Creditreform Rating AG Rating Methodology

RMBS Ratings

Creditreform Rating

Neuss, 22 January 2024
Version 1.0

Creditreform Rating

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1 Introduction

In this document, Creditreform Rating AG ("CRA") discloses its rating methodology for the rating of residential mortgage-backed securities ("RMBS") to provide the parties involved, investors and the wider public with the opportunity of developing a deeper understanding of the mechanisms behind its ratings. This document will be regularly updated to reflect any changes in our methodologies and approach. The CRA rating methodology and Code of Conduct can be freely accessed on our web page (www.creditreform-rating.de).

An RMBS transaction is a financial arrangement that securitises residential mortgage loans, typically originated by banks, mortgage lenders, or other financial institutions, and uses the loans as securities for investors. This enables financial institutions, such as banks and mortgage lenders, to acquire capital for further lending activities. The mortgage pool is subsequently transferred to a special purpose vehicle ("SPV"), a distinct legal entity formed solely for the purpose of the transaction. The SPV issues securities that are backed by the cash flows generated by the mortgage pool.

The cash flows generated by the mortgages, comprise principal and interest payments made by homeowners and are used to compensate investors holding the RMBS securities. The payments flow through the tranches in descending order of seniority. To provide a level of protection to investors, RMBS transactions often include credit enhancement mechanisms. These mechanisms may include over-collateralization (adding more loans to the pool than the value of the securities issued), reserve funds and insurance.

CRA performs RMBS ratings by considering all accessible and relevant information to quantify the associated risks. CRA conducts its ratings by applying a rating methodology that combines quantitative and qualitative approaches.

RMBS ratings represent well-informed assessments of an issue's credit quality. They do not represent a recommendation to purchase, sell or hold financial instruments. Neither are they legal opinions, and they provide no independent valuation of the future market values of individual assets and/or investments in the issuer's possession.

2 Rating indication and process

2.1 Rating indication

The CRA RMBS rating methodology serves as a general framework for the rating of RMBS programs. Specific jurisdiction- and program-specific extensions and modifications of the rating approach outlined here will be based on an evaluation of relevant facts (i.e. legal framework assessment, asset class specification, structural features etc.) and will be referenced in a particular rating report.

The rating process aims to efficiently and consistently arrive at a reliable and appropriate risk assessment. The approach focuses on the objective of ensuring the quality and integrity of the rating process, avoiding conflicts of interest, and maintaining consistency in our decision-making process.

A team consisting of at least two rating analysts is responsible for the RMBS rating. This team of analysts is the contact for the client throughout the entire rating and subsequent monitoring processes. All data obtained by CRA is treated by the agency with confidentiality. The final authority for the rating assessment is a rating committee.

CRA uses the following rating scale for its structured finance ratings. As the rating system for structured finance (which, among others, includes RMBS) differs from the one used for bond and corporate ratings, structured finance ratings will be subscripted with the suffix “sf”.

Rating category	Rating	Assessment
AAA sf	AAA sf	Highest level of credit quality, lowest investment risk
AA sf	AA+ sf	Very high level of credit quality, very low investment risk
	AA sf	
	AA- sf	
A sf	A+ sf	High level of credit quality, low investment risk
	A sf	
	A- sf	
BBB sf	BBB+ sf	Highly satisfactory level of credit quality, low to medium investment risk
	BBB sf	
	BBB- sf	
BB sf	BB+ sf	Satisfactory level of credit quality, medium investment risk
	BB sf	
	BB- sf	
B sf	B+ sf	Moderate level of credit quality, increased investment risk
	B sf	
	B- sf	
C sf	CCC sf	Low level of credit quality, high or very high investment risk
	CC sf	
	C sf	
D sf	D sf	Insufficient level of credit quality, total loss of investment
NR	Not Rated	Rating temporarily suspended, i.e. liquidation in process

2.2 Data requirements and preliminary analysis

Initially, CRA evaluates securitization structure, collecting information on economic, business, and legal environment. The originator must provide documents and loan-level data, including details on collateralization of receivables. CRA seeks data on transaction parameters, pool composition, and historical performance, including fund usage, downstream structure, and default and loss statistics of similar portfolios, preferably in static vintage format. If the data is inadequate, CRA may use proxy data for extrapolation. The review encompasses both the collateral pool's structure and the historical performance of analogous pools.

Additionally, CRA examines information about the transaction's originator, servicer, and other counterparties. Documents provided undergo plausibility checks, and legal opinions are requested when necessary.

2.3 Management meeting

The management meeting serves to explain and supplement the information presented and is held with the attendance of the arranger and other relevant parties to the transaction. Both qualitative and quantitative factors are discussed. The assessment focuses primarily on the allocation of responsibilities, operational procedures, organizational structure, the credit standing of the parties relevant to the transaction, historical track record and performance, as well as on the tools and capacities necessary for portfolio management, servicing, debtor management and work-out processes. The quality of collateralization as well as debtor protection in the context of the rules and contracts for mitigation of the risk involved in complex, multilevel RMBS securitization transactions are discussed, as are planned hedging instruments, external credit enhancements and loss or liquidity reserves. Where the rating is unsolicited, there may be no management meeting.

