Creditreform Rating AG Rating Methodology

Auto ABS Securitizations

v.1.4
Neuss, July 2018

Creditreform Rating

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This document (v.1.4) is an update that introduces a material methodological change: following this update, CRA will include information on the age and maturity of the currently securitized portfolio in the calculation of the base loss assumption from historical data (see 3.4 "Credit and Portfolio Risk").

The presentation of contents was also clarified and expanded. The update is dated July 2018.

1 Introduction

Over the past 15 years, Creditreform Rating AG ("CRA"), established in 2000, has become one of Europe's leading rating agencies.

In this document, CRA discloses its methodology of rating Auto ABS securitizations in order 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 upgraded to reflect any changes in our methods and philosophy. The CRA rating methodology and Code of Conduct can be freely accessed on our web page (www.creditreform-rating.de).

This document outlines the procedure used in carrying out a rating for Auto ABS securitizations, which are used to refinance a portfolio of finance lease or loan contracts for automobiles. In most cases the buyer is a special purpose vehicle which raises debt capital, e.g. by issuing a financial instrument or in the form of a bond, in order to purchase financing. Auto leasing or loan contracts are granted to private or commercial customers by banks and leasing enterprises. The underlying assets, i.e. new or second-hand automobiles, can be used as collateral to minimize losses incurred due to portfolio defaults. The financial instrument issued is usually structured, i.e. tranches rank senior or subordinate and are serviced according to a predefined order of priority. The rating of the tranches is based on - among other factors - the predefined tranching, taking into account their respective risk profiles. CRA carries out ratings for these instruments but does not size issue tranches.

Creditreform Auto ABS ratings are performed by taking into account all available and relevant information in order to quantify the risks of the issue at hand. They represent well-informed assessments of a given emission's credit quality. They issue no recommendation of whether or not 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 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 ensuring a comparable decision-making process.

A team consisting of at least two rating analysts is responsible for the Auto 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 Auto ABS ratings. As the structured finance rating system, such as Auto ABS, differs from that used for bond and corporate ratings, structured finance ratings will be subscripted with the abbreviation “sf”. Unsolicited ratings will be marked.

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

In a first step, the relevant Auto ABS securitization structure is analyzed and information concerning the economic and legal circumstances is researched. Documents and loan level data provid-

ed by or on behalf of the originator, as well as industry and market-related data are used for this purpose. In addition to the parameters of the transaction, the data request includes historical information, e.g. past use of funds, the downstream structure and quality of the pool of automobiles serving as collateral, and historical default and loss data of comparable portfolios. Furthermore, information related to the originator and servicer of the transaction is analyzed as is that of other counterparties. Depending upon the scope of the documents provided, plausibility checks are made and, as the case may be, 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 Auto ABS securitization transactions are discussed, as are planned hedging instruments, external credit enhancements and loss and / or liquidity reserves. Where the rating is unsolicited, there may be no management meeting.

