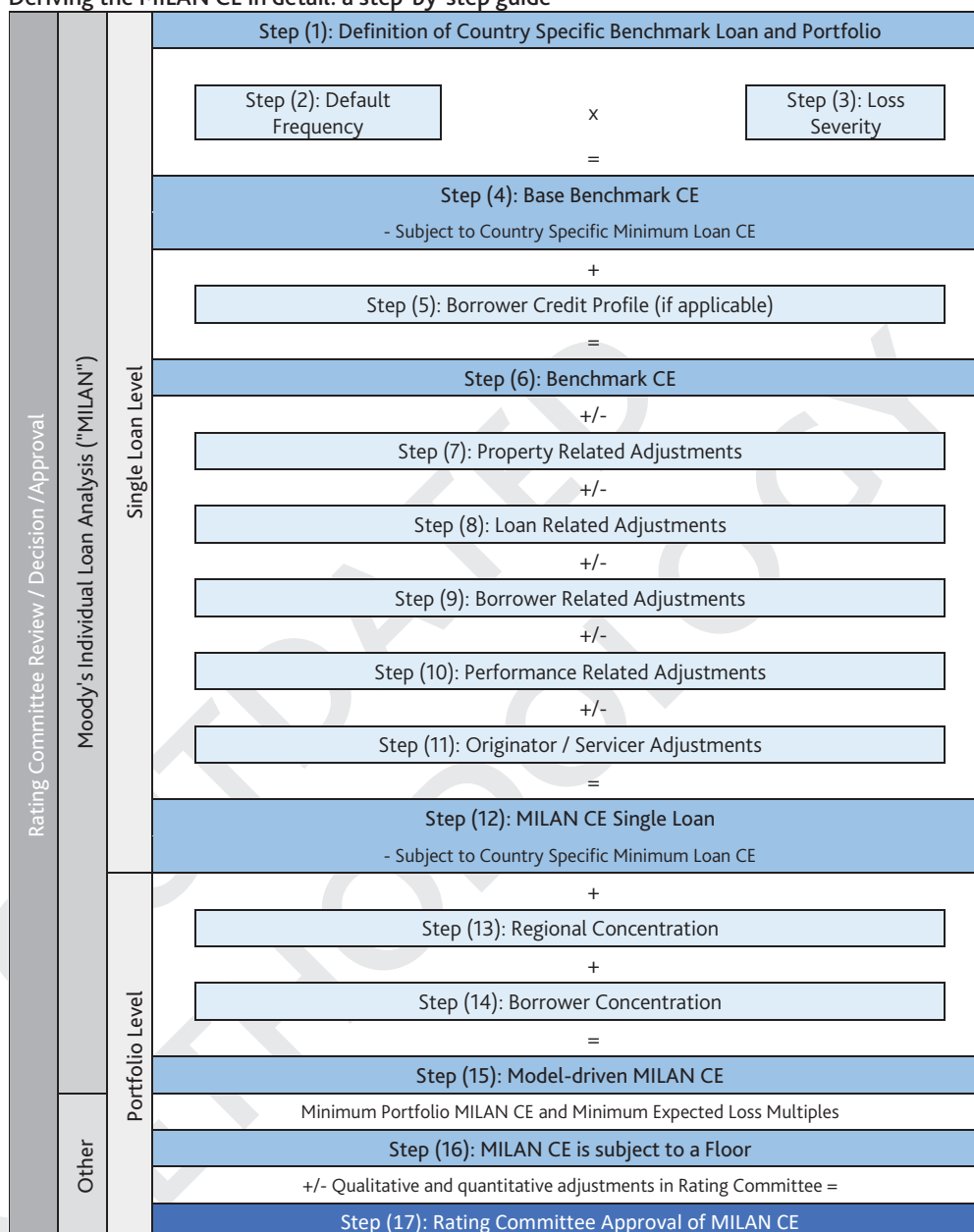
Where:

» *Rating Lower Bound$_R$* means the lowest Idealized Expected Loss associated with rating *R* and the expected loss range of rating *R* is inclusive of the *Rating Lower Bound$_R$*.

» *Initial Rating Upper Bound$_R$* means the highest Idealized Expected Loss associated with rating *R* that is either initially assigned or upgraded and the expected loss range of rating *R* is exclusive of the *Rating Upper Bound$_R$*.

» *Current Rating Upper Bound$_R$* means the highest Idealized Expected Loss associated with rating *R* that is currently outstanding and the expected loss range of rating *R* is exclusive of the *Rating Upper Bound$_R$*.

» *R-1* means the rating just above *R*.

» *R+1* means the rating just below *R*.

» The Rating Lower Bound for Aaa is 0% and the Rating Upper Bound for C is 100%. These are not derived using the formula.

Appendix 1: Deriving the MILAN CE

EXHIBIT 4
Deriving the MILAN CE in detail: a step-by-step guide

Rating Committee Review / Decision / Approval	Moody's Individual Loan Analysis ("MILAN")	Single Loan Level	**Step (1): Definition of Country Specific Benchmark Loan and Portfolio**

Step (1): Definition of Country Specific Benchmark Loan and Portfolio

Step (2): Default Frequency	x	Step (3): Loss Severity

=

Step (4): Base Benchmark CE
- Subject to Country Specific Minimum Loan CE

+

Step (5): Borrower Credit Profile (if applicable)

=

Step (6): Benchmark CE

+/-

Step (7): Property Related Adjustments

+/-

Step (8): Loan Related Adjustments

+/-

Step (9): Borrower Related Adjustments

+/-

Step (10): Performance Related Adjustments

+/-

Step (11): Originator / Servicer Adjustments

=

Step (12): MILAN CE Single Loan
- Subject to Country Specific Minimum Loan CE

+

Step (13): Regional Concentration

+

Step (14): Borrower Concentration

=

Step (15): Model-driven MILAN CE

Minimum Portfolio MILAN CE and Minimum Expected Loss Multiples

Step (16): MILAN CE is subject to a Floor

+/- Qualitative and quantitative adjustments in Rating Committee =

Step (17): Rating Committee Approval of MILAN CE

Source: Moody's Investors Service

Overview

We use the MILAN model to help evaluate the collateral. MILAN is a scoring model assessing the credit risk of residential mortgage loan portfolios. It is an assessment of individual loans as well as overall portfolio diversification, estimating the portfolio's loss in a severe recession scenario.

The MILAN model relies on assumptions regarding the performance of country-specific benchmark loans and how deviations from these benchmarks may affect default probability and loss severity. Similarly, the

model assumes that deviations in overall portfolio diversification from a country-specific benchmark RMBS portfolio affect performance (see Appendix 4 for details of these assumptions per country).

Going forward, we will update certain assumptions and input parameters, including the house price indices, population density figures, classifications of provinces and regions, and the house price stress rates. Additionally, we will incorporate new mortgage products that are emerging in some countries.

Finally, we will periodically review all assumptions used in MILAN and, if needed, revise them according to market developments and new research and information.

Country-Specific Benchmark Loan – Step 1

A country-specific benchmark loan is defined for each country. The benchmark loan has market-standard features with regard to its property, loan, and borrower characteristics.

The only features of a benchmark loan that vary are the standard market features, which are also seen as the key drivers of default probability and loss severity within a market. For most countries, we assume one of the key drivers to be the loan-to-value (LTV) ratio. Moreover, certain countries consider variations in other market-standard features, such as the debt-to-income (DTI) ratio or the borrower's credit score (e.g., FICO), in the benchmark loan definition.

Base Benchmark Credit Enhancement – Steps 2 and 3

The Base Benchmark CE is the loss on a benchmark loan occurring during a severe recession scenario. The loss is split into two components:

» default frequency

» loss severity.

> ### Flexible Loans
>
> In some countries, borrowers are allowed to make further drawings up to a limit stated at the origination of the mortgage loan or to redraw prepayments made on the loan.
>
> Generally, a redraw of prepayments or other further drawings are subject to the lender's credit review and approval. We typically determine the default frequency and severity based on the maximum drawable amount defined by the loan product, rather than the actual current balance.

Default Frequency – Step 2

A MILAN default frequency curve is defined for the benchmark loan features, which vary in each country. For example, in most countries, the main feature is the loan's LTV ratio. In this case, the curve assigns an assumed default frequency to each LTV level.

To determine the LTV, the current balances of all loans that are secured by the same property are aggregated. Therefore, all prior and equal ranking claims on the property, regardless of whether they are securitized or not, are taken into account. For claims where the current balance is unknown, we typically consider the original loan balance.

We calculate the LTV ratio by using the original property valuation[23] rather than the current indexed valuation.

---

[23] In some countries, originators or issuers provide the property value as the foreclosure or lending value instead of the market value. For those countries, we adjust the property value provided to derive the market value using a market-specific adjustment factor. In limited instances, we may use an issuer-specific adjustment factor.

Loss Severity – Step 3

The main drivers of loss severity are property value, aggregated loan balance, house price stress rate (HPSR), foreclosure costs, time to foreclosure, and accrued interest.

We first determine a stressed property value[24] to calculate a loan's loss severity. We do this by applying a HPSR assumption. The HPSR is our assumption of how far the current property value will fall as a result of a severe recession scenario. The HPSR can be different for each region within a specific country. In order to obtain the current property value, we typically index the last valuation provided using country- and region-specific house price indices.[25]

FORMULA 1

$$PV_{Stressed} = PV_{Unstressed} * (1 - HPSR_{Region})$$

Whereby:

$PV_{Stressed} = $ Stressed property value

$PV_{Unstressed} = $ Current, indexed, property value

$HPSR_{Region} = $ Region-specific house price stress rate

The loss severity of a particular loan is then derived from the following formula (see Exhibit 5).

FORMULA 2

$$L_i = Max(0, -PV_{Stressed} + C + (PR_i + PR_i * I * FP) + \{CB_i + PP_i + (CB_i + PP_i) * I * FP\})$$

Whereby:

$L_i = $ Loss of Loan i

$CB_i = $ Current balance of Loan i

$C = $ Foreclosure costs on the property

$PR_i = $ Current balance of loans ranking senior to Loan i

$PP_i = $ Current balance of loans ranking pari passu with Loan i

$I = $ Interest rate per annum

$FP = $ Foreclosure period in years

---

[24] For loans secured on multiple properties, we separately stress each property's value.

[25] We select the indices to update property values on the basis of the available market data. We typically use nominal house price indices constructed using absolute price levels based on property trades on new and existing residential properties.

EXHIBIT 5
Loss Severity for a Benchmark Loan
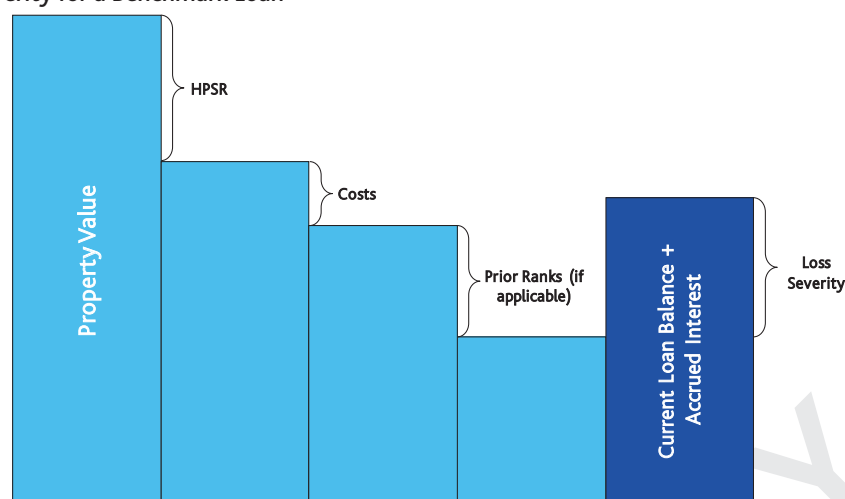
Source: Moody's Investors Service

HPSR: Loss severity is dependent on the house price evolution. For each country, the MILAN approach includes an assessment of how far house prices will fall in response to a severe recession scenario; this assessment leads to the HPSR. The HPSR takes into account a forced sale haircut based on the assumption that, in a stressed scenario, all properties sold are distressed sales. Appendix 1a outlines our approach to deriving the HPSR assumption.

Foreclosure costs: We have estimated the costs associated with the legal proceedings and the auction sale for each country. In some countries, these costs will vary by region.

Time to foreclosure: We use historical information to determine the time to foreclosure in each country. In some countries, time to foreclosure will vary by region.

Accrued interest: Interest accrued during the foreclosure period influences the severity of losses.

Realized Loss Definition in Synthetic Transactions

As can be seen from the loss severity formula described above, excluding foreclosure costs and accrued interest can decrease the severity substantially. This is especially relevant in the case of synthetic transactions, in which the realized loss definition could exclude either interest or foreclosure costs or both.

For true sale transactions, which are the most common type of RMBS transactions that we publicly rate, severity is capped at 100% of the current loan balance plus accrued interest. For synthetic transactions, the cap is transaction specific and may be different from the cap used in true sale deals.

Property value haircuts: In certain cases, we may apply a haircut to the property value either for the severity calculation or for the LTV calculation we use to determine the default frequency of the loan. For example, if the valuation provided is not a full valuation but rather a valuation obtained through indexing or an automated valuation model (AVM), we typically apply a haircut. We determine the haircut through the analysis of the accuracy of such models and how frequently they are updated.

Finally, we may apply a property haircut for the severity calculation when additional mortgage loans may arise during the life of the transaction and reduce the claim of the securitized loan against the property. The

size of the haircut, in this case, would depend on the expected size of additional exposure and any mitigants designed to limit any additional claims or to ensure that the issuer has a prior ranking claim to the property.

Base Benchmark Credit Enhancement – Step 4

We define the Base Benchmark CE for any loan included in the pool as the product of default frequency and severity, subject to a country-specific Minimum Loan CE.

FORMULA 3

*Base Benchmark CE$_i$ = Max(MinCE, DefFreq * L$_i$ / (CB$_i$ + PP$_i$)*

Whereby:

Base Benchmark CE$_i$ = Base Benchmark Credit Enhancement for Loan i

MinCE = Minimum Loan CE

DefFreq = Default frequency

L$_i$ = Loss of Loan i

CB$_i$ = Current balance of Loan i

PP$_i$ = Current balance of loans ranking pari passu with Loan i

---

Why Ranking of Loans Matters

Given a property value of 100 and a current loan balance of 100, the LTV is 100%. Given a house price decrease of 40%, the severity upon default is 40 (not considering foreclosure costs and accrued interest). As a percentage of the current loan balance, the loss is 40%.

Given the same property value as before and a current loan balance of 50, but subordinated to prior ranks of 50, the LTV again is 100%. Hence, the default frequency in both cases is equal. Given a house price decline of 40%, the total loss on the property is again 40. The property value is used to first pay back the prior ranks, which results in a loss for the securitized loan of 40. As a percentage of the current loan balance, the loss is 80%. This higher severity will increase the Base Benchmark CE for this loan, compared with the loan in the first example.

The Minimum Loan CE, which is set at a percentage of the current mortgage loan balance, depending on the specific country, covers certain risks that are not captured anywhere else in MILAN. These risks are:

» sovereign risk

» uninsurable natural risk

» possible weaknesses of legal and regulatory system

» credit culture of borrowers.

In synthetic transactions or transactions based on specified (guaranteed) mortgage products, the Minimum Loan CE is transaction-specific and may deviate from the country-specific Minimum Loan CE.

Borrower Credit Profile - Step 5

In certain countries, we apply an adjustment for the borrower's credit profile. The adjustment is dependent on the country-specific characteristics of a borrower's credit profile, such as county court judgments (CCJ) in the UK or Bureau Krediet Registratie (BKR) codes in the Netherlands. Based on the type of credit profile information and for some countries the number and amount of adverse credit registrations, we make

adjustments to the Base Benchmark CE. By applying the Borrower Credit Profile adjustment after the Minimum Loan CE is applied in the Base Benchmark CE, we ensure that we captured any potential risk layering.

FORMULA 4

$Credit\ Profile\ Adj_i = Base\ Benchmark\ CE_i * AdjFactor_{Credit\ Profile}$

Whereby:

$CreditProfileAdj_i = Borrower\ Credit\ Profile\ Adjustment\ for\ Loan\ i$

$AdjFactor_{Credit\ Profile} = Borrower\ Credit\ Profile\ Adjustment$

Benchmark Credit Enhancement - Step 6

The Benchmark CE is an aggregation of the Base Benchmark CE and the Borrower Credit Profile adjustment. All the other loan level adjustments outlined below will be multiplied by the Benchmark CE for that individual loan. The aggregation enables a greater differentiation between different mortgage loan products targeted at borrowers with varying credit profiles by capturing the resulting risk layering.

The aggregation produces a Benchmark CE for each loan in the pool. We calculate the Benchmark CE with the formula below.

FORMULA 5

$Benchmark\ CE_i = Base\ Benchmark\ CE_i + Credit\ Profile\ Adj_i$

Whereby:

$Benchmark\ CE_i = Benchmark\ Credit\ Enhancement\ for\ Loan\ i$

Adjustments on Single Loan Level – Steps 7 to 11

We adjust the Benchmark CE for each loan to account for higher- or lower-risk features as compared with the benchmark loan. Most adjustments address a different default frequency from that of the benchmark loan. Others, however, address a different loss severity. Unless indicated otherwise, we define adjustments to a loan's Benchmark CE with the following formula:

FORMULA 6

$Adjustment_{k,\ i} = Benchmark\ CE_i * Adjustment\ Factor_k$

Whereby:

$Adjustment_{k,\ i} = Adjustment\ type\ k\ to\ Loan\ i$

$Adjustment\ Factor_k = Adjustment\ factor\ for\ characteristic\ k$

The characteristics we consider and our assumptions regarding the impact of deviations from the benchmark loan on risk assessment vary from country to country. Below are some of the typical characteristics that lead to adjustments in MILAN. Appendix 4 contains details of the characteristics and related assumptions per country.