2.4 Rating committee

In a rating committee, the results of analyses are presented and a rating decision is made, taking into account the results of the quantitative and qualitative analyses. The rating is subsequently published according to the classification and commissioning of the rating as “private” or “public”. Ratings with a regulatory background must be commissioned as “public”. They do not necessarily need to be made publicly available but will be disclosed to the ESMA authority.

3 Rating methodology

A rating for an RMBS securitization consists of several analytical steps. In addition to examining structural, legal/regulatory and operational risks, it includes in particular an analysis of the credit quality and the risk of the loan contracts in the portfolio to be securitized. The information and assumptions drawn from the analyses will be subjected to various stress scenarios in a cash flow model to examine the stability of the transaction under circumstances of economic stress. Details specific to the transaction such as revolving periods, trigger events, internal and external credit enhancements, swaps, etc. are taken into consideration. The results of the cash flow studies are subsequently condensed and included in the rating assessment.

The SPV invests the funds raised through the issuance of financial instruments in the purchase of the originator’s mortgage loan receivables. In the case of a “true sale”, the SPV becomes the owner of the receivables with rights of disposal. The servicer monitors the cash flow management and debt collection as well as the workout in the event of a delayed payment or default on the part of a debtor. The servicer subsequently transfers the cash flows to the SPV. If the transaction is managed by trustees, they will

scrutinize cash flows in the interest of the investors and will usually hold the accounts. Investors receive cash flows as specified in the transaction's terms and conditions in the form of interest and redemption. Financial instruments are usually structured in tranches, serviced and ranked as senior/subordinate based on cash flow according to a predefined priority order.

3.1 Transaction features and structural risks

3.1.1 Legal considerations at the issuer level

CRA will review the risks related to the transfer of the receivables to the issuer and the issuer's legal structure. Among other things, we examine the following key questions:

- Is there a "true sale" transfer of the pool of assets from the originator to the SPV?
- Does the structure ensure "ring-fencing" of the issuer's assets?
- Can the SPV be considered bankruptcy-remote (i.e., will its contracts contain appropriate "limited recourse" and "non-petition" provisions)?

Our understanding of the presence and effectiveness of such structural characteristics will inform the subsequent quantitative analysis. Note that our inspection concentrates on the transaction documents, including the term sheet, prospectus, related contracts, and related legal opinions and documents. These documents are typically prepared with the involvement of specialized lawyers. CRA forms an opinion on them, but no additional legal examination will be conducted. If any potential risks related to the transaction's legal structure become apparent, the analysts will include them in their assessment. However, it is important to note that such statements do not constitute a legal opinion of CRA. In conjunction with transaction-specific legal risks, we also assess regulatory risks more broadly. That assessment informs our issue rating.

3.1.2 Credit enhancement

Credit enhancement is crucial in RMBS transactions and varies in form. The following section covers common features but is not exhaustive. CRA will also analyse any additional credit-enhancing mechanisms in a transaction for their performance impact.

As stated in the introductory chapter, this methodology applies to transactions that are structured in the sense of incorporating subordination. When the assets exceed the outstanding amount of a specific class of notes by virtue of subordination that provides some protection for that particular class against losses on the assets. Related sources of credit enhancement include over-collateralization, reserve funds (such as liquidity reserves or first loss reserves), and account pledges (for instance, through a letter of credit).

The excess spread refers to the yield of the pool of assets exceeding the ongoing interest expenses on the notes plus other associated costs. Excess spread may sometimes support a transaction and mitigate

cover cash-flow shortfalls attributable to losses on the asset portfolio. CRA will carefully model the extent to which the rating object can rely on excess spread in different scenarios: Among other factors, prepayments as well as pro-rata features in the waterfall may cause excess spread to leak out of the transaction.

3.1.3 Order of priority

Generally, transaction documents carefully delineate how available distribution amounts will be allocated to interest and redemption payments on various classes of notes as well as to other obligations of the issuer (e.g., taxes). CRA will review the relevant provisions carefully, given their significant impact on assumptions and settings made for the quantitative cash flow model. In many transactions, the seniority of one class of notes over another may not hold in every state conceivable. Instead, in some state, redemption payments may be sequential, while in others, they may be pro-rata. Triggers, as discussed in more detail below, are a tool used to control and alter the order of priority.

3.1.4 Trigger

Triggers define events, which alter the priority of payments. The event is often defined in reference to a given threshold. For example, a specific cumulative default ratio at a certain payment date could constitute the threshold, which, if the actual ratio exceeded, constitutes a trigger breach.

Well-designed triggers reduce the requirements for additional collateralization mechanisms as well as the risk involved in the transaction. Determining the extent to which a trigger serves to protect investors from a deterioration of the quality of the asset pool is therefore clearly relevant to the rating process. Further examples of trigger events include a decline in the credit standing of the originator or servicer, a breach of contractual obligations (covenants), the deterioration of existing collateral (credit enhancement), liquidity reserves below predefined limits, and delinquencies and receivables terms (i.e., remaining maturities) exceeding given values.

The consequence of a trigger breach varies among transactions. In RMBS transactions, the breach of a performance-based trigger (such as the cumulative default ratio trigger in the example above) may occasionally result in a switch from pro-rata to sequential amortization. Instead, if a counterparty fails to maintain a specified credit rating, it might constitute a breach that triggers a collateral requirement or a replacement of the counterparty.

