Criteria | Structured Finance | ABS:

Global Auto ABS Methodology And Assumptions

March 31, 2022

Associated SIVR

This criteria article is related to "Sector And Industry Variables: Global Auto ABS Methodology And Assumptions," published March 31, 2022. Rating analysts must use applicable sector and industry variables reports (SIVRs) as they apply criteria and exercise analytical judgment in determining credit ratings.

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OVERVIEW AND SCOPE

1. This criteria article describes S&P Global Ratings' methodology and assumptions for assessing the credit quality of consumer auto asset-backed securities (ABS).
2. These criteria apply globally to all ABS that are backed predominantly by consumer loans and leases used to acquire a new or used light vehicle. The criteria may also apply to ABS backed by loans and leases to commercial obligors--as long as their purpose is to acquire a light vehicle and they do not exhibit a material borrower concentration (such financing agreements are usually underwritten following a consumer finance approach). We also use the residual-value approach under these criteria to analyze the market value risk in ABS secured by light vehicles. Light vehicle types include road motorcycles, but typically exclude motorsport and recreational-type vehicles, marine or watercraft, and heavy-duty vehicles.

Key Publication Information

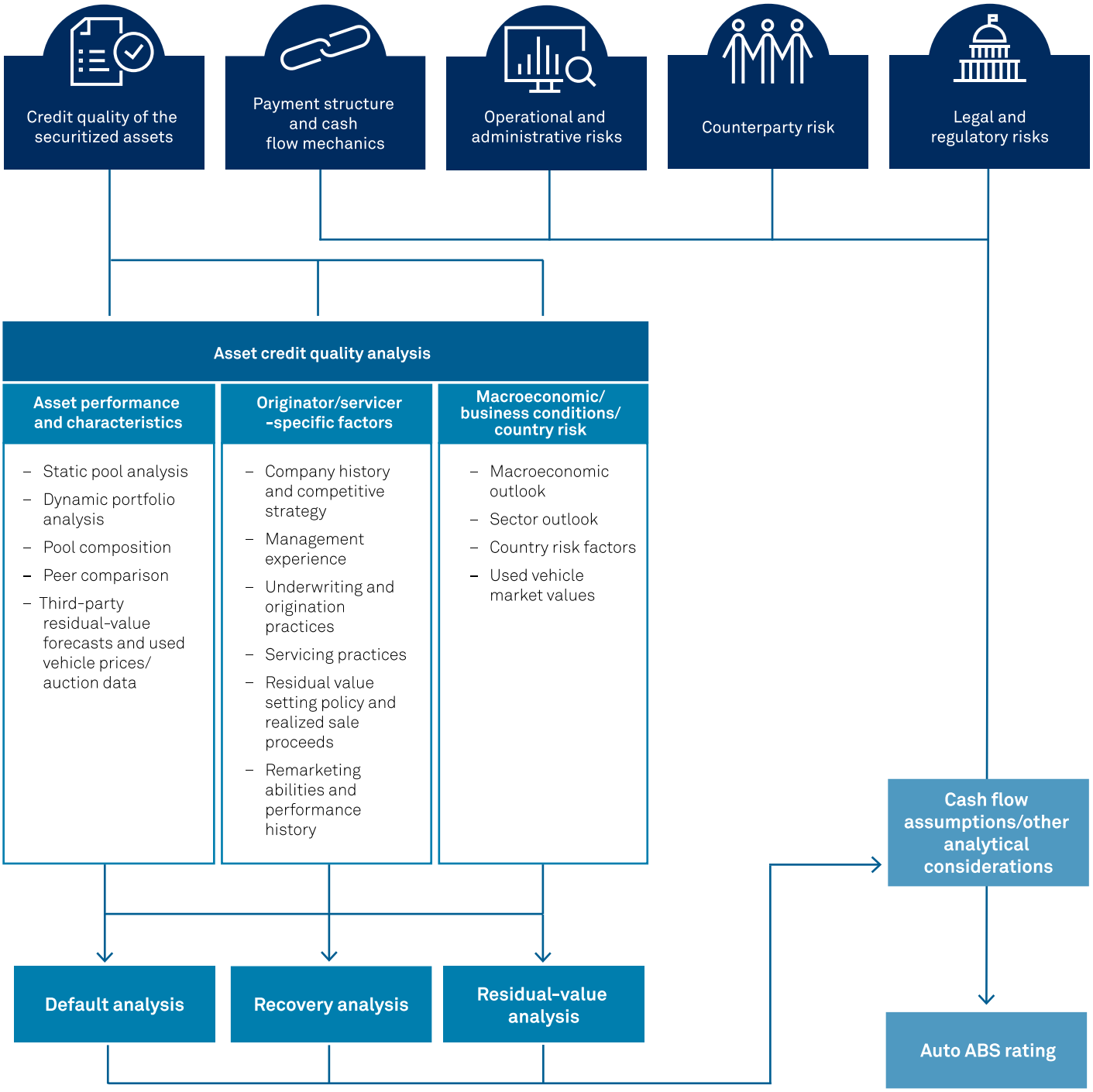
- Original publication date: March 31, 2022
- Effective date: These criteria are effective immediately, except in jurisdictions that require local registration. In those jurisdictions, the criteria are effective only after the local registration process is completed.
- This methodology follows our request for comment, titled "Request For Comment: Global Auto ABS Methodology and Assumptions," published Nov. 30, 2021. For the changes between the RFC and the final criteria, see "RFC Process Summary: Global Auto ABS Methodology And Assumptions," July 9, 2021.
- These criteria supersede the articles listed in the Criteria Fully Superseded and Criteria Partly Superseded sections at the end of this article.