Property-Related Adjustments — Step 7

We adjust the Benchmark CE according to property type, occupancy type, property valuation type, and property value. To calculate the property value adjustment, we estimate the average property value of the benchmark loan. The average property value is derived looking at the available market data in a given country (e.g., national bank, national statistical office and other) or looking at data provided by international organization (e.g., Eurostat, IMF, Hypostat, OECD and others). Properties that deviate from the average property value attract a penalty. For this adjustment, all regions are classified as either "high," "medium," or "low" price regions. This is determined by ranking the regions according to property prices. The lower quartile of this ranking is classified as the low-price region, the upper quartile as the high-price region.

Loan-Related Adjustments — Step 8

We adjust the Benchmark CE according to loan purpose, interest rate type, interest, and principal frequency, currency of the loan, loan region, loan amounts, and origination channel. The interest rate type adjustment depends on whether the market in the specific country can be characterized as a fixed- or floating-rate market. If a fixed-rate loan is the benchmark in a specific country, floating rate loans or loans with a short period until interest rate reset, will be penalized in MILAN. A fixed rate loan or a loan with a longer period until interest rate reset in a floating rate market can be considered less risky and will therefore be given benefit in MILAN. In order to determine if the market is floating or fixed, we will collect data from different sources to identify the most common product in the market.

Borrower-Related Adjustments — Step 9

We adjust the Benchmark CE according to employment type, borrower type, nationality, and multiple borrowers.

Performance-Related Adjustments — Step 10

We adjust the Benchmark CE according to seasoning/months current and arrears status.

Months-current data indicates the number of months since the loan was last in arrears. To account for a loan's historical payment performance, we give credit for seasoning if the monthly payment has been made consistently. However, there will be limited benefit if the loan has previously been in arrears, depending on the period since the loan was last in arrears up to the cut-off date.

For loans that are not in arrears, we calculate the seasoning benefit on the Benchmark CE but not on any increase due to Borrower Credit Profile or to any of the other penalties applied.

We apply a scaling factor to performance-related adjustments to ensure the MILAN CE remains a more stable measure of risk through the cycle. This takes into account the other adjustments on each particular loan. A loan with more risky characteristics than the benchmark receives more credit for good historical performance but attracts a lower penalty if it is in arrears or has recently been in arrears. Similarly, a loan with less risky characteristics than the benchmark receives less credit for good historical performance but attracts a higher penalty if it is in arrears or has recently been in arrears. We calculate the scaling factor with one of the formulas below and use it to scale up or down the performance-related adjustment factor.

For credits with regard to seasoning/months current and arrears:

FORMULA 7

$ScalingFactor_i = Max(Benchmark\ CE_i + all\ adjustments_i,\ MinCE) / Benchmark\ CE_i$

Whereby:

$All\ adjustments_i$ = the aggregation of the Single Loan Level adjustments for Loan i described above in steps 7-9.

$ScalingFactor_i$ = Scaling factor used to scale up or down the performance-related adjustment factor for Loan i.

For penalties with regard to seasoning/months current and arrears:

FORMULA 8

$ScalingFactor_i = Benchmark\ CE_i / Max(Benchmark\ CE_i + all\ adjustments_i,\ MinCE)$

When loans in arrears are included in the pool at closing, we will analyze them individually, taking into account assumed roll rates from arrears into default and ultimate loss severity levels. In such cases, we do not consider the standard benchmark loan features to be the major driver for default frequency. Consequently, roll rates and severity levels become more important. For loans in early-stage arrears (typically under 30 days) in the countries where such loans were found to have high probability of default, we assume a minimum default frequency for such loans. This default frequency is then the minimum used together with the loss severity (calculated as described above) to determine the Benchmark CE for such loan.

We will also investigate the level of loan modifications in the pool and the lender's general approach to loan modifications. Depending on the results, we may apply an additional case-by-case penalty.

Originator and Servicer Adjustments — Step 11

The final Single Loan Level adjustments in MILAN are related to the quality of origination and servicing. These adjustments are applied to the aggregation of Benchmark CE and all the Single Loan Level adjustments described above in steps 7-10.

FORMULA 9

$Adjustment_{Originator/Servicer,\ i} =$

$Max(Benchmark\ CE_i + all\ adjustments_i,\ MinCE) * Adjustment\ Factor_{Originator/Servicer}$

Whereby:

$All\ adjustments_i$ = the aggregation of the Single Loan Level adjustments for Loan i described above in steps 7-10.

MILAN CE Single Loan – Step 12

After we make all **Single Loan Level** adjustments, we calculate the total MILAN CE for a single loan as the sum of the Benchmark CE plus all adjustments.[26] We re-apply the Minimum Loan CE to this sum to ensure that the CE for each loan is at least the country-specific minimum.

> **FORMULA 10**
>
> *MILAN CE Single Loan$_i$ = Max(Benchmark CE$_i$ + ∑ Adjustment$_{k, i}$, MinCE)*

Adjustments on the Portfolio Level – Steps 13 and 14

We make further adjustments at the portfolio level. These are dependent on regional diversification and borrower concentration in the portfolio as compared with the country-specific benchmark RMBS portfolio.

We may make further adjustments, on a case-by-case basis, to account for other portfolio concentrations, such as a large exposure to a single employer or industry or to particular regions which lack economic diversity.

Both portfolio level adjustments are applied multiplicatively to the aggregated MILAN CE for each loan in the portfolio.

> **FORMULA 11**
>
> *Aggregated loan MILAN CE = ∑ (Loan MILAN CE$_i$ * W$_i$)*
>
> Whereby:
>
> *Aggregated Loan MILAN CE = Aggregated MILAN CE for each loan in the portfolio*
>
> *Loan MILAN CE$_i$ = Benchmark CE plus all adjustments for loan i*
>
> *W$_i$ = Weight of the total exposure to loan i in the portfolio*

Regional Concentration Adjustment — Step 13

We compare the regional diversification of the portfolio with the property density for the country-specific benchmark RMBS portfolio. For some countries, property density data may not be available. In these cases, we use either population density or GDP data as a proxy for the benchmark portfolio. We generally allow for 10%-20% excess concentration within each of the regions in a specific country. The sum of concentration above that excess concentration threshold bears a country-specific adjustment for concentration on the portfolio.

---

[26] MILAN CE requirement for a single loan is subject to a frequency cap of 100% and severity cap of 100% plus accrued interest.

FORMULA 12

Regional Adjustment =

*1+ Regional Adj Factor * $\sum$ {Max(0, (W_{Region} - $Density_{Region}$ * (1+ Excess)))}*

Whereby:

Regional Adj Factor = Adjustment for excess regional concentration

W_{Region} = The weight of loans secured against properties in a region versus the total portfolio

$Densitys_{Region}$ = Property density in a specific region for the benchmark RMBS portfolio

Excess = Excess concentration threshold

Borrower Concentration Adjustment – Step 14

We address a portfolio's lack of diversification by using the borrower concentration adjustment. RMBS portfolios are typically highly diversified in terms of borrowers and single loan sizes. However, a low average loan size could be the result of an extreme portfolio, with a few large and many small loans. Or, a few borrowers may have many small loans resulting in less diversification.

We assess borrower or loan concentration by calculating the effective number of borrowers in the portfolio. The calculation uses an adjusted Hirschman Herfindahl Index based on the aggregated borrower exposure and can be interpreted as the number of equally weighted borrowers in a hypothetical portfolio. For example, we assume a pool with 500 borrowers and an effective number of 300 borrowers has the same borrower concentration risk as a pool with 300 borrowers that all have the same amount outstanding. The benchmark RMBS portfolio typically has an effective number of borrowers of 3,000, which is equivalent to a 0.033% exposure to each borrower.

FORMULA 13

Effective Borrowers = 1 / $\sum (W_m)^2$

Whereby:

Effective Borrowers = Effective number of borrowers for the portfolio

W_m = Weight of the total exposure to borrower m in the pool

As can be seen in the formula above, larger borrower concentrations result in a lower effective number of borrowers, indicating less diversity.

FORMULA 14

Borrower Adjustment =

Aggregated Loan MILAN CE $^{\{Borrower\ Adj\ Factor\ *\ Max(0,\ LN(Benchmark\ Borrowers)\ –\ LN(Effective\ Borrowers))\}}$

Whereby:

Borrower Adj Factor = Adjustment factor for borrower concentration

Benchmark Borrowers = The effective number of borrowers for the benchmark RMBS portfolio

For small portfolios with significant borrower and/or regional concentration, we may determine that the regional and/or borrower concentration risk cannot be mitigated through credit enhancement. In this case, we may decide to cap the ratings of the transaction below the maximum rating achievable in the country.

In addition, during the life of the transaction, as pool sizes decrease to a small fraction of their initial size, credit risk exposure to large borrowers may increase significantly. This may happen when the amortization of loans to large borrowers is slower than that of the pool as a whole. A significant borrower concentration build-up is typically offset by a commensurate CE build-up so that rated notes remain at all times protected against the default risk of the largest borrowers in the pool. Structural features, such as sequential amortization and reserve fund floors, are generally designed to build such credit enhancement cushions against residual borrower concentration risk.

As part of our continuous monitoring of RMBS transactions, we track the evolution of borrower concentration risk and verify that the amount of credit enhancement under a given class of notes always protects this class from the risk of a default by the largest borrowers. In the absence of borrower-level information allowing the largest borrower exposures to be accurately tracked, we may withdraw our ratings on notes backed by pools that have amortized to a small fraction of their initial size. If we estimate that the exposure of notes to the largest borrowers is not consistent with their ratings, we will downgrade these ratings accordingly and may withdraw them.

We will not assign or maintain ratings on the following types of RMBS transactions:

» transactions that do not have support mechanisms, such as credit enhancement floors or reserve fund floors, when the underlying pool has decreased to an effective number of borrowers of 30[27] or below

» transactions with reserve fund or credit enhancement floors that partially compensate for the increased exposure to single borrowers when the underlying pool has decreased to an effective number of borrowers of 15[28] or below.

However, we will make exceptions for securities with ratings that do not rely on our assessment of individual obligor creditworthiness, such as those that benefit from a full and unconditional third-party guarantee, whether at the pool or note level, or securities that benefit from full cash collateralization.[29]

Model-Driven MILAN CE – Step 15

To determine the MILAN CE for a portfolio, we aggregate all calculations made within MILAN and adjust for regional and borrower portfolio concentrations:

FORMULA 15

*Model Driven MILAN CE = Aggregated Loan MILAN CE * Regional Adjustment * Borrower Adjustment*

The model-driven MILAN CE is expressed as a percentage of the total portfolio balance.

MILAN CE Is Subject to a Floor – Step 16

The model-driven MILAN CE is subject to a floor, namely the Minimum Expected Loss Multiple. For countries where the availability of information limits the predictability of severe stress scenarios, the model-driven MILAN CE may be subject to a further floor, the Minimum Portfolio MILAN CE.

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[27] If we cannot obtain the effective number, we will use a threshold of 45 borrowers instead. If we cannot obtain the effective number of borrowers, we will use the effective number of loans instead.

[28] If we cannot obtain the effective number, we will use a threshold of 25 borrowers instead.

[29] However, for structured finance securities with full support from a financial guarantor, if the financial guarantor's rating is below investment grade, we would expect to withdraw the rating of the security after withdrawing its underlying rating.

For all countries, if the standard analytical approach produces MILAN CE levels below 4%-5%, we will further assess the specific pool and the appropriate application of this methodology and, if applicable, make qualitative adjustments to reflect our view of the full extent of the risk.

We apply a **Minimum Expected Loss Multiple** for all countries to ensure that extreme loss scenarios have an adequate probability of occurrence in our analysis. It is applicable when the Portfolio EL is assigned or updated. It is determined as a multiple of the Portfolio EL to ensure that the minimum level of difference is maintained between the Portfolio EL and the MILAN CE. This allows for a minimum coefficient of variation to be maintained by the lognormal distribution used to simulate losses incurred by the securitized portfolio. This is particularly important for high Portfolio EL assumptions or where there is an expectation of adverse performance, which is not yet reflected by the arrears performance of the collateral portfolio but is already qualitatively incorporated into the Portfolio EL assumption. Using a multiple of the Portfolio EL to determine a floor for the MILAN CE ensures the stability of the highest ratings achievable in the country in various economic environments. The multiples differ based on the level of the Portfolio EL assumed, and vary between 3x (for high Portfolio EL assumptions) and 5x (for low Portfolio EL assumptions). Multiples in the range of 3x-5x apply for most RMBS transactions.[30]

We generally use the **Minimum Portfolio MILAN CE**[31] levels for each country as a function of the potential deterioration arising from macroeconomic, social, or political events that would affect all portfolios originated in a particular jurisdiction, regardless of (1) the strength of the origination and underwriting processes of an originator; (2) the type of borrowers in a portfolio; or (3) the characteristics of the underlying security that the borrowers provide. We will set the Minimum Portfolio MILAN CE at different levels for each affected country. The following factors influence the magnitude of the deterioration and the minimum credit enhancement:

» country-specific factors such as our expectation of the level of increased unemployment rates, consumer leverage levels, and economic development

» country-specific effects of banking system disruptions or macroeconomic stresses either preceding or following a country default

» effects of possible adverse changes to the legal and institutional environment in the country.

We will apply such Minimum Portfolio MILAN CE levels for as long as we assume these conditions to prevail.

Rating Committee Approval of MILAN CE – Step 17

The rating committee approves the MILAN CE taking into account the calculated model result and any other qualitative and quantitative aspects of the portfolio.

For example, since MILAN assesses the risk of a static portfolio, transactions with revolving periods and/or prefunding require further adjustments on the MILAN CE to reflect the expected pool composition over time. Also, if further advances, product switches, and/or loans conversions are allowed, additional adjustments are required depending on the transaction-specific criteria. Depending on the criteria, we may apply the adjustment either via a defined percentage increase of the MILAN CE or via modeling a certain level of substitution in the portfolio.

The result, which is obtained after we have applied all adjustments to the model-driven MILAN CE, is the MILAN CE for the portfolio.

---

[30] For very high Portfolio EL assumptions, the multiple will be assessed case by case.

[31] We will apply the Minimum Portfolio MILAN CE to the RMBS part of the portfolio. For mixed pools, we will assess the non-RMBS portion of the pool separately.

Appendix 1a – Deriving the HPSR Assumption

The HPSR assumption has two distinct components: (1) a fixed floor and (2) a variable element dependent on the sustainability of previous house price developments.

We compound the two factors, applying the fixed element to the level of house prices after the unsustainable portion of recent house price growth has been lost.

FORMULA A

$$HPSR_{Region} = HPSR_{Variable} + (1 - HPSR_{Variable}) * HPSR_{Fixed}$$

Whereby:

$HPSR_{Region}$ = Region-Specific House Price Stress Rate

$HPSR_{Variable}$ = House Price Stress Rate Variable Factor

$HPSR_{Fixed}$ = House Price Stress Rate Fixed Factor

Variable factor: To what extent have current house prices departed from current fundamentals?

» The variable factor assumes a portion of the medium-term house price growth will be lost in response to a severe economic shock.

» For countries that have seen a greater departure from fundamentals, we assume a larger proportion of the medium-term growth is lost. We will reassess this proportion periodically based on the following fundamental demand and supply drivers:

  – Demand drivers include:

    – the past 10 years of growth in household disposable income

    – the past 10 years of growth in the number of households.

  – Supply drivers include:

    – the past 10 years of growth in housing stocks.

» We then compare the increase in house prices over the last 10 years with the historic drivers above to assess how much the house price growth is not justified by fundamentals. We make a qualitative assessment as to whether the growth in house prices has outstripped fundamentals. We express our assessment on a scale of 1-5, where 1 is the lowest and, though there is no upper bound, 5 is typically the highest.

» We take a final qualitative adjustment based on the ratio of house prices to household disposable income per capita, a simple measure of house price affordability that does not depend on the medium-term trends.[32]

» The variable factor updates dynamically since it is based on a rolling window of medium-term, typically 10-year, house price growth. Therefore, all else being equal, strong growth in prices will automatically lead to an increased HPSR assumption.

---

[32]   We give more weight to the price-to-income ratio when we observe increasing consumer leverage in a given country. Increasing consumer leverage indicates that medium-term house price growth has been sustained because households were provided with sufficient increases in debt financing. We believe there will be a disruption to this increase in debt financing in an economic shock, which will in turn reduce house prices.

FORMULA B

$HPSR_{Variable} = VFM * HPC_{Region}$

Whereby:

VFM = The variable factor multiplier, which is the proportion of medium-term house price growth that we assume is lost following an economic shock. We convert the score described above to the percentage of house price growth that we assume is lost during an economic shock. The exhibit below provides a guide that converts the assigned scores into the VFM we use in the variable factor:

HPCRegion = The component of today's house price which is derived from medium-term growth in regional prices (e.g., if prices have doubled, then this component is 50% since half of today's price is made up of medium-term house price growth). This will update dynamically based on a rolling window of medium-term house price growth.

EXHIBIT 6
Variable Factor Score to VFM Guidance

Score	Factor
1-2	0%-30%
3	35%
4	40%
5+	50%+

Source: Moody's Investors Service

Fixed factor: To what extent will structural features of the economy contribute to declines in house prices?

» The fixed factor assumes house prices will fall by an additional fixed percentage. It is based on a qualitative assessment of how each country's structural features will contribute to a housing market downturn following an economic shock.

» Our qualitative assessment made under the fixed factor is based on the following four sub-factors. We score each of the sub-factors separately and take a weighted average (according to the weights shown in parentheses):[33]

a. How vulnerable is the consumer to the economic shock? (weight 35%)

Higher household debt leverage will leave consumers more vulnerable to the economic shock. We look at various available measures of household leverage and savings rates to assess this question.

In the case of countries where GDP, disposable income, and savings may be affected as a result of current or expected economic contraction, we will take a forward-looking view of these measures.

b. How large is the structural surplus of houses? (weight 35%)

Countries with more spare housing capacity will fare worse because there is structural surplus that puts downward pressure on prices. As a proxy for the structural surplus of houses, we primarily look at how many more dwellings there are than households. This part of the fixed factor is different than the change in housing supply assessed in the variable factor because it looks at the stock of unused housing rather than the flow of new housing.