CRA thoroughly examines triggers and their effects, incorporating them into quantitative analyses.

3.1.5 Eligibility criteria

Transactions with a revolving period or prefunding will most likely involve eligibility criteria. The parties to the transaction initially agree on the quality criteria that aim to define limitations to the purchase of receivables from loan contracts regarding particular characteristics, thereby significantly affecting the risk profile of the receivables pool. Additionally, concentration limits related to the total portfolio can be defined, which must be complied with during the transaction's term.

The seller must adhere to eligibility criteria, guaranteeing compliance when adding new receivables to the portfolio. Typically, the seller compensates for any breaches by either repurchasing non-conforming receivables or providing a suitable substitute or remedy. Non-compliance, such as deteriorating values in the existing portfolio, can trigger events like early note redemption. These criteria aim to reduce risk from an investor's perspective.

Generally, eligibility criteria relate to maturity and tenor of the loan, exclusion of delinquent loans, the absence of defenses, the court of jurisdiction and legal framework, status and enforceability of the receivables, priority of mortgages (mostly first-priority mortgages), residence type, limits for individual debtor concentrations, geographical concentrations, loan-to-value ("LTV") or debt-to-income ("DTI") limits, compliance with the originator's underwriting guidelines, interest rates, and profit margins for the individual loan contracts in the portfolio, balloon payments related to the financing amount, or historically low delinquency levels on receivables.

In analysing a transaction's structure, CRA evaluates the eligibility criteria and portfolio restrictions for their risk-mitigation impact. These criteria also feed into the empirical analysis to establish base assumptions, often setting minimum thresholds for these parameters.

3.1.6 Revolving period

RMBS securitizations typically have a revolving period for purchasing receivables, during which redemption payments to investors are often reduced or omitted. This reinvestment is contingent on new receivables meeting specific criteria to prevent credit quality decline in the receivables portfolio (refer to "Eligibility criteria" section). To mitigate these risks, certain trigger events are defined. CRA's quantitative cash flow model accounts for the revolving period, as it can impact the weighted average life (WAL) and periodic interest and redemption cash flows. This, in turn, affects credit enhancements and tranche stability against defaults and losses.

3.2 Counterparties and operational risks

3.2.1 Originator and servicer

The originator — usually a bank or other financial institution — is the initiator of the underlying RMBS securitization. He sells the receivables to the issuer for refinancing purposes. For CRA, the underwriting standards of the originator are a key characteristic. Acceptance and quality criteria that need to be met by the underlying loan contracts, documentation requirements, and scoring processes are examined and included in the rating. It is worth noting that our assessment of the originator serves a dual role. For one, it is relevant to our portfolio analysis (e.g., credit risks are sometimes related to the origination channel and underwriting policies). For another, it helps us uncover potential counterparty risks (e.g., to gain insights into the likelihood of issues with regulatory compliance or failures concerning representations and warranties). Additionally, it aids in identifying potential counterparty risks, such as regulatory compliance issues or failures in representations and warranties.

The servicer is responsible for managing and processing payments from receivables in the portfolio. Typically, the servicer is the same as the originator. In addition to the servicing processes and receivables management, the human and technical resources constitute important aspects of CRA's due diligence. The servicer carries out the administration of the receivables, in particular the management of cash flows, debt collections, management of delayed payments, and, if applicable, collateral repossession. The assessment of servicer operating risks also takes into account the type of payment and debt collection and capacities of cash management, as well as an assessment of the capacity of IT systems involved in debtor management and the quality of internal controlling. Valuable indications related to future performance can be derived from historical data regarding servicing performance and by examining business practices.

The ability of the servicer to effectively handle charge-offs, collections, repossessions, etc. directly affects the losses on the pool of securities. Furthermore, a servicer's default during a transaction may have undesirable consequences for the transaction. First, following a servicer default, the forwarding of cash flows from the pool of receivables to the issuer may be delayed. That might pose a challenge from a liquidity perspective. Second, and more importantly, a default of the originator-servicer may give rise to set-off or commingling risks, or both, as discussed in the following.

If CRA considers the servicer to be below average in servicing standards and practices or its creditworthiness, it will thoroughly evaluate if plans to mitigate a servicer default are in place (e.g., the existence of a substitute servicer).

3.2.2 Set-off risks

Set-off refers to the legal process of netting financial claims and obligations between two or more entities, either of which may be a business or a person. Within the context of RMBS securitizations, a situation in which set-off can occur is when the debtor of a purchased mortgage loan receivable holds deposits with the originator-servicer. If the originator-servicer defaults, the debtor may be able to declare a set-off of his claim against the originator-servicer versus his liability from the mortgage loan, in turn reducing the outstanding principal amount of the purchased mortgage loan receivable.

In evaluating set-off risks, CRA will take into account the likelihood of the originator defaulting, mitigating structural features such as a set-off reserve account (if present), and the pertinent legal environment.