METHODOLOGY

3. This article outlines our global methodology and assumptions for rating consumer auto ABS. These transactions are backed by auto loans or leases that dealers, finance companies, banks, and credit unions extend to consumers purchasing new or used vehicles. Auto financings can be direct or indirect. In an indirect financing, the auto dealer helps secure the financing for the obligor acquiring the vehicle; in a direct financing, the consumer obtains this directly from a lender.
4. We apply these criteria in the development of forward-looking base-case and rating-specific stress scenario assumptions for key asset performance variables. Throughout this article, we use the terms "base case" and "expected case" interchangeably.
5. The analytical framework for structured finance securitization ratings has five key areas:
   - The credit quality of the securitized assets;
   - Payment structure and cash-flow mechanics;
   - Operational and administrative risk;
   - Counterparty risk; and
   - Legal and regulatory risk.
6. Of those categories, this article focuses mainly on the credit quality of securitized assets and the payment structure and cash-flow mechanics. (See the "Related Publications" section at the end of this article for general criteria articles addressing the last four areas of analysis.) Chart 1 provides an overview of the criteria framework for rating global auto ABS.

Chart 1

Overview Of Criteria Framework For Rating Global Auto ABS



Source: S&P Global Ratings.

7. Our analysis of the asset quality of a pool of auto receivables focuses on generating base-case and stressed assumptions for defaults and recoveries or for net losses, and--when

applicable--residual values. This analysis is informed by our review of:

- The characteristics and historical performance of the pool of assets;
- The originator and servicer of the receivables; and
- Our view of the macroeconomic and business conditions and country risk factors as well as their impact on the expected performance of the securitized pool of receivables.

8. We then determine rating-specific assumptions by applying a level of stress to the base-case assumptions, reflecting our view of the impact on the securitized pool's performance of various degrees of macroeconomic stress that we view as commensurate with each rating level, according to our ratings definitions (see Related Research). These reflect the likely increase of a borrower's propensity to default in a situation of stress and the likelihood that amounts that are able to be recovered could be impaired under worsening economic conditions.
9. Finally, we incorporate these assumptions, along with any other relevant analytical considerations, into our cash flows analysis based on the transaction's payment structure so that we can assess the structure's ability to pay timely interest and principal by final maturity under rating-specific stress scenarios consistent with our ratings definitions (see Related Research). We do so in the application of our cash-flow criteria (see Related Criteria), which should be read in conjunction with this article. For general criteria articles addressing the other key areas of our analytical framework, see the "Related Publications" section at the end of this article.
10. Our rating analysis for auto ABS under these criteria incorporates an assessment of environmental, social and governance (ESG) risks if we believe they have the potential to impact the securities' creditworthiness (see Related Criteria for more information on the principles that we apply to incorporate ESG credit factors into our credit ratings analysis).

