

Creditreform Rating AG Rating Methodology

Consumer ABS Securitizations

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1 Introduction

This document outlines Creditreform Rating AG's (henceforth also referred to as Creditreform or CRA) approach to rating consumer ABS securitizations, which are used to refinance a portfolio of consumer installment loans. Typically, the pool of receivables underlying the securitization is medium-term, granular and homogeneous.

In most cases, the buyer is a special purpose vehicle (SPV) that issues financial instruments (e.g., bonds) to refinance the receivables portfolio. The underlying receivables usually originate from a bank or specialized financial institution that extends credit to consumers. Compared to Auto ABS transactions, consumer loans are typically not secured and are used to finance non-essential purchases such as vacations or home renovations. The issued financial instruments are generally structured in tranches, which may be senior or subordinated, and are serviced according to a predefined order of priority. The rating of the debt classes is based—among other factors—on the predefined tranching, which takes into account the respective risk profiles. CRA performs ratings on these instruments but does not size the tranches.

CRA consumer ABS ratings are carried out taking into account all available and relevant information in order to quantify the risks of the respective issue. However, the ratings do not constitute a recommendation to buy, sell or hold financial instruments. They are also not legal opinions and do not represent an assessment of the future market values of individual assets or investments.

2 Rating Indication and Process

2.1 Rating indication

The aim of the rating process is 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 consumer ABS 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 consumer ABS) 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

As a first step, CRA analyzes the relevant consumer ABS securitization structure and gathers pertinent information, including on the economic, business, and legal environment. Documents and loan-level data shall be provided by or on behalf of the originator. In addition to the parameters of the transaction and data on the composition of the pool, CRA requests historical data. CRA seeks tables detailing the past use of funds, the downstream structure, and historical default and loss data of comparable portfolios, ideally in static vintage form. If CRA considers the data obtained through the request insufficient, proxy data may be used to augment it (if appropriate).

In case the pool contains receivables that are secured, CRA will request information on them. CRA strives to review both the structure of the collateral pool as well as the historical performance of similar pools.

Furthermore, information related to the originator and servicer of the transaction is analyzed as is that of other counterparties. Depending on the scope of the documents provided, plausibility checks are made and, so deemed appropriate, legal opinions will be requested.

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 creditor protection in the context of the rules and contracts for minimization of the risk involved in complex, multilevel consumer ABS 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 a consumer ABS 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 portfolio risk of the loan contracts 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 proceeds obtained through the issuance of financial instruments are invested by the SPV in the purchase of the originator's consumer 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 handling of the cash flows 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 transfers the cash flows to the SPV. If the transaction is managed by trustees, the latter checks the cash flows in the interest of the investors and will usually hold the accounts. Investors receive the cash flows stated in the terms and conditions of the transaction in the form of interest and redemption. The financial instruments issued are usually structured, i.e. tranches are issued which, dependent on the cash flow, are serviced and treated in senior/subordinate ranks according to the predefined order of priority.

3.1 Transaction Features and Structural Risks

3.1.1 Legal Considerations at the Issuer Level

CRA will review 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 include suitable "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 the transaction documents (term sheet, prospectus, related contracts, etc.) and related legal opinions and documents are the focus of our inspection. These documents are typically prepared with the involvement of specialized lawyers. CRA forms an opinion about them, but no additional legal examination will be conducted. If potential risks related to the transaction's legal structure become apparent, the analysts will state these in their assessment. However, such statements do not constitute a legal opinion of CRA. In addition to transaction-specific legal risks, we assess regulatory risks more broadly. That assessment informs our issue rating.

3.1.2 Credit Enhancement

While credit enhancement forms a key part of typical consumer ABS transactions, it can be provided by a wide variety of means. Hence, the credit-enhancement features discussed in the following cannot be considered all-encompassing. Of course, if other credit-enhancing mechanisms are present in a transaction, CRA will study their performance implications, too.

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 are over-collateralization, reserve funds (e.g., liquidity reserves or first loss reserves), and account pledges (e.g., through a letter of credit).

Excess spread refers to the yield of the pool of assets being larger than the running interest costs on the notes plus other costs and expenses. Excess spread may sometimes support a transaction and help cover cash-flow shortfalls attributable to losses on the portfolio of assets. 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 the different classes of notes as well as

to other obligations of the issuer (e.g., taxes). CRA will review the relevant provisions carefully as it will greatly influence the 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 another, they may be pro-rata. Triggers, as discussed in more detail below, are a tool used to control and alter the order of priority.