---

[33] Although we have assigned weights to the sub-components of this component, the method is not formulaic in that the scores assigned to each sub-component is qualitatively assigned using a broad range of information.

In some countries where second homes are common, this number looks large, even though many houses are not truly vacant. However, in the context of a severe economic shock, many households will sell their second homes, and the tourism industry may also be acutely affected. As a sense check, we also look at the reported vacancy rates, although this data is usually not timely because they date to the last census conducted in the country. Also, the reporting convention in each country is not always comparable because some countries include second homes and others do not.

c. Does the lack of automatic stabilizers amplify the shock? (weight 20%)

Countries with freely moving exchange rates and control over their monetary policy will fare better; for example, asymmetric economic shocks in eurozone countries may mean that some countries will have a harder time lifting out of the recession and housing slump because the interest rate and exchange rate may not be accommodating for them.

d. How large could a 'second-round' impact be? (weight 10%)

Higher unemployment and slower growth may result from a softening in the housing market. Countries with a higher degree of reliance on the residential construction sector in terms of employment and contribution to output are likely to be more affected by the initial decrease in house prices assessed in the variable component.

» We convert the weighted average fixed factor score described above to a fixed factor house price stress. The exhibit below provides a guide that converts the scores assigned into the fixed factor:

EXHIBIT 7
Fixed Factor Score to Fixed HPSR Guidance

Score	Factor
1-3	25.0%-27.5%
3-4	30.0%
4-5	35.0%
5+	40.0%+

Source: Moody's Investors Service

Appendix 2 - Lognormal Distribution

We use the two outputs from our portfolio analysis to determine a probability loss distribution. The probability loss distribution associates a probability with each potential future loss scenario for the portfolio. For RMBS portfolios, we typically assume the probability loss distribution is lognormal.[34] We use three parameters to determine the lognormal loss distribution:

» Portfolio EL: assumed as the median of the lognormal loss distribution

» MILAN CE: defined as the subordination of a theoretical senior tranche targeting the highest rating achievable in the country[35]

» expected average life: of the theoretical senior tranche.

We can define a lognormal loss distribution if we know its median loss and standard deviation. We use the Portfolio EL assumption as the median loss. To determine the shape of the lognormal loss distribution, we estimate the standard deviation of the losses associated with the MILAN CE assumption. We estimate the standard deviation using a methodology similar to value at risk (VAR) theory. In VAR theory, the distribution is known, and the risk at a certain quantile is searched for. However, under our methodology, we know the risk and quantile and search for the standard deviation that will define the distribution.

We first establish a theoretical single senior tranche with only note subordination as credit enhancement equal to the MILAN CE assumption. Given the portfolio features, we determine the expected average life of this tranche. Using this average life and the highest rating level achievable in the country, we define the risk as the expected loss from our idealized expected loss tables.[36] Finally, we can derive the quantile using the expected loss and the theoretical note subordination in order to search for a standard deviation for the portfolio's loss distribution.

EXHIBIT 8
General Shape of the Lognormal Loss Distribution
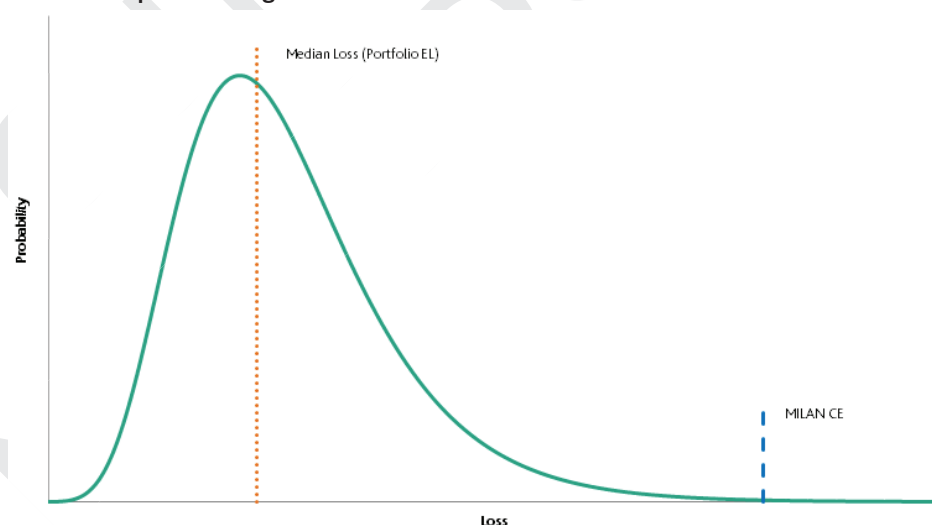
Source: Moody's Investors Service

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[34] See The Lognormal Method Applied to ABS Analysis, July 2000.

[35] The maximum achievable rating in the market typically aligns with the local currency country ceiling. In certain circumstances, depending on the drivers of the local currency country ceiling, we may consider alternative loss distribution assumptions or may not adjust our loss distribution assumptions taking into consideration the local currency country ceiling.

[36] For details, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* under the "Moody's Related Publications" section.

Appendix 3 – Approach to Assessing Certain Specific Features of RMBS

Appendix 3a – EMEA RMBS/ABS SME Mortgage Loan Portfolios Mixed-Pool Analysis

In Europe, the Middle East, and Africa (EMEA), we use a unified approach to analyzing a 'mixed-pool' portfolio, which is a portfolio with two sub-pools of mortgage loans made to individuals and to small and medium-sized enterprises (SMEs). Our approach combines the standard EMEA rating methodologies for assessing RMBS and ABS SME loan portfolios.

We split the portfolio into sub-components and analyze each sub-pool using the standard EMEA methodologies for individuals and SMEs. We then merge the loss distributions associated with the two sub-pools. This appendix describes our method for merging the two loss distributions. In instances where one of the pools is very small (typically less than 5% of the total portfolio), we may adopt a simpler approach, whereby we will apply only the standard methodology of the main asset type.

Splitting the Portfolio Between Individuals and SMEs

We divide the portfolio of mortgage loans in the pool by borrower and property type to create the two sub-pools.

RMBS sub-pool: The first sub-pool includes loans to individual borrowers or small unlimited liability companies that have taken out a mortgage loan to purchase/renovate a residential property. In cases where these borrowers are companies, they are generally artisans and self-employed professionals who are purchasing their house, typically as a primary residence, with full recourse to the shareholders. We capture the increased risk that these self-employed borrowers pose through our standard RMBS approach.

SME sub-pool: The second sub-pool includes (1) loans to limited liability companies (no recourse to the shareholders) with mortgage loans on either a residential or commercial property; and (2) loans to small unlimited liability companies with a mortgage loan on a commercial property or residential property to finance the business activity of the borrower.

Merging the Loss Distributions of the Portfolios – Single-Rated Tranche Transactions

Once we have determined the loss distributions on a standalone basis of the ABS SME and RMBS sub-pools, we merge the loss distributions of the two sub-portfolios. The approach we use to merge the two distributions has two properties:

1. The resulting loss distribution follows a lognormal distribution.

2. The approach is relatively simple so that we can determine the key parameters for rating and monitoring the portfolios.

For ABS SME pools, we generally use a normal inverse (or transaction-specific) distribution, whereas, for RMBS pools, we typically use a lognormal distribution.

To determine the loss distribution of the mixed portfolio in a single-rated tranche transaction, we follow these steps:

1. We determine the loss distribution of the RMBS sub-portfolio by using a lognormal distribution.

2. We determine the loss distribution of the SME sub-portfolio. Depending on the granularity of the sub-portfolio, we either use a Monte Carlo simulation approach or assume a normal inverse distribution.[37]

3. Based on the country's maximum achievable rating and the SME's sub-pool weighted average life, we determine the expected loss of such maximum achievable rating using Moody's Idealized Expected Loss tables.[38]

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[37] For SME sub-portfolio, we will convert the stochastic recovery distribution, typically used for SME portfolios, into a fixed recovery rate.

[38] For details, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* under the "Moody's Related Publications" section.

4. We derive the percentile on the SME loss distribution (Equivalent MILAN number) so that the area under the distribution curve on the right hand of this percentile number equals the expected loss calculated in step 3 (see Exhibit 9, area beyond the green line until the Equivalent MILAN number).

5. We fix the mean of the SME lognormal matched distribution to the distribution derived in step 2.

6. We fix the standard deviation of the SME lognormal matched distribution so that the expected loss of the area under the distribution curve on the right hand of the Equivalent MILAN number matches the one calculated in step 3.

EXHIBIT 9
Tails of the Transaction-Specific Default Distribution and "Matched" Lognormal
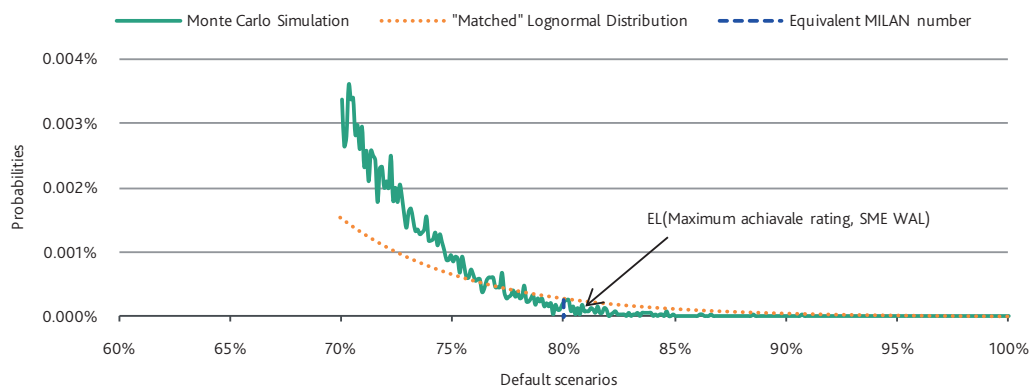
Source: Moody's Investors Service

7. We merge the two loss distributions assuming a 100% correlation.[39]

8. We use the combined loss distribution in our cash flow analysis.

Exhibit 9 shows an example of a manual default distribution determined using Monte Carlo simulation and of a "matched" lognormal distribution. In the example, we assume a maximum achievable rating of Aaa and a weighted average life of five years to derive the "matched" lognormal distribution.

Merging the Loss Distributions of the Portfolios – Multi-rated Tranche Transactions

For transactions with more than one tranche rated across the capital structure, our procedure is:

1. We determine the loss distribution of the SME sub-portfolio, either using a Monte Carlo simulation approach or assuming a normal inverse default distribution.

2. We determine the loss distribution of the RMBS sub-portfolio by using a lognormal distribution.

   We merge the two loss distributions using a non-parametric approach: For each given probability scenario across the two loss distributions, we take the weighted average of each loss scenario based on the contribution of each sub-pool.

Analysis of the Individuals Sub-pool

For the "individuals" part of a mixed pool, we use our RMBS rating methodology.

Analysis of the SME Sub-pool

For the SME pool, please refer to "Moody's Related Publications" at the end of this report for the methodology used.

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[39] The standard deviation of the combined pool will be calculated as the weighted average standard deviation of the SME and RMBS sub pools.

Appendix 3b – Automated Valuation Models in RMBS

This appendix outlines the framework we use to quantify the risk associated with automated valuation models (AVMs) as an alternative method of valuation in RMBS transactions.

For mortgage loans where an AVM has been used to value a property, the potential risk is sized in a twofold approach:

» **Property value haircut**: Firstly, a haircut is applied to the AVM valuation, effectively increasing the loans' LTV ratio for all calculations in our collateral analysis.

» **MILAN Property Valuation Type Penalty**: Secondly, a property valuation type penalty is applied under the Single Loan Level adjustments of the MILAN model. In addition, we will review the manner in which the lender uses AVMs in its underwriting in order to ensure they are used in a prudent manner. If not, we may apply additional penalties.

We primarily analyze test data supplied by each provider to review its respective AVM. The analysis focuses on the AVMs' ability to accurately estimate the property value within each of their stated confidence levels. We statistically quantify the estimation error[40] between the AVM valuation and test data from independent surveyor valuations or sales prices.[41]

Property Value Haircut

The haircut we apply to the AVM property valuation is sized to capture two concerns:

» **Time lag:** Based upon a qualitative assessment of the AVM providers' procedures, we apply a haircut to account for the time lag between actual real-estate market movements and the time it takes for these movements to be reflected in updates to the AVM.

» **Median estimation error:** Our concern is not only the estimation error associated with AVM valuations but also any consistency in over-estimation of the property value. If applicable, we further reduce the AVM valuation with a haircut typically equal to the median value of the estimation error distribution if the AVM consistently overvalues. We derive the haircut separately for each AVM's stated confidence level.

MILAN Property Valuation Type Penalty

A property valuation type penalty is derived for each of the AVM's stated confidence levels. The penalty is applied within the Single Loan Level adjustments of the MILAN model.

The penalty is set equal to the censored standard deviation of the estimation errors. The part of the estimation error distribution that represents AVM valuations lower than the surveyor valuation or sales price is calculated and censored; this statistical approach enables the derivation of volatility in AVM and property value in instances where the AVM overvalues. The volatility is measured by the standard deviation of this distribution. A separate standard deviation of the censored distribution is calculated per confidence level employed by the AVM provider.

Maximum Property Values

Due to the extra volatility observed for larger property values, we may decide to assess AVM valuations over a certain threshold on a transaction-specific basis. The thresholds will be reviewed on a periodic basis using updated data from the providers.

Appendix 3c – Foreign Currency Loans

This appendix describes our approach to analyzing mortgage loans denominated in foreign currencies. A sharp depreciation of the domestic currency would typically affect borrowers' ability to service their foreign currency loans, for example, because the income of the borrowers is paid in the local currency. A sharp depreciation of the domestic currency would also increase the loan severity since proceeds from the

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[40] Estimation error = (AVM valuation –property value) / property value. The risk is quantified assuming the estimation error is normally distributed.

[41] Descriptive statistics, such as mean, median and standard deviation, are some of the statistical measures used in the analysis.

property sale would be in local currency, and the loan balance would be in foreign currency. Therefore, we incorporate Foreign Exchange (FX) adjustment factors into our MILAN framework to account for the impact of FX risk on the default frequency and severity of the foreign currency loans. The FX adjustment factors are applied as adjustments to the Benchmark CE of the foreign currency loans.

We apply one of two types of FX adjustment factors for foreign currency loans: Standard or Mitigated. Mitigating factors apply if, for example, the borrower can elect to redenominate their loan payment obligations at any time or the borrower's income is paid in the loan currency. The applicable adjustment factor for each foreign currency loan depends on (1) the loan-to-value (LTV) ratio;[42] and (2) the loan amortization type (i.e., amortizing or bullet).

Exhibit 10 shows the FX adjustment factors for the eight most common currency pairs in RMBS and residential pools in Covered Bonds, referencing the currency of the loan and the local currency in that order.[43.]

EXHIBIT 10
Standard FX Adjustment Factors

LTV	Amortizing	Bullet	LTV	Amortizing	Bullet
Japanese Yen/Euro			**US Dollar/Euro**		
>=0%-<=20%	0%	60%	>=0%-<=20%	0%	20%
>20%-<=30%	15%	180%	>20%-<=30%	0%	115%
>30%-<=40%	45%	230%	>30%-<=40%	20%	190%
>40%-<=50%	300%	380%	>40%-<=50%	200%	340%
>50%-<=60%	300%	380%	>50%-<=60%	200%	340%
>60%-<=70%	300%	380%	>60%-<=70%	200%	340%
>70%-<=80%	300%	380%	>70%-<=80%	200%	340%
>80%-<=90%	300%	380%	>80%-<=90%	200%	340%
>90%	300%	380%	>90%	200%	340%
Swiss Franc/Euro			**Swiss Franc/Romanian Leu**		
>=0%-<=20%	0%	20%	>=0%-<=20%	20%	150%
>20%-<=30%	0%	100%	>20%-<=30%	100%	230%
>30%-<=40%	20%	180%	>30%-<=40%	200%	250%
>40%-<=50%	170%	330%	>40%-<=50%	400%	400%
>50%-<=60%	170%	330%	>50%-<=60%	400%	400%
>60%-<=70%	190%	330%	>60%-<=70%	400%	400%
>70%-<=80%	190%	330%	>70%-<=80%	400%	400%
>80%-<=90%	190%	330%	>80%-<=90%	400%	400%
>90%	190%	330%	>90%	400%	400%
Euro/Romanian Leu			**US Dollar/Russian Ruble**		
>=0%-<=20%	0%	30%	>=0%-<=20%	100%	200%
>20%-<=30%	15%	130%	>20%-<=30%	350%	350%
>30%-<=40%	40%	200%	>30%-<=40%	350%	350%
>40%-<=50%	220%	280%	>40%-<=50%	350%	350%
>50%-<=60%	220%	280%	>50%-<=60%	350%	350%
>60%-<=70%	220%	280%	>60%-<=70%	350%	350%
>70%-<=80%	220%	280%	>70%-<=80%	350%	350%
>80%-<=90%	220%	280%	>80%-<=90%	350%	350%
>90%	220%	280%	>90%	350%	350%

[42] To calculate the LTV of a foreign currency loan, we convert the current loan balance to the local currency using the exchange rate at the time of loan origination. Therefore, the LTV will not be affected by post-origination FX movements.

[43] Foreign currency loans are denominated in a currency other than the local currency of the country where the relevant property is situated and/or where the borrower receives the income or holds the assets from which the mortgage loan is to be repaid.

Euro/Hungarian Forint			Euro/Danish Krone		
>=0%-<=20%	0%	25%	>=0%-<=20%	0%	0%
>20%-<=30%	10%	120%	>20%-<=30%	0%	40%
>30%-<=40%	30%	190%	>30%-<=40%	10%	120%
>40%-<=50%	80%	220%	>40%-<=50%	50%	250%
>50%-<=60%	250%	370%	>50%-<=60%	50%	250%
>60%-<=70%	250%	370%	>60%-<=70%	50%	250%
>70%-<=80%	250%	370%	>70%-<=80%	50%	250%
>80%-<=90%	250%	370%	>80%-<=90%	50%	250%
>90%	250%	370%	>90%	50%	250%

Source: Moody's Investors Service

For some foreign currency loans, exposure to FX risk is reduced by mitigating factors. In such a case, we use lower FX adjustment factors, as shown in Exhibit 11. These factors apply to all currency pairs.

