SCOPE Ratings

Residential Mortgage-Backed Securities Rating Methodology

Structured Finance

7 July 2025

Contents

1. Scope of application

This document describes our approach to rating European residential mortgage-backed securities (RMBS) whose collateral consists of granular portfolios of mortgage loans to purchase, refinance or refurbish a residential property[1]. This methodology should be applied to portfolios composed of residential mortgage loans or guaranteed residential loans[2] for the relevant country. A portfolio strongly deviating from the standard of the relevant mortgage market may need additional analysis to complement our methodology. It should be noted that the methodology can be applied, with adjustments described herein, to reperforming loans portfolios if those are loans to individuals secured by a residential property.

This methodology may be selectively applied to mixed portfolios of commercial and residential loans when commercial[3] loans represent a minor proportion of the pool. This methodology may also be selectively applied to RMBS outside of Europe when the mortgage loan market and institutional framework are similar.

This methodology presents the analytical framework and key concepts to be applied when rating RMBS, where for each country, our methodology will be complemented by a Country Addendum[4] that provides additional analytical insights. In the absence of a Country Addendum detailing the assumptions for such country, our Rating Action Release will describe the relevant assumptions taken for such country.

This methodology complements our General Structured Finance Rating Methodology and should be read together with our Counterparty Risk Methodology, both available at scoperatings.com.

2. Key components

Our analytical framework covers five areas: i) originator and servicer analysis; ii) portfolio performance analysis; iii) cash flow and structure analysis; iv) counterparty analysis; and v) legal analysis.

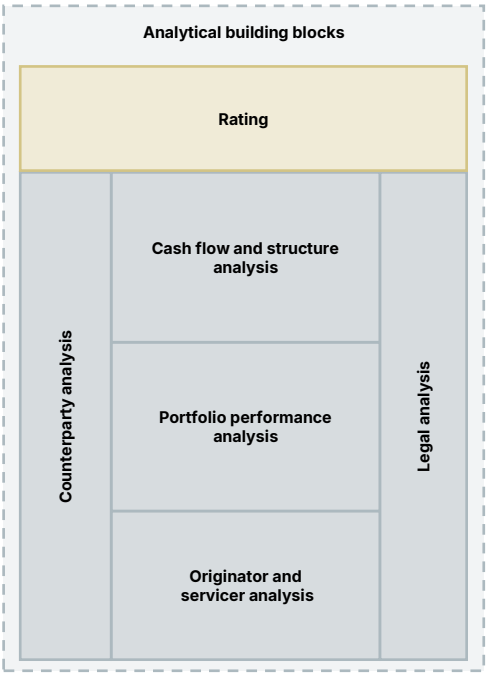
The ratings reflect the expected loss on securitised debt instruments in the context of the instruments' expected weighted average life (WAL). The expected loss accounts for the time value of money at the rate promised to the investor. Our General Structured Finance Rating Methodology provides more detail on our expected loss framework.

We derive portfolio assumptions using both transaction-specific data and relevant market data. We construct a portfolio default probability distribution using an inverse Gaussian distribution where the mean corresponds to our base case default rate. The coefficient of variation is calibrated using a country-specific distressed default rate, adjusted in order to reflect the characteristics and risk profile of the securitised portfolio.

We assume recovery rates follow a Beta distribution, reflecting the stochastic nature of recoveries.

We integrate the portfolio default distribution and the recovery rate distribution within Scope Cash Flow Models (Scope CFM and Scope CFM MW)[5], which also incorporate other portfolio assumptions such as recovery timing, cure rates, default timing, interest rates, and the transaction´s structural features.

Qualitative and quantitative inputs are both essential to the analysis. The final rating may deviate from purely model-driven results to reflect credit views on material risks that are not be fully reflected in the quantitative framework.



3. Data Sources

Assumptions for new rating assignments are typically informed by historical performance of the originator's mortgage loan book or of other portfolios with similar characteristics. This is complemented by discussions with the originator and servicer of the securitised

[1] The methodology can still be applied if the proportion of commercial loans is not material to the analysis of the transaction.
[2] For simplicity of reference, the term "mortgage loan" will be assumed to also encompass "guaranteed residential loan" in this methodology.
[3] We typically define here commercial loans as loans which: (i) do not have recourse to private individuals and (ii) are dependent upon corporate income.
[4] A Country Addendum is a component of this methodology presenting rating assumptions applicable in a specific country.
[5] See General Structured Finance Rating Methodology for a technical note on Scope Cash Flow Models implementing the expected loss framework.

portfolio (see section 5.1) and by other market or macro-economic data. We do not require specific data templates and can adapt to a wide range of information formats produced by the originator systems. We check the reliability of all available information. In cases where the provided information is inconsistent with our assessment, we seek clarification or request further information. Our assumptions may also be informed by discussions with other external parties — such as issuers, investors and regulators — and our analysis of financial and nonfinancial information. Further data considerations are discussed under section.

4. Executive Summary

This document is the latest update of Scope Ratings' (Scope) Residential Mortgage-Backed Securities (RMBS) Rating Methodology. Relative to the methodology published in July 2024, it incorporates clarifications, editorial changes and a reorganisation of the structure of the methodology to enhance transparency and clarity, and in particular the following:

- Clarify key components and data source with two new sections, 2 and 3.
- Further details on the monitoring activities described in section 6.4.

None of the amendments introduce changes to our rating approach and no ratings are impacted as a result of the update.

4.1 Methodology highlights

Our methodology combines bottom-up and top-down approaches. In our opinion, the expected behaviour of the mortgage pool under mild or no stress will be primarily driven by the origination strategy of the originator. The portfolio behaviour under severe stress will depend furthermore on the country's institutional and macroeconomic conditions, giving still considerations to the origination context.

Our opinion regarding the future behaviour of the mortgage pool in a mild or no stress scenario is mainly based on the analysis of the information provided by the originator, be it detailed historical performance data, scores, or origination processes. Our assumptions on the behaviour of the mortgage portfolio under a severe stress scenario have been built using historical case studies[6], including amongst others, the dynamics of the unemployment rate, the then-current monetary policy and the real estate market. In addition, we explicitly capture sovereign risk within the methodology through the usage of country-specific assumptions.

Comprehensive credit risk framework. This methodology defines a comprehensive analytical framework for analysing the credit risk of a portfolio of mortgage loans. Such analysis, to define the expected behaviour of the portfolio relies on several sources of information including some or all of the following elements: (i) originator historical performance, (ii) loan characteristics assessed through a Scope Generic Scoring Algorithm[7], (iii) originator internal scores or public scores, and (iv) peer comparison versus other originators/servicers. Our approach captures both the specificities of the loan portfolio and originator and the potential macroeconomic shocks on the mortgage/housing market.

No mechanistic link to sovereign credit quality. As mortgage market specificities are embedded in the portfolio analysis, we do not mechanistically limit a transaction's maximum achievable rating as a function of the sovereign credit quality of the country in which the assets are located. Instead, our distressed default rate already considers a severe macroeconomic shock and its subsequent mortgage crisis.