With a principal deficiency ledger (PDL), many transactions contain a structural feature that serves as a mechanism to prioritize the redemption of notes. For example, receivables charge-offs are recorded as a debit in a PDL that is assigned to a specific note class. In the further course of the transaction, these debits can be offset by credits, which in turn can be used to redeem the corresponding note class. For example, interest payments on receivables can be recorded as credits instead of being paid out as coupons to the noteholders.

3.1.4 Trigger

Triggers define events which alter the priority of payments. The event is often defined in reference to a given threshold. E.g., a three-month rolling average dynamic net loss ratio of 0.5% at a certain payment date could constitute the threshold; if the actual ratio exceeded that threshold at the payment date, it would constitute a trigger breach.

Well-designed triggers reduce the requirements for further 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 from transaction to transaction. In consumer ABS transactions, the breach of a performance-based trigger (such as the dynamic net loss ratio trigger in the example above) may sometimes give rise to 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 studies the triggers and their implications (as defined in the transaction documents) carefully and considers them when deriving quantitative results.

3.1.5 Eligibility Criteria

Transactions with a revolving period or with prefunding will most likely involve eligibility criteria. The parties to the transaction initially agree on certain quality criteria which define limitations for the receivables from loan contracts to be purchased with regard to particular characteristics, thereby significantly affecting the risk profile of the receivables pool. Likewise, concentration limits concerning the total portfolio can be defined which must be complied with during the term of the transaction.

The seller is constrained by these eligibility criteria. In typical transactions, he will guarantee to have complied with the criteria when transferring a new receivable to the portfolio. Furthermore, the seller of the receivables usually commits to provide compensation in the event of a breach of eligibility criteria by either buying back the non-conforming receivables or by providing a corresponding substitute or remedy. In the event of non-compliance (e.g., a deterioration of the characteristic values within an existing portfolio), events such as an early redemption of the issued notes may be triggered. From the investors' perspective, eligibility criteria should serve to mitigate risk.

Generally, eligibility criteria relate to the maturity and tenor of the loan, the absence of defenses or payment delinquencies, the court of jurisdiction and legal framework, status and enforceability of the receivables, hedging by loan insurers, limits for individual debtor concentrations, geographical or brand concentrations, 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, limits or exclusions of residual values, or historically low default levels on receivables and delayed payments.

Within the framework of the analysis of the structure of the transaction, CRA assesses the eligibility criteria and portfolio restrictions with regard to their expected risk-mitigating effect.

The criteria are likewise taken into account during the empirical analyses for the derivation of base assumptions, as they sometimes imply a minimum threshold for the assumed parameters.

3.1.6 Revolving Period

The structure of Consumer ABS securitizations often includes a period within which there is repeated purchasing of receivables (a “revolving period” or “replenishment period”), for example in response to prepayments. During the revolving period, it is common practice to omit or reduce redemption payments to investors. The reinvestment of incoming redemption payments on the part of debtors is, however, usually subject to the obligation that new receivables must comply with certain criteria, as otherwise, investors would bear the risk of a deterioration of the credit quality of the receivables portfolio due to the acquisition of new receivables with a lower quality (see the section “Eligibility Criteria”). These risks may be reduced by defining corresponding trigger events. CRA will adapt its quantitative cash flow model such that it reflects the revolving period (if present). We consider this to be important because, among other characteristics, the weighted average life (WAL) may be affected by loan purchases made throughout the revolving period. The purchase of new loans or lease receivables may increase the periodic interest and redemption cash flows, thus affecting the optimal sizing of credit enhancements and the stability of the tranches with regard to 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 consumer ABS 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 with regard to 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 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 with regard to servicing standards and practices or its creditworthiness, it will evaluate particularly carefully if plans mitigating 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 consumer ABS securitizations, a situation in which set-off can occur is when the borrower of a purchased consumer receivable holds deposits with the originator-servicer. If the originator-servicer defaults, the borrower may be able to declare a set-off of his claim against the originator-servicer

versus his liability from the consumer loan, in turn reducing the outstanding principal amount of the purchased consumer 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

After the sale of the receivables to the issuer, the servicer typically continues to receive collections on the receivables in its bank accounts. In the normal course of business, these funds are subsequently passed on to the issuer. 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 with regard to 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

The analysis of the credit and portfolio risk of the securitized assets is crucial to our assessment of a consumer ABS transaction. To determine the credit quality of the underlyings, CRA evaluates both current and historical data while taking into account the eligibility criteria. We

then derive base-case assumptions on expected default rates, recovery rates, and prepayments. The findings of the analysis with regard to the qualitative and quantitative factors serve as input for the subsequent cash flow analysis.