Asset-Quality Analysis And Establishing The Base Case

11. Under the criteria, we assess the credit quality of a pool of consumer auto receivables by analyzing quantitative and qualitative factors that inform our view of a pool's expected credit and residual-value losses under different scenarios.
12. Depending on market convention and data availability, we may base our analysis of the asset performance on default and recovery data or on net-loss data. (The net loss rate is the product of the default rate and the loss severity rate, which is 1 minus the recovery rate.) Throughout this article, we usually refer to gross defaults for our analysis, but for North America, we base our analysis on net losses based on market practice and availability of consistent data across originators. In some markets such as Europe, where data reporting is usually on a gross-default basis, if we receive data on a net-loss basis, we may derive the implicit cumulative gross default level by grossing-up based on the upper end of our estimate of typical recovery rates for the originator or a comparable one.

Performance history and data quality

13. The originator's and servicer's histories and backgrounds are the starting points in our analysis. We may also review management's experience, the company's strategy, the underwriting and credit-adjudication process, the target market, and market positioning, which could range from high-quality prime obligors to credit-impaired individuals. By understanding these factors, we gain a better perspective of the historical loss performance and how it may change.
14. Because our approach for estimating base-case defaults, recoveries, and cumulative net loss

(CNL) rates for auto receivable securitizations is informed by data, our confidence in estimating base-case lifetime losses on a pool of auto receivables generally increases as the quantity and quality of performance data increase. An originator's ability to provide detailed performance data covering a sufficient time period affects our base-case and stress-scenario performance assumptions for the securitized pool and our ability to assign a rating. In addition, when the performance track record is, for example, short (typically, less than three years), erratic, or highly volatile--or if the level of data segmentation is limited--our expected case accounts for this and is generally higher, or it may constrain the rating we assign. We may also supplement our analysis with a review of proxy data from comparable originators to calibrate our assumptions.

Developing expected default, recovery, and net credit loss rates

15. We generally establish base-case cumulative default, recovery, or CNL rate assumptions for the assets comprising the portfolio by considering and analyzing the following factors, when applicable:

- Static pool credit performance and its stability (originator-specific vintage pool data or securitized pool data);
- Pool composition;
- Dynamic portfolio performance data;
- Peer comparisons;
- Data granularity;
- Originator- and servicer-specific factors;
- Recoveries on defaulted loans;
- Charge-off policies;
- Receivables' term and seasoning;
- Macroeconomic factors and business conditions;
- Country risk factors, such as outlook, market conditions, and economic cycles affecting the country; and
- Transaction-specific considerations, such as prefunding and revolving structures (see "Assumptions for revolving transactions/prefunding structures").

Asset performance and collateral characteristics

16. Our analysis of the asset performance typically involves looking at static pool data as well as dynamic (or managed) portfolio performance information. We also consider a pool's characteristics like seasoning and composition. Characteristics that could increase a pool's risk level can include, among others, loans with balloon payments or specific products like loans with voluntary termination (VT) rights (see "Waived payments/early termination risks" in the "Other Analytical Considerations" section).

17. When assessing residual-value risk, we look at other factors. For example, we review whether there is a third party providing forecasts for residual values, and we check for availability of used vehicle prices (preferably auction data) and any idiosyncratic features with the used vehicle price data for a particular originator (see the "Residual-Value Loss Assumptions" section for more

information).

Static pool data and pool composition

18. Static pool analysis involves tracking the performance of a discrete pool or vintage of receivables as the assets amortize. The vintage refers to the period in which the receivables were originated--often a month or quarter. When the data is available, we generally analyze monthly or quarterly static pool performance based on company-provided origination data and the performance of past securitizations--to the extent the company has securitized similar assets. We use the information to develop base-case assumptions for the amount and timing of gross losses and recoveries or net credit losses. For example, we measure defaults of past securitizations as the aggregate amount of defaults experienced during the pool's life, which can provide the cumulative gross default percentage when divided by the original pool balance. When market convention provides for net loss data, we can follow the same exercise to arrive at a CNL percentage.

19. We may evaluate historical loss-timing curves to determine the rate at which the historical originations incur losses and then use these curves to project losses on the company's more recent, less-seasoned pools. We may also use the pool factor data to develop our base-case default or net loss assumption for vintages that have not fully paid down.

20. The performance of past static pools is often a strong indicator of a new pool's performance, assuming comparability of pool characteristics and consistent underwriting. Therefore, we may adjust the base-case default, recovery, and net loss rates to the extent pool characteristics, underwriting, servicing, and economic conditions have changed.