EXHIBIT 11
Mitigated FX Adjustment Factors

LTV	Amortizing	Bullet
>=0%-<=20%	0%	0%
>20%-<=30%	0%	0%
>30%-<=40%	0%	0%
>40%-<=50%	25%	60%
>50%-<=60%	25%	60%
>60%-<=70%	25%	60%
>70%-<=80%	25%	80%
>80%-<=90%	25%	80%
>90%	25%	80%

Source: Moody's Investors Service

If a portfolio includes a small exposure to foreign currency loans (for example, no more than 5%) for which the currency pair is not currently presented in Exhibit 10, we use for simplification purposes the highest adjustment factor under Exhibit 10 (Swiss Franc/Romanian Leu) for those loans. However, if such loans represent a greater exposure (for example, more than 5% of the portfolio), we will determine the applicable FX adjustment factors on a case-by-case basis.

In our analysis, when calculating the recovery upon default of the loan, we use a stressed interest rate assumption to account for accrued interest during the foreclosure period (see Step 3 in our framework above). We determine the stressed interest rate assumption based on local currency loans and the interest rate that applies to the local currency loans. In portfolios that contain more than 30%[44] of loans in different currencies (for example, 60% of the loans are in foreign currency and 40% of the loans are in local currency),[45] we will adjust the interest rate assumptions that we use to calculate the loss severity under Step 3 in our framework. We will typically assume that the interest rate on foreign currency loans is 2.5% lower than the one in local currency, which is approximately the average historical difference between the interest rates on local and foreign currency mortgage loans in the markets which we analyzed.[46]

Appendix 3d - NHG Mortgage Loans in Dutch RMBS

A borrower may obtain a Nationale Hypotheek Garantie (NHG Guarantee) for a mortgage loan that is or will be occupied by the owner. The guarantee covers loss to the lender after the end of the foreclosure process for a defaulted borrower subject to a loss coverage formula. NHG loans are only granted if certain strict eligibility conditions on the loan, borrower, and property are met. Such conditions also apply to the eventual claim made by the lender regarding the origination and servicing process. The Homeownership

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44   Below 30%, the sensitivity to different interest rate assumptions is limited.

45   Regardless of which FX adjustment factors apply.

46   For example, Romania and Russia.

Guarantee Fund (Stichting Waarborgfonds Eigen Woningen, WEW[47]), a foundation set up by the Dutch government and the municipalities represented by the Association of Dutch Municipalities (Vereniging Nederlandse Gemeenten), grants the guarantees.

The benefit of such guarantees may substantially reduce the severity of loss upon a borrower default. However, in our approach, we assume the NHG Guarantee will not cover all losses as a result of borrower default for two main reasons:[48]

» **Guarantee mismatch:** The coverage level of the NHG Guarantee is not necessarily 100%. In our loan loss severity analysis, we take into account any mismatch between the actual outstanding mortgage loan balance and the NHG guarantee.

» **Rescissions:** The full check for whether a loan is compliant with NHG criteria is only performed when a loss arises, and the claim is made to WEW. It is therefore not certain in advance that the loan is compliant and the guarantee will pay out as expected.

Guarantee Mismatch

We adjust the loss severity calculation in the MILAN model to account for the assumed mismatch between the actual outstanding mortgage loan balance and the NHG guarantee. The NHG underwriting conditions relating to coverage levels are occasionally amended for new mortgage loan originations. The size of the potential mismatch may therefore vary depending on when the loan was originated. In our analysis, the coverage level for each loan is individually assessed, taking into account the specific NHG conditions that apply.

Should the conditions specify how the guarantee amortizes overtime, this may not necessarily match the actual loan amortization. Since the coverage level may change, the timing of default for NHG borrowers becomes an important assumption. In the specific case of NHG loans whose conditions specify guarantee amortization, we assume the default timing to be 48 quarters. Taking into account the default timing, we are able to calculate the mismatch between the actual outstanding mortgage loan and the NHG guarantee.

In addition to the principal losses after foreclosure, lenders can typically claim accrued interest and foreclosure costs with WEW. The guarantee mismatch does not typically affect this part of the claim. Subject to the specific NHG conditions as they apply to each loan, we disregard the guarantee mismatch when assessing the impact of accrued interest and foreclosure costs in the loss severity calculation.

Rescissions[49]

Due to a number of reasons, WEW will not always pay the full claim to the originator and may instead fully or partially rescind the claim. The most common reason for rescissions is the mistakes made during the underwriting or servicing process. We use the historical rescission rates provided by each originator and servicer as a starting point for deriving the assumed rescission rates in our analysis. As the historic rescission rates vary, we will use a different rescission rate per originator or servicer.

We stress the historic rescission rates to account for potential increases during recession scenarios. We believe that WEW is likely to be more critical toward the application of its originating and servicing criteria when the number of claims and the possible payout increase. We adjust the loss severity calculation in the MILAN model to account for the assumed rescission rate. We apply the adjustment by reducing the calculated benefit of NHG claims in proportion to the rescission rate. We apply this reduction to the full claims, including costs and accrued interest.

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47   As WEW is a Dutch institute providing insurance for Dutch mortgages, there exists some correlation between defaults in the mortgage portfolio and a default of WEW. However, as WEW is guaranteed by the Dutch government, we assume the correlation is low.

48   We focus on the loss arising from borrower default. We assess other potential sources of loss not covered by NHG, such as set-off risk, separately.

49   We define rescissions as reduced or denied claims for reasons other than the guarantee mismatch.

Appendix 3e – UK RMBS Master Trust Cash Flow Analysis

Due to the complexity and flexibility of the UK RMBS master trust structures, we perform a variety of cash flow scenarios in our structural analysis. The cash flow scenarios include (1) variations in the loss timing; (2) the time lag between default and loss realization; (3) variations in the principal payment rate (PPRs); (4) substitutions; (5) and servicer downgrade and servicer default.

Cash Flow Scenarios

The scenarios in the summary exhibit below are not exhaustive but are an example of the types of scenario that we will review. Circumstances specific to a particular transaction may involve running additional scenarios.

EXHIBIT 12

Summary of Our Cash Flow Scenarios

Scenario	Loss Timing	Losses Time Lag (mths)	PPR	Substitution Period (mths)	Substitution Amount	Servicer Downgrade	Servicer Default
1	Auto	12	Auto	0	N/A	No	No
2	Auto	12	Auto	60	Initial Trust Size	No	No
3	Auto	12	Auto	60	Minimum Trust Size	No	No
4	Auto	12	Auto	30	Initial Trust Size	No	No
5	Auto	12	Auto	30	Minimum Trust Size	No	No
6	3	12	Auto	0	N/A	No	No
7	3	12	Auto	60	Initial Trust Size	No	No
8	3	12	Auto	60	Minimum Trust Size	No	No
9	Auto	12	10%	0	N/A	No	No
10	Auto	12	10%	60	Initial Trust Size	No	No
11	Auto	12	10%	60	Minimum Trust Size	No	No
12	Auto	12	40%	0	N/A	No	No
13	Auto	12	40%	60	Initial Trust Size	No	No
14	Auto	12	40%	60	Minimum Trust Size	No	No
15	Auto	12	Auto	0	N/A	Yes	Yes
16	Auto	12	Auto	12	Initial Trust Size	Yes	Yes
17	Auto	12	Auto	12	Minimum Trust Size	Yes	Yes
18	Auto	12	Auto	12	Initial Trust Size	Yes	No
19	Auto	12	10%	12	Initial Trust Size	Yes	No
20	Auto	24	Auto	60	Minimum Trust Size	No	No
21	Auto	24	Auto	60	Initial Trust Size	No	No
22	Auto	24	Auto	0	N/A	No	No

Source: Moody's Investors Service

We typically review 22 main scenarios as part of the master trust cash flow analysis. However, in some cases, we may consider additional scenarios to analyze additional circumstances particular to a transaction. Scenarios 1, 2, and 3 represent the key scenarios, which we use to assess the ratings on the notes. In addition, the following are the general criteria for the ratings on the notes in the non-key scenarios 4-22:

» **Aaa (sf) rated notes**: should remain in the Aaa range in all scenarios

» **Aa (sf) rated notes:** should fail by no more than one to two notches in the non-key scenarios

» **A (sf) rated notes:** should fail by no more than two to three notches in the non-key scenarios

» **Baa (sf) rated notes:** should fail by no more than three notches in the non-key scenarios.

However, we analyze every material failed rating in more detail to ensure it is not caused by an unusual structural weakness of the master trust.

Loss Timing

In most scenarios, we assume the timing of losses varies dynamically depending on the size of the loss point being considered in the cash flow model. These scenarios are labeled as "Auto" in the exhibit above. Specifically, for low loss points, we assume the losses are distributed over 10 years with a decreasing rate over time. For higher-loss scenarios, we assume the loss timing is more front-loaded, and the loss allocation is more concentrated. These assumptions ensure that the most stressful loss allocation is applied to the most stressful loss scenario to verify that the ratings of the notes can withstand this combined stress. This is particularly relevant for the senior notes, which usually have shorter average lives and, as a result, are more affected by front-loaded losses. In addition, front-loaded losses generally represent a conservative assumption for all notes because excess spread available in the future is decreased by the losses incurred by the pool. Certain scenarios assume a fixed loss timing in order to test sensitivity.

The loss timings we typically assume are summarized in the exhibit below. Loss timing 1 will generally be used for loss points less than 2%, loss timing 2 for loss points between 2% and 4%, and loss timing 3 for loss points above 4%.

EXHIBIT 13
Loss Timings

Year	Loss Timing 1	Loss Timing 2	Loss Timing 3
0	0.0%	0.0%	0.0%
1	10.0%	19.5%	25.0%
2	12.0%	18.8%	25.0%
3	12.0%	17.3%	25.0%
4	12.0%	15.2%	25.0%
5	12.0%	12.4%	0.0%
6	12.0%	9.2%	0.0%
7	9.0%	5.7%	0.0%
8	8.0%	1.9%	0.0%
9	7.0%	0.0%	0.0%
10	6.0%	0.0%	0.0%
11	0.0%	0.0%	0.0%
Total	100%	100%	100%

Source: Moody's Investors Service

For the various loss timings, we assume the losses are distributed evenly throughout the year.

Loss Time Lag

As can be seen from the exhibit above, we assume that losses start to occur one year after closing. This assumption takes into account the foreclosure period, and so we assume loans that become delinquent generate losses approximately one year after. In addition, we review the scenarios in which losses start in year 2 in order to test the ratings using back-loaded losses. The loss timing starts at year 2 and ends at year 11. While monitoring or for existing master trust structures, we may shorten the loss time lag to reflect the current performance of the pool.

Principal Payment Rate

In most scenarios, we assume the timing of losses varies dynamically depending on the size of the loss point being considered in the cash flow model. These scenarios are labeled as "Auto" in the summary exhibit above.

The PPR rates we typically assume are summarized in the exhibit below. The PPR rates reflect both scheduled and unscheduled amortization of the pool; the scheduled amortization vector is not included separately in the model because we assume that a master trust pool is continuously substituting and that the amortization vector obtained from the closing pool may thus not be reflective of the actual amortization of the pool after substitution.

EXHIBIT 14
Principal Payment Rates

Loss Point	>=0% & <=1%	>1% & <=3%	>3% & <= 6%	>6%
PPR	35%	25%	20%	15%

Source: Moody's Investors Service

We convert the annual PPR rates shown to monthly equivalents and apply them to the performing principal balance at the beginning of each month. If the amortization of the portfolio would result in some losses not being allocated to the pool, the amortization of the portfolio is delayed in order to allow all losses to be allocated to the trust. This may arise if the pool would ordinarily amortize before all losses are incurred, as defined by the loss timing vector.

Substitutions[50]

In the cash flow analysis, we assume each new batch of loans added to the pool would generate its own losses following its own loss pattern from the day these loans are placed into the trust. The same loss pattern is used for the new loans and for the original loans, but the loss pattern for the new loans starts from the date they are added to the trust.

In addition, the cash flow analysis examines scenarios with different levels of substitution, such as:

» **substitution to the initial trust size:** the amount of loans added to the pool is such that the performing balance of the pool stays constant. The total pool balance during the substitution period is decreased only by the losses incurred by the pool and not by the prepayments.

» **substitution to the minimum trust size:** the total trust size would not fall below the minimum trust size, if applicable, and/or the seller share would not fall below the minimum seller share. The minimum trust size and/or minimum seller share are usually defined to be lower than the initial trust size and seller share. Therefore, the scenario would result in a lower amount of substitutions and hence a lower amount of additional losses. These scenarios, in particular, help assess the cash flows whilst avoiding triggers related to breaches in minimum trust size and/or minimum seller.

We also perform scenario analysis in relation to the length of the substitution period as outlined in the summary scenario exhibit above.

Servicer Downgrade and Default

The modeling includes a scenario to simulate a downgrade of the originator/servicer at a certain point in time of the transaction in order to incorporate the breach of any rating-based triggers. A rating trigger breach would typically have various consequences in the cash flows of the transaction, such as trapping of principal receipts to build up a liquidity reserve and stopping substitution. We typically assume the downgrade will occur one year after closing.

We also include servicer default in the scenario analysis. A servicer default is typically one of the 'non-asset trigger' conditions resulting in a change in the cash flow allocations of the transaction. In addition, following a servicer default, we assume the servicing fee will increase to a stressed level. Lastly, following a servicer default, we assume the arrears multiple will increase to a higher level, and the loss timing distribution for the remaining losses will become more front-loaded. This allows us to simulate the disruption, which we expect will be associated with the servicer default and lead to higher delinquencies and possibly higher losses while the servicing transfer is taking place. We assume the default will occur two years after the downgrade.

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[50] Due to ongoing substitution, master trust documentation typically contain criteria to restrict poorer quality assets being added to the pool. We take the criteria into consideration in our portfolio analysis. The criteria may include, loan level eligibility criteria, limits on the portfolio's LTV distribution or the use of Moody's Portfolio Variation (MPV) test. The MPV test compares the pool quality at two points in time through a simplified MILAN model.

Other Cash Flow Assumptions

Evolution of Asset Yield

We use three inputs to define the evolution of the yield on assets over time in the transaction: the initial yield, the minimum yield for the substitution period, and the post-substitution yield. We define the yield as the margin received by the issuer on the assets through the associated swaps over the floating swap base rate. We calculate the initial yield level from the closing pool. While substitution continues, we typically assume the yield will decrease continuously over one year to the minimum margin defined in the documentation for the master trust. It then stays at this level until substitution stops. Once substitution stops, we assume that fixed and discounted mortgages reset over time, which leads to an increase in the asset yield of the pool to an assumed level determined on a case-by-case basis per master trust.

Arrears

In the master trust cash flow model, we back-calculate arrears from losses by applying an arrears multiple to the loss amount a certain period before the loss is modeled to occur. This calculation simulates loans going into arrears prior to generating a loss and accounts for the fact that a certain proportion of loans in arrears will become current instead of defaulting. For example, if the cash flow analysis assumes the arrears multiple of two, this would mean that, for each £1 of loss, £2 of assets go into arrears 12 months before this loss is incurred. The arrears multiple can also vary dynamically in the cash flow analysis to account for sudden spikes in arrears due to, for example, servicer default.

Once a loan goes into arrears, no interest would be collected on this loan. Thus, a high arrears multiple has a negative impact on liquidity and excess spread. If the loan becomes re-performing, we assume the interest accrued on the loan will recover fully; however, the interest on a defaulted loan, which results in a loss, is ignored and is not recovered.

We typically ignore any arrears triggers in our cash flow analysis. Such triggers typically modify the transaction waterfall or cause the reserve fund to build up after a certain arrears level has been breached. They are ignored due to the uncertainties and inconsistencies in arrears reporting by different originators that make it difficult to predict exactly when the arrears trigger would be breached.

Bullet Test

To ensure that the bullet notes[51] can be repaid as scheduled, even under adverse performance scenarios, we use a separate Bullet Test, which assumes a high PPR, typically 30%, up to the beginning of the accumulation period of the note and a low PPR, typically 7%, during the accumulation period. This simulates the lowest possible principal collections received during the accumulation period because the master trust size is decreased by the high PPR prior to accumulation, which is then dramatically lowered for the duration of the accumulation period.

Appendix 3f – Global Approach to Lender's Mortgage Insurance

This appendix describes how we evaluate lender's mortgage insurance (LMI) when rating RMBS.[52] LMI can play a critical role because it provides the first layer of credit protection in RMBS transactions. If a borrower defaults and a loss occurs after the sale of the security property, the lender may file a claim under the LMI policy for the loss amount. The policy typically covers 100% of the principal, accrued interest, and reasonable expenses incurred in the enforcement of the mortgage.

LMI policies do not generally constitute guarantees. They are normally subject to terms and conditions that include, among others, a lender's compliance with agreed underwriting policies and the relevant procedures

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[51] Bullet redemption notes typically have a short maturity and are redeemable on full on a single date. The payment date is typically preceded by an accumulation period with the aim of trapping sufficient cash to pay the note in full when due.

[52] The methodology is only applicable to private mortgage insurers. Our approach to a highly rated government-owned or government-supported mortgage insurance provider would be different, to account for a much lower correlation between the mortgage market and financial strength of a highly rated government.

and loans management process. While mortgage insurers must pay valid claims, they have the right to reduce or deny claims that breach the terms and conditions under the policy.

A summary of our approach follows.

Overview of LMI Benefit

The LMI benefit is the measure by which the presence of LMI results in a transaction needing less credit enhancement from other sources in order to achieve a target rating.

The LMI benefit is primarily a function of (1) the insurer's claim-paying ability, which we express as its IFSR, and (2) a discount to account for loan losses that the insurers will not cover (the discount is the loss adjustment rate (LAR)). To address the risk of loss adjustments, we typically use a LAR in the range of 10%-25%. We determine a LAR on an RMBS program or transaction basis.