In order to determine the relevant input parameters for the cash flow model, CRA takes the following approach. First, historical performance data are analyzed to derive base-case assumptions on expected default rates, recovery rates, prepayments, and, if necessary, default and recovery distributions. Subsequently, the base case assumptions are stressed to determine the rating relevant loss rates for the cash flow model (see also section 3.4).

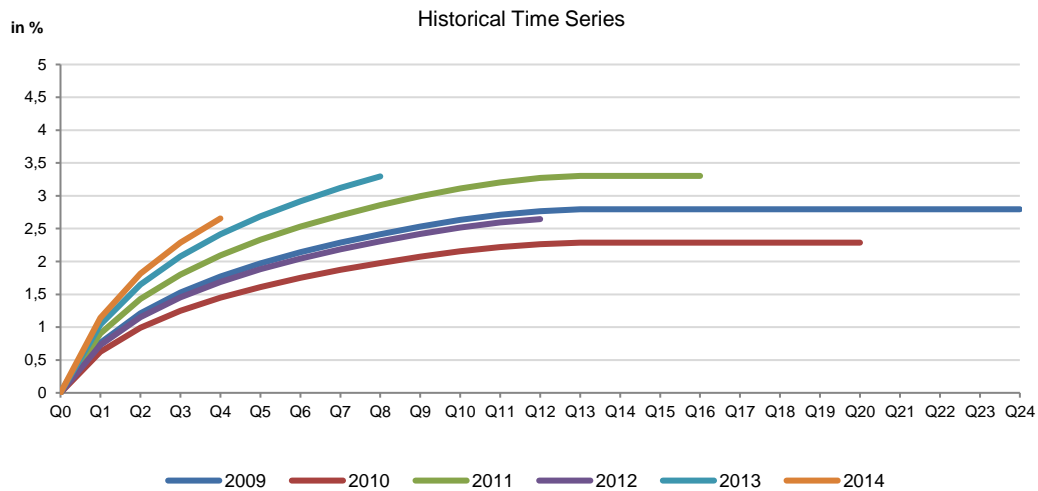
In our preliminary data request, we expect an appropriate data history with regard to defaults, delinquencies, dilutions, etc. The evaluation of the historical data concerning asset and credit quality and portfolio performance is carried out provided that the quality of the data obtained is sufficiently high. In addition, if the data is comparable with planned future individual or portfolio 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 in the event that sufficient manager or originator-specific data is not available.

3.3.1 Portfolio Performance Analysis

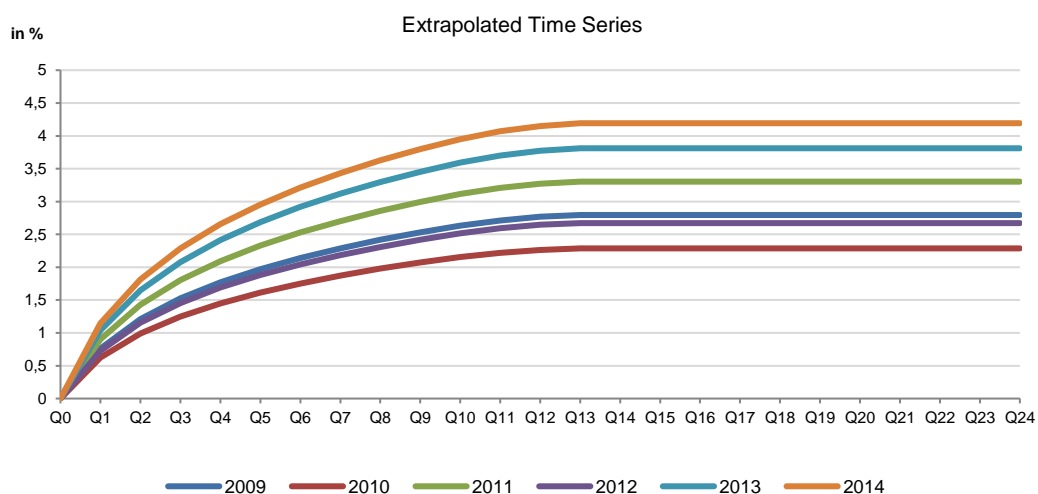
The evaluation of the historical performance of assets and collateral enables us to derive default and recovery assumptions, the extrapolation of expected trends, and the construction of base cases which shall serve as input parameters in the course of further quantitative analyses.