Originator/Servicer analysis. We leverage on the originator's and servicer's knowledge of their customers. We form a credit view of the assets based on our analysis of the originator's quality and risk appetite, using amongst others market positioning, product portfolio, origination strategy, risk management, and the servicer's monitoring and recovery functions including the presence of strong guarantees. Alignment of interest between parties is also factored in. Our assessment has a direct impact on the distribution of default rates (originator) and recovery rates (servicer).

Emphasis on Governance. This methodology puts significant emphasis on governance with a particular focus on: (i) the institutional governance of the mortgage market which directly affects our distressed default rate; (ii) the origination governance which also directly affects our distressed default rate, (iii) the servicing governance which directly affects our distressed recovery rate; and (iv) the rated transaction governance which may cap the achievable ratings.

[6] We refer the interested reader to "Collateral Damage: The Impact of Foreclosures on New Home Mortgage Lending in the 1930s" – The Journal of Economic History, Vol. 80, No. 3 (September 2020) and "The Interwar Housing Cycle in the Light of 2001–2012: A Comparative Historical Perspective" – NBER 2014.

[7] As described in Appendix III and Appendix IV.

5. Detailed Analytical Framework

5.1 Originator and servicer analysis

The quality and risk appetite of the originator and the servicer, including amongst other their business strategies, experience and track record in the industry are highly important for the assets' performance. Our approach to determine the asset risk assumptions considers the idiosyncrasies of both originator and servicer. Our credit view on the securitised assets considers market positioning, product types, origination strategy, risk management (see Table 1) and servicing practices (see Table 2). Our assessment of the originator/origination has a direct impact on our portfolio's lifetime default rate distribution assumption, both in the base case and in the distressed case, as outlined in section 3.2 below, whereas our servicer assessment will be captured in our recovery rate assumptions outline in section 3.3.

Table 1 and Table 2 provide an indicative list of the areas covered in our analysis of the two main parties of the transaction: the originator and the servicer.

Table 1: Indicative risk appetite and quality assessment of the origination

Theme	Description	Examples
Market positioning and strategy	We analyse the strategy and its stability over time: whether products and obligor segments are time-tested, who are the competitors, what is the stability of market share and what are the distribution channels used. We use past data on originated volumes and the originator's performance to form a view on the stability of the originator's business model and of the assets' performance.	Governance Business model and its riskiness Credit risk of the originator Origination volume and its evolution Proportion of NPL or reperforming versus peers EBA Reporting
Risk appetite	The risk appetite of the originator defines the type of borrowers/loans targeted. Standard or atypical borrowers represent the two extremes. Apart from the definition of the targeted borrowers, we will also look at the level of control of the origination channel and the level of aggressiveness of the selling.	Mortgage loan characteristics Non-standard product offering Specialised lender Broker/third-party origination
Staff, systems and processes	We review the originator's operational competence, capacity and expertise in managing the types of assets in the transaction. Staff numbers, team turnover and training are also reviewed.	Adequateness of staff compared to originated volume Strength and independence of the risk function Automation of processes Internal control function IT systems and robustness
Underwriting standards	Understanding the underlying conditions of the typical mortgage contract offered by the originator is a key factor in our assessment of the originator and its underwriting standards. We will also consider historical changes of those standards. Finally, we assess the originator's internal auditing standards, documentation and processes, as well as the independence of the risk function.	Strength of the institutional/regulatory framework for origination under which the originator operates Evolution in the originator underwriting criteria
Origination stability and performance	We compare the assets' origination trends and credit performance with the volume and credit performance of the entire market and/or of peer originators. This peer comparison helps us position the originator versus its peers.	Pillar 3 (as per EBA requirements) reporting on defaults and recoveries Historical performance and its volatility

Credit-scoring systems and risk models	An originator with sound, stable and predictive credit scoring may be subject to lower default volatility. Our review of the originator's underwriting processes incorporates elements such as the use of external and/or internally developed credit scoring and the quality of data sources. We also assess the frequency, and the methods used to validate and review credit-scoring systems.	Usage of F-IRB[8] versus A-IRB[9] approach for mortgages Back testing results showing robustness/predictability of the internal model Pillar3 Reporting (Tables CR1, CR6 and CR9)
Fraud prevention	We review measures to prevent and monitor fraud (e.g. identity theft, loan stacking, fraudulent payslip). The robustness and stability of processes related to borrower selection and loan application validation are important in reducing the volatility of loan portfolios. We consider documentation and investigations surrounding loan applications and approvals.	Case studies Automated checks of documentation Know your customer (KYC) regulations Past scandals and their management
Securitisation experience	We examine the previous experience of any third party involved in the origination process and the originator. We also analyse how and to what extent the interests of the originator are aligned with those of investors in the securitisation.	Relevance of covered bond or securitisation in the financing of the originator: duration, stability, investor base. Existence of "Skin in the game" mechanism.

Table 2: Indicative dimensions of assessment of the servicer

Theme		Examples
Servicer experience	We examine the quality and the experience of the servicer. We also analyse how and to what extent the interests of the servicer are aligned with those of investors in the securitisation.	Credit risk of the servicer Servicer's fee structure Importance and volume of recovered defaulted loans
Staff, systems and processes	We review the servicer's operational competence, capacity, and expertise in managing delinquent and defaulting loans. Timeline of actions to resolve cases following a missed payment, and corresponding cure rates are analysed. Staff numbers, turnover and training, are also reviewed.	Resources allocated to the recovery process Seniority of the staff Efficiency of IT systems tracking recovery process
Monitoring and recovery strategy	We review the servicer's processes, from early delinquency strategies to loss mitigation for defaulted loans, which should be reflected in roll rates and recovery vintage data. Proactive servicing generally limits the number of delinquent loans rolling into default and increases recoveries.	Early arrears management Timeline of recovery strategy Out-of-court versus judicial proceedings Outsourcing/Automation Historical recovery performance and its volatility