21. We generally analyze pools on a segmented basis--by specific collateral characteristics or on a cross-sectional basis. Analyzing static pool performance data stratified based on key credit-quality indicators can help us understand the effects of changes in the pool composition. Examples of characteristics of the pool composition on which we may examine performance include:

    - Credit score;
    - Term of receivable;
    - Subvened (or incentive-rate) versus nonsubvened;
    - Direct versus indirect loans;
    - Financing contract structure, such as the presence of balloon payments;
    - Obligor concentration;
    - Geographic concentration;
    - Vehicle type (such as full-size truck versus midsize car);
    - Loan to value (LTV); and
    - Whether the financed vehicle is new versus used.

22. A cross-sectional static pool analysis can drill down and examine performance on a multilevel basis--for example, analyzing the performance of 120%-plus LTVs on long-term auto loan contracts to obligors with low credit scores. Cross-sectional analysis is particularly helpful in identifying risk layering. Depending on the pool composition relative to historical data, we may increase loss expectations to account for any incremental risk posed by exposure to a particular attribute or combination of attributes.

23. An example of how pool composition may affect our analysis of credit quality is when the pool includes loans with balloon payments. When balloon loans are securitized, we typically adjust the rating-specific default and recovery rates and the timing of defaults to address the additional risk that might not be reflected in the historical loss data.

24. Additional collateral characteristics may also be applicable to our analysis of certain assets within a particular jurisdiction. For example, for U.K. and Irish pools, we also consider whether the contracts are subject to voluntary-termination provisions. (These additional characteristics are described further in Appendix 2.)

Dynamic portfolio performance data

25. Although we generally derive our base-case default and recovery or net loss expectations primarily from static pool data when such data is available, we may also analyze dynamic (or managed) portfolio data. This data can be used to measure annual defaults, recoveries, net losses, and delinquencies relative to the average or previous year-end portfolio balances. Unlike static pool default or net loss rates, which are generally the cumulative lifetime defaults or net losses as a percentage of the initial principal balance for a fixed pool of assets, managed portfolio performance data provide a measure of defaults on an annual basis.

26. There are certain limitations associated with dynamic portfolio performance data. Defaults occurring in a given period may relate to receivables originated in an earlier period; therefore, expressing defaults as a percentage of the same period's origination may not be appropriate. This is especially true for a rapidly growing portfolio (because of the increasing size of the default rate denominator) or for a portfolio that exhibits significant changes in its underlying collateral. Therefore, managed portfolio losses are often adjusted to link defaults to their relevant originations. During periods of modest growth, multiplying this growth-adjusted default level by the expected weighted average life of the pool in question can yield a cumulative default level that is generally close to the proxy established using static pool default data.

27. The analysis of dynamic portfolio data is also useful in providing a better understanding of the trends in a company's performance, particularly with respect to delinquencies. Delinquencies are a leading indicator of future credit performance. Therefore, if they are rising, defaults are likely to increase as well. Rising delinquencies could signal a worsening economy, a liberalization of underwriting standards, or simply that the company has grown faster than its infrastructure. In any event, rising delinquencies are typically a negative factor in our analysis. By the same token, declining delinquencies could be a positive factor. Because delinquencies are seasonal, we typically compare this metric on a year-over-year basis.

Peer comparisons

28. To enhance ratings comparability across originators, we may compare a transaction's pool with individual pools originated by others that we consider to be in the originator's peer group. Our comparison may cover aspects like collateral characteristics, static and managed portfolio performance data, and our original expected and updated projected loss ranges. While we generally place more emphasis on originator-specific static pool performance for determining the base-case loss assumptions for the pool being analyzed, the peer comparisons allow us to assess the pool and base-case assumptions in light of other pools we've analyzed and achieve adequate rank-ordering of our assumptions for different transactions based on their relative risk profile. It can also be useful in identifying trends and market developments that might be less apparent when looking exclusively at a single portfolio or originator or when analyzing pools from new originators.

29. We typically measure a transaction's pool against applicable comparable pools in terms of expected loss rate. Deviations in historical and expected performance or current loan and obligor characteristics relative to the applicable peers' pools could lead to variations in pool-specific base-case and stress-case performance assumptions. For example, if the pool mix shifts away from historical norms to include a greater percentage of longer-term loans with higher LTVs, our analysis takes a forward-looking view and would likely project higher losses on these loans.

30. When the originator-specific performance is significantly better than that of its peers, we examine the reasons for the difference. To the extent that we view the superior historical performance as unsustainable or believe the conditions contributing to the superior performance would not exist in a stressed environment, we may adjust the base-case default rate, recovery rate, and CNL accordingly.