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 contain data series which are correspondingly shorter due to the fact that the loan contracts have a shorter history.



In case that complete data series are not available, the missing periods need to be extrapolated. Extrapolation occurs by way of 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:



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 consumer loan financing is a starting point for the derivation of the **default rate** 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, which is stretched to the average remaining term of the portfolio using the CRA PD Term Structure.¹ 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 the appendix.

CRA arrives at the base case assumption with regard to the expected **recovery rate** by evaluating statistical recovery data sets where these are available. However, it is common for data regarding gross and net losses to be available in vintage form only. In that instance, the base case is derived from the observed difference between time series, as net losses typically contain proceeds generated by realizations of the recovery process. If merely a small proportion of the pool of receivables is secured, we assess the effects qualitatively. In addition, CRA analyses the share of collateralized loan contracts in the transaction portfolio against the share of collateralized loan contracts in the historical data when determining the recovery assumptions.

In addition, 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

¹ For more information, see also our methodology *Technical Documentation Portfolio Loss Distributions*, v1.0, July 2018.

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 the appendix.

The **expected loss** (EL), a key target parameter to be used in the cash flow model, is generally derived using the formula **EL = default rate x (1 - recovery-rate)**.

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, consumer protection laws limit the fees and penalties that can be imposed on the obligor in case of early repayment. Such legal norms may contribute to relatively high prepayment rates in the asset class. When a prepayment occurs, typically some excess spread is lost, which may be detrimental to the credit rating. On the other hand, 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 with regard to concentrations, the existing aging schedule (the empirical distribution of payment arrears), as well as historical default and dilution rates. E.g., pools with geographical concentrations tend to be more strongly affected by regional economic shocks. The findings from that step serve as input to our quantitative analysis.

3.3.2 Exposures Resulting from Legal Rights of the Obligors

CRA will take into consideration to what extent borrowers have taken out payment protection or residual debt insurance. Such insurances have the potential to somewhat 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 insurances among obligors are of particular importance (under the relevant jurisdiction), we will account for their effect qualitatively.

Legal rights and obligations of the transaction parties can sometimes give rise to legal risks other than the ones discussed in sections 3.1.1 and 3.1.5 above. In the context of consumer

ABS transactions, there are four areas we would like to highlight as those are relatively common and relevant to multiple jurisdictions.

First, amendments to consumer 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. An example of this would be revolving provisions on a consumer's right of withdrawal in Germany in recent years. Second, there may be a risk that a purchased receivable does not exist or ceases to exist. CRA checks if the transaction documents provide policies on the issue (e.g., stipulations on indemnification claims against the seller). Third, we ask ourselves if there are 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 specific characteristics of the respective consumer ABS securitization such as costs and fees, interest rate and repayment structure, existing credit enhancements (reserves, excess spread, etc.), tranching, triggers and order of priority are included in the cash flow model. The aim is to replicate all relevant mechanisms so that 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

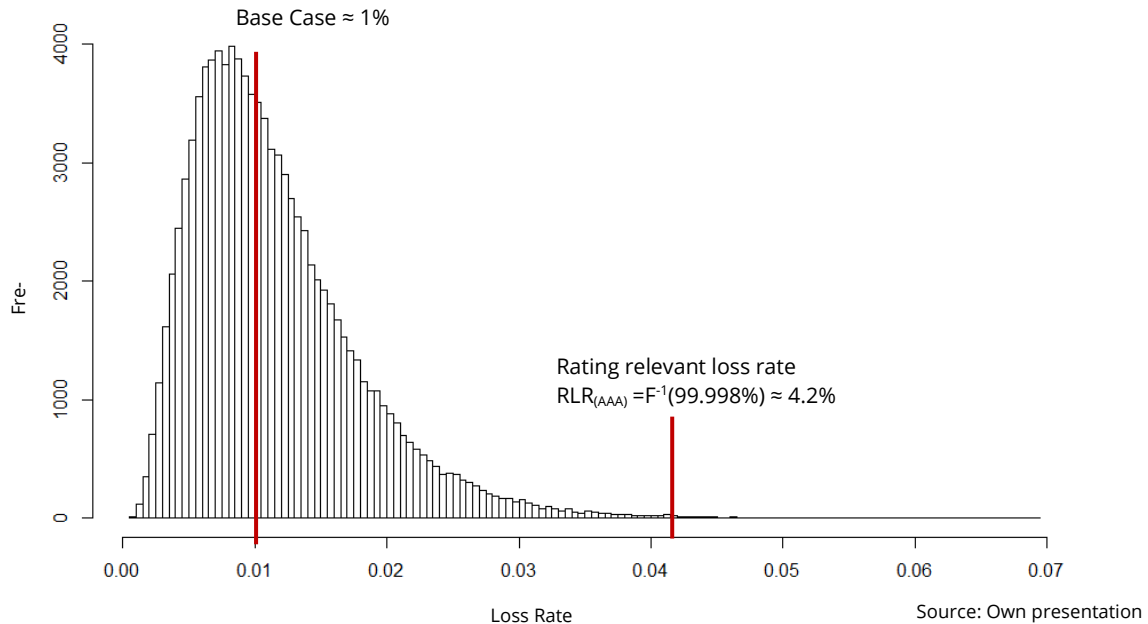
We will stress the base case assumptions of expected default and recovery rates (which we obtained in the preliminary analysis) by applying risk premiums in varying amounts. We refer to these premiums as 'stress factors' in the following. A specific combination of stress factors constitutes a rating scenario. The naming of the rating scenarios follows the rating scale pro-