LMI Benefit for Senior Aaa (sf) Notes

Exhibit 15 details the LMI benefit for senior notes with Aaa (sf) ratings. We calculate the benefit as a percentage of the MILAN CE. We incorporate the benefit into our cash flow analysis to arrive at a credit enhancement commensurate with the target Aaa (sf) rating on the notes.

EXHIBIT 15
LMI Benefit for Aaa (sf) Senior Notes

Mortgage Insurer IFSR Rating	Claim-Paying Ability Benefit	Overall Benefit after LAR of 10%-25%
Aa1	70%	63%- 53%
Aa2	60%	54%-45%
Aa3	50%	45%-38%
A1	40%	36%-30%
A2	35%	32%-26%
A3	30%	27%-23%
Baa1	20%	18%-15%
Baa2	10%	9%-8%
Baa3	5%	5%-4%

Source: Moody's Investors Service

LMI Benefit for Non-Aaa(sf) Senior Notes

Exhibit 16 details the LMI benefit for senior notes whose rating is below Aaa (sf).

EXHIBIT 16

Claim-Paying Ability Benefit for Non-Aaa (sf) Senior Notes

We may reduce the LMI benefit below to account for LAR. LAR is typically in the range of 10% to 25%.

Mortgage Insurer's IFSR Rating	Note Rating								
	Aa1(sf)	Aa2(sf)	Aa3(sf)	A1(sf)	A2(sf)	A3(sf)	Baa1(sf)	Baa2(sf)	Baa3(sf)
Aa1	100%	100%	100%	100%	100%	100%	100%	100%	100%
Aa2	80%	100%	100%	100%	100%	100%	100%	100%	100%
Aa3	70%	80%	100%	100%	100%	100%	100%	100%	100%
A1	60%	70%	80%	100%	100%	100%	100%	100%	100%
A2	45%	60%	70%	80%	100%	100%	100%	100%	100%
A3	40%	45%	60%	70%	80%	100%	100%	100%	100%
Baa1	30%	35%	40%	55%	65%	75%	100%	100%	100%
Baa2	15%	20%	25%	35%	45%	55%	75%	100%	100%
Baa3	10%	15%	20%	30%	40%	50%	65%	80%	100%
Ba1	5%	10%	15%	25%	40%	45%	60%	70%	75%
Ba2	-	5%	10%	20%	25%	40%	45%	60%	65%
Ba3	-	-	5%	15%	20%	20%	35%	40%	55%
B1	-	-	-	10%	15%	15%	20%	30%	35%
B2	-	-	-	-	10%	10%	15%	15%	25%

Source: Moody's Investors Service

Impact of LMI on Junior Notes

The rating on the junior notes will correspond to the IFSR of the lowest-rated mortgage insurer in the transaction if structural protections, other than non-retainable excess spread, are in place to cover loss adjustments.

Junior notes lacking structural protections are exposed to losses not covered by the LMI. We measure the probability of incurring a loss on these junior notes by taking into account, among other factors, 1) the credit quality and performance to date of the underlying mortgage pool; and 2) the LAR in our cash flow analysis.

Claim-Paying Ability Benefit

The claim-paying ability benefit is based on the mortgage insurer's IFSR. The level of benefit depends on the notes' target rating relative to the mortgage insurer's IFSR. The benefit takes into account:

1. **Correlation:** The high correlation between the performance of the mortgage market, RMBS portfolios, and the financial strength of the LMIs. The correlation between mortgage insurers and RMBS portfolios is usually very high because both are exposed to the local mortgage market. In addition, insuring RMBS portfolios usually constitutes a material proportion of the mortgage insurers' business. The claim-paying resources and financial strength of the mortgage insurers will be challenged in the event of material losses arising in RMBS portfolios and in the non-securitized segment of the mortgage market covered by mortgage insurance.

2. **Timing of loss uncertainty:** A mortgage insurer's claim-paying resources are available to cover losses on its entire portfolio and can be used on a "first-in, first-served" basis. As such, there is uncertainty about the timing of losses on the mortgage insurer's overall portfolio relative to a specific portfolio of mortgages, whether they are securitized or not. This could mean that in a stressed scenario, a mortgage insurer's claim-paying resources could be substantially depleted prior to losses materializing in a specific securitized pool.

Loss Adjustment Rates

We may reduce the LMI benefit to account for LAR if we believe that there is a risk of the mortgage insurer rescinding claims. Our LAR assumption is typically in the range of 10% to 25%. We determine a LAR on an RMBS program or transaction basis.

We incorporate loss adjustments into our analysis because the benefit of LMI in RMBS can be substantially diluted if there is a material level of loss adjustments.

Loss adjustments encompass any LMI claim adjustments, such as claim reductions or denials or rescissions of non-claimable amounts.

Loss adjustments also cover any loss amounts that are not submitted to a mortgage insurer. In some cases, lenders voluntarily do not submit loss amounts, partial or full, if they know that the amounts would not constitute a valid claim. However, it is still important to consider such a loss amount as it represents an economic loss to the RMBS.

Historical LAR Range for RMBS Can Vary

For each RMBS program, we calculate the observed LAR as the amount of all claim adjustments, plus loss amounts not submitted as claims, divided by the total loss amount after the sale of security property (i.e., losses incurred prior to submitting LMI claims).

Increases in claims lead to higher claim scrutiny and adjustments. Increases in the frequency and magnitude of LMI claims will lead to greater scrutiny by mortgage insurers of the claim process, leading to a higher risk of claim adjustment.

Reasons for loss adjustments vary. Loss adjustments generally occur when the lender fails to comply with the terms and conditions of the LMI policy or the type of loss incurred is not covered by the policy.

Determining LAR

In determining the LAR for each lender/servicer, we take into account, among other factors, the following:

Contractual arrangement for the Insurance Agreement

We consider the contractual arrangements and whether the insurance agreement allows for rescission and under what criteria. In some markets, the determination of compliance is made ex ante, and as such, limits the ability of the insurer to rescind a claim made against it. Furthermore, the specific contractual arrangement may not insure all losses incurred.

Originator's Underwriting Arrangements with Mortgage Insurers

Underwriting arrangements generally fall into three categories:

Category 1: Full underwriting by mortgage insurers. This type of underwriting substantially reduces the risk of claim adjustment caused by irregularities in loan underwriting or misrepresentations. Mortgage insurers typically review all information necessary to underwrite the loan, including income verifications, valuations, evidence of serviceability calculations, and credit bureau checks. In some jurisdictions, the insurer may only review a sample of the loans in the pool; however, the subsequent contractual arrangements exclude rescission for non-compliance for all loans in the insured pool. We will typically assign a lower LAR under this category, provided other criteria are satisfactory.

Category 2: Delegated underwriting authority (DUA). Lenders themselves underwrite mortgage loan insurance policies under DUAs issued by the mortgage insurers. The mortgage loans must be underwritten in line with the criteria agreed with the mortgage insurers. The risk of claim adjustments under such an arrangement is typically higher than in Category 1 because it leaves the mortgage insurers with grounds to adjust the claims on the basis of deficiencies in underwriting practices.

Category 3: Pool insurance. Pool insurance is normally taken out at the time of securitization. The risk of claim adjustment under such arrangements is higher than in the case of the other two types because the mortgage insurers rely heavily on lenders' underwriting processes and because any deficiency may lead to claim denials.

Under Categories 2 and 3, the mortgage insurers typically audit a sample of loans to ensure that they have been underwritten in line with agreed criteria. While the audits help the mortgage insurers to mitigate the risk of deficiency in the underwriting processes of lenders, the risk remains because the mortgage insurers carry out the audits themselves and are not independent parties. The timing and scope of the audits are also set by the mortgage insurers at their own discretion.

Lenders' Underwriting Controls

Tight underwriting standards are crucial to minimizing the risk of loss adjustments. We will assign a higher LAR if a lender falls short of the underwriting criteria, which include:

» A clear separation between loan origination/sales and loan approvals

» Verification of critical information, such as employment and income, is not delegated to brokers or staff involved in the loan origination/sales process

» Settlement review process is in place to ensure all relevant loan assessment information is obtained

» Lenders perform comprehensive hindsight reviews to ensure loans are underwritten in line with their underwriting policies.

Historical LAR Experience

LARs vary by lender and provide an important insight into an individual lender's underwriting controls and its ability to efficiently manage the foreclosure process.

We will generally consider historical loss rates as a floor for our assumptions on stressed loss adjustment rates for each lender/servicer.

If a lender's historical claim adjustments are mainly caused by foreclosure expenses above the limits specified in the LMI policy, we will consider a LAR of 10% or 15% as appropriate, assuming other criteria are satisfactory.

Historical LARs due to excessive foreclosure expenses are typically below 5% when calculated as total loss adjustments divided by the total amount of loss experienced after the sale of the security property (i.e., amount of loss prior to submitting any claim to mortgage insurers).

If historical experience shows loss adjustments because of misrepresentation by a lender or deficiencies in the underwriting process, we will apply a LAR of at least 20%.

We assume a higher claim adjustment rate if a lender fails to provide us with reliable historical data on LARs, but there are historical losses on its RMBS portfolio, or if it is a new issuer.

Scale of Servicing Operations and Servicer's Financial Strength

We apply a higher LAR if a lender's servicing capacity is limited by its scale and/or financial strength. Efficient servicing of mortgages through the foreclosure process is critical to minimizing claim adjustments, particularly in times of economic stress.

Alignment of Interest

We apply a higher LAR if the lender's interest is inadequately positioned to mitigate risks during the origination and servicing process.

Most bank lenders originate loans on their balance sheets and only securitize a small proportion of the loans. Since the majority of the risk remains on their balance sheets, the incentives of these lenders are generally well aligned with the need to maintain robust origination and servicing practices.

In cases where the origination model is predominantly for the purposes of securitization, we may apply higher LARs. However, we will consider low historical LARs as a positive factor.

Based on the factors outlined, LARs are typically 15% or 20% for most lenders. Refer to Exhibit 17 below for a summary of the above factors.

Representations and Warranties

Additionally, we may reduce assumed LARs for some programs in the context of junior notes, depending on the representation and warranties provided by the lender regarding the compliance of the mortgages with the terms and conditions of the LMI policies. We will consider giving any benefit to such representations and warranties if:

» they are tightly construed

» adequate and timely indemnities are in place in case of any loss to the transaction caused by a breach of representation and warranties

» the lender is rated investment grade.

EXHIBIT 17

Loss Adjustment Rate Guidance

LAR	Guidance
10%	» Loans are underwritten by mortgage insurers themselves.
	» In the case of pool insurance, the lender obtains an external audit covering whether underwriting is in line with underwriters' policies and procedures.
	» Negligible historical loss adjustment rates are mainly caused by foreclosure expenses exceeding a mortgage insurer's allowable limit.
	» Lender has strong internal and external underwriting controls.
	» Servicer has adequate operational capacity.
15%	» Lender has DUA subject to regular audits (in the context of rewriting loans) by mortgage insurers.
	» Median historical loss adjustment rates are below 5% and are mainly caused by foreclosure expenses exceeding a mortgage insurer's allowable limit.
	» Lender has adequate internal and external underwriting controls.
	» Servicer has adequate operational capacity.
20%	» Lender has DUA, which is subject to regular audits (in the context of rewriting loans) by mortgage insurers.
	» Median historical loss adjustment rates are 5%-10%, and some are caused by deficiencies in the underwriting process or misrepresentations.
	» Lender has strong internal and external underwriting controls.
	» Servicer has adequate operational capacity.
25%	» Lender has DUA, which is subject to regular audits (in the context of rewriting a loan) by mortgage insurers.
	» Median historical loss adjustment rates are above 10% or are mainly caused by deficiencies in the underwriting process or misrepresentations.
	» Verification of critical information, such as employment and income, is delegated to brokers/staff involved in the loan origination/sales process.
	» Financially weak servicer.
	» Lender's interest is inadequately positioned to mitigate risk during the origination and servicing process, and this is reflected in high claim adjustment rates.
> 25%	» There are systematic issues with the underwriting/high level of claim reductions emerging.

Source: Moody's Investors Service

Appendix 3g – Tail Risk in Australian RMBS that Pay Principal Pro-rata

This appendix describes our monitoring approach to 1) evaluating tail risk in Australian RMBS that pay principal to the securities on a pro-rata basis, and 2) assessing the sufficiency of the credit enhancement and liquidity available to the rated securities. Tail risk is the risk of a disproportionately large loss on the underlying pool at the end of a transaction's term when few loans remain in the pool and credit enhancement, though high in percentage terms, is low in dollar terms.

We will use this approach to monitor senior and mezzanine securities with Aaa (sf)–A (sf) ratings from pro-rata pay transactions that do not have compensating mechanisms of support, such as credit enhancement and liquidity floors. Pools of mortgages with LMI back these senior and mezzanine securities.

In general, so long as the senior and mezzanine securities do not incur losses under the stress scenario, we will cap their ratings at 1) the relevant mortgage insurer's rating[53] if the transaction has sufficient liquidity to cover the collection shortfall during the insurance claim period; or 2) one notch below the relevant mortgage insurer's rating if the transaction has insufficient liquidity to cover the shortfall during that period. If the securities do incur losses, their ratings will be commensurate with the losses under that scenario.

Approach to Assessing Tail Risks

To assess the vulnerability of senior and mezzanine securities to tail risk, we run an additional stress test, whereby we increase our projection of losses and slow the timing of future defaults:

» **Step 1 Stress Factor:** We first compute a stress factor by analyzing the securitized pool's LTV distribution and the percentage of low documentation loans. The stress factor ranges between 1.5, for pools with low LTVs and low percentages of low documentation loans, to 2.0 for pools with high LTVs and large percentages of low documentation loans.

» **Step 2 Stressed Expected Loss:** We apply the stress factor to our projection of expected loss on the pool. We subject this stressed loss to a floor equal to the aggregate loss from the default of the five largest loans.

» **Step 3 Default Timing:** Using the stressed loss, we perform a cash flow analysis that employs a stress back-ended loss curve. We distribute the timing of defaults over the next three to 10 years depending on the pool's LTV and the percentage of loans with long interest-only periods. The higher the LTV or, the greater the percentage of loans with long interest-only periods, the further into the future we will push the timing of the majority of defaults.

In addition, we assess the sufficiency of the liquidity facility to cover any collection shortfalls at the end of a transaction. To determine sufficiency, we assume that the largest loans with the longest interest-only periods will remain outstanding. We then determine the collection shortfall from the high delinquency of these loans for a prolonged period and compare it with the available liquidity in the transaction.

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[53] The relationship between the rating of the relevant mortgage insurer and the security rating is not one to one. We will analyze the rating impact on the security arising from the rating migration of the mortgage insurer on a case-by-case basis.

Appendix 3h - Revising Assumptions Over the Life of an EMEA RMBS Transaction

As part of our ongoing surveillance of EMEA RMBS transactions, we use transaction-specific performance data to help revise our expected default or loss assumptions during the life of the transaction. The transaction-specific data we consider generally includes:

» delinquency rates and trends

» observed periodic and cumulative default or loss[54] rates

» historical portfolio redemption rates, which can often be separated into scheduled redemption and prepayments.

We have two broad approaches to help revise expected default assumptions: a trend analysis and a roll rate analysis. We consider the results of both approaches when revising our assumptions.[55] The roll-rate analysis, which uses a more static approach, provides a simpler assessment compared to the trend analysis. The trend analysis becomes more relevant for seasoned portfolios as it leverages transaction performance data to project future defaults. However, the trend analysis could also produce more volatile results as it is more reactive to temporary changes in performance trends.

In the early months of a transaction's life, we typically maintain our initial expected default or loss assumption unless we observe signs of material deviation in performance. More weight may be given to the results of these approaches the more the transaction is seasoned. When significant transaction-specific performance information is available, the payment patterns exhibited by the portfolio can be better performance predictors than loan-level or portfolio characteristics, in particular when forecasting future defaults considering our baseline projected economic outlook.

We also incorporate benchmarking analysis and other qualitative considerations when reassessing our expected default or loss estimates. For example, we may complement our analysis by reviewing performance indicators such as the evolution of the securitized portfolio delinquency trend or the distance between the observed defaults or losses and our expected default or loss assumption for the life of the transaction. In case of significant deviation of observed defaults or losses to our assumed level, we would adjust our expected loss or default assumption considering the two broad approaches described below and may adjust further to acknowledge the observed deviation.

Trend Analysis

Our trend analysis considers two elements: a short-term projection and a long-term projection. The two elements are then added together. We may then convert the projected default rate to a projected loss using a transaction and/or country-specific severity assumption.

Short-term Projection

We apply roll rates (probability of default) to the non-performing parts of the portfolio, with higher rates applied to loans in later stages of delinquency. Unlike the roll rate analysis below, the short-term projection for the trend analysis considers only the non-performing part of the portfolio to which it may apply more refined roll-rates.

Long-term Projection

We forecast future default frequency rates from recent default trends and extrapolate the future amortization of the portfolio from recent redemption data. We consider in particular the following:

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54 Sometimes loss rates are reported instead of default rates. The entire approach to revise the expected default assumption that is described in this report also applies to revise the expected loss assumption, although the exact modelling approach is not identical.

55 For example, we may consider a simple average of the two results or only the roll rate analysis if the trend analysis is resulting in very low projected default rate.

Default Frequency Rate (DFR) of reporting period *t* is defined as the balance of the loans that have defaulted[56] from reporting date *(t-1)* to reporting date *t*, divided by the portfolio balance at the beginning of the period (this is, therefore, a dynamic measure).

Total Redemption Rate (TRR) of reporting period *t* is defined as the portfolio redemption from reporting date *(t-1)* to reporting date *t*, divided by the portfolio balance at the beginning of the period.

Growth Rates (GR_{DFR} and GR_{TRR}). DFRs and TRRs typically slowly increase through at least part of the transaction's life. Therefore, we apply growth rates to the 12-month average DFR and the 12-month average TRR to project the future expected default frequency rates and the future expected amortization of the portfolio. Specifically, we will apply different growth rates at different stages of the transaction's life, separately for DFRs and TRRs.