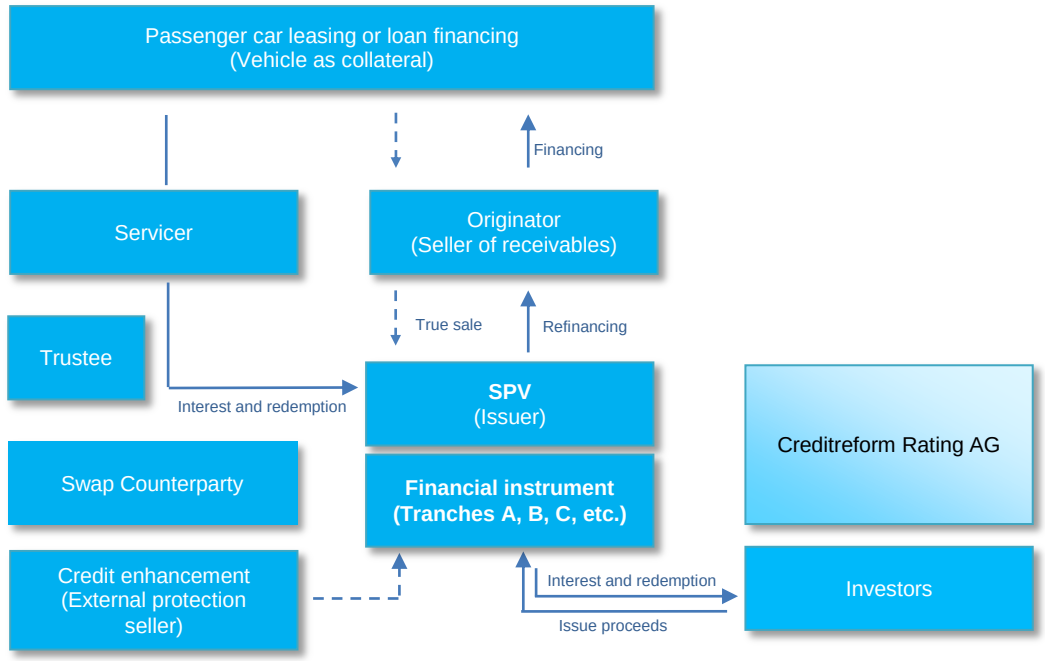
2.4 Rating Committee

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 Method

A rating for an Auto ABS securitization consists of several analytical steps. In addition to examining structural, legal/regulatory and operating risks, it includes in particular an analysis of the credit quality and portfolio risk of the leasing and loan contracts to be securitized, as well as an analysis of the pool of motor vehicles serving as collateral. 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 downturn. 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.

A typical, simplified Auto ABS securitization structure is depicted below:



Source: Own presentation

The proceeds obtained through the issue of the financial instrument are invested by the SPV in the purchase of the originator's auto leasing or loan receivables. It is common for the originator to be a financing bank associated with the manufacturer of the motor vehicles ("captive"). In this way the originator refinances the motor vehicle financing which was originally granted to the buyer. In the case of a "true sale", the SPV becomes the owner of the receivables with rights of disposal. The vehicles serve as collateral for the financial instruments issued. 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 check 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 instrument issued is

usually structured, i.e. tranches are issued which, in dependence on the cash flow, are serviced and treated in senior / subordinate ranks according to the predefined order of priority.

3.1 Leasing and Loan Contracts

The securitized assets in Auto ABS transactions are usually receivables from customers in the leasing or loan business. The parameters of leasing and loan contracts can differ substantially from one originator to another. This does not only apply to individual contractual variations such as repayment and interest payment schedules, interest rate and term, but also to general strategies in the business model such as whether or not pricing related to individual customers or a group of customers which is adequate with regard to the risk involved (acceptance, rejection) is to be implemented. In most cases the financing provided has a fixed interest rate and a term between three and six years.

Financing agreements also vary according to the type of contract, e.g. leasing contracts or financing-loans which give rise in particular to legal questions as to the value of the collateral (creditor legal protection). In particular, an important point to be addressed is the rights and securities of the creditors of the securitization transaction with regard to the parties involved in the transaction. These rights and securities are linked to specific contractual characteristics and the resulting risks are modeled and evaluated.

3.2 Structural Risk

The analysis of the transaction and redemption structure serves to accesses the significant structural characteristics of the Auto ABS transaction which, from the investor's point of view, may have a positive or negative effect on future performance. The flexibility of structuring makes it nearly impossible to set out an exhaustive list of all the potential characteristics. The primary characteristics include the order of priority for interest and redemption payments with regard to the individual tranches ("waterfall"), collateralization and additional securities such as excess spread, cash reserves and other liquidity buffers, but also external credit enhancements, guarantees and hedging mechanisms, pre-defined events such as performance triggers which alter cash flows, call and repayment options (early redemption, clean-up call, etc.), as well as constraints and quality requirements related to the quality of the assets and portfolio (covenants and eligibility criteria). Characteristics are assessed in terms of their effectiveness and prospective performance and taken into account in the quantitative modeling of the transaction.

3.2.1 Revolving Period

The structure of Auto ABS securitizations often includes a period within which there is repeated purchasing of receivables (a "revolving period"). During the revolving period, it is common practice to omit 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 means of defining corresponding trigger events. Revolving periods must be taken into account during the cash flow analysis, as the aging structure (WAL) and the average weighted coupon (WAC) may change during the revolving period. The purchase of new loan 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.