Seasoning

31. We may consider a pool's seasoning (the extent to which the assets have already amortized) when assessing credit quality. Meaningful seasoning may reduce the remaining losses as a percentage of the current pool balance to the extent the percentage of losses already incurred (for example, 30% of total losses taken by Month 12) exceeds the percentage by which the pool balance has amortized by that time (for example, the pool balance has declined by 20%).

32. The impact of seasoning on asset credit quality is generally more significant when assets exhibit front-loaded default timing behavior. However, for pools with back-ended loss tendencies (such as those with material exposure to balloon loans), we may apply limited or no seasoning credit.

33. We may account for this by adjusting downward our base-case default or loss assumptions. Typically, we account for a greater seasoning benefit in our assessment of base-case defaults or losses where there is significant data on pool amortization and loss rates on a static pool basis. The level of seasoning may also affect the shape of the loss- timing curve we assume in our rating-specific stress scenarios.

Balloon loans

34. The typical fully amortizing receivable, such as an auto loan, is repaid over its life with constant installments. Balloon loans are different in that they typically have constant, but relatively small, installments during the life of the loan plus one final, relatively large, installment at the end. We consider balloon loans to be riskier because it might be more difficult for obligors to make a relatively large balloon payment during periods of economic stress. There may also be a degree of market-value risk. For example, a balloon loan may be used to finance a vehicle, and the lender may set the final balloon payment to match the forecasted vehicle value at the maturity of the loan. If the obligor is relying on the sale of a financed vehicle to make the final balloon payment, the proceeds from the sale could be insufficient if the market value is below the forecasted price at the time of loan origination. In addition, because the loan amortization is slower, this could impair recoveries on defaulted loans.

35. Specific balloon loss assumptions applied in our analysis reflect an analysis of originator- and loan-specific pool characteristics and country-specific considerations. Pool characteristics that may affect balloon loss stress include the types of vehicles in the pool, brand/manufacturer diversification, maturity concentration, the originator's policies related to balloon loans and vehicle-value forecasting, and the presence of any third-party repurchase obligations.

- Vehicle type: In our view, high-volume standard vehicles have more stable markets than vehicles of special types, like luxury cars or motorbikes.

- Diversification: In our view, significant manufacturer and brand diversification is a positive factor, as it generally reduces the impact of event risk, such as a manufacturer default.
- Maturity distribution: A pool with balloon payments that are concentrated in a short period of time may be riskier than one with well-distributed maturities.
- Size of balloon payment: Balloon rate setting and vehicle-value forecasts by the originator that are above the market average negatively affect the balloon risk.
- Third-party agreements: If, for example, as part of the financing contract, a third-party (usually the auto dealer) is obligated to repurchase the car at a predetermined price equal to the balloon payment, the risk may be reduced, as this would require simultaneous nonpayments by both the obligor and third party to result in a loss.

36. Country-specific factors that may affect our balloon loss stresses include current and expected economic and business conditions and the position of the manufacturer in the local market. The securitization's legal rights to quickly take possession of the vehicle and sale proceeds in case of borrower default could also affect the balloon loss stress. The liquidity of the country's second-hand vehicle market also affects the servicer's ability to liquidate repossessed vehicles.

Originator- and servicer-specific factors

37. We typically consider qualitative factors related to the originator and servicer in setting our loss assumptions. The following factors, for example, can affect pool performance and reporting of losses, which could have an impact on our default expectations:

- Company history, business model, and management experience;
- Competitive strategy and market position;
- Origination and underwriting practices;
- Servicing and collection practices and charge-off policies;
- Residual-value setting policies and remarketing abilities; and
- Collateral repossession practices.

38. Changes to an originator's underwriting and collections policies and procedures may limit our ability to use historical performance to gauge future performance and could lead to more conservative estimates of base-case losses for the pool to be securitized.

39. Our analysis of operational risk may also result in a cap on the maximum rating we assign to a transaction according to our operational risk criteria (see Related Criteria).

Charge-off policies

40. We may adjust our base-case default or loss rates based on an analysis of historical delinquencies and the originator's/servicer's charge-off policies. If, in our view, historical default rates potentially understate the credit risk profile of the pool based on an analysis of delinquency trends or the charge-off policies, base-case default or loss assumptions may be adjusted upwards. For example, if the originator's/servicer's charge-off policies are out of line with industry norms and loans are being charged off at a later stage of delinquency, base-case default or loss rates may be increased to adjust for the more liberal charge-off policy. In some cases, a late-stage delinquency rate may be used as a proxy for default or loss rates.