3.2.3 Commingling risks

Following the sale of the receivables to the issuer, the servicer typically continues to receive collections on the receivables in its bank accounts. These funds are subsequently passed on to the issuer as part of the regular business process. However, following the bankruptcy of the servicer, it is conceivable the funds collected on behalf of the issuer are not transferred but commingled with the insolvency estate of the defaulted servicer instead. CRA will assess such commingling risks, taking into account the likelihood of a servicer bankruptcy, potential mitigating structural features, as well as jurisdiction-specific legal aspects.

3.2.4 Other counterparty risks

In addition to the analysis of counterparty risks related to the originator and servicer, CRA assesses the creditworthiness and experience of the swap counterparties, collateral providers, appointed account banks, and trustees. Here, CRA examines all dependencies between the parties involved. Counterparty risks arising, e.g., due to the provision of derivatives, credit lines, or financial guarantees constitute risks beyond the credit risk of the pool of receivables. The solvency and credit quality of parties involved in the transaction such as account banks or guarantors, insurance companies, swap counterparties, and trustees are therefore reviewed in the context of the rating process.

3.3 Asset analysis and credit risks

To determine the credit quality of the underlying, CRA evaluates both current and historical data (aggregated or at loan-level, macroeconomic- and issuer-specific performance data) while taking into account the eligibility criteria. We seek to understand the collateral characteristics of the pool that shape the magnitude and pattern of defaults and loss severities. Several quantitative and qualitative parameters of the portfolio are derived from data, such as its granularity, levels of prepayments, credit enhancements such as LTVs or, if available, additionally also DTIs, exposure to interest and FX risk,

geographical concentration, employment status of the borrower, delinquency rates, seasoning and remaining terms, etc. CRA then derives rating-specific assumptions on expected default rates, recovery rates, and prepayments and calculates the expected loss of the portfolio over its life. The findings of the analysis concerning the qualitative and quantitative factors serve as input for the subsequent cash flow analysis (see also section 3.4).

In our preliminary data request, we expect an appropriate data history about defaults, delinquencies, dilutions, etc. The evaluation of the historical data concerning asset and credit quality and portfolio performance is carried out considering that the quality of the data obtained is sufficient. In addition, if the data is comparable with individual or portfolio's planned future investments, the evaluations based on this data can be used to derive the base case assumptions. CRA will use comparative data drawn from a variety of sources if sufficient manager or originator-specific data is not available.

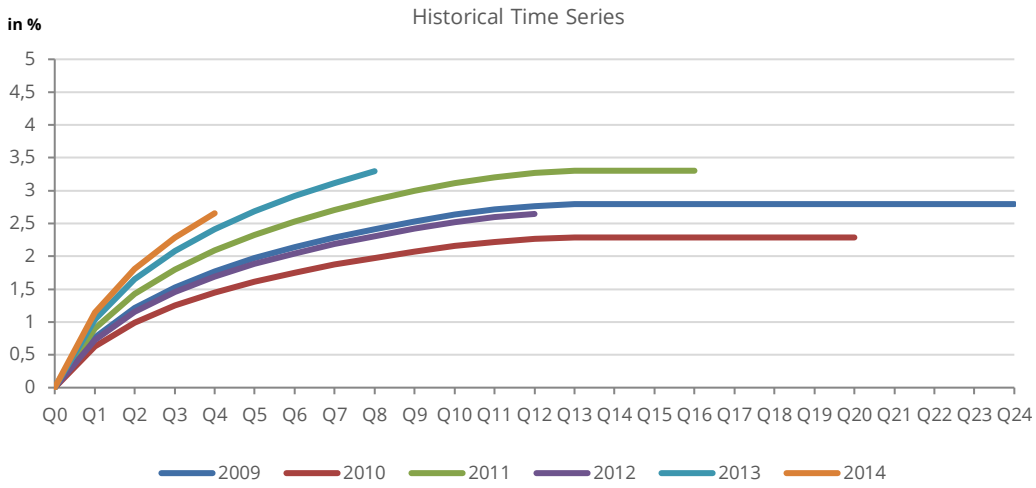
3.3.1 Portfolio performance analysis

The evaluation of the historical performance of assets and collateral enables us to derive default and recovery assumptions, the extrapolation of expected trends, and the construction of base cases, which shall serve as input parameters in the course of further quantitative analyses.

Historical performance data is usually provided in the form of static pools ("vintages"). These are related to a specific date and are often provided on a monthly or quarterly basis. Static data sets are particularly suitable for forecasts for the performance of new portfolios or similar assets.