3.2.2 Eligibility Criteria

The parties to the transaction initially agree on certain quality criteria which define limitations for the receivables from loan and leasing contracts to be purchased with regard to particular characteristics, thereby significantly affecting the risk profile of the receivables pool. Likewise, concentration limits with regard to the total portfolio can be defined which must be complied with during the term of the transaction. It is the responsibility of the seller of the receivables to examine these criteria with the purchase of new receivables, and it is he who usually guarantees for their compliance when a new receivable is transferred to the receivables portfolio. Typically, the seller of the receivables commits to provide compensation in the event of a breach of eligibility criteria by either buying back the non-conforming receivables or providing a corresponding substitute or remedy. In the event of non-compliance (e.g. incl. a deterioration of the characteristic values within an existing portfolio), trigger 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 for investments are related to the term of the loan or leasing, 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 and/or brand concentrations, compliance with the originator’s underwriting guidelines, interest rates and profit margins for the individual loan and leasing 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, Creditreform Rating assesses the eligibility criteria and portfolio restrictions with regard to the expected risk-mitigating effect. The criteria are likewise taken into account during the empirical analyses for the derivation of base assumptions, as they define the minimum threshold for the assumed parameters.

3.2.3 Trigger-Events

It is often the case certain events are defined which may trigger an early termination of the revolving period, early redemption of the notes, or a change in cash flows. Trigger events can reduce the requirements for further collateralization mechanisms as well as the risk involved in the transaction. Hence they serve to protect investors from a deterioration of the quality of the asset pool. Defined trigger events include e.g. a decline in the credit standing of the originator or servicer, a

breach of contractual obligations (covenants), the deterioration of existing collateral (credit enhancement) as well as of liquidity reserves below predetermined limits; and limits for (dynamic) default rates, delinquencies and receivables terms (i.e. remaining maturities). By analysing the defined trigger events, CRA derives worst-case scenarios which are considered in the quantitative analyses. A trigger event often triggers an early redemption of the notes. Hence trigger events need to be included in the cash flow modelling to provide an accurate picture of the transaction cash flows.

3.2.4 Credit Enhancement

The transaction structure of an Auto ABS securitization may include various instruments in order to hedge various types of risks ("credit enhancement"). The following are among the common hedging mechanisms used:

- Tranching
- First loss reserve, static or dynamic
- Liquidity reserves and liquidity facilities
- Lockbox accounts / account pledges
- Interest rate and currency swaps
- Trigger-events
- Overcollateralization

CRA will examine the appropriateness and dimensioning of the respective hedging mechanism with regard to its effect in minimizing risk and takes the results into consideration both qualitatively, in the rating assessment, as well as quantitatively during cash flow modelling.

3.2.5 Legal Considerations

Starting from the analysis of the transaction´s structural features, CRA will analyse the complexity of the issue and deduce potential risks associated with the envisaged structure. This check is based on an analysis of the transaction documents (term sheet, prospectus, related contracts, etc.). The relevant contracts, terms sheets and / or legal opinions are typically created by specialised attorneys; relevant contractual documents and legal opinions are examined by CRA. If potential risks related to the transaction legal structure become apparent, the analysts will state their assessment of these risks. A discussion of legal aspects does neither constitute a legal opinion of CRA, nor will secondary legal opinions be created internally. Although CRA forms an opinion about these documents, no additional legal examination will be conducted. In addition to transaction-specific legal risks, regulatory risks in the broader sense are assessed and will be included in the analysis with as part of the issue rating.

3.3 Operational risk

3.3.1 Originator and Servicer

The originator is the initiator of the underlying Auto ABS securitization. He sells the automobile financing to the issuer in order to refinance and generate facilities for new business. For a CRA Auto ABS rating, the underwriting standards of the originator for leasing and lending are a key characteristic. Acceptance and quality criteria which need to be met by the underlying leasing and loan contracts, documentation requirements and scoring processes are examined and included in the rating. An originator default during a transaction may, under certain circumstances, lead to significant risks for the enforcement of obligations for all the parties involved, which will need to be accordingly evaluated and assessed. Potential “set-off” risks may occur when, for example, in the event of a default on the part of the originator or a payment failure in servicing, outstanding receivables from parties involved are offset against the pool of assets with respect to the originator, thus reducing the value of the collateral. Examples for this might be bank balances of lessees with the originator or extraordinary servicing costs which are to be borne by the lessee due to a payment failure in servicing. Depending on national law, the insolvency of a lessor may entitle the lessee to prematurely terminate a leasing contract. CRA examines the transaction for operational risks with regard to the originator and includes this in the rating assessment.