vided in section 2.1 above ('BBB', 'AA', etc.). The rating scenarios vary according to the respective stresses, or premiums, on the base case assumptions ("default multiples" and "recovery haircuts"), which increase in scenarios with higher ratings.² Using the stressed base case assumptions, the rating relevant loss rate is determined, which will serve as input for the subsequent cash flow analysis.

To determine the rating relevant loss rate, a loss distribution is approximated by means of a Monte Carlo simulation. The loss distribution is the result of a calibration based on empirical data. The relevant loss rate for any rating scenario can subsequently be determined as a quantile of the distribution at the level of the probability of default assumed for the given rating scenario.

In the fictitious example below, based on an average loss rate of approximately 1%, the quantile of the simulated distribution is sought for the level, which corresponds to the probability of default assumed by Creditreform for the given rating scenario. The rating relevant loss rate for the AAA scenario, for example, would correspond to the quantile $F^{-1}_{(99.998\%)} \approx 4.2\%$. This result in turn would serve as an input to the cash flow model in the AAA rating scenario.

² Stress factors serve to depict phases of economic downturn and correspond to the risk of the 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.



An alternative for deriving stress factors with regard to default and recovery rates is the *ex-ante* calibration of the corresponding multiples and haircuts using our own data. Using the CRA database, corresponding risk premiums are determined for the various rating scenarios. The risk premiums for determining the relevant recovery rates are formulated as relative risk premiums (“haircuts”). Their amounts vary according to the corresponding rating scenario. In some cases, analysts exercise analytic judgment and determine stress factors based on other, 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 which have been determined quantitatively. Qualitative factors we consider particularly important in the context of consumer ABS transactions include:

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

Such qualitative factors—along with our rating definitions—may lead us to choose smaller or larger risk premiums (further details are provided in the appendix). The determination of stress factors is subject to diligent assessment and approval by the rating committee.

In order to rate a particular transaction with a rating corresponding to a rating scenario, the structure must show sufficient cash flows in the stress case defined by the rating scenario to guarantee the complete repayment of investor claims within the assessed tranche. Creditreform checks whether, when applying the rating scenarios and the implied relevant loss rate, there is ultimately *no* loss occurring. In case of no loss, the assessed tranche passes the stress test.

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, we will, for example, 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, the proprietary Creditreform 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 much detail and over the entire term of the transaction. For example, for a worst-case analysis, we can feed the cash flow model 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 consumer 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 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 Base 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. In the event that 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, obligor type (private or commercial), origination channel, obligor 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.

Recovery rates

Additional haircuts to mirror the risk of a deviation between current recovery values and base assumptions may occur e.g. due to changes in qualitative factors. Depending on the historical data, the haircut may be higher where the database of defaulted receivables is small and shows high volatility. Furthermore, the level of the default and recovery base case 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 base model concerning the recovery base case assumption. Should this effect be inappropriately high, an adjustment will need to be made with a larger haircut.

One important factor for the level of the recovery rate is the type of collateralization. If the transactions are collateralized, recovery rates may be higher than for non-collateralized transactions. In the case of securitized consumer ABS transactions, issuers are entitled to the collateral subsequent to default, whereas in the case of unsecured transactions, there are only recourse claims against the borrower. Hence the latter type of transaction higher haircuts may be applied.

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.