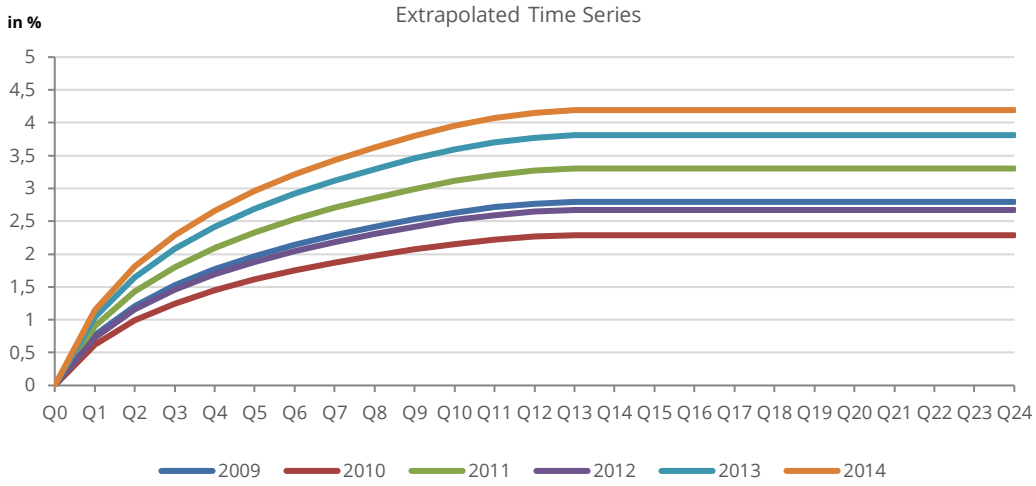
The following chart shows a static data set in vintage form, plotting the amount of defaulted loan contract volumes in relation to the total originated volume over time. Time series from younger vintages are correspondingly shorter because the loan contracts have a shorter history.

Figure 1: Example historical time series vintage curves| Source: CRA



In case that complete data series are not available, the missing periods need to be extrapolated. Extrapolation occurs by examining the average change in the cumulative default rates for similar asset pools. On occasion, CRA may deem the data it received to be insufficient. This may be the case when (i) the product under review is new and no predecessor product exists; (ii) the characteristics of a product have changed to such a degree that historical data is of little value; or (iii) the documentation of the data is missing or defective. In such cases, CRA may augment the data it received with data from other sources (e.g., CRA-internal data or data from similar transactions). This would result in assuming the same structure for all years. The expanded data set is depicted as follows:

Figure 2: Example extrapolated historical time series vintage curves| Source: CRA



When extrapolating historical data, it is essential to control for exogenous factors in the calculation. In addition, existing volatilities and differences in trend may be enhanced by this process, with the result that individual years, in particular more recent ones, may differ from the average. CRA examines the causes for divergences of this nature and integrates the results of the analysis in the rating.

The average of extrapolated cumulative defaults from the static pool of mortgage loans is a starting point for the derivation of the **default rate's** base case assumption. In deriving the base case, CRA considers both the average seasoning and average maturity of the portfolio. Taking into account the residual maturity profile of the portfolio, CRA determines an annual default rate. Subsequently, CRA may adjust the base case, thereby taking into account trends, differences in the composition of the pool, asset age, changes in servicing standards or underwriting criteria, as well as potential changes in exogenous factors such as the general economic environment. These adjustments are further elaborated in "Appendix: Adjustment of assumptions".

Assumptions concerning the expected **recovery rate** are derived by analyzing the LTV distribution of the securitized portfolio. CRA assumes that if the debtor defaults, repayment of the loan will depend on the ultimate realization of the collateral. The higher the LTV, the lower the expected recovery. In addition, CRA will evaluate historical and statistical recovery data sets where these are available. Furthermore, the general economic cycle to which the data refer needs to be considered to avoid an over- or underestimation of performance with the current economic cycle. Likewise, the specific definition of default, the length of recovery processes and the quality of servicing must be taken into account. Specific criteria for the adjustment of base assumptions are described in greater detail in "Appendix: Adjustment of assumptions".

Prepayments enter our model in the form of a constant prepayment rate ("CPR") that is applied to the portfolio in each period. In some jurisdictions, debtor protection laws limit the fees and penalties that can be imposed on the debtor in case of early repayment. Such legal norms may contribute to relatively high prepayment rates in the asset class. Whenever a prepayment occurs, typically some excess spread is lost, which may be detrimental to the credit rating. On the contrary, prepayments reduce credit exposure, which may have a positive effect on the rating result. Assuming an underlying statistical distribution, CRA determines the base case prepayment rate from historical data, which is often available on a monthly basis.

In a separate analytical step, CRA will examine the portfolio structure concerning concentrations, the existing ageing schedule (the empirical distribution of payment arrears), as well as historical default and dilution rates. For instance, pools with geographical concentrations tend to be more strongly affected by regional economic shocks. Balloon payments and final instalments should be examined here with regard

to their maximum value proceeds and/or coverage. The findings from that step serve as input to our quantitative analysis.

3.3.2 Interest- and FX risk

The cash flows available to RMBS transactions may be sensitive to fluctuations in either interest rates or foreign exchange quotes. Interest rate and currency mismatches typically arise when portfolio assets and note tranches have different interest rates, durations, or currency denominations. FX risks emerge with currency mismatches between RMBS transaction assets and liabilities and may lead to a reduction of available cash flows. Movements in interest rates can pose a risk when significant differences between assets and notes exist, either because of a fixed vs. floating mismatch or because of duration gaps between assets and liabilities. Depending on the particular conditions, interest rate risks will materialize in rising or falling interest rate environments.

CRA will assess stress scenarios by considering particular parameters (e.g. specific curve tenors, or FX volatility) and will base its analysis on prudent assumptions concerning stressed movements in interest and FX rates to incorporate the results in its cash flow model. The FX and interest rate risk breakdown serves to enhance the cash flow model by providing a consistent analysis to appraise economic stress events. The assessment approaches for Interest rates and FX stresses are presented in “Appendix II: Interest rates and foreign currency stress”.