Delinquency Trend Coefficient (DT_{DFR}). Additionally, as increasing delinquencies often translate (with some lag) into increasing default frequency rates, the 12-month average DFR is also stressed by a delinquency trend coefficient to reflect any possible predictive trend in delinquencies. We compute this coefficient as the average of smoothed ratios calculated separately for each delinquency bucket and reflecting recent trends.

The formulas to determine future DFRs and TRRs are the following:

FORMULA 1

$$DFR_\tau = (12MonthAverageDFR) * DT_{DFR} * \prod_{t=2}^{\tau} \left(1 + GR_{DFR}\right)_t$$

Note that for the first period in the future, the DFR would simply be:

$$DFR_1 = (12MonthAverageDFR) * DT_{DFR}$$

FORMULA 2

$$TRR_\tau = (12MonthAverageTRR) * \prod_{t=1}^{\tau} \left(1 + GR_{TRR}\right)_t$$

Total projected long-term defaults are then computed as the sum for all future periods of the product between the default frequency rate and the current portfolio balance.

Outlook Adjustment

To account for our market-specific RMBS outlooks, we make adjustments to our roll rate analysis and trend analysis. Adjustments may be applied to roll rates, severity assumption, as well as to the growth rates applied to future DFRs or TRRs.

For instance, in a negative outlook scenario, the assumptions for the roll rates and the severity could be increased compared with the assumptions corresponding to a stable outlook scenario. The growth rates applied to future DFRs could be increased too, whereas the growth rates applied to future TRRs could be decreased so that the amortization of the portfolio would be slower, and the DFRs would be applied for a longer time, resulting in a higher long-term defaults projection.

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[56] Similarly, if loss rates were reported, Loss Frequency Rate (LFR) would be defined as the losses that have occurred from reporting date (t-1) to reporting date t, divided by the portfolio balance at the beginning of the period.

Hypothetical Example

This example considers a theoretical seasoned transaction.

For the short-term projection, we apply asset class and country-specific roll-rates to the current delinquency rates to project the short-term defaults. Over the short-term, the defaulting loans will typically emerge from the loans which are already delinquent.

EXHIBIT 18
Short-term projection

Delinquency bucket	Proportion of the portfolio	Example roll rates	Projected defaults
31-60 days	3%	25%	0.8%
61-90 days	2%	50%	1.0%
90+ days	1%	100%	1.0%
Total short-term projection			**2.8%**

Source: Moody's Investors Service

For the long-term projection, we start with the transaction's last 12-month average DFR and the last 12-month average TRR. We also apply asset class and country-specific growth rates and delinquency trend coefficients.

EXHIBIT 19
Long-term projection

Future Period (t)	Pool Factor PF(t)	TRR(t)	DFR(t)	Projected Defaults
0	100%[57]	14.3% _12Mth average TRR_	0.8% _12Mth average DFR_	derived in the short-term projection[58]
1	85.5% $PF_0 \, x \, (1-TRR_1)$	14.5% $TRR_0 \, x \, (1+GR_{TRR})$	0.9% $DFR_0 \, x \, DT_{DFR} \, x \, (1+GR_{DFR})$	
2	72.8% $PF_1 \, x \, (1-TRR_2)$	14.8% $TRR_1 \, x \, (1+GR_{TRR})$	0.9% $DFR_1 \, x \, (1+GR_{DFR})$	0.8% $DFR_2 \, x \, PF_1$
3	61.8%	15.1%	0.9%	0.7%
4	52.3%	15.4%	0.9%	0.6%
5	44.0%	15.7%	1.0%	0.5%
6	37.0%	16.0%	1.0%	0.4%
7	30.9%	16.4%	1.0%	0.4%
8	25.8%	16.7%	1.0%	0.3%
...	...	...	...	...
Total long-term projection				**5.2%**

Source: Moody's Investors Service

Finally, the short-term and the long-term projections are added together to derive the total expected defaults for the remaining life of the transaction.

EXHIBIT 20
Combined projection

Projection	Projected Defaults
Short-term projections	2.8%
Long-term projection	5.2%
Total future defaults	**8.0%**

Source: Moody's Investors Service

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[57] Pool factor relative to the outstanding balance of the portfolio at the date of assessment.

[58] The number of periods included in the short-term projection will vary depending on the transaction's frequency of reporting and default definition. In certain cases we may use the long-term projection approach in the first periods if the results of this approach are more conservative than the results of the short-term roll rate analysis projection.

Roll Rate Analysis

The roll rate analysis is a simpler static approach which applies probabilities of default for the life of the transaction to the performing pool, early, mid, and late-stage delinquencies.

We calculate the probability of default on the delinquent loans by applying roll rates to the loans based on their delinquency status: the more severe the loan's delinquency status, the higher the probability of default.

We also apply a lifetime default rate to the performing part of the portfolio based upon the quality of the pool. A pool of lower credit quality loans will have a higher lifetime default rate applied to the performing loans.

We estimate our standard asset class and country-specific roll-rates and default rates based upon observed historical data for the sectors. If a transaction is sufficiently seasoned, we may estimate transaction-specific roll rates from the past default and delinquency performance of the transaction, replacing our standard estimates.

As described above under the trend analysis, we may also make adjustments to the roll rate and severity assumptions to account for our market-specific RMBS outlooks.

EXHIBIT 21
Roll Rate Analysis Hypothetical Example

Portfolio Buckets	Proportion of the portfolio	Example roll rates	Projected defaults
31-90 days	5%	50%	2.5%
90+ days	1%	100%	1.0%
Performing pool	94%	3.5%	3.3%
Total future defaults			**6.8%**

Source: Moody's Investors Service

When converting our expected default assumption to an expected loss, we also apply a severity assumption derived from transaction- and country-specific data.

Appendix 4 – Settings for Countries Using the MILAN Framework

Please click here to access a list of countries using the MILAN framework and the related settings.

Appendix 5: Originator Assessments in EMEA and Asia-Pacific RMBS Transactions

As part of the residential mortgage-backed securities (RMBS) transactions' credit analysis, we undertake originator assessments (OAs). These assessments are a qualitative analyses of the originator's origination, underwriting, and closing practices. The results of this analysis lead to an originator adjustment, which is incorporated into the MILAN model. The originator adjustment may have a positive, neutral or negative effect on the MILAN CE.

We use the OA approach to determine an OA level, along with the main strengths and challenges regarding loan performance, originator ability, and originator stability.

1. Overview

Assessment Levels

OA level translates our view of the originator's loan quality

The OA analysis primarily determines if 1) the origination, underwriting, and closing practices applied by the originator are in line with our expectations for good loan quality; and 2) the originator is acting as a prudent mortgage lender within its stated risk/reward strategy. The OA assessment focuses solely on the effect of the originator's policies and practices on the loan performance distinct from other factors such as the macroeconomic environment and servicer performance. OA analysis also takes into account the type of mortgage loans that are originated. This means we may assign more than one OA level if the lender originates mortgage loans across different main product types (e.g., prime, buy-to-let, and sub-prime). The outcome of the analysis is a score that we then map to a level, as shown in Exhibit 22.

EXHIBIT 22

Mapping Score to Assessment Level

Originator Assessment Score	Originator Assessment Level
<=1.5	Strong
>1.5 and <=2.5	Above Average
>2.5 and <3.5	Average
=>3.5 and <4.5	Below Average
=>4.5 and <=5.0	Weak

Source: Moody's Investors Service

In certain markets where origination procedures are relatively robust and standardized due, for example, to regulation, we have established typical OA levels for certain types of originators. Section 5 below contains the typical OA levels for the relevant markets.

Areas of Review

Our OA analysis encompasses a review of the historical portfolio performance and the origination, underwriting, and closing infrastructures, as well as an analysis of these departments' support functions. We divide the analysis into three broad categories: 1) loan performance, 2) originator ability, and 3) originator stability. The exhibits in each of the categories below contain selected criteria which act as a guide in determining an OA score for each category. The criteria listed are not exhaustive and may not be relevant in all markets.

Each of the three broad categories receives a weighting (as outlined in Exhibit 23), generally reflecting the degree to which we believe that that component provides insight regarding an originator's loan credit quality.

The weights below act as a typical guide. However, we may, on a case-by-case basis, amend the weighting to reflect particular areas of strength or concern. For example, in the case of new originators with limited

performance history, the weights assigned will be adjusted to reflect this fact. We will disclose any amendments in the associated new issuer report.

EXHIBIT 23
Originator Assessment Components
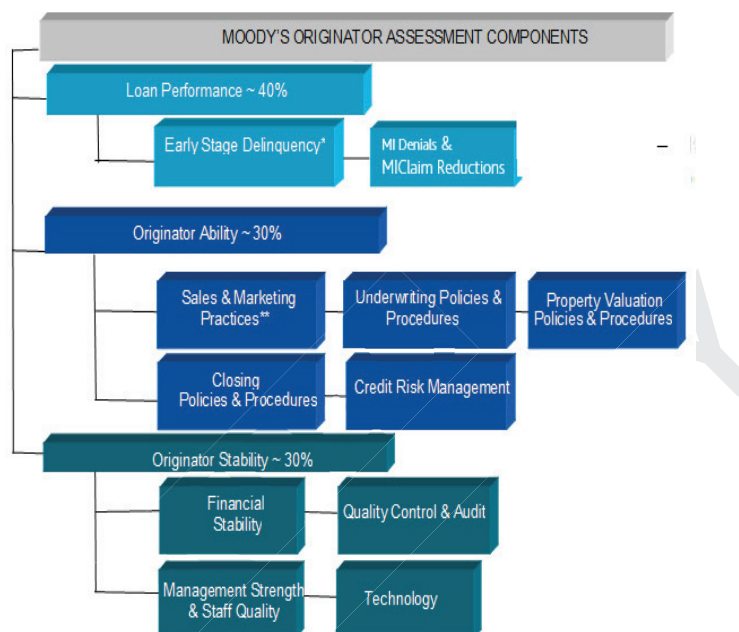
*In case of teaser rate, we will analyze delinquency rates after the reset date
** It also includes third-party origination
Source: Moody's Investors Service

We first analyze the originator's historical loan performance focusing on delinquencies, defaults, and losses. In addition, we look at different milestones during the life of the mortgage loans depending mainly on product characteristics (e.g., end of the grace period or the teaser rate period, interest-only loans).

The second part of the analysis (originator ability) focuses on the originator's standards with regard to loan origination, underwriting, and closing functions. Therefore, we review the following sub-components:

» **Sales and marketing practices**: How an originator sets its loan production strategy and associated underwriting and sales approach to originate loans of a targeted quality. We also assess the Third Party Originator, e.g., broker (TPO) processes such as their approval and monitoring.

» **Underwriting policies and procedures**: The robustness of the originator's underwriting and loan approval processes – in particular, the quality of the affordability assessment and stress-testing depending on the characteristics of the product offered – and adherence to them.

» **Property valuation policies and procedures:** How an originator establishes an accurate property valuation for the purpose of determining loan-to-value (LTV) ratios.

» **Closing policies and procedures:** How an originator ensures that all loan conditions are met before closing and that the liens are perfected and assigned to the originator and/or trust as appropriate. How thorough the originator is in checking that all the data gathered in the underwriting process is recorded on the system

» **Credit risk management:** How an originator continuously assesses actual loan performance against expected loan performance and adjusts loan production strategies accordingly. In addition, how conservative their product mix is with regards to LTV, other key variables, and niche markets (e.g., self-certified borrowers).

The third part of the analysis (originator stability) focuses on the factors that shape an originator's operational and financial stability. We review the following sub-components:

» **Financial strength:** An originator that has a strong financial foundation is better able to compete for quality market share and adapt to changing conditions.

» **Quality control and audit functions:** The originator's ability to control loan origination quality through adherence to established operational checks and balances.

» **Management strength and staff quality:** Evaluation of the adequacy of personnel at all levels of an originator's operations, including the training program in place.

» **Technology:** An assessment of the originator's technology to efficiently operate and control loan production.

We would typically expect some minimum operational history and performance information (two years) to make an assessment of any of the categories in order to assign our highest ratings. We conduct the assessment through both an onsite visit to the originators and servicers and an analysis of an origination and servicing questionnaire, which allows us to obtain more granular details regarding processes and performance.

Exhibit 23 summarizes the sub-components for the three broad categories (loan performance, originator ability, and originator stability). In order to determine the OA level, we first assign a score to each sub-component (from 1 to 5 with 1 equivalent to strong originator's practices while 5 means weak originator's practices). Once a score has been assigned to all the sub-components, we determine the originator assessment score by multiplying the individual score with the relevant weights. In some markets, certain sub-components may not be relevant, and hence weights are adjusted accordingly to reflect this.

EXHIBIT 24

$$OA\ score = \sum_{i=1}^{n} score\ (i) \times weight(i)$$

Where (i) is the OA sub-component.

Source: Moody's Investors Service

The outcome of the formula is then mapped as per Exhibit 22 to determine the OA level. The committee may amend either the weighting of the individual component or may overrule the score provided by the framework as a result of significant concerns or other circumstances. As the MILAN framework takes into account country-specific features when calculating the benchmark loan, each country will have its own calibration when mapping the originator score to a MILAN adjustment.

If the analysis results in our viewing the originator as weak in terms of 1) corporate governance; 2) the control framework across the origination and underwriting/valuation processes; 3) anyone sub-component, or 4) multiple sub-components, it may not be possible for us to assign our highest ratings unless the originator provides additional supporting information to allay our concerns. Exhibit 25 provides some examples of cases where we may not be able to assign our highest ratings. In an extreme case, such as where the lender is not compliant with local legislation and regulation and/or there are numerous looming litigations and/or regulatory action(s) that will result in insolvency, we may not be able to rate the transaction.

EXHIBIT 25

Examples Where We May Not Be Able to Assign Our Highest Ratings per OA Sub-Components

Sub-component	Example
Sales and Marketing	» There is no separation between sales activity (including TPO) and loan approval.
	» Sales staff compensation is tied to loan production only.
Underwriting Policies and Procedures	» There are no written underwriting guidelines (including approval authority policy), or the guidelines are routinely ignored or overruled by the underwriters.
	» There are no reasonableness checks for key factors such as income.
Valuation Policies and Procedures	» When there is no valuation performed by a competent appraisal method, or the appraisals are not independently conducted by the production team.
	» There is no confirmation of the purchase price.
Credit Risk Management	» If there is no performance monitoring process in place.
QC and Audit Review	» If there is no periodic (typically annual) audit of the underwriting processes unless there are strong quality controls in place.
Management Strength and Staff Quality	» If there are relevant past or pending fraud investigations.
	» We deem corporate governance to be weak.
Technology	» Where the originator cannot deliver the most important data required by us for rating analysis.
	» No disaster recovery plan in place in case the originator is also involved in the servicing activities.

Source: Moody's Investors Service

Use of OA in our RMBS Analysis

Once we have determined the OA level, we translate this into an originator's adjustment, which we use within the MILAN model. The table mapping the OA level to the MILAN adjustment is country-specific as it takes into account country characteristics identified within the benchmark credit enhancement. Overall, the originator's adjustment generally ranges from -10% to 50%; however, the actual range used in any market will vary depending on the divergence of originator standards. A negative adjustment reduces the MILAN CE, while a positive adjustment increases the MILAN CE. We may further adjust the originator's adjustment if there is adverse selection within the portfolio.

As the MILAN loan-level input data file includes an originator field, the MILAN model can deal with pools from multiple originators. The originator adjustment can be individualized by originator, thereby allowing an originator adjustment which reflects, on a loan-level basis, the entity which originated the loan. We will use this approach (of multiple originator scores) where the pool comprises more than one originator, based on our review of the underlying processes in place with each individual originating entity.

Where the seller purchases a portfolio of mortgage loans or delegates its underwriting function to a TPO, we may add an additional adjustment to reflect our view of the seller's due diligence process and/or controls in place to monitor the quality of the third party. If there are material omissions in the representations and warranties relating to these TPO portfolios, we may need to receive additional due diligence and checks prior to assigning an investment-grade rating.

Originator Participation and Process

Our reviews require regular and active originator participation. An OA is a prerequisite for us to assign a rating. Incomplete or missing information may result in a weaker OA level, higher credit enhancement to reach the same rating levels or lower RMBS ratings.

We will typically benchmark an originator against its peers within that country.

2. Loan Performance

We believe that the relative weakness of an originator's practices, policies, and procedures primarily manifests itself in early loan performance, generally during the first year after origination and at reset date and/or at the end of the grace period when applicable. We consider arrears within this timeframe to be largely a function of loan origination quality, and that longer-term loan performance is also affected by servicing quality, as well as borrower life events (which cannot always be controlled by the originator).

When assigning the loan performance score, we review the percentage of loans that are 30+ days in arrears within the first two years of origination (and at the end of the grace periods and/or reset dates when applicable) on a vintage level basis. Where this data is not available, we use as a proxy other performance data (e.g., defaults or losses on a vintage level basis).

If applicable, the volume of repurchase demands, Mortgage Insurance (MI) denials, and MI claim reductions are additional metrics that we will utilize to further support our assessment of performance.

3. Originator Ability

Sales and Marketing Practices

Our assessment of an originator's sales and marketing practices is a qualitative review. In the aftermath of the global financial crisis, there has been a growing trend for reinforcing the existing regulatory supervision of the mortgage market with a specific focus on responsible lending. Where originators are unregulated, we may need additional representations and warranties and/or possibly additional due diligence information.

Intermediary and third-party origination may dilute the quality of loans

Mortgage lenders have been maintaining diversified origination channels, including online and TPO origination. We believe that using intermediaries can potentially weaken the quality of the loans if there are not adequate controls and processes in place. Therefore, we also consider the channels of distribution as part of our assessment and place greater weight on originations sourced through channels with a strong infrastructure and controls in place.

Strong controls and processes can mitigate the lower quality of mortgage loans originated using intermediaries

In some RMBS transactions, the seller purchases mortgage loan portfolios or delegates the underwriting process to TPOs. For the former, our assessment focuses on the due diligence process, while for the latter, we assess the controls and processes in place to ensure that TPOs underwrite within the seller's underwriting and valuation policy.