Macroeconomic factors and business conditions

41. In addition to the static and dynamic performance data and the other quantitative and qualitative information previously mentioned, we consider other forward-looking factors--such as the economic outlook and business conditions--when estimating expected-case assumptions for defaults and recoveries or CNLs. This is because the economic cycle usually influences pool performance. For this reason, base-case default or loss rates are generally expected to increase under more stressful economic conditions.

42. For example, unemployment, inflation, and household income can all affect an obligor's ability to make loan or lease payments. Therefore, when analyzing historical static pool performance, we may look not only for a cohort pool with similar characteristics but also for a cohort that underwent a similar level of economic stress as the one that we expect the current pool to be subject to during its life, if available.

Country risk

43. When establishing our base-case default or loss rates for a pool of consumer auto receivables, we also consider country risk factors that could affect asset performance over time (for more information see our country risk assessment methodology in see Related Criteria). Such risks generally include:

- Economic risk: Economic risk, including heightened macroeconomic volatility, may increase the instability of the underlying assets' performance, which could affect repayment of the debt obligations. Relatively low per capita income in a given jurisdiction may also constrain consumer debt repayment.
- Institutional and governance effectiveness risk (including political risk): Weak institutional and governance effectiveness risk, including political risk, can cause a more severe impact for the business environment and auto loan delinquencies.
- Financial system risk: Financial system risk is important because we tend to observe weak points in business and consumer credit cycles correlated with banking crises.
- Payment culture and rule-of-law risk: Our assessment of payment culture and rule-of-law risk covers key country-specific aspects that can affect pool performance, including respect for the rule of law, property rights, contract rights, enforceability, corruption, and related event risk.

44. In addition to these aspects of country risk, for ratings higher than the rating on the sovereign, we assess the potential effect on the pool performance of a sovereign default. This may lead ratings on an individual security to be constrained, as per our criteria regarding ratings above the sovereign (see Related Criteria).

Stressed Default And Loss Assumptions

45. Stress scenarios are meant to capture varying levels of deterioration in both economic and business conditions. Once the base-case default or net loss rate is determined considering our forward-looking view of the expected performance of a pool over the life of a securitization, we estimate the impact of various stress scenarios on the pool performance to develop rating-specific default and recovery or net loss rates commensurate with our ratings definitions (see Related Research).

46. Rating-specific default or loss rates are sized as a multiple of the base-case assumption. Table 1 shows the typical range of rating level-specific stressed defaults or losses as a multiple of the base-case assumption for pools with low to modest levels of defaults or losses (for example, in North America, we typically use this table for pools with an expected CNL of approximately 13% or less).

Table 1

Typical Stress Scenario-Defaults/Loss Rates As A Multiple Of The Expected Case For Pools With Low To Modest Expected Defaults

Rating level*	Stressed default/loss rate range (x)
AAA	3.50-5.00
AA	3.00-4.00
A	2.00-3.00
BBB	1.50-2.00
BB	1.25-1.75
B	1.00-1.50

*For notched rating levels (that is, ratings with +/- modifiers), we interpolate the rating-level stress multiples.

47. We consider qualitative and quantitative factors when deciding a specific stress multiple within the range for a given rating, such as the:

- Level of base-case defaults or losses, because the multiples for pools with low base cases (for example, prime pools in North America) are generally higher than those of pools with high base cases (like subprime pools in North America);
- Originator/servicer experience and track record;
- Extent, timespan, and quality of the data;
- Performance history of a specific pool, especially when performing surveillance;
- Performance history of relevant previous transactions by the same originator; and
- Relevant concentrations in the pool: In some cases, there may be concentrations by obligors' employer or industry. This could be especially relevant in the case of novated leases, when the employer retains the lease payments from an employee's wages and forwards the payment to the servicer.

48. Where base-case default or loss rates are very high or very low, the stress multiple ranges in Table 1 might not apply. We may apply a lower multiple when considering portfolios with very high base-case default or loss rates if the stressed default rate would otherwise approach or even exceed 100%.

49. If we believe a pool's geographic concentration is unusually high (for example, if a particular region is significantly overrepresented when compared to the country's population or GDP), the multiples we use may be higher than for a more geographically diversified portfolio, and they may even be outside the ranges in Table 1.