The servicer is responsible for managing and processing payments from receivables in the portfolio. Often, the servicer is identical to 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 the repossession of vehicles. 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.

3.3.2 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, banks where accounts are kept, and the trustees. Here, CRA examines all dependencies with regard to the parties involved. Counterparty risks arising due to e.g. 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.

3.4 Credit and Portfolio Risk

A key element for risk assessment for Auto ABS securitization transactions is the analysis of the credit and portfolio risk of the securitized assets. The credit quality of underlyings will be assessed using both current and historical data, and the structure of the portfolio is analysed under consideration of the eligibility criteria. CRA then derives base case assumptions with regard to expected default and recovery rates. Further risks, e.g. residual value risks, will be included. 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 uses - depending upon the planned size of the portfolio - two different approaches: (1) in the case of large homogeneous portfolios, historical performance data are analysed in order to derive base case assumptions as to expected default and recovery rates, and if necessary to validate distributional assumptions related to expected defaults and losses. The base case assumptions are subsequently stressed in order to determine the rating relevant loss rates for the cash flow model (see also 3.6); (2) in the case of small and medium-sized portfolios, the specific credit risks are determined and a simulation of the planned portfolio is carried out for a direct approximation of the loss distribution. In this case, stressed loss rates relevant to the cash flow model will also be determined.

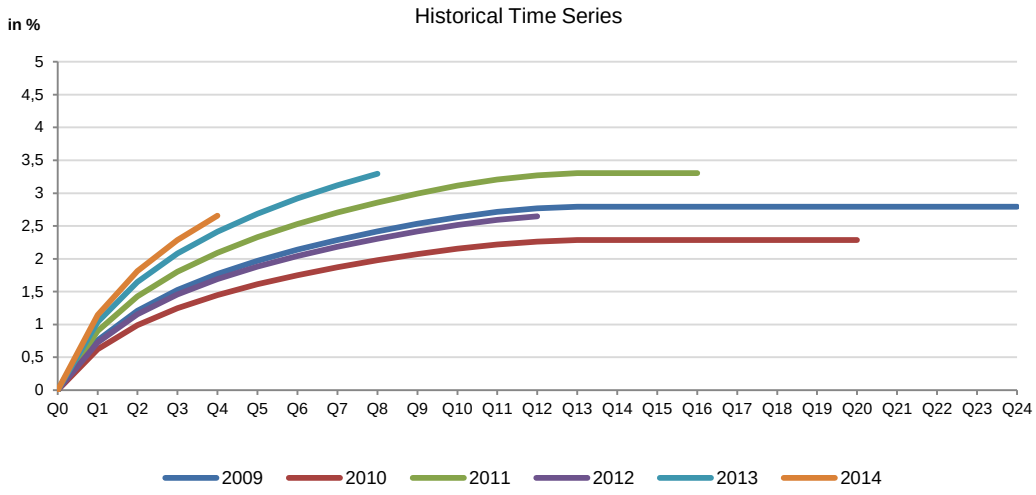
The preliminary data request includes an appropriate data history with regard to defaults, delinquencies, dilutions etc. The evaluation of the historical data concerning asset and credit quality and portfolio performance is carried out provided that the data quality is sufficiently high. In addition, 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.

3.4.1 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 the further quantitative analyses.