[8] Foundation Internal Ratings-Based
[9] Advanced Internal Ratings-Based

5.2 Portfolio Performance Analysis

5.2.1 Default rate distribution

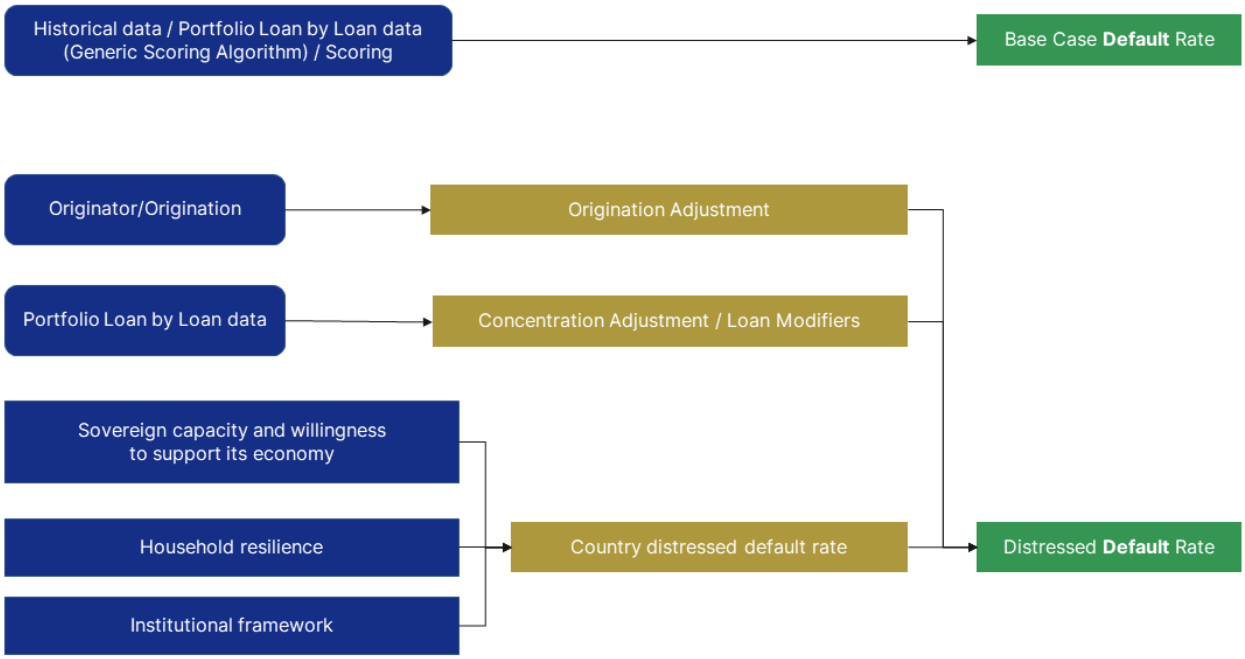
Our approach to define the (Inverse Gaussian) portfolio default rate distribution relies on two pillars:

- The expected behaviour of the portfolio, or Base Case Default Rate, which defines the mean of the Inverse Gaussian distribution used.
- The Distressed Default Rate, which is used to infer the standard deviation (or coefficient of variation – CoV[10]) of the default rate distribution. The Distressed Default Rate is defined as the distribution's default rate whose probability of exceedance is equal to Scope idealised AAA default probability at 10 years (defined as 0.26%).

It should be noted that in the instance where the assets of the securitisation pool would be deemed to be too heterogeneous, we could create several sub-pool (segments) and apply the analysis described here to each sub-pool. Those segments would be then assumed to be fully dependent both in terms of default and recovery rate distributions, but the resulting portfolio default distribution would not necessarily be Inverse Gaussian.

Figure 1 illustrates the key elements we use to assess the mean and distressed portfolio behaviour, described in detail further below.

Figure 1: Key concepts to define the default rate distribution



Source: Scope Ratings

5.2.1.1 Expected behavior of the portfolio – Base Case Default Rate

Our approach to analyse the expected behaviour of the portfolio captures the specificities of the originator/origination without losing consistency across transactions. To derive our Base Case Default Rate assumption, we can consider (a) any of the following three data sources: (i) historical performance data from the originator; (ii) a Scope Generic Scoring Algorithm[11] considering line-by-line loan characteristics; (iii) originator internal scoring or public scoring; and (b) comparisons with country-specific data and other representative transactions.

We view the comparisons of transaction as important in our analysis, this relies on the comparison of (i) the transaction loan characteristics versus the mortgage market of the country and (ii) the historical performance of mortgage loans across the country.

[10] Defined as the ratio between: (i) the standard deviation and (ii) the mean of the distribution.
[11] As described further in the relevant Country Addendum.

The Country Addendums detail the standard approach (amongst (i) – (iii)) to define the base case default rate and the required information needed according to the specific country. If the information provided is considered not to be representative or adequate enough (see section 7), this will be factored in by stressing the full default distribution (see section 3.2.2 - Origination Adjustment).

Expected behaviour from historical performance

We analyse performance data provided by the originator/servicer on a representative sample of assets with similar characteristics to those of the securitised assets. The originator could provide us with: (i) loan-by-loan historical performance, (ii) cohort historical performance, or (iii) time series of delinquencies or default rates. We consider historical data representative of the portfolio being securitised, taking into consideration both the proximity of loan characteristics between the historical sample and the securitised portfolio and the duration of available historical data.

Expected behaviour from our Scope Generic Scoring Algorithm

We may apply a country-specific regression algorithm based on loan characteristics to derive an expected loan lifetime default rate for each loan. The respective Country Addendum describes our Generic Scoring Algorithm if this is the standard approach. The mathematical framework of our scoring algorithm is built from a logistic regression using key collateral characteristics according to each country. The algorithm does not incorporate the specificities of the origination, which are considered through a qualitative adjustment of the resulting default rates.

Expected behaviour from the originator's scoring

We see potential value in existing scoring systems with a proven track record for example through regulatory usage. If we assess default risk scores used by the originator to be an adequate predictor of the portfolio behaviour under normal conditions, we can use such scores to define our base case default rate assumption. In addition to the internal scores of credit institutions, there are public scores created and maintained either by private parties (FICO, Experian, etc.) or by public institutions (UC-Score in Sweden, etc.) which we can use, in absence of any of the previous sources of data.

The adequacy of that approach for the purpose of assessing the base case default rate would be assessed checking (i) the usage and purpose of the scoring (internal versus external, absolute default rate versus classification purpose, …), (ii) the availability of such scores and (iii) a continuous communication on the changes in the scoring algorithm.

Such an approach does not incorporate the specificities of the origination, which are considered through a qualitative adjustment of the resulting default rates.

5.2.1.2 Estimating the behavior under stress of the portfolio – Distressed Default Rate

Scenarios for defaults are used in our cash-flow engine[12] to test the transaction structure versus several potential future default evolutions exploring both expected default behaviour and behaviour under stress. Our Base Case Default Rate, as defined in accordance with section 3.2.1, represents our expectation with regards to most likely future lifetime default rate, whereas we capture the extreme scenario, occurring in the right tail of the default distribution, through the introduction of the notion of Distressed Default Rate.

We derive a Distressed Default Rate starting with (i) a country-specific distressed default rate, (ii) penalised for overconcentration (at borrower or region level), adjusted by (iii) modifiers capturing some of the loan and pool characteristics and (iv) our assessment of the origination and originator strategy, with the aim of capturing the impact of these respective factors in a period of stress.

Our country-specific distressed default rate in (i) captures (a) the country specificities regarding the capacity and willingness of the sovereign to support its economy, including inter alia our macroeconomic expectations, (b) the households' resilience to crisis and (c) the strength of the institutional framework governing the mortgage market.