50. Other factors may cause us to apply additional adjustments to the multiples in Table 1, such as:

- For some revolving transactions, if we believe that the risk might not be fully captured by our base-case defaults projected using the transaction's eligibility criteria (such as for longer reinvestment periods).

- When the performance history data is limited or does not cover a period of economic stress.
- For transactions in jurisdictions with an elevated degree of country risk.

51. Base-case default or loss rates are expected to increase if there is a significant economic deterioration (and conversely, to decrease when the macroeconomic environment significantly improves). However, the level of sensitivity to a change in our base-case assumptions is generally lower at higher ratings than at lower ones. That is, some level of volatility around the base case can occur, and although it generally results in changes to the stress assumptions for the 'B' category, it might not necessarily affect higher ratings. In a normal economic cycle, as the rating scenario moves up the rating scale from 'B' to 'AAA', the level of sensitivity to a change in the economic environment is generally expected to decline. For example, a hypothetical pool could have a base-case default rate that ranges from 2.0% to 2.5%, depending on economic conditions. While this may lead to a change in the 'B' stress scenario default rate, the 'AAA' stress scenario default rate for the hypothetical pool may remain at or near 10% throughout a normal economic cycle. However, if the economic and market conditions deteriorate significantly beyond the normal ranges for cyclical fluctuations, we would expect even the 'AAA' default rates to increase.

52. In our surveillance reviews of outstanding securities, we may adjust our base-case and stressed-case default or loss assumptions on outstanding transactions based on actual performance and our outlook for the economy in general. Reflecting the availability of actual pool performance and shorter time to maturity, our stressed-case losses as a multiple of our revised base-case losses may be in a lower range of multiples in surveillance than the range of multiples that generally apply at the time of issuance. We believe that our ability to project losses on outstanding pools improves as the loans season, given that we're taking into account actual performance and the current economic environment.

Stressed Recovery Assumptions

53. Recoveries may be a source of significant cash flow to an auto ABS transaction. Recoveries may consist of proceeds received from the sale of the repossessed vehicle and funds obtained directly from the obligor in full-recourse markets. Recovery rates and timings vary significantly, depending on factors such as:

- Jurisdiction and legal rights;
- Methods and strategies of recovery used (pursuing legal remedies, repossession, and liquidation or re-leasing);
- Financing terms (such as the LTV and term);
- Servicing intensity and expenses involved;
- Idiosyncratic risks related to the vehicle brand or type; and
- Liquidity of the used vehicle market.

54. When available, we analyze historical recovery rates and timings for the originator and the market. Our assessment of recovery rates and timings is generally country-specific and typically begins with an analysis of the characteristics of the receivables and of the vehicles that secure the loans or leases in the securitized pool.

55. A receivables pool with lower average LTVs typically has a higher average recovery rate than similar pools with higher average LTVs. In our view, shorter-term receivables (48 months, for example) are likely to have higher recovery rates, as the pace of amortization relative to vehicle

depreciation--especially for new vehicles--is faster than longer-term receivables (such as 84 months). In addition, we expect high-volume standard vehicles to generally have more stable markets than vehicles of special types, like luxury cars.

56. Our analysis also includes the legal rights and remedies that the servicer has against the borrower or to the vehicle. Country-specific factors that may affect the recovery rate assumptions applied under the criteria include current economic and business conditions and the legal setup, where, for example, consumer protection laws might limit a servicer's ability to quickly repossess the vehicle when the receivable becomes delinquent or defaulted. The liquidity of the secondary market in a country may also affect the servicer's ability to liquidate repossessed vehicles and maximize recoveries. Other country-specific factors like the tax rate can affect recovery rates when these taxes are rolled into the amount financed.

57. Our analysis generally incorporates a review of historical static or portfolio data to determine appropriate base-case recovery rates and stressed haircuts. Where appropriate, we may review this recovery performance data by relevant cohorts. We may adjust for fees, such as repossession and auction fees, from the recovery rate data.

58. In determining our recovery assumptions, we consider the stability of historical recovery rates and factors that may affect the timing, amount, and availability of future recovery rates for the securitized pool. We also review whether the historical recovery data cover a stressed period. If, in our view, the recovery rates are volatile or the data do not cover a sufficiently long period that includes a stressed environment, or if the availability of recoveries is subject to significant operational or legal risks, historical recovery rates may be discounted in developing our base-case recovery assumptions. The discount applied to recoveries also depends on our assessment of originator's/servicer's collection and recovery strategies. For example, when recoveries are volatile or driven by temporary factors, such as a one-time sale of defaulted receivables, we may assume lower or zero base-case recoveries.