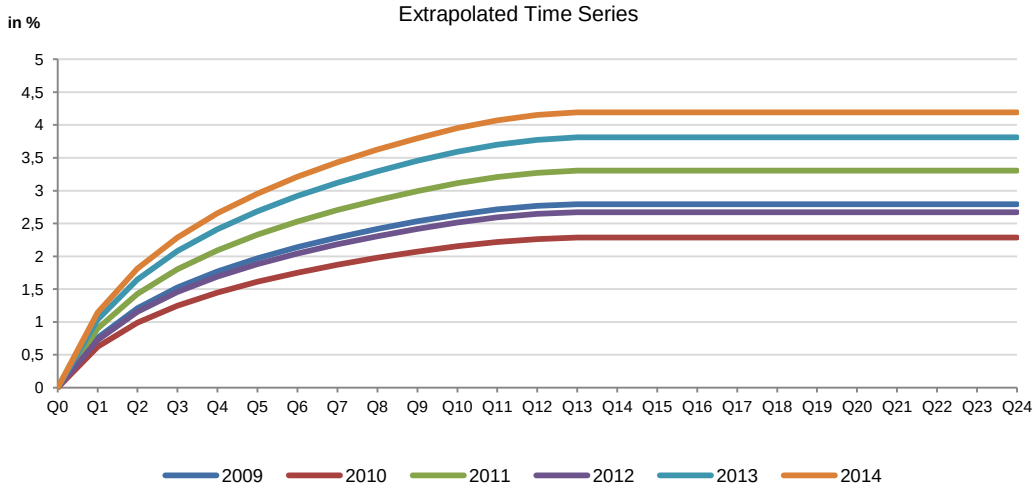
Historical performance data is usually provided in the form of static pools (“vintages”). These are related to a specific date and are often provided on a monthly or quarterly basis. Static data sets are particularly suitable for forecasts for the performance of new portfolios or for similar assets.

The following chart shows a static data set in vintage form, plotting the amount of defaulted loan or leasing contract volumes in relation to the total originated volume over time. Time series form younger vintages contain data series which are correspondingly shorter due to the fact that the leasing and loan contracts have a shorter history.



Source: Own presentation

In the event that complete data series are not available, the missing periods will need to be extrapolated. Extrapolation occurs by way of examining the average change in the cumulative default rates for similar asset pools. Data of other originators may also be used where the product under review is new and has not had a predecessor as well as where the characteristics of the product have changed to a large degree or the data was not documented. In this case, the same structure is assumed for all years. The expanded data set is depicted as follows:



Source: Own presentation

When extrapolating historical data, it is essential not to include 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 statistic pool of car leasing or loan financing will be a starting point for the derivation of a **default rate** base case assumption. In deriv-

ing the base case, CRA considers both the average seasoning and average maturity of the portfolio. Subsequently, CRA may adjust the base case, thereby taking into account development trends, differences in the composition of the pool, asset age, change 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 1a.

CRA arrives at a base case assumption with regard to the expected **recovery rate** by evaluating statistical recovery data sets where these are available. However, as it is common for data regarding gross and net losses to be available only in vintage form, in such cases the base case is derived from the observed difference between time series, as net losses typically contain proceeds generated by realization of collateral (sale of a car). In deriving recovery assumptions, residual risks are taken into consideration (see item 3.4.3). In addition, the general economic cycle to which the data refer needs to be considered in order to avoid an over- or underestimation of performance in relation to the current economic cycle. Likewise, the specific definition of default, the length of recovery processes, the historical stability of collateral values, the quality of servicing and the collateral type must be taken into account. Specific criteria for the adjustment of base assumptions are described in greater detail in appendix 1b.

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)**.

In a next step, CRA will examine the portfolio structure with regard to concentrations (individual debtors, industrial sectors, countries, etc.), existing ageing structure (the empirical distribution of payment arrears), as well as historical default and dilution rates. While increased geographical concentration can, as an example, cause a certain amount of dependence on regional economic shocks, concentration risks related to a certain brand of automobile or a particular model are dependent on the associated volatility of the proceeds. Residual amounts and final instalments should be examined here with regard to their maximum value proceeds and/or coverage. The assumptions derived in this way can be included in the qualitative analysis and will continue to serve as input for the quantitative analysis.

3.4.2 Determination of Credit Risks

In the case of small to medium-sized portfolios, Creditreform alternatively uses simulations to directly derive a loss distribution. Initially, credit risks are estimated at the level of the individual debtors. Credit risk at the asset level describes the risk of purchased receivables and assets defaulting on payment during the term of the contract and it usually corresponds to the credit risk of the individual debtor. In effect, the assets in the portfolio under review are evaluated with regard to their probability of default. Default probabilities are determined using a CRA rating methodology for the evaluation of credit risk. In addition to CRA's own comparative data (the scope of the databases includes information on private and commercial debtors) this will also take into account information drawn from historical performance. Subsequently an adjustment can be made of the

default risk at the level of individual debtors. In addition to the default probabilities, the expected loss given default for the assets underlying a portfolio is also evaluated. Loss given default is evaluated using available historical data, taking into account CRA comparative data, and is supplemented by a residual value analysis (see item 3.4.3).