3.3.3 Exposures resulting from legal rights of the obligors

CRA will take into consideration to what extent debtors have taken out payment protection or residual debt insurance. Such insurance has the potential to stabilize interest or principal collections. However, high-quality historical data should reflect that. Therefore, we generally do not explicitly model such insurance quantitatively. However, in case we form the opinion that insurance among obligors is of particular importance —under the relevant jurisdiction — we will account for their effect qualitatively.

Legal rights and obligations of the transaction parties may result in legal risks other than those discussed in sections 3.1.1 and 3.1.5 above. In the context of RMBS transactions, there are four areas we would like to highlight, as those are relatively common and relevant to multiple jurisdictions.

First, amendments to debtors’ protection laws or current court decisions may sometimes interfere with the issuer's financial claims vis-à-vis the obligors, hence posing a legal risk. Second, there may be a risk that a purchased receivable does not exist or ceases to exist. CRA reviews if the transaction documents provide policies on the issue (e.g., stipulations on indemnification claims against the seller). Third, we inquire if there are General Data Protection Regulation (“GDPR”)-related risks material to the transaction.

Fourth, we investigate whether legal norms related to linked credit agreements result in risks for the issuer.

Please note the same disclaimer as in section 3.1.1 above applies. CRA forms an opinion on the legal framework, which may be explained in our rating report. However, these opinions do not constitute legal advice.

3.4 Cash flow analysis

Based on the analysis of the transaction structure, the cash flow model includes the specific characteristics of the respective RMBS securitization such as costs and fees, interest rate and repayment structure, existing credit enhancements (reserves, excess spread, etc.), tranching, triggers, as well as the order of priority. The aim is to replicate all relevant mechanisms, thus cash flows generated from the assets with regard to the payment obligations of the issuer can be examined in detail. To conduct a rating, CRA will introduce specific stress factors providing different rating scenarios in order to study the stability of the cash flows and to assess the risk of incomplete payment of investors' entitlements within the different tranches.

3.4.1 Stress factors and rating scenarios

Based on the findings of the Portfolio Performance Analysis we derive stressed assumptions on default rates, recoveries and prepayment rates, whose combination of stress factors constitutes a rating scenario. The 2.1rating scenarios vary according to the respective stressed assumptions, and applied stresses increase in higher rating scenarios.[1] Using the stressed assumptions, the rating relevant loss rate is determined, which will serve as input for the subsequent cash flow analysis.

To determine rating-relevant default rates, CRA exploits the fact that a relatively high degree of granularity is a typical characteristic of real estate portfolios. CRA will typically estimate credit risk in granular pools using a Large Homogeneous Portfolio (“LHP“) approach to derive the default distribution of the portfolio at the relevant time horizon. Under the LHP assumption, there are two relevant input parameters to estimate the default distribution: (1) mean asset probability of default and (2) asset default correlations at the relevant time horizon.

[1]Stress factors serve to represent phases of economic downturn and correspond to the risk of performance remaining below the base assumptions. Stress factors are calibrated under the premise that the corresponding rating scenarios and the expected default rates associated with them will be according to the empirically observed distribution of default in the respective rating category.

Applying the derived base case assumptions for the portfolio, the rating-specific portfolio cumulative default rate is derived by using the Vasicek approximation to LHP default rates. Thereby CRA assumes a conservative asset default correlation of 15% on residential credit portfolios, which is in line with BASEL II IRB Risk Weight Function[2]. However, CRA may adjust this assumption based on particular jurisdictions and concentrations (i.e. industry, geography etc.). Another important component taken into account when deriving the rating default rates is the weighted average life of the transaction pool. While the actual remaining maturity may be higher on average, CRA sets the maximum horizon for default assumptions at 15 years.

To derive rating-specific recovery rates, we estimate portfolio LGDs, primarily based on house price indexes ("HPI") and adjusted by quick sale factors and LTVs. HPIs are country-specific, reflecting residential property price trends. We use stochastic time series processes, like ARIMA, to derive property-level haircuts from indexed values of residential and commercial properties for respective countries.

The computed weighted average LGDs are then adjusted to LTV distributions and the weighted average maturity of the pool, provided by the issuer. A maximum loss horizon of 15 years is also defined here by CRA. Finally, the weighted average rating recovery rate ("RRR") for a given rating scenario is estimated using the formula (RRR = 1- LGD).

In the absence of further disaggregated data, CRA will make use of public information, i.e. historical development of the real estate market and mortgage price indices, other macroeconomic data and market studies to derive country-specific base-case assumptions and reasonable recovery stresses, including assumptions about foreclosure and asset-sale costs.

In some cases, analysts exercise analytic judgment and determine stress factors based on qualitative criteria. These criteria will be explained and their usage justified in the rating report. The actual stress factor applied may therefore differ from the values that have been determined quantitatively. Qualitative factors particularly important in the context of RMBS transactions include:

- quality of the historical data provided
- stability of servicing and underwriting standards
- quality and performance of the hedging instruments in relation to the economic cycle
- Revolving periods
- level of delinquency and default rates (both in absolute terms as well as relative to economic activity).