59. We may also use very low or even zero base-case recovery rates in jurisdictions where there are significant hurdles to foreclosure and repossession of the securing asset, or when a jurisdiction or servicer shows an insufficient track record of successful recoveries.

60. We apply haircuts to the base-case recoveries to derive stressed recovery rates at each rating, except where market convention provides for the use of net loss data. In such cases, we review historical recovery rate data and recent trends to size our expected CNL assumption (for example, in North America, see section "Recovery and cash-flow analysis" section under North America in Appendix 2). Table 2 outlines the typical haircuts that we apply to our base-case recoveries on defaulted loans and leases at each rating level. We may apply haircuts near the bottom end of the range when we have data showing a strong track record of recoveries that covers downturns in the economic cycle with low volatility in recovery levels. Conversely, where we have limited data, the volatility observed has been higher, or the base-case recoveries are very high, we may apply haircuts that range from the middle to the high end of the ranges.

Table 2

Haircuts Applied To Our Base-Case Recovery Assumptions At Each Rating Level

Rating level*	Typical haircut range (%)
AAA	15-50
AA	12.5-40
A	10-30
BBB	7.5-25
BB	3-20

Table 2

Haircuts Applied To Our Base-Case Recovery Assumptions At Each Rating Level (cont.)

Rating level*	Typical haircut range (%)
B	0-15

*For notched rating levels (that is, those with +/- modifiers), we interpolate the rating-level haircuts.

61. We may apply additional stress recovery haircuts for balloon loans when the aggregate balloon payments constitute a significant portion of the total pool balance. This is to address the additional risk given the limited or no equity built for such loans, resulting in higher loss severities. In addition, the historical recovery data for a given originator might not fully reflect balloon loan recoveries.

Residual-Value Loss Assumptions

62. At the end of the contract term (generally a lease), a lessee or obligor that is current on its payments may have the option (but not an obligation) to purchase the vehicle at the contract value or return it. When an obligor does not exercise this option and instead returns the vehicle, this is sold in the secondary market. Residual-value risk is the risk that the sales proceeds after selling the returned vehicles are less than the base residual value of those vehicles. The base residual value is generally defined as the lesser of (i) the residual values set in the lease or loan contract or (ii) the third-party residual-value forecast or projection assigned to the vehicle, if available (at inception or as updated from time to time).

63. Some non-defaulted borrowers may exercise the purchase option; however, we typically assume most do not and the vehicle is returned and therefore subject to residual loss.

64. A key consideration when analyzing residual cash flows and determining an appropriate stress at each rating scenario is the legal framework governing the transfer of the vehicle and the right to take possession and therefore to receive residual-value cash flows. Legal rights are generally a jurisdiction-specific consideration, and in some countries or transactions, we might limit the value we assign to certain cash flows. We might even give no value to residual-value cash flows if the issuer does not have legal rights to the asset.

65. In addition, we consider the liquidity of the market for used vehicles because monetization of residual values on returned vehicles depends on their sale.

66. As part of our analysis of residual-value risk in auto ABS, we typically conduct a review of the following factors that inform our assumptions for base residual values and stress assumptions:

- Residual-value pool characteristics;
- The originator's residual-value setting policy and accuracy;
- Third-party forecasts of residual values, if available, including their expectation of economic stress in those forecasts;
- The servicer's experience of realizing residuals;
- Static pool and managed portfolio performance;
- Historical used vehicle prices and market data;
- Current used vehicle market values; and

- The vehicle manufacturer's creditworthiness.

67. This review informs our assumptions for base residual values and stress assumptions that result in a residual-value loss for a transaction. To account for the potential loss due to market-value fluctuations relative to the stipulated residual values at the end of the contracts, we typically apply rating-specific haircuts to the base residual values based on a number of considerations that reflect the local/regional market for the vehicle as well as originator- and transaction-specific features. The vehicles subject to market-value risk include those under non-defaulted and non-prepaid contracts.

68. The rating-specific haircuts we apply are the combination of an initial haircut that we apply to all pools in a particular market as well as additional haircuts and adjustments that we apply to pools with certain characteristics as they deviate from a benchmark pool (one that we consider typical for said market). The haircuts and other assumptions are usually larger as the rating stress scenario increases.