Assumptions with regard to the assets contained in the portfolio (probabilities of default, loss given default, contract volumes and terms, etc.) are processed in a Monte Carlo simulation in order to determine the specific portfolio loss distribution. After determining the loss distribution, this can be used to set the rating-relevant **loss rate** used in the cash flow model (see item 3.5). For a general explanation of Monte Carlo simulation methods, please see the **CRA Structured Finance** Rating Methodology.

3.4.3 Residual Value Risk

In general, leasing contracts involve the return of the car to the originator after the lease contract has expired. As a result, originators are exposed not only to the default risk of the debtor but also to residual value risk, as the current market value of the car at the end of the contract may be lower than the calculated residual value at the conclusion of the contract.

Lease agreements can also include an option that the lessee does not return the car at the end of the term, but acquires the car by paying a residual value balloon payment. The decision of the lessee to return or purchase depends on the residual value of the leased vehicle. If the residual value to be paid is lower than the current market value of the car at the end of the contract, the lessee presumably will decide to buy the car and no residual value risk arises. However, if the current market value is lower, the originator will be affected by a loss of the difference between the market residual and the contractual residual value of the securitization.

The transaction risk for securitized residual values may be mitigated by an originator by ensuring that the residual value risk is covered. Furthermore, a repurchase guarantee can be agreed upon, which obliges the manufacturer or dealer to take back the car from the lessor after expiration of the contract. Although the latter leads to a reduction of residual value risk, a counterparty risk arises in return, which requires a separate assessment.

There are several reasons why the market value of a car may be less than the residual value of the lease, such as, for example, the current market for used cars. If it is unexpectedly weak, the prices are accordingly low. In this context, market launches of new models or technologies can hurt the used-car market as well. Also, the cessation of production lines or the bankruptcy of a car builder can adversely affect the current market situation.

For the analysis, CRA assumes a stressed estimate for the residual market values or residual value losses incurred at the time the leasing contract matures. Estimates are either based on historical depreciation or RV loss rates or based on estimated market values. Historically, the gross proceeds are considered in relation to the contractual residual value. Discounts on the base case

are made for cases in which foreseeable changes of qualitative factors are evident. These may include, for example, adjustments to the contractually agreed residual value, costs of sale, economic downturns or consumption preferences mentioned above.

The level of exposure to residual value risk depends on whether residual values are securitized in a transaction and whether lessees have an option of purchasing the car at the end of the term. Securitized residual values of contracts without a call option are generally exposed to 100% residual value risk. If a call option has been implemented and is part of the lease contractual agreement, the rate of return accepted by CRA depends on the rating scenario (see 3.5.1).

3.5 Cash flow analysis

Based on the analysis of the transaction structure, the specific characteristics of the respective Auto 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.