We may view aggregators positively who have thorough due diligence processes in place or where there is a bias towards selecting better quality loans.

Exhibit 26 below maps selected criteria into originator's assessment levels for sales and marketing.

EXHIBIT 26
Sales & Marketing Practices Selected Criteria

Criteria	Strong	Average	Weak
Independent Sales Function	» Clear separation and independence of sales and loan approval functions. » Sales staff have minimal or no influence on the development of the underwriting policy, particularly exceptions for larger intermediaries. » Sales team's compensation is significantly tied to loan quality and loan performance. » Little or no change in underwriting guidelines or exception rates through demand cycles.	» Little or no separation and independence of sales and loan approval functions » Sales staff have some influence on changes in underwriting guidelines and exceptions policy. » Sales team's compensation has some components related to loan performance. » Moderate changes in underwriting guidelines and/or exception rates through reduced demand cycles	» Sales activity and loan approval are handled by the same group. » Sales staff can change underwriting guidelines without management approval/oversight. » Sales team's compensation is only tied to loan production. » Underwriting guidelines do not exist in a format that enables the assessor to determine if guidelines have been relaxed through reduced demand cycles or if exception loans are being made.
Sales Channels and TPO Management	» Frequent review of intermediaries related to loan performance. » Evidence of routine, proactive management of underperforming counterparties. » Transparent methodology behind commissions linked to loan performance. » All loans underwritten/re-underwritten in house, not by intermediaries. » Sales channels unable to adapt underwriting policy. » Rigorous process with high standards for TPO approval. » Robust loan performance monitoring and reporting as well as evidence of routine, proactive management of underperforming TPOs. » Correspondent business is on a flow or non-delegated underwriting basis. » Proactive use and reaction to anti-fraud software tools.	» Random sample of intermediaries reviewed for their associated loan performance. » Loan performance inconsistencies are escalated when found. » Intermediary compensation has some components tied to loan performance. » Intermediaries can underwrite some loans within agreed parameters. » Sales channel has some flexibility, within agreed limits, to adapt underwriting policy. » Standard approval process for TPOs. » Less than 50% correspondent business is on a flow or non-delegated underwriting basis. » Use and reaction to anti-fraud software tools. » Pre-closing borrower verification call for some TPO loans.	» No analysis of loan performance by source of origination. » No clear infrastructure for escalating issues concerning loan quality or for dealing with underperforming counterparties. » Commissions driven by volume. » Intermediaries have ability to underwrite mortgages in-house without supervision/checks. » Originator has limited ability to track product performance by intermediary. » Lax process for TPO approval. » Correspondent business is 100% based on a delegated and/or bulk basis. » Limited or no use of anti-fraud software tools. » No pre-closing borrower verification call for TPO loans.
Marketing Campaigns	» Customer solicitation/advertising is produced, monitored, and approved by management. » Clear and consistent business strategy that is communicated to all departments. » All documentation (including marketing materials) is compliant with local legislation and regulation.	» Customer solicitation/advertising is approved by management. » Consistent business strategy is communicated to all departments. » All documentation (including marketing materials) is compliant with local legislation and regulation (e.g., FSA/MCOB for the UK).	» Customer solicitation/advertising is unrestrained and unmonitored by management. » Inconsistent business strategy with little communication across the firm. » Documentation (including marketing materials) is not compliant with local legislation and regulation.
Origination Channels	» Strong infrastructure and policies in place to monitor origination practices for all channels.	» Good infrastructure and policies in place to monitor origination practices for all channels.	» Poor infrastructure in place to monitor origination practices for all channels.

Source: Moody's Investors Service

Separation and Independence of Sales Function Critical for High Quality Loans

An originator's business strategy and solicitation practices have a material effect on the quality of originated loans. We assess the marketing methods and targeted markets for each originator in order to understand the originator's customer acquisition model and the associated risks and rewards. In particular, we analyze the controls that an originator uses to manage TPO loans. We expect that regular quality control reviews will establish that the counterparties' underwriting and appraising guidelines are in accordance with the originator's guidelines and policies for third-party origination. We view positively the proactive suspension of TPOs that consistently violate an originator's guidelines or requirements.

For portfolio purchases, where possible, we review a sample of some of the whole loan purchase agreements, with a particular focus on the representation and warranties.

Underwriting Policies and Procedures

We look at the underwriting infrastructure' robustness as well as the underwriting analysis's quality

Our qualitative assessment of an originator's underwriting policies and procedures has two parts: 1) an analysis of the infrastructure for developing, maintaining, and communicating the underwriting policy as well an assessment of underwriters' workload and experience; and 2) a review of the originators' underwriting criteria for different borrower products types, together with an assessment of the borrower's willingness and ability to repay debt, as well as the processes in place to validate information and prevent fraud.

A thorough, unambiguous, up-to-date underwriting document is one of the main elements of a robust underwriting process

The first part of the analysis focuses on the infrastructure for developing and maintaining a thorough and unambiguous underwriting document. The document should provide specific rules for each criterion that is assessed by underwriters, as well as an overall framework to ensure consistent lending decisions across underwriters. In addition, the originator should have developed a robust process for keeping the underwriting document up to date and in line with the regulatory framework and the firm's stated risk appetite, including a clear delegation of authority for approving changes to the document. We also assess the experience of the underwriting team and the underwriter's workload to ensure that the team has the necessary knowledge and time to adequately assess borrower willingness and ability to repay debt.

Exhibit 27 below maps selected criteria characteristics into originator's assessment levels for underwriting processes and procedures.

EXHIBIT 27

Selected Criteria for Assessing Originators' Underwriting Infrastructure

Criteria	Strong	Average	Weak
Underwriting Policy (document) and Infrastructure	» Thorough and unambiguous document. » Best-in-class infrastructure to drive changes to underwriting policy (up to board level as needed), keep document up to date, and communicate amendments to underwriters.	» Thorough document, limited room for underwriter interpretation. » Infrastructure to drive change to underwriting policy (up to board level as needed), keep document up to date, and communicate amendments to underwriters.	» Ambiguous document leaving room for interpretation (or no document). » Lack of infrastructure to drive change to underwriting policy, keep document up to date, and communicate amendments to underwriters.
Underwriter Workload and Experience	» Underwriters have adequate time to review files and some excess capacity (to manage peak time). » Underwriters have significant experience in the type of mortgage they underwrite (e.g., the average experience of the team is higher than the industry benchmark).	» Underwriters have adequate time to review files but do not have excess capacity (to manage peak time). » Underwriters have experience in the type of mortgage they underwrite (e.g., the average experience of the team is equal to the industry average).	» Workload is too high; underwriters do not have enough time to properly review borrower's file and follow up. » Underwriters lack experience in the type of mortgage they underwrite (e.g., the average experience of the team is lower than the industry average).
Underwriting Guidelines - Exceptions	» Very limited exceptions to underwriting guidelines and always with strong mitigating factors. » If exceptions, the rationale for deviating from underwriting guidelines is always well documented.	» Limited exceptions to underwriting guidelines and always with mitigating factors. » If exceptions, rationale for deviating from underwriting guidelines is mostly documented.	» High exceptions to underwriting guidelines and few, if any, mitigating factors. » If exceptions, rationale for deviating from underwriting guidelines is not always documented.
Approval Authority Policy to Underwrite Files	» Clear and appropriate approval authority policy, including various criteria (underwriter experience, LTV, loan size). » Rules for approval authority are within the loan origination system.	» Approval authority policy including few criteria (underwriter experience, LTV loan). » Some rules for approval authority are within the loan origination system.	» Limited or no approval authority policy in place. » Limited or no built-in rules within the loan origination system.
Underwriter's Compensation	» Bonus based on appropriate key performance indicators (KPI) (e.g., main one being quality of work and performance and not volume).	» Bonus based on KPIs (quality of work or performance is included but may not be the main driver).	» Bonus not based on KPIs, or the main KPI is based on an inappropriate indicator (e.g., volume of approved loans).

Source: Moody's Investors Service

Our analysis addresses the responsible lending principle

The second part of our underwriting and policies analysis 1) examines an originator's underwriting criteria for different borrower and product types; and 2) determines to what extent the originator accurately assess a borrower's ability and willingness to pay, as well as the verification of information provided by the borrower to prevent losses and fraud.

Over the past few years, an increasing number of originators have implemented automated underwriting and credit scoring tools, which streamline the underwriting process and speed up the decision process. We take into account the robustness of these tools when assessing the accuracy of the originators' affordability and willingness to pay analysis. We also review the originator's understanding of how these tools work.

We take into consideration the different market standards across countries for analyzing affordability.

Affordability analysis drives the borrower's ability to repay mortgage loans

Loan affordability assessment aims to prevent any mismatch between an originator's underwriting practices and a borrower's repayment capacities. In that respect, stable and verifiable sources of income, recurrent expenses, and other commitments are the main drivers determining the borrower's ability to pay contractual mortgage obligations. Affordability analysis should also take into account mortgage characteristics such as repayment type (repayment versus interest-only), loan purpose (purchase versus refinancing or debt consolidation), and occupancy type (owner-occupied versus buy-to-let). Best-in-class affordability analysis also stresses some of the variables to assess sensitivity to changes in market conditions.

Historical payment performance provides insight into borrower's willingness to pay

Originators assess willingness to pay by reviewing the borrower's historical payment performance for financial and non-financial commitments during a certain time period. Originators use internal and/or external sources of information to derive a borrower's willingness to pay. We review the sources used by the originators, the historical timeframe analyzed, and credit profile (for example, in the UK, the number of negative records in the credit bureaus) to form a view on the originator's ability to assess borrower willingness to pay. Some originators may subscribe to more than one credit bureau to get an extensive view of the borrower's financial condition. In addition, originators in some countries may be able to access more information than originators in other countries as a result of local legislation and availability of standardized and detailed data.

Originators should put in place robust processes to confirm information provided and validate submitted documents…

We also analyze the processes in place to verify all information and documents provided. For example, in terms of income, we will assess how it is confirmed: Is an original or copy requested? How many payslips are required? Does the originator confirm the borrower's employment status with the employer? Does the originator perform other checks to confirm employment or have additional checks where the borrower is either partially or fully self-certifying their income? How does the underwriter treat income from pensioners or borrowers who will become pensioners prior to the end of the term of the mortgage?

…as well as a fraud prevention infrastructure

We view positively a consistent approach to preventing fraud by assessing each loan prior to closing through various anti-fraud software tools.

Exhibit 28 below maps selected criteria characteristics of an originator's checks to test affordability and borrower willingness to pay.

We may review randomly selected files during our originator assessment process to assess 1) the underwriter's adherence to stated guidelines; 2) the quality of the underwriting analysis; 3) the depth of the underwriting analysis, and 4) file completeness in terms of required documents and the validation of the information. If this review highlights any material concerns regarding the underwriting processes or data

quality that cannot be explained, we may be unable to assign our highest ratings to a portfolio that contains loans from this originator.

EXHIBIT 28

Selected Criteria Characteristics of an Originator's Checks to Test Affordability, Borrower Willingness to Pay

Criteria	Strong	Average	Weak
Borrower's Affordability Income	» Income is equal to borrower's net income, which only takes into account recurrent income. » Borrower's situation over the mortgage term is assessed (e.g., the maturity date is after borrower's retirement date) » Underwriter checks reasonableness of income, especially where the borrower's income is not verified.	» Income is equal to borrower's net income including a less stringent definition for other types of income. » Borrower's situation over the mortgage term is assessed (e.g., the maturity date is after borrower's retirement date). » Underwriter checks reasonableness of income, especially where the borrower is self-certifying or non-verified.	» All types of income are taken into account (recurrent and non-recurrent). » Borrower situation over the mortgage term is not assessed. » Underwriter does not check reasonableness of income where income is not verified.
Borrower's Affordability – Expenses and Other Commitments	» As far as possible, all monthly reasonable expenses are accurately taken into account (including family situation, e.g., childcare). » All other debt commitments (as well as undrawn and/or unsecured facilities) are taken into account and analyzed in detail.	» Expenses are taken into account using nationwide available statistics, some adjustments are made. » All other debt commitments are taken into account (only drawn facilities).	» Expenses and other debt commitments are not taken into account.
Affordability – Stress Testing and Customized Approach by Borrower Type: 1) Unemployed; 2) Temporary Worker; and 3) Self Employed			
Unemployed	» The presence of a guarantor or additional borrower with a stable source of income is required. » A full underwriting analysis of the guarantor's or additional borrower's creditworthiness is also performed. » Credit is given to the entitled unemployment subsidy.	» Serviceability calculation such as Debt to Income (DTI), giving full benefit to unemployment subsidy even if this is limited in time. » A guarantor is not required.	
Temporary Worker	» Borrowers have been working constantly for a minimum period of time (at least 12 months). » The presence of a guarantor with a stable source of income is required. » Previous employment history is checked using public information. Borrower must work in stable/non-seasoned industries for all LTV's.	» Temporary workers have to have been working constantly for a minimum period of time (at least 12 months). » Previous employment history is checked using public information. » Guarantor with full-time employment is always required for high LTV's or riskier borrowers.	» A guarantor is not required. » Serviceability calculation is only based on the borrower's recent income. » There is no analysis on the terms of previous employment contracts.
Self Employed	» Income relevant for the serviceability calculation, such as DTI, is verified. For example, on 2/3 years of audited financial statements, tax returns or similar official documentation. » Proof of undeclared income is obtained analyzing the borrower's business relationships. » Underwriting is performed by bank employees with specific knowledge of balance sheet analysis. » LTV and Serviceability limits are stricter than for employed borrowers.	» Same as strong except that proof of undeclared income is obtained without analyzing the borrower's business relationships and. » Underwriting is performed by bank employees with no specific knowledge of balance sheet analysis.	» Serviceability calculation, such as DTI, is based on all income even with limited verification based on official documents. » Limited checks are performed to verify income generation stability.
Negative Record in a National Credit Bureau	» No negative record in the relevant national credit bureau in the past with no exceptions.	» A satisfied negative record in a national credit bureau for a low value and if more than 2 years old. » The scoring model of the bank returns a positive credit score. » Negative credit information is taken into account in the product offering to the borrower.	» Negative record in the relevant national credit bureau indicating outstanding defaulted amounts.
2nd Liens Excluding Further Advances	» The bank has also granted the first lien loan.	» The first lien can be with another lender. » A new valuation is performed on the property, drive-by or indexed valuation are	» The first lien loan is with another lender. » New valuation on the property using indexed, drive-by or AVM[59] valuation.

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[59] Automated Valuation Models

EXHIBIT 28

Selected Criteria Characteristics of an Originator's Checks to Test Affordability, Borrower Willingness to Pay

Criteria	Strong	Average	Weak
	» The borrower has a stable income that is fully verified. » An updated valuation has been performed on the property	allowed with certain criteria, max LTV limits set » Borrower has a stable income that is fully verified.	Maximum combined LTV is relatively high (e.g., 90%) » Serviceability /affordability not on stable income.
FX Loans/Debt Consolidation		On a case-by-case basis	
TPO (Broker) Loans	» TPO acts as 'introducer.' The lender takes over all contact with the borrower, and the underwriting process is entirely performed by the bank. Fees are partially paid upfront and partially during the life of the loan, depending on the loan's performance. » An ongoing review of the quality of the loans and TPOs with weak performance are excluded.	» Some of the contact with the borrower is via the TPO (including collecting required documentation for the underwriting process), but the lender performs the entire underwriting process. » Lender controls valuation process. TPO fees are paid upfront, but there is an ongoing review of the quality of the loans, and TPOs with weak performance are excluded.	TPO is sole contact point with the borrower and is granted underwriting approval within the lenders underwriting guidelines. TPO will check borrower proof of income and arrange property valuation. » TPO fees are paid upfront.
Buy-to-Let/Investment Mortgage	» Low LTV and high interest coverage ratio using stressed interest rate. » Valuation reports contain details on rentability and likely rental levels that could be achieved. » Restrictions on LTV for new build properties. If rental income is the main affordability test, extra borrower income should not be taken into consideration. Total borrower exposure is restricted.	» High interest coverage ratio using stressed interest rate. » Valuation reports contain details on likely rental levels that could be achieved. » If rental income is the main affordability test, extra borrower income should not be taken into consideration.	Bank allows significant exposure to individual borrowers or does not monitor cumulative exposure to individual borrowers. » Low interest coverage ratio at stressed interest rate. Full valuation performed but does not take into account non-owner occupancy valuation methods. » If rental income is the main affordability test, extra borrower income should not be taken into consideration.
Interest Only	» Serviceability criteria are passed assuming an annuity amortization » LTV restrictions and/or a repayment vehicle is required to cover the principal element, and this is regularly checked by the lender.	» Serviceability criteria are passed assuming an annuity amortization » Depending on market specifics, max LTV is in the 75%-90% range. » Borrower confirms that a repayment strategy is in place that does not rely on the property's sale.	Affordability is purely on IO basis at current interest rates. » No requirements to build up funds in a repayment vehicle. Max LTV 95%-100%.
Affordability Measurement	» Serviceability calculation, such as DTI, is more conservative than industry average.	» Serviceability calculation is in line with industry average.	Serviceability calculation is weaker than industry average. » Only uses income multiples when assessing affordability and does not consider liabilities or other debt obligations.
Assessment Borrower Willingness to Pay	» All borrowers are checked thoroughly with all relevant credit bureaus (when applicable).	» All borrowers are checked through the main credit bureau.	Credit bureau data is not used.
Information Verification and Fraud Process	» Various documents are required to cross-validate information; original or certified copies are also requested. » Underwriter also performs additional verification to confirm employment (using techniques that involve more than a phone call) and occupancy. » More than one third-party fraud tool is used » All loans are reviewed for potential fraud (including cross-reference to validate signature and name with original proof of ID). » Built-in approval tools within the loan origination system (automatic check).	» Various documents are required to validate information. » Underwriter performs some verification checks to confirm employment (a phone call) and occupancy. » One third-party fraud tool is used. » At least 75% of the loans are checked for fraud (including cross-reference to validate signature and name with original proof of ID).	Few documents are required to confirm information provided; no certified copies are requested. » Underwriter does not perform any additional checks to confirm employment and occupancy status. » No use of anti-fraud software tools.