Portfolio Concentrations

The existence of very high portfolio concentration will lead to a commensurate increase of the Distressed Default Rate, with regards to:

- Borrower concentration: if any borrower has an exposure above 0.5% of the outstanding pool balance, irrespective of the country, an additional loan modifier will be applied in the computation, depending on (i) the credit quality of the specified borrowers (ii) the loan characteristics and (iii) the excess concentration.

[12] Scope's cash flow model (Scope CFM), as further described in our General Structured Finance Rating Methodology.

- Regional concentration: if any region has an exposure concentration materially diverging from our Benchmark Regional Distribution, the excess concentration[13], weighted by the Region Overconcentration Penalty will increase the Distressed Default Rate. Each Country Addendum include the benchmarking regional distribution.

Loan Modifiers

Several historical housing crises have highlighted loan characteristics which have an impact on default probabilities in a period of stress. However, it is unlikely that all loan characteristics will play a role in a very severe crisis, where it is probable that only a subset of the usual mortgage default drivers will be differentiating factors. In our methodology five characteristics will modify, for each loan, the country-specific distressed default rate pertaining to their country:

- The original LTV [Effect: Positive or Negative], defining a multiplicative modifier Mod_{LTV_i} depending on the deviation of the loan LTV versus the mortgage country benchmark average[14], where the relationship between the adjustment and the original LTV is defined through a log-linear function to further stress larger LTV deviations;
- The seasoning of the loan [Effect: Positive] if the loan is fully amortising, aka neither complete nor partial bullet, where we assume a decrease of the distressed default rate, noted $Haircut_{Seasoning_i}$ directly proportional to the seasoning with a maximum to reflect the benefit of seasoning limited to the initial years of mortgage loans;
- The usage of the underlying property [Effect: Negative], commercial or investment (buy-to-let) will exhibit a higher default rate than standard residential, owner-occupied properties, where we would use a relative modifier, denoted Mod_{Usage_i} increasing the distressed default rate;
- A borrower/loan which previously was defaulted or is delinquent [Effect: Negative] will be stressed continuously in accordance with its performance history, including amongst others payment behaviour and seasoning in case of restructuring, either with a dedicated modifier or up to a point where typically a recently defaulted borrower/loan[15], would see a 100% distressed default rate;
- The interest rate type [Effect: Negative], fixed versus floating interest rate[16], where we would penalise floating rate loans proportionally to the difference between the pool share versus the country share or sub-market share of floating rate mortgages using a relative modifier, denoted $Mod_{InterestType_i}$ increasing the distressed default rate depending on the country. The modifier for fixed rate loans is 0.

The modifiers are country-specific, and the Country Addendums contain the assumptions or benchmark levels of those modifiers and their detailed computations.

Origination Adjustment

Finally, we apply an adjustment, denoted $Adj_{Origination}$, to all loans from the same originator capturing our origination assessment as described in Table 1. Such an assessment accounts for, among other things, the origination channel, the type of mortgage product offered, if different from the specific market standard, the targeted type of borrowers, or more generally any specificity of the underwriting standards.

This is a key element because past mortgage crises have evidenced a clear differentiation between originations in the affected countries. Such adjustments could be either negative or positive depending on our assessment of the quality of the origination versus the country standards. For example, the adjustment could be set at 100% if the originator has very lax standards, weak risk management and its loan book performance has shown larger sensitivity to the occurrence of a crisis versus its peers. The adjustment could be at zero if the origination does correspond to the country mortgage standards or the originator has a large market share in that country, or even be negative if the origination is better than the market standards or there exists a double underwriting process (see example of guaranteed loans on section 3.3.2).

The distressed default rate of the portfolio is defined as a weighted average loan-specific distressed default rate, with the following formula, using the current balance in percentage of each loan ($Balance_i$) as weight.

[13] Regional concentrations of two times the Benchmark Regional Distribution, as detailed in the Country Addendums, will be assumed to be the upper limits. The excess concentration will be computed as any positive deviation from such limits but only for the three largest regions.
[14] The term benchmark refers in this document to a number defined in the applicable Country Addendum.
[15] Not accelerated.
[16] Floating rates typically include all interest rate types that are not fixed rate for life.

Figure 2: Description of the computation of the DDR

Distressed **Default** Rate $= \sum_{i=1}^{n} Balance_i * LoanDDR_i$

$LoanDDR_i =$

- If previously defaulted → $stressed\ default\ probability_i$
- If borrower over-concentration → $stressed\ default\ probability_i$
- $\text{Country Distressed Default Rate} * Mod_{LTV_i} * (1 + Mod_{InterestType_i} + Mod_{Usage_i}) * (1 - Haircut_{Seasoning_i}) * (1 + Region\ Overconcentration\ Penalty_i)$
  - → Multiplied by (1+ Originator Adjustement)
    - → Capped at 100%

Source: Scope Ratings

The formula for the Distressed Default Rate computation can also be applied to sub pools in cases of different origination standards within the same securitisation.

5.2.1.3 Default timing

We derive a default timing assumption specific to the transaction, considering the characteristics of the securitised assets. We define as a central scenario a constant marginal default rate applied to the outstanding balance at each period, hence following the portfolio's scheduled amortisation. If deemed relevant e.g. due to specific structural features of the transaction or of the loans, we can also test more front-loaded or back-loaded default timing scenarios to assess the impact they could have on the transaction.

Each Country Addendum provides a standard assumption for mortgage loans' default timing, which we could modify depending by the historical default rate of the originator.

5.2.2 Recovery rate distribution

Alongside the default distribution, we define a recovery rate distribution to better reflect the stochastic nature of recoveries. We describe in this section the parametrisation of the recovery rate distribution and its relationship with the default rate distribution.

Our approach to define the portfolio recovery rate distribution relies on three pillars:

- We assume recovery rates follow a Beta distribution to reflect the bounded nature of recovery rates;
- The Base Case Recovery Rate defines the mean of the Beta distribution used;
- The Distressed Recovery Rate is the distribution's recovery rate whose probability of non-exceedance is equal to Scope idealised AAA default probability at 10 years (defined as 0.26%).

Appendix II provides more details on the recovery rate distribution and its relationship to the default rate distribution.

In the cash flow analysis, the instrument's expected loss is determined via a numerical integration of the losses under different simulations, weighted with their respective probability. For each simulated scenario, single assumptions for both a default rate and a corresponding recovery rate are defined. This incorporates a full dependency between default and recovery rates, where we implicitly apply decreasing recovery rate assumptions as the default rate becomes higher.

The presence of strong guarantees or mortgage insurance is taken into account for both the definition of the base case recovery rate and the Distressed Recovery Rate as defined under their relevant sections below, considering (i) the proportion of guaranteed/insured

loans; (ii) the review of the standard guaranty/insurance contract; (iii) the credit quality of the guarantors/insurers, defined as the public or private rating by Scope, or, in its absence, external ratings mapped to Scope's rating scale of either the entity itself or of its group; and (iv) the historical performance of guaranteed / insured loans, notably the stability of such performance. Each of the four elements listed above would give rise to a quantification allowing us to define the decreasing factor to the country specific haircut.