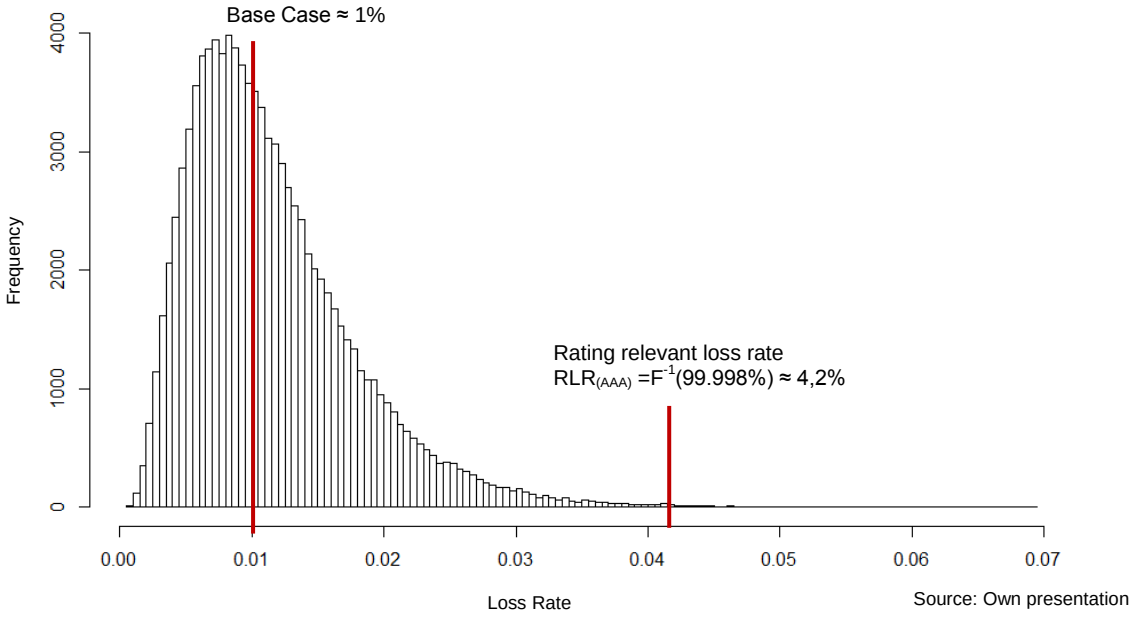
3.5.1 Stress factors and rating scenarios

The base case assumptions of expected default and recovery rates gained through the preliminary analysis will be stressed using risk premiums in varying amounts. These premiums are called '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 shown in part 2.1 ('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.[1] Using the stressed base case assumptions, the *rating relevant loss rate* is determined, which will serve as input for the subsequent cash flow analysis. Alternatively, the rating relevant loss rate can be determined directly by using the portfolio loss distribution (analytical derivation or approximation by simulation). The particular approach for sizing and adjusting stress factors is selected with respect to the characteristics of the portfolio.

In the case of small and medium-sized portfolios, a loss distribution is approximated with the help of a Monte Carlo simulation. This requires sufficient information as to the credit quality of the as-

[1] 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.

sets contained in the portfolio. This loss distribution can be used directly to determine the relevant loss rate for any rating scenario:



Source: Own presentation

In the above fictitious example, based on a n average loss rate of ≈1%, the quantile of the simulated distribution is sought for the level which corresponds to the probability of default assumed by Creditreform for the respective rating scenario. The rating relevant loss rate for the scenario AAA, for example, would correspond to the quantile $F^{-1}_{(99.998\%)}$ ≈ 4,2%. This would then be assigned as an input parameter for the cash flow model in the AAA rating scenario.

Alternatively, for granular portfolios, a distributional assumption for losses is arrived at and calibrated to empirical data. Thus in the same way the relevant loss rate for any rating scenario can subsequently be determined as a quantile of the distribution to the level of probability of default corresponding to the specific rating scenario.

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.

If residual values are securitized in an auto-ABS transaction, the assumed base case sale proceeds are also subject to different levels of risk premia. These will gradually increase in scenarios with higher ratings (“residual value haircuts”). If leases contain a call option, scenario-specific turn-in rates are assumed (AAA scenario: 100%, AA: 90%, etc.), which gradually decrease with

lower ratings. Turn-in rates and the resulting total exposure will always be reduced by the scenario-specific default rates.

In particular cases, stress factors are determined by the analysts and are dependent upon other qualitative factors which are assessed and elucidated in the rating report. The actual stress factor applied may therefore differ from the values which have been quantitatively determined. Among other factors, assessments on the following are particularly relevant for Auto ABS transactions: (1) the quality of the historical data provided, (2) the stability of servicing and underwriting standards, (3) the quality and performance of the hedging instruments in relation to the economic cycle, (4) revolving periods, (5) balloon- and residual value risks, and (6) the absolute and relative level of default rates. According to their characteristic values, these factors may positively or negatively influence the amount of the risk premium (see Appendix 1). 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, in order 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 this case, the stress test implied in the rating scenario is considered to have been passed.