Source: Moody's Investors Service

Property Valuation Policies and Procedures

Appraiser selection is critical

We believe that it is important that the valuer selection is separated from the sales and underwriting team where possible, as this reduces the chance of a biased property value. The selection process and the

originator's ability to ensure appropriately qualified valuers are particularly important. We will view negatively any bias in selecting a valuer for factors beyond the quality and accuracy of the valuation.

We also examine the second review processes employed when the initial valuation is not consistent with internal quality checks. We take a negative view of an originator that obtains multiple appraisals to achieve a property value it or the borrower believes to be correct (where the highest value in such circumstances is taken). We also assess how the value is defined within the LTV ratio (e.g., the minimum of the appraisal value and the purchase price, a forced sale price, or the appraisal value).

Valuation standards vary significantly across countries. For example, in the UK, Spain, Italy, and the Netherlands, regulated appraisers conduct valuations, while in France, the process is less regulated.

Exhibit 29 below maps selected review criteria for originators' valuation policies and procedures.

EXHIBIT 29
Property Valuation Policies and Procedures Selected Criteria

Criteria	Strong	Average	Weak
Valuer Selection Process	» Valuers are randomly selected from the originator's pre-approved panel of external valuers. » Valuers must be locally based. » Valuers must be members of a relevant association where applicable and have the pre-requisite qualification. » Valuers are approved (through thorough due diligence to assess their ability and stability) and routinely tested for the appropriate licenses and registrations. » Professional liability insurance should be in place.	» Valuers are randomly selected from the originator's panel. » Valuers must be locally based. » Valuers must be members of a relevant association where applicable and have the pre-requisite qualification. » Regular checks to confirm that valuers have the appropriate licenses and registrations.	» There is no panel or list of approved valuers. » The borrower or intermediary may appoint/select the valuer. » Infrequent checks to confirm that the valuer is registered with a relevant association where applicable and has the pre-requisite qualification.
Valuation Type	» Full internal inspection – drive-by valuations acceptable only with mitigating factors. » Where possible, details of at least three comparable properties are recorded on the valuation report (where necessary information on rental market is also included). » Valuation report includes photographs of the property (both internal and external). » New build properties have all details concerning incentives and other related discounts fully disclosed and considered in the value. » AVMs, when available, are used for secondary checks when there is a query on the valuation and are used for general validation of the values.	» Full internal inspection - drive-by valuations acceptable only with mitigating factors. » Where possible, details of at least three comparable properties are recorded on the valuation report. » Valuation report includes some photographs of property. » New build properties have all details concerning incentives and other related discounts fully disclosed. » Whenever available, AVMs are obtained as a secondary check pre-closing and for post-closing.	» No internal inspections - drive-by or AVM used for valuing properties. » No comparable properties are recorded. » No photographs required. » No guidelines for valuation of new build properties and no record kept of any discounts/incentives.
Procedures for Querying Valuations	» There is a clear policy for reviewing/escalating any appraisals that come in materially lower or higher than borrower or lender expectations both prior to approving the loan and also during the foreclosure process (if applicable).	» An escalation policy in place, but the underwriter can circumvent it. »	» There is no clear policy for reviewing/escalating queries or valuations concerns.
Appraiser's Compensation	» There is a clear policy on appraiser compensation. The originator pays the valuer a retainer or fee per property, and while this may be charged to the borrower, all payments are via the originator.	» There is no clear policy or controls surrounding appraiser compensation.	

Source: Moody's Investors Service

Closing Policies and Procedures

Strong closing policies and procedures can potentially mitigate losses

As part of our review of an originator's abilities, we examine the processes and controls that are in place to validate that all conditions are met to release the funds, track the receipt of key documents (e.g., deed registration) and confirm that all data included in the servicing system is reconciled with a borrower's loan file.

We consider as best practice a pre-closing call to the borrower to confirm transaction details and to re-confirm key information such as occupancy type, employment status, and income.

Exhibit 30 outlines mapping selected criteria to the originator's assessment levels for closing policies and procedures.

EXHIBIT 30

Selected Criteria For Assessing Originator's Closing Policies and Procedures

Criteria	Strong	Average	Weak
Pre-closing Steps	» Pre-closing call to confirm certain information. » Process to check that all pre-closing requirements (such as insurance) are in place before disbursement.	» Process to check that pre-closing requirements are in place before disbursement.	» Ad hoc checks to confirm that pre-closing requirements are in place before disbursement.
Funds Disbursement	» Four eyes principles for disbursement of funds (i.e., more than one person will review the loan application prior to the disbursement of funds). » Daily automated cash reconciliation.	» Four eyes principles for disbursement of funds. » Daily cash reconciliation (for the most part done automatically).	» No process in place to control disbursed funds. » Weekly/monthly manual cash reconciliation.
Document Tracing	» Strong, efficient process in place to ensure 100% of deeds are registered within stated period.	» Efficient process in place to ensure deeds are registered.	» No consistent approach to validating that key documents are received and registered.
Quality Control on Data	» Loans are audited to ensure information is fully captured[60] and reconciled between the system and files. » Very low level of errors.	» Representative sample of loans is audited for quality purposes on a monthly basis by independent team. » Low level of errors.	» Lack of quality control on data and fields, although included on the file, is not entered into the system. » High level of errors.

Source: Moody's Investors Service

Credit Risk Management

The originator's credit risk management framework is also part of our originator assessment as it fulfils an oversight role, ensuring that credit/underwriting policies are in line with the firm's risk governance. We view positively 1) the implementation of a clear credit risk strategy; 2) the development of adequate tools to monitor adherence to this strategy, and 3) the implementation of a strong process to amend credit/underwriting policy, ensuring the originator remains within its stated risk tolerance. To form a view of credit risk management quality, we look at the authority of the credit management team to drive changes to credit policy, as well as the staff's expertise and technology for analyzing performance data. We also assess the quality of data available to the credit risk team. Exhibit 31 below maps selected criteria characteristics of the originator's credit risk management infrastructure onto the originator's assessment levels.

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[60] In many instances, we have noted that, for example, the construction year while taken into consideration in the underwriting analysis, is not always recorded in the system.

EXHIBIT 31

Selected Criteria for Evaluating Credit Risk Management

Criteria	Strong	Average	Weak
Risk Management Independence	» Credit risk management input is one of the primary drivers for change to credit policies. » Independence of the team, reporting directly to CEO.		» Credit risk management input is not a driver to change credit policies. » No direct reporting line to CEO.
Risk Appetite/Product Mix	» Clear, detailed, and consistent risk tolerance/appetite over time. » Risk appetite clearly known by all relevant employees. » Where there is an innovative product, mitigating factors have been taken into consideration.	» Clear risk tolerance/appetite. » Risk appetite clearly known by all managers. » Where there is an innovative product mitigating factors have been taken into consideration.	» Risk tolerance/appetite not properly defined. » Product ranges and criteria very different from market and without any mitigating factors (e.g., low interest coverage ratios for high LTV investment mortgage loans).
Performance and Adherence to Risk Appetite	» Highly sophisticated and detailed credit risk dashboard to monitor performance based on various variables (e.g., by TPO, product, roll rate, vintage) with efficient feedback loop. » All recurrent reports are fully automated and updated daily via an Intranet portal for easy use by other departments. » Access to loan-level data (in case of third-party servicing).	» Sophisticated and detailed credit risk dashboard to monitor performance based on various variables (e.g., by TPO) with good feedback loop. » All recurrent reports are fully automated and updated weekly. » Access to loan-level data (in case of third party servicing).	» Limited implementation of credit risk dashboard. » Limited or no automation of performance reports. » No access to loan-level data (in case of third party servicing).
Staff	» Highly experienced staff (financial and statistical background).	» Experienced staff (financial and statistical background).	» Staff shas limited or no experience in the asset type.

Source: Moody's Investors Service

4. Originator Stability

Financial Strength

The originator's financial strength and strategic positioning (or its parent corporation if the originator is an integrated, operating subsidiary within a holding company structure) has a strong influence on our view of an originator's stability. For example, an originator with strong financial resources will be better able to repurchase any loans that are in breach of representations and warranties. Furthermore, a good financial position will ensure that the originator is able to make the required investments in the business and indicates that they are less likely to take unnecessary risks in order to generate additional income. This will also demonstrate the originator's ability to absorb change and tough market conditions.

If the originator is not rated by us, we may perform an internal assessment, where available of the entity's financial credit quality. The internal assessment is conducted with input from other analysts that possess industry, as well as company and country-specific expertise to derive a credit assessment.

At the time of the securitization transaction's closing or replenishment, or sale, we expect that the issuer will receive a solvency certificate from the seller protecting investors from any potential claw-back risk as a precedent for the rating unless the seller is sufficiently highly rated.

Quality Control and Audit Functions

Quality control and audit are critical functions

We also evaluate the originator's ability to control its origination and underwriting processes and ensure adherence to its policy guidelines and regulatory requirements. As such, we perform a qualitative review of the originator's quality control and audit infrastructure.

For both quality control and the audit infrastructure, we review, among other things, 1) the sampling methods in place; 2) the process for reporting findings and recommendations; 3) the process for monitoring whether recommendations are implemented; 4) the frequency of review and; 5) the team structure.

As part of our analysis, we also assess the independence of the originator's internal audit function (i.e., the reporting line within the organization structure) and review the result of third-party financial and non-financial audits when available.

In addition, we take into account the outcome of the third-party data quality audit on the securitized pool. The confidence level and error tolerance should be in line with our guidelines, which take into account the type of mortgage, the originating entity's short-term rating, and the issuance frequency. A clean audit result will have a neutral impact. Audits, where errors are flagged, may have a negative impact in 1) this category; and/or 2) in the relevant sub-component of the originator ability analysis; and/or 3) directly in the appropriate field within MILAN. Where there are material concerns raised in the audit report, additional measures may be taken as applicable.

Exhibit 32 below maps selected criteria on to the originator's assessments levels for the quality control functions.

EXHIBIT 32

Quality Control Functions and Audit Functions Selected Criteria

Criteria	Strong	Average	Weak
Third-party Audit on Pools to be Securitized	» Minimal errors that are not material and can be easily explained, e.g., typo in the postal/ZIP code of property	» Significant errors in multiple data fields and/or missing files	
Quality Control Framework	» Sampling methods are conservative and generally go beyond the minimum requirements to statistically expose defects. » A robust formal framework is in place to ensure all files are evaluated on a consistent basis independently of the reviewer. » A strong infrastructure is in place to report findings from quality control activities to senior managers and line manager, training, credit policy, and audit team. » Quality control checks include full re-underwriting of loans, data consistency tests, and review of intermediaries' (e.g., valuers) work.	» Sampling methods are robust and holistic enough to uncover defects. » A framework is in place, although some inconsistency exists between reviewers. » An infrastructure is in place to report findings from quality control activities to senior managers, line managers, training team, credit policy, and audit team. » Quality control checks include data consistency checks and high-level review of adherence to underwriting standards.	» Sampling methods do not exist or do not expose defects. » Very limited or no framework to ensure consistency in review. » Weak or no active dialogue between reviewer and senior management team. » Quality control checks test minimal fields, documents, or processes.
Internal Audit Framework	» An internal audit plan is developed based on the company's internal risk assessment. » Yearly operational audits of the origination processes are conducted (including sample testing). » A strong infrastructure in place to report findings and recommendations from the internal audit as well to ensure recommendations are implemented.	» An internal audit plan is developed. » Yearly operational audits of the origination processes are conducted (including sample testing). » An infrastructure is in place to report findings and recommendations from internal audit as well to ensure recommendations are implemented.	» No or ad hoc operational audits of the origination process. » Weak or no dialogue between auditors and board of directors.
Quality Control & Internal Audit Teams	» Quality control is performed by an independent team as well as a third-party company. » Quality control agents have extended experience in underwriting. » Independent audit team reports directly to board of directors.	» Quality control is performed by an independent team. » Quality control agents have previously gained relevant experience in underwriting. » Independent audit team reports directly to board of directors.	» Quality control is performed on an ad hoc basis by a team leader. » Internal audit team is not independent and does not report directly to board of directors.

Source: Moody's Investors Service

Management Strength and Staff Quality

We view favorably highly experienced managers who have developed a clear strategy and strong business/company's oversight

We believe that an originator's investment in personnel at both managerial and staff levels is critical to operational quality and stability.

We look for highly experienced senior managers who demonstrate a clear understanding of the market and company and who can respond adequately to market changes. In addition, we assess the extent to which the senior management team is in control of their business (i.e., the ability to maintain a consistent level of oversight and control).

Highly experienced, well-trained, and appropriately incentivized staff enhance the quality and stability of the underwriting process

We also review the originator's strategy for staff recruitment, retention, and development to ensure that the staff has the necessary experience, expertise, and motivation for their job functions. The company and department turnover rate (voluntary and involuntary) are benchmarked against the industry turnover rate to identify potential operational deficiencies. We also focus on the compensation package across the various departments, with greater emphasis on the underwriting staff's variable compensation structure (i.e., ensuring that the appropriate key performance indicators are used; otherwise the compensation scheme could potentially cause undesired outcomes). The compensation analysis is included in each area of review within the originator's assessment methodology to take into account each department's specificity.

We also consider the training program for both new and existing staff involved in the origination and underwriting processes, with an emphasis on the underwriters' training program. We assess, among other things, how formalized the underwriting induction program is and how the company tests underwriters to ensure they have the necessary skills within their underwriting mandates (including file auditing).

When analyzing underwriters' experience, their workload is taken into account in the underwriting policies and procedures assessment section.

Exhibit 33 below maps example selected criteria on to the originator's assessments levels for management strength and staff quality.

EXHIBIT 33

Staff Quality Selected Criteria

Criteria	Strong	Average	Weak
Corporate Governance	» Strong corporate governance controls in place.		» Lack of adequate governance controls in place. » Past or pending fraud investigations on management
Company/Department Turnover Rate	» The company/department turnover rate is below the industry average.	» The company/department turnover rate is equal to the industry average.	» The company/department turnover rate is above the industry average.
Underwriter's Training Program	» All new hires go through a formalized training program, including knowledge testing and 100% file review before getting a mandate (i.e., training academy). » Ongoing training update and testing on product knowledge, on change in underwriting procedures, on regulatory and compliance, and on other specific job-related training.	» All new hires go through a formalized training program, including knowledge testing and some file reviews before getting a mandate (i.e., training academy). » Yearly training update and testing on product knowledge, on change in underwriting procedures, on regulatory and compliance, and on other specific job-related training.	» On-the-job training provided by peers. » Ad hoc training for experienced staff.

Source: Moody's Investors Service

Technology

As part of our assessment of an originator's technological capabilities, we review the systems used to control and enhance processes. We analyze the originator's ability to minimize manual data manipulation outside of the loan origination system as industry best practice. An example of a strong approach to technology is the integration of information technology requirements into business planning so that systems within the originator's operations have robust functionality to deal with changing loan products, underwriting guidelines, and regulatory compliance demands on a timely basis. A good technology platform will also enable an originator to track portfolio performance in multiple fields and have a thorough overview of its risk profile.

We take a favorable view of originators that establish a process framework to allow for the adequate testing of system changes well in advance of full implementation. The quality of backup arrangements is also an important consideration in assessing technology adequacy. We consider the ability of an originator to capture and transmit key data we require to rate and monitor RMBS transactions in our assessment.

Exhibit 34 below maps selected criteria on to the originator's assessments levels for the technology components.

EXHIBIT 34

Technology Selected Criteria

Criteria	Strong	Average	Weak
Integrated and Robust Systems	» Minimal ability to manipulate data or circumvent rules.	» System covers most business and regulatory compliance rules; however, some manual processes are necessary to ensure compliance.	» Staff has the ability to manipulate data or circumvent system rules.
Formal Change Process	» Formal change process in place that prioritizes system changes elevates regulatory compliance items, and thoroughly tests major changes before rolling them out.	» Formal change process that tests major changes before rolling them out.	» No formal change process. » Little or no testing before major changes are rolled out.
Data Requests	» All requested data is delivered in a timely manner.	» Most data is delivered in a timely manner, with some exceptions.	» Most (including key items) data cannot be delivered.
Report	» System produces various types of performance reports (dynamic and vintage), and these are generated for multiple characteristics (e.g., origination channels, loan, and borrower characteristics). » New types of reports can easily be produced (i.e., within a week)	» System produces various types of performance reports, and these are generated for a limited number of characteristics. » New types of reports can be produced within a reasonable timeframe.	» System produces limited performance reports (e.g., only dynamic) and only on a consolidated basis. » It is difficult to implement a new performance report.
Scanning Technology	» All documents are available electronically (i.e., all the documents are scanned).	» Most documents are available electronically.	» Documents are not available electronically.
Disaster Recovery and Back-Up Systems	» Field tested plan. » Regular (hourly) data back-ups, so the risk of data loss is minimal. » Back-up data tapes at a secure off-site location.	» Written disaster recovery plan. » Daily data back-ups, so the risk of data loss is minimal. » Back-up data tapes at a secure off-site location.	» No disaster recovery plan. » Irregular data back-ups, so the risk of data loss is increased. » No backup data tapes available.

Source: Moody's Investors Service

5. Typical OA Level Guidance for Certain Standardized Markets

In certain markets where origination procedures are relatively robust and standardized due, for example, to regulation, we have established typical OA levels for certain types of originators. In other markets not listed here, we have not established typical OA levels, and each originator will be assessed individually.

Japan

Exhibit 35 provides our typical assessment level by originator categories. This is for guideline purposes only.

EXHIBIT 35
Guidance for Typical Originator Categories - Japan

Assessment Level	Types of Originator
Strong	Mega banks
Above Average	Commercial banks
Average	Mortgage banks, Consumer credit companies
Below Average	Newcomers to the mortgage market
Weak	Others

Source: Moody's Investors Service

For newcomers to the Japanese mortgage market, more detailed reviews are essential due to their limited experience and expertise in underwriting mortgages. As a result of our review, we may not be able to assign the highest ratings to RMBS or will not rate an RMBS transaction in extreme cases.

Moody's Related Publications

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

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

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

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