[2] An Explanatory Note on the BASEL II IRB Risk Weight Functions (July 2005)

Such qualitative factors — along with our rating definitions — may lead us to choose lower or higher stresses (further details are provided in the Appendix: Adjustment of assumptions). The determination of stress factors is subject to diligent assessment and approval by the rating committee.

A tranche passes a specific rating scenario if its cash flows fully and timely cover interest and redemption payments.

The scenario-specific default and recovery rates are computed by applying stress multiples or haircuts. The Rating Default Rate ("RDR") can be defined as the weighted average of the cumulative default rate of cover assets over their lifetime in a given rating scenario. The RRR is the weighted average recovery rate of the defaulted assets in a given rating scenario. The rating-specific expected loss rate ("RLR"), a key target parameter to be used in the cash flow model, is then typically derived for a given rating scenario S using the formula **RLRs = RDRs x (1 - RRRs).**

3.4.2 The cash flow model

CRA models cash flows in consideration of all particularities specific to the transaction as outlined above. As such, for example, we will take into account the order of priority as well as performance triggers. Based on the targeted interest rate and redemption flows at the beginning of the amortization phase, all costs are included and the tranches (interest and principal) are serviced according to the predetermined priority of payments.

Here, CRA's proprietary cash flow model processes assumptions concerning the relevant loss rate (or the relevant default and recovery rates that define the loss rate), the timing of losses or defaults and recoveries, as well as the influence of prepayments and interest rate risk. The cash flow model is the central quantitative tool that allows us to evaluate cash flow stability in a wide range of scenarios. Furthermore, it enables us to depict the influence of a range of rating scenarios on the servicing of financial instruments in detail and over the entire term of the transaction. For example, for a worst-case analysis, we can set the cash flow model with the worst possible portfolio that is feasible under the eligibility criteria.

3.4.3 Scenario-based stress tests

The information gained in the course of the rating process is used to construct sensitivities related to the parameters of the cash flow model. This enables scenario-based stress testing by which the cash flow model, in the context of a particular rating scenario, is subjected to these predetermined additional stress parameters. We investigate their effect on the serviceability of the structure. Furthermore, we conduct sensitivity analyses to quantify the extent to which the stability of the structure is affected by variations in individual parameters. This enables us to assess the robustness of the rating indication for

parameter uncertainty. In addition to the stress factors affecting the rating relevant loss rate, CRA may stress other relevant parameters and their impact on the risk profile (e.g., level and timing of prepayments, timing of defaults and recoveries, interest rates, and portfolio yields).

To determine a rating indication for a tranche, the predefined scenarios are evaluated. CRA investigates whether the claims of creditors to payment of interest and principal can be fulfilled in accordance with contractual obligations.

The sensitivity analysis on the parameters governing the timing of defaults and recoveries (or losses) deserves some further motivation. The data on mortgage loans suggests that defaults tend to follow a hump-shaped pattern, peaking roughly 12-24 months after origination, and slowly falling thereafter. Therefore, it may be instructive to test whether the structure is robust to a front-loading of defaults (particularly if the pool is unseasoned). However, some structures are designed in such a way that potential credit enhancement may flow out of the transaction if losses are initially low (pro-rata structures). Consequently, it is instructive to test whether the structure is robust to a back-loading of defaults as well.

CRA's quantitative model allows us to stress front test-, even-, and back-loading of defaults. We will run these stress tests whenever analysts deem them to be appropriate based on the characteristics of the pool of receivables as well as the transaction structure.

The rating report presents the results from the cash flow analysis including findings from the scenario-based stress tests. These findings are discussed extensively in the rating committee.

4 Environmental, social and governance factors

CRA generally takes ESG-relevant factors (environmental, social and governance) into account when assessing Covered Bond ratings. CRA assumes that an isolated consideration and presentation leads to further transparency and greater granularity of information.

We mainly take into account relevant aspects of the RMBS transactions, the relevant legal basis and pool-specific ESG factors. Considering this, CRA assesses governance factors (e.g. risks related to transaction structure, counterparties, legal and regulatory environment and risk management) in particular as significant for the assessment of RMBS ratings.

On the subject of ESG (Environment, Social and Governance), CRA has published the basic document "The Impact of ESG Factors on Credit Ratings". This document and the rating methodology related to the issuer-relevant ESG factors are readily available on our website. (www.creditreform-rating.de).

5 Continuous monitoring and follow-up rating

A rating is typically valid for one year. During this period, the development of the issue is continuously monitored by the team of analysts. For monitoring purposes, the analysts remain in direct contact with the relevant parties to the transaction while also evaluating relevant information. We strive to ensure, at all times, that the indication provided by the rating is valid. Should any significant events occur during the monitoring period, which may have a negative or positive effect on the risk profile of the issue, the rating will be adjusted.

Appendix: Adjustment of assumptions

Default rates

An adjustment of assumed default rates due to development trends may be necessary where current default rates differ in comparison to historical values. If trend variations prove to be significant, current periods may be weighted more strongly.

Should historical data show different characteristics from the portfolio under review, assumed default rates will need to be adjusted. Differences may occur where historical portfolios have been stratified according to particular variables or sets of variables. This creates individual sub-pools, which then have to be extrapolated and weighted according to the composition of the total portfolio. The result is usually an adjustment of the base assumption. Typical variables according to which the originator stratifies a portfolio include the original term to maturity, seasoning, initial (or outstanding) balance, origination channel, debtor credit score, geographical concentration, debtor concentration, and yield.