3.5.2 The cash flow model

Cash flows are modelled under consideration of all particularities specific to the transaction. These include the order of priority and performance triggers (clean-up call, early redemption, etc.) which could alter the payment waterfall. 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 which define the loss rate), the timing of losses or defaults and recoveries, as well as the influence of prepayments and interest rate risk, resulting in a number of scenarios which will be analysed in their effect upon cash flow stability. The cash flow model enables us to depict the influence of a range of rating scenarios on the servicing of financial instruments over the entire term of the transaction. In a worst-case review, the worst possible portfolio composition can be used, while preserving the eligibility criteria, as a basis.

3.5.3 Scenario-based stress tests

Information gained in the course of the rating process is used to construct best, mid, and worst-case scenarios 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 sub-

jected to predetermined additional stress parameters whose effect upon the serviceability of the structure is examined. Sensitivity analyses are used to study the extent to which the stability of the structure is subject to change due to variations in individual parameters. This enables an assessment of the effects of uncertainty and risk related to the input parameters and the resulting changes in the rating indications of the issue. In addition to the stress factors affecting the rating relevant loss rate, the following parameters are examined with respect to their influence on the serviceability and ultimate repayment of the tranches:

- Level of default and recovery rates, or loss rates
- Level and timing of prepayments
- Timing of defaults and recoveries, or losses
- Interest rate and portfolio yield (excess spread)

In order to determine a rating indication for a tranche, the predefined scenarios are evaluated. Creditreform checks whether the claims of creditors to payment of interest and principal can be fulfilled in accordance with contractual obligations. The results from the cash flow analysis are elucidated in the rating report and are the subject to the rating committee.

4 Continuous Monitoring and Follow-up Rating

The rating is categorically valid for twelve months from the date of publication. During this period, the development of the issue is continuously monitored by the team of analysts. The aim of this is to ensure at all times the current validity of the indication provided by the rating. For this purpose, the analysts remain in direct contact with the relevant parties to the transaction while evaluating relevant information. Should any significant events occur during the monitoring period which have a negative or positive effect on the quality of the issue, the rating will be adjusted.

At the end of the twelve-month period (monitoring phase), it is generally necessary to carry out the rating again in the context of a follow-up rating.

5 Appendix I: Adjustment of Base Assumptions

a) 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 asset characteristics e.g. the original term or loan-to-value ratio, vehicle characteristics such as vehicle type, automotive group or status as either a new or used vehicle; the type of loan e.g. leasing with full amortization or balloon loan; debtor characteristics such as the classification as private or commercial debtor, the extent of geographical concentrations and debtor concentration and debt ratios.

CRA forecasts default events for a pool for the time period following its securitization. However, statistical data also include defaults from the time of the granting of a loan or leasing i.e. before any securitization was undertaken. Hence for forecasting purposes, either prior securitizations should be used with similar characteristics and the same life cycle or, if unavailable, more recent years for the securitized portfolio. More recent vintages, however, need to be adjusted for typical characteristics due to age. This could be e.g. a delay in write-offs or the exclusion of delinquent receivables from the securitization. The older a securitization pool is, the stronger the effects on the adjustment will be.

Experience has shown that changes in servicing and underwriting standards have a delayed effect upon performance indicators or are difficult to discern 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.

Furthermore, the macroeconomic environment is examined. In the event that there are different general economic circumstances underlying the portfolios to be compared, this will need to be taken into account in the determination of the base assumptions. In particular, changes in economic growth, unemployment rate, and in the value of used cars will have a significant influence.

b) 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 with regard to the recovery base case assumption. CRA may apply a larger haircut on a case-by-case basis should this effect be inappropriately high and an adjustment be appropriate.

One important factor for the level of the recovery rate is the type of collateralization. If the transactions are collateralized, the recovery rate will be higher than for non-collateralized transactions. In the case of securitized Auto ABS transactions, issuers are entitled to the car subsequent to a default, whereas in the case of unsecuritized transactions there are only recourse claims against the borrower following a default. Hence the latter type of transaction must be taken into account with a higher haircut.

Furthermore, the originator specific recovery process has to be accounted for. The jurisdiction and the type of asset class as well as third-party involvements in the work-out process can have a significant influence on the timing of the recovery process. Should it be possible to repossess and sell the collateral more quickly, the base case scenario will receive a better assessment.

An expected downturn in the economic cycle will also affect the level of recovery rates. Where the base case scenario has already seen a haircut due to an expected short-term downturn, a haircut will be lower than where the base model has been oriented toward the long-term trend.