5.2.2.1 Expected behavior of the portfolio – Base Case Recovery Rate

The Base Case Recovery Rate can be defined either through (i) a statistical analysis of historical data or (ii) a fundamental analysis of the loan portfolio (see Appendix VII of the General Structured Finance Rating Methodology for a full description), in both cases enriched by a comparison with relevant transaction or country-wide recovery data. The standard approach is defined for each country in its respective Country Addendum.

If chosen, the statistical analysis needs to ensure consistency between the nature of the mortgage pool to be securitised and the historical data. If the fundamental approach is the chosen approach and only in that case, a minimum volatility of house prices is assumed leading to a maximum allowed value for the Base Case Recovery Rate at 95%.

The presence of strong guarantees or mortgage insurance can modify our Base Case Recovery Rate assumption if this is not reflected in the historical performance data provided or in the fundamental analysis.

5.2.2.2 Estimating the behavior under stress of the portfolio – Distressed Recovery Rate

The Distressed Recovery Rate is defined by applying a country specific haircut to the Base Case Recovery Rate, potentially modified by our assessment of the servicing if it differs materially from the country standard. Country Addendums provide details on the level of the country specific haircut.

If the information provided by the servicer is considered not to be representative or adequate (see also section 7), this should be factored in by stressing the full recovery rate distribution.

The presence of strong guarantees or mortgage insurance could lead us to decrease the country specific haircut used to define the Distressed Recovery Rate. Such decrease will be a function of the four factors ((i) to (iv)) described above. As an example, for a portfolio:

- fully guaranteed (proportion of guaranteed is 100% - see (i)),
- with fully adequate guarantee (strength of the guarantee is 100% - see (ii)),
- by a guarantor rated AA (credit risk of the guarantor would lead to an estimated efficiency of 60% – see (iii)),
- whose historical performance have exhibited resilient stability (low volatility of the guarantee effectiveness would lead to an estimated efficiency of 100% - see (iv)),
- we would use a dampening factor of the country specific haircut of 100%*100%*60%*100% = 60%, thus decreasing the country specific haircut by 60%.

If the historical performance of the guaranteed / insured loans does not show any difference versus the historical performance of the mortgage loans, our dampening factor will be null, thus keeping the country specific haircut unchanged.

5.2.2.3 Timing of recoveries

We use deterministic transaction specific recovery-timing assumptions, derived from historical data pertaining to the servicer of the transaction. When defining the timing of recoveries for a servicer, we will be mindful of the specific recovery processes and strategy put in place (see Table 2), all within the umbrella of a country-specific legal framework.

Each Country Addendum provides a standard assumption for mortgage loans' recovery timing, which we could modify based on our assessment of the servicer capabilities.

5.2.3 Prepayment assumptions

Prepayments are mostly driven by loan refinancing or property sales (due to e.g. moving, divorce, etc.). Expansionary monetary policy or increased bank competition[17] may result in a decrease of the refinancing costs favouring prepayments. In addition, regulatory changes

[17] Increased bank competition in an environment of easing bank lending standards would drive prepayment rates higher.

and country-specific laws or market practices lead to changes in prepayment penalties, costs which, in some cases, are zero even for fixed-rate mortgage loans.

We assume a medium constant prepayment rate for the full duration of the transaction as our base case. Such constant prepayment rate is defined primarily from historical data provided by the originator. If relevant, e.g. due to notes being largely dependent upon excess spread or loans characteristics, we may test lower or higher prepayment assumptions in the quantitative analysis.

Each Country Addendum gives country-specific low, medium and high prepayment rates benchmarks, which can be modified depending on the historical prepayment rate of the originator.

5.2.4 Revolving portfolio

Revolving transactions may introduce further risks to the transaction. The revolving nature of a portfolio will have consequences on (i) the pool characteristics, due to the potential reinvestments leading to a migration of the portfolio characteristics, and (ii) the cumulative losses experienced by the transaction before the pool's amortisation.

To address the portfolio migration, we assume potential changes in the key portfolio characteristics adjusted according to (i) the duration of the reinvestment period, (ii) the expected reinvested amounts, (iii) our assessment of the originator and its origination (the Origination Adjustment), and (iv) the eligibility and portfolio criteria to be maintained. An Origination Adjustment of zero combined with strong criteria and triggers would lead to an assumption of minimal portfolio migration.

To address the potential increase in the cumulative losses introduced by reinvestments, we assume the portfolio will experience defaults during the reinvestment period where the assumed loss levels consider (i) the duration of the reinvestment period, (ii) the expected reinvested amounts, (iii) the historical performance and (iv) the strength of the performance-based early amortisation triggers. A small expected reinvested amount would lead to no further losses to be assumed. Weak performance-based early amortisation triggers would lead us to assume losses in line with triggers.

We then analyse the amortisation phase of the transaction based on (i) the portfolio's characteristics migration and (ii) the assumed erosion of credit enhancement. We generally assess an expected portfolio from the point of amortisation and benchmark the instrument's expected loss against its expected weighted average life over the amortisation phase.

5.3 Cashflow and Structure analysis

We calculate losses on each note class by projecting the cash flow generated by the securitised portfolio, accounting for the transaction's structural features. For the asset side, section 3 outlines our main quantitative inputs, complemented by asset amortisation and portfolio yield assumptions. For the liability side, the main inputs are the priorities of payments, the size of the notes, expected coupons, transaction fees and expenses, any reserves covering liquidity or credit risk, any interest rate or currency hedging, any transaction triggers and, in some instances, a quantification of certain, identified counterparty risks.

We assume an aggregate of the level of senior costs, senior to the rated instruments, consistent with the standard within each country. Our analysis assumes increased senior costs versus the initial contractual arrangements, particularly to address servicer replacement at market-level fees. We generally assume that senior fees are a percentage of the outstanding portfolio amount, with a minimum amount. Each Country Addendum describes our assumptions regarding senior fees.

Our quantitative analysis determines the cash flows available for the tranches in each simulated scenario as well as the associated probability of that scenario. We then calculate both an expected loss rate and a weighted average life under a specific set of assumptions (prepayment, default timing, interest rate scenarios, and other where relevant) for each class of note, which are benchmarked against the levels in our idealised expected loss tables to obtain a model implied credit assessment as explained in our General Structured Finance Rating Methodology.

5.3.1 Liquidity risk

The risk that portfolio interest collections cannot cover the transaction's senior fees and the senior notes' coupons is generally mitigated by structural protection provided by cash reserves, or the ability to use principal collections. The minimum required liquidity support for ratings in the AAA or AA categories ranges between two and six months of the expected senior fees and interest on the notes in case of timely payment assessment. For investment grade ratings on senior notes in the A or BBB categories, a servicer disruption scenario is likely to have a lesser negative impact. At this level, our analysis can also incorporate the incentives in place and capabilities of a transaction party to provide additional liquidity to a transaction. Further details are to be found in the General Structured Finance Rating Methodology.

5.3.2 Exposure to interest rate risk

Interest rate risk is the risk that the interest rate payable on the rated instruments differs from the interest rate on the securitised assets. Such risk may stem from: (i) fixed-floating risk where the portfolio pays a fixed rate, whereas the rated instruments pay a floating rate (or vice versa), (ii) basis risk, where both the portfolio and the notes have a floating rate, but they are linked to different reference rates, and (iii) reset date mismatch, where both the portfolio and the rated instruments have floating rates linked to the same reference rate, but the reset dates are different.

To mitigate interest rate risks, the issuer may enter into a hedging agreement. We assess the main terms of the hedging agreement to determine how effectively the risk is mitigated. Unless fully covered, structurally or hedged, we would analyse the sensitivity of the transaction to extreme changes (upward or downward) in interest rates throughout the transaction life. We refer the reader to Appendix VI of the General Structured Finance Rating Methodology for further details.

5.3.3 Exposure to foreign exchange rate risk

Foreign currency risk occurs when the securitised asset portfolio is (partly or fully) denominated in a currency other than that of the rated instruments. Scope considers the impact of foreign exchange rate fluctuations on a rated instrument, on a transaction specific basis, typically by a haircut cash-flows exposed to the foreign currency. In addition, any foreign-currency denominated loans will be considered to be atypical and will require a specific analysis to define the appropriate Origination Adjustment.

We refer the reader to the appropriate section of the General Structured Finance Rating Methodology for further details.

5.4 Counterparty risk analysis

We evaluate how risks are linked between the rated instruments and the various parties to the transaction. We assess the materiality of a counterparty exposure as excessive, material or immaterial. We distinguish financial risk from operational risk and assess the transaction's ability to mitigate or reduce counterparty risk. Key risks for RMBS include servicer commingling, liquidity risk arising from servicer disruption or replacement, and set-off risk when borrowers hold deposits or other crossclaims with the originator.

For more detail, refer to our Counterparty Risk Methodology.

5.5 Legal risk analysis

Legal risks can arise from three main sources: i) the assets and the transfer of these assets to the special purpose vehicle; ii) the special purpose vehicle issuing the rated debt and its legal structure (e.g. bankruptcy remoteness); and iii) the transaction parties. We review legal opinions to gain comfort on assumptions regarding relevant legal issues.

For RMBS transactions specifically, we focus additionally on i) borrower protection statutes under laws governing the contracts; and ii) the validity of rights assigned to the issuer in an event of the originator's liquidation.

Further details can be found in our General Structured Finance Rating Methodology.

6. Complementary analysis

6.1 Integration of ESG factors into our analysis

We integrate environmental, social and governance (ESG) factors into our credit analysis. We incorporate the risks arising from a transaction's exposure to ESG factors as part of the analytical approach as described in this rating methodology. For each of those factors, their importance in the rating construct will be published in the Rating Action Release.

Environmental factors are considered in our analytical review of a transaction in so far as those do constitute risk factors that could modify the expected cash-flows. This is more important for RMBS than for other typical securitisation asset classes due to the long duration of the underlying assets and the physical nature of the underlying mortgaged assets. Environmental issues can be decomposed into (i) Physical Risks which are changes in both weather/climate or environment that would impact economies, and (ii) Transition Risks which are the societal changes arising from a transition to a low-carbon economy. Environmental factors are incorporated as per the description given in Appendix I.

Social factors are also considered in our methodology either within its core tenets or within the analysis of a specific transaction which may have a social purpose. We understand the notion of social risks to describe several different issues ranging from (i) the fundamental

dynamics of society as whole (demographics, income/employment distribution, …), (ii) the current household resilience (household indebtedness, social benefit), (iii) down to the specific transaction-related issue. Such social factors are incorporated into our analysis either within the definition of the country distressed default rate (see section 3.2.2) for points (i) and (ii) or within the Origination Adjustment analysis (see section 3.2.2) for point (iii).

Governance factors are both country- and transaction-driven. Country-driven because we believe that the institutional framework in which the mortgage market operates is key in defining the country distressed default rate (see section 3.2.2), ranging from the rule of law to the regulatory strength of the country. Transaction-driven because our analysis of the quality of the key counterparties (originator and servicer) and of their governance (see section 3.1) will be captured in our credit ratings.

6.2 Data adequacy

As outlined in our approach to define default and recovery rate distribution, representative data is key to our approach.

Standards of disclosure of mortgage loans differ depending on the country and the asset class. We verify the adequacy of the information received to enable a proper assessment of the risk factors of the transaction.

6.2.1 A standard portfolio data template

We do not use a proprietary portfolio template for RMBS portfolios. However, we welcome data that adheres to portfolio reporting standards set by the European Central Bank taxonomy, set by ESMA or by the Bank of England – as long as the information is relevant and sufficient for analysing the assets' risk characteristics. We can also work with templates that allow a comparison between the credit characteristics of portfolio assets and those in the originator's entire book.

6.2.2 Data checks

We judge the plausibility of the information we receive from the originators and other sources, even if we consider these to be reliable and accurate. We may request additional information or clarification from an issuer or its agents if the information conflicts with our assessments. These 'sanity checks' do not, however, verify the reliability and accuracy of information used in the rating analysis.

Agreed-upon procedures performed by reputable, independent auditors highlight differences between the data provided by the originator/seller that we use for our rating analysis and the original documents or computer files containing such data.

We believe that the reliability of information increases with the degree of the originator's alignment of interests with noteholders, and/or the independence, experience, of the parties providing information.

Conference calls and operational review visits also provide us with more details on the information received. We may review files to gain insight into the processes presented during the operational review visit or the assets being securitised.

6.3 Rating sensitivity

Our analytical framework for structured finance transactions is designed to result in rating stability for high investment grade ratings. Two mechanisms enable this: i) an asset default and recovery distribution representing a through-the-cycle view for the key drivers of credit risk (default and recovery); and/or ii) rating-conditional stresses for other drivers ()e.g. interest rates.

Our Rating Action Release illustrate the stability of ratings when shocks are applied to relevant analytical assumptions. Sensitivities to shifts in the default rate and recovery rate distributions illustrate to what extent and in which direction ratings depend on quantitative assumptions. Sensitivity test scenarios should not be interpreted as likely or expected scenarios for the transactions.

The table below shows the typical scenarios in the rating sensitivity test. Upon excessive sensitivity to key analytical assumptions, we may decide to lower a rating so that the rating stability is in line with our expectations for the assigned rating.

Typical sensitivity tests considered during the analysis

Analytical assumption tested	Shifts considered
Default rate distribution	Parallel shift by +50% of the base default rate
Recovery rate distribution	Parallel shift by -10 percentage point

6.4 Monitoring

We monitor RMBS transactions using performance reports such as those produced by the management company, the trustee, or the servicer. Standards performance reports should include data on the key risk metrics necessary for the monitoring of the ratings. The ratings are monitored on an ongoing basis and are reviewed once a year, or earlier if warranted by events.

The monitoring review focuses on the periodic reassessment of the portfolio remaining lifetime default distribution and other key analytical assumptions. As part of this process, we review observed performance metrics since closing – such as delinquency and default rates, recovery levels, and prepayments), alongside with portfolio seasoning and deleveraging. We also consider material developments in the macroeconomic and industry environment, including changes in interest rates or other factors that may affect the portfolio's risk profile.

Once we have recalibrated the portfolio's remaining lifetime mean default rate, we typically adjust the Distressed Default Rate by maintaining a constant distance to the mean. This implies that the Distressed Default Rate remains relatively stable, regardless of shift to mean expectations, which accounts for the risk the credit impairments could be revealed in a severely concentrated and backloaded fashion.

Even when updated and reliable loan-level information is available, we typically only reperform the loan-by-loan analysis to reassess the Distressed Default rate in cases where there have been material changes in the portfolio composition or regional and/or borrower concentrations since closing. This is because portfolio seasoning is already captured through observed performance analysis, and other loan modifiers, such as the origination adjustment, are typically considered as static inputs.

We also consider any updates to the transaction's liability structure and key counterparty exposures. The originator assessment is typically only revisit in transactions with long revolving periods. Legal analysis is generally not reassessed unless material changes in the legal or regulatory environment arise that could impact the transaction's performance.

Further description of the monitoring process can be found in our General Structured Finance Rating Methodology. Additional examples - beyond those outlined in the General Structured Finance Rating Methodology - for not re-running the cash flow analysis include: 1) key assumptions have not changed materially enough to affect model outputs since last analysis was conducted, and 2) a lack of new relevant information that would warrant re-running the cash flow model to assess the ratings. This reflects our view that cash flow model results are generally stable when portfolio characteristics remain consistent and there was no significant deleveraging of the transaction's capital structure.

Appendix I – Energy efficiency, climate risk and mortgage credit risk

Climate Change Risk (CCR) is a known unknown risk to any investments, either because of the direct consequences of a more volatile climate on physical assets or because of the associated regulatory framework. Unmitigated and material exposure to Climate Change Risk may impact the rating analysis and thus our assigned ratings.

Transition Risk

Transition Risk may be both an opportunity and a risk.

An opportunity for building showing strong energy-efficiency, both in terms of a potential reduction in default probability and resilience of their value confronted with CCR.

Climate change has required governments and regulators worldwide to find tools to reduce energy consumption. Buildings represent a large part of the overall energy consumption. A European research initiative, the Energy efficiency Data Protocol and Portal (European Mortgage Federation), has been set-up to raise awareness of the importance and benefits of mortgages on energy-efficient buildings.

The Energy Performance of Buildings Directive (EPBD) requires that the energy performance of a building be expressed by means of a primary energy consumption indicator. Energy performance certificates (EPCs) are issued on residential properties to be sold, let, or constructed. EPC labels range from A to G.

There has been increasing focus on the relationship between mortgaged property energy efficiency and default rates. Studies in different countries show that defaults are less frequent on mortgages against energy efficient properties, even when controlling for key variables such as loan-to-income ratios and borrower income. Explanations for this relationship could be either: (i) a positive selection on borrowers valuing the energy efficiency of properties or (ii) savings linked to energy efficiency that become available to service mortgage loans.

However, Transition Risk is a risk for building with the lowest energy efficiency class, notably due to the sensitivity of those building's price to CCR.

We consider in our analysis information on property energy efficiency, when available.

Physical Risk

Weather risk and climate change leading to catastrophic events, such as floods and wildfire, as well as earthquakes, may cause severe property damages, leading to loss of property value, lower mortgage borrowers' affordability, and thus negatively impact performance of securitisations.

First, we will assess the natural catastrophe risk to which the portfolio is exposed based upon both: (i) the geographical distribution of the underlying properties and (ii) public databases of known natural catastrophe risks (storms, earthquake, floods, wildfire, etc.). Second the potential mitigants will be considered such as insurance coverage or limited concentration in the riskier areas.

According to both (i) the materiality of the exposure and (ii) the quality of the mitigants, Physical Risk may have an impact on the rating analysis, leading to an adjustment of the recovery rate distribution.

Appendix II – Recovery rate distribution

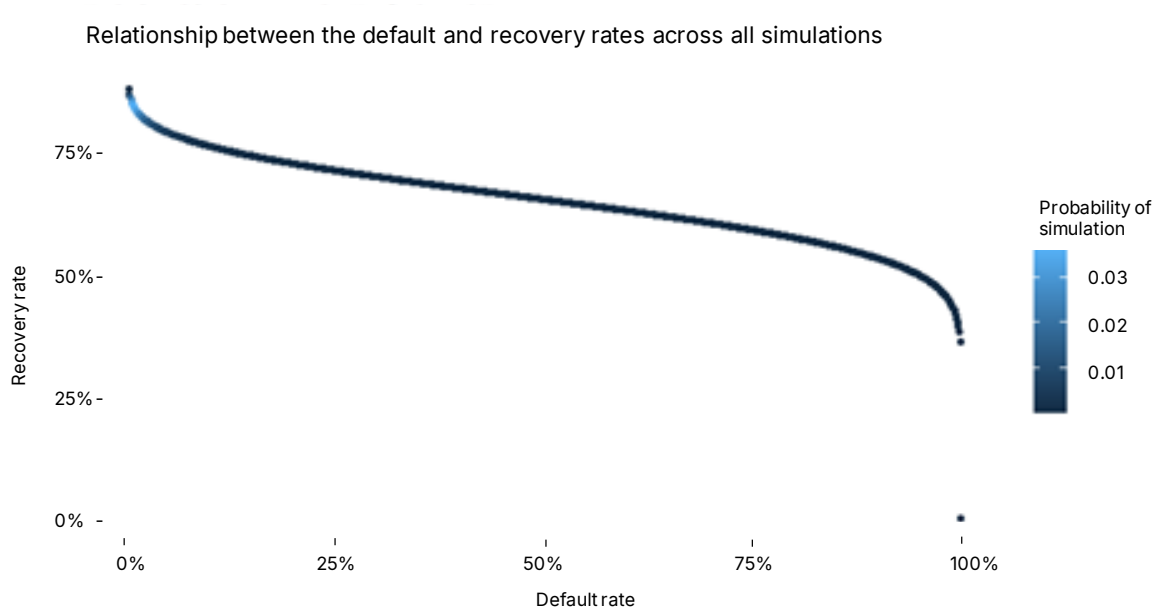
Our analysis of a portfolio of mortgage loans is assuming stochastic recovery rates for the defaulted loans. We incorporate within our overall framework a stochastic distribution for the average recovery rate on defaulted loans. The final recovery rate on a specific defaulted loan is exhibiting stochasticity due to either: (i) idiosyncratic risks (the nature of the recovery processes followed, the liquidity of the underlying collateral, etc.) or (ii) systemic risks (pressure on household budgets, rise of unemployment, house price index (HPI) decline).

On granular pools of mortgages, idiosyncratic risks are diluted away whereas systemic risks remain. Such systemic risks are driven by the same determinants as the default rate when in an economic crisis ('tail dependency').

Our proposed approach captures those stylised properties:

- The stochastic distribution of the recovery rate is defined as a beta distribution defined by its mean, being equal to the base case recovery rate and its distressed quantile[18] defined as the Distressed Recovery Rate;
- We assume full dependency between the recovery rate and the default rate distribution such that there exists a one-to-one relationship between recovery rate and default rate, as outlined in Figure 3 below.

Figure 3: Simulated default and recovery rates relationship



Source: Scope Ratings

Figure 3 depicts an example of the dependency between default and recovery rates where the negative correlation between the two is evident. The above example assumes: (i) a mean default rate of 3.5% and a distressed default rate of 31% and (ii) a mean recovery rate of 65% and a distressed recovery rate at 39%. Colour is used to represent the probability of occurrence of a specific simulation defined as the occurrence of the pair (default rate, recovery rate).

[18] The distressed quantile is defined as the recovery rate such that the likelihood of a lower recovery rate is equal to Scope's idealized AAA default probability.

Appendix III – Distressed Default Rate - example

The computation of the Distressed Default Rate is a key step of the methodology; thus, we present below the exact computation done for a specific example.

A standard portfolio

Country specific assumptions	**Value**
Country Distressed Default Rate	20%
Country Benchmark OLTV	75%
Country Benchmark floating rate loans	30%
Sensitivity to : Original LTV	0.9
Sensitivity to : Seasoning	5% per annum
Sensitivity to : Property usage	80%
Sensitivity to : Floating interest rate	60%
Origination Adjustment	**10%**
Portfolio Characteristics	**Value**
Number of borrowers	500
Borrower concentration[19]	0.2%
Regional concentration	Aligned with our benchmark concentration
OLTV[19]	80%
Seasoning[19]	2 years
Proportion of 'Risky' usage	0%
Proportion of 'Previously Defaulted' loans	0.6% - i.e. 3 loans all fixed for life
Proportion of floating rate loans	40%

We further assume that the portfolio is composed of two types of loans, either fixed for life or floating rate loans with the exact same characteristics corresponding to the weighted average of the total pool.

Intermediary	**Calculus**
Borrower overconcentration penalty	None as the maximum borrower concentration is 0.2%
Region overconcentration penalty	None as the portfolio is distributed in accordance with our benchmark regional
Mod_{LTV_i}	exp(0.9 * (80%-75%)) = 1.046
$Mod_{InterestType_i}$	60% * Max(0;40%-30%) = 0.06 for floating rate loans, 0 otherwise
Mod_{Usage_i}	80% * 0% = 0.0
$Haircut_{Seasoning}$	5% * 2 years = 10%

To compute the transaction Distressed Default Rate, we decompose the portfolio into three subsets: all fixed rate loans (300 loans), all floating rate loans (197 loans) and all defaulted loans (3 loans). Here three loans have been categorized as 'Defaulted' being in arrears for three months, for the purpose of the computation of the Distressed Default Rate, they will be assumed to have a stressed default probability of 100%.

Then, replacing those intermediary calculus in the final formula, and capping each at 100%, we do obtain:

[19] All loans are assumed to have the same balance, the same OLTV and the same seasoning in the example.

$$Distressed\ Default\ Rate$$

$$= \sum_{i=1}^{n} Balance_i * \min\{1; (1 + Adj_{origination}) * \\ * \text{ifelse}[\text{Previously defaulted}; 100\%; \text{Country Distressed Default Rate} * Mod_{LTV_i} * (1 + Mod_{InterestType_i} + Mod_{Usage_i}) \\ * (1 - Haircut_{Seasoning_i})]\}$$

$$= (1 + 10\%) * \sum_{i=1}^{297} 0.2\% * 20\% * 1.046 * (1 + 0 + 0) * (1 - 10\%) + (1 + 10\%) * \sum_{i=301}^{500} 0.2\% * 20\% * 1.046 * (1 + 0.06 + 0) * (1 - 10\%) \\ + \sum_{i=298}^{300} 0.2\% * \min\{1; (1 + 10\%) * 100\%\} = 21.68\%$$

Appendix IV – Country Addendum Description

To capture accurately the idiosyncrasies of each sovereign jurisdiction regarding its mortgage market, our RMBS Methodology is completed with Country Addendum which provide parametrisation to our overall architecture. We describe here the key building blocks of our parametrisation.

Base case default rate (see section 3.2.1)

We define for each country the preferred set of information needed to define our base case default rate. If required, we provide the terms and sensitivities of our Scope Generic Scoring Algorithm.

Distressed Default Rate (see section 3.2.2)

This section presents the parameters required to compute the Distressed Default Rate of a transaction: both the country specific distressed default rate and the value of the different loan modifiers. Additional elements pertaining to the mortgage market description (benchmark original LTV and benchmark proportion of floating rate mortgage loan) are given under that section too.

Recoveries (see section 3.3)

We define for each country the preferred set of information needed to define our base case recovery rate. To compute the required parameters of the recovery rate distribution, the recovery rate assumptions for the Distressed Recovery Rate haircut is given. In addition, an indicative recovery timing is published.

Prepayment (see section 3.5)

The annual prepayment rate benchmarks (low, medium and high) for the respective country are described under this section.

Structural assumptions (see section 4)

Additional parameters relevant for the transaction structural modelling are also published in that dedicated section, like our standard senior fee assumption.

Benchmark Regional Distribution (see section 3.2.2)

Our benchmark regional distribution, used to penalise any regional over-concentration are detailed under that section for each NUTS1[20], or equivalent, regions of the country.

[20] The European Union has established a common classification of territorial units for statistics, known as 'NUTS', to facilitate the collection, development and publication of harmonised regional statistics in the EU. NUTS level for an administrative unit is determined on the basis of demographic thresholds, with NUTS1 units having in between 3 to 7 million inhabitants.

Contacts

Olivier Toutain
Executive Director
+33-1-82-882-356
o.toutain@scoperatings.com

David Bergman
Group Managing Director
+39-02-30-315-838
d.bergman@scoperatings.com

Antonio Casado
Managing Director
+49-30-278-91228
a.casado@scoperatings.com

Davide Nesa
Senior Director
+39-02-3054-4989
d.nesa@scoperatings.com

Paula Lichtensztein
Senior Representative
+49-30-27-891-224
p.lichtensztein@scoperatings.com

Benoit Vasseur
Managing Director
+49-69-667-738-940
b.vasseur@scoperatings.com

Scope Ratings GmbH

Lennéstraße 5, D-10785 Berlin
Phone: +49 30 27891-0
Fax: +49 30 27891-100
info@scoperatings.com

Scope Ratings UK Limited

52 Grosvenor Gardens
London SW1W 0AU
Phone: +44 20 7824 5180
info@scoperatings.com

Bloomberg: RESP SCOP
Scope contacts
scoperatings.com

Disclaimer