CRA forecasts default events for a pool for the time following its securitization. However, static data also include defaults from the time the loan was given until the time it was securitized. Hence, for forecasting purposes, one should either use prior securitizations with similar characteristics and the same life cycle or, if unavailable, focus on more recent years of data on the securitized portfolio.

Experience has shown that changes in servicing and underwriting standards have a delayed effect on performance indicators or are difficult to determine in the data beforehand. In particular, delinquent receivables, write-offs, and losses can be affected. If any changes have been made to standards, this information is included in the adjustment of default and recovery base cases.

CRA may evaluate a portfolio's loan-, debtor- and property-specific information to adjust and differentiate base-case assumptions derived from issuer-specific performance data, and macroeconomic and market data, if available. In addition, CRA may apply conservative adjustments to base-case assumptions for pools with a low degree of homogeneity (high granularity and high dispersion of debtor credit quality).

Recovery rates

Additional haircuts to mirror the risk of a deviation between current recovery values and historical values may occur e.g. due to changes in qualitative factors. Depending on the historical data, the stresses may be higher where the data of defaulted receivables is small and shows high volatility. Furthermore, the level of default and recovery assumptions is dependent upon the definition of a default event. A more stringent interpretation will lead to higher default rates and better (higher) recovery rates. This will lead to a more positive assessment of the model concerning the recovery assumption. Should this effect be inappropriately high, an adjustment will need to be made with larger stresses.

CRA will analyse the historical recovery performance of the servicer and will examine the characteristics of the portfolio and the collateral structure in more detail, making adjustments as necessary depending on relevant characteristics or changes to the historical mean.

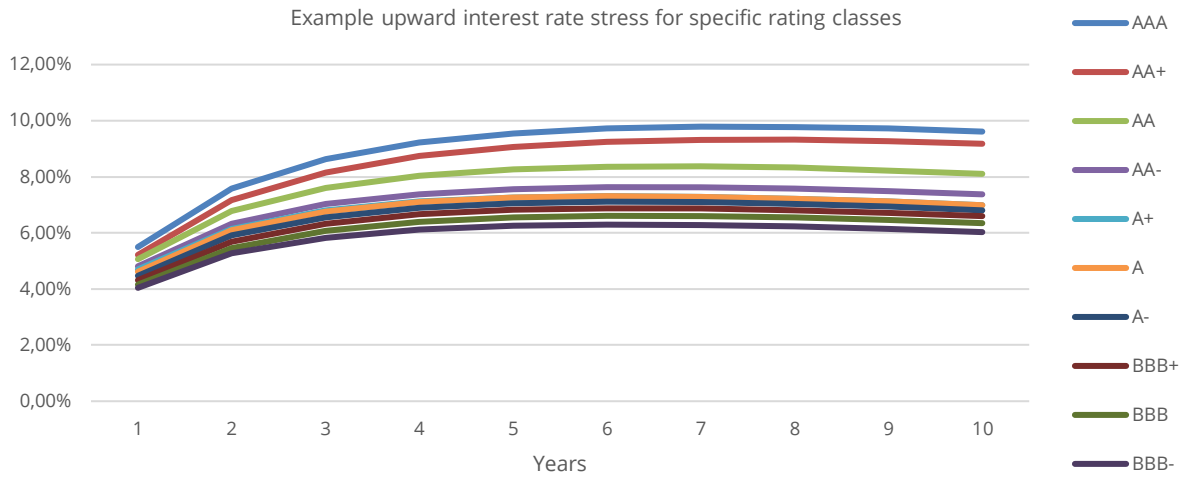
Furthermore, in CRA's experience, the servicer-specific recovery process matters, as does the jurisdiction, the type of asset class, and third-party involvement in the workout process. The above factors can have a significant impact on the timing of the liquidation process. Faster repossession and liquidation of collateral can have a positive effect.

Appendix II: Interest rates and foreign currency stress

Interest rate risk modelling

CRA uses deterministic and/or stochastic approaches to assess interest rate risks by stressing the interest rate term structure taking historical volatility into account. The starting point of the analysis is the historical evolution of forward rate curves, typically EURIBOR rates. We then apply a stochastic model to forecast future developments of interest rates for upward and downward scenarios and for specific time horizons. Market spot rates are dynamic and updated regularly, so the CRA closely monitor the evolution of interest rates regularly and updates its rating-specific interest rate stress scenarios.

Figure 3: Example of upward interest rates stress over time for specific rating class| Source: CRA



Foreign currency risk modelling

Similar to forecasting Interest rate stress, CRA assesses FX rate risks by stressing historical exchange quotes in the pertinent market, taking into account FX volatility. The modelling approach to derive losses due to FX risk is similar to a parametric VaR model. Average returns and standard deviations of currency baskets are calculated based on historical FX data of selected currencies. Then factors are applied to define the rating level stresses, which are fed into the cash-flow analysis.

Typically, we calculate both, currency appreciations and devaluations for specific time horizons to apply these stress scenarios to the cash-flow analysis on foreign currency collections or payment obligations.

Figure 4: Example FX devaluation over time for specific rating class| Source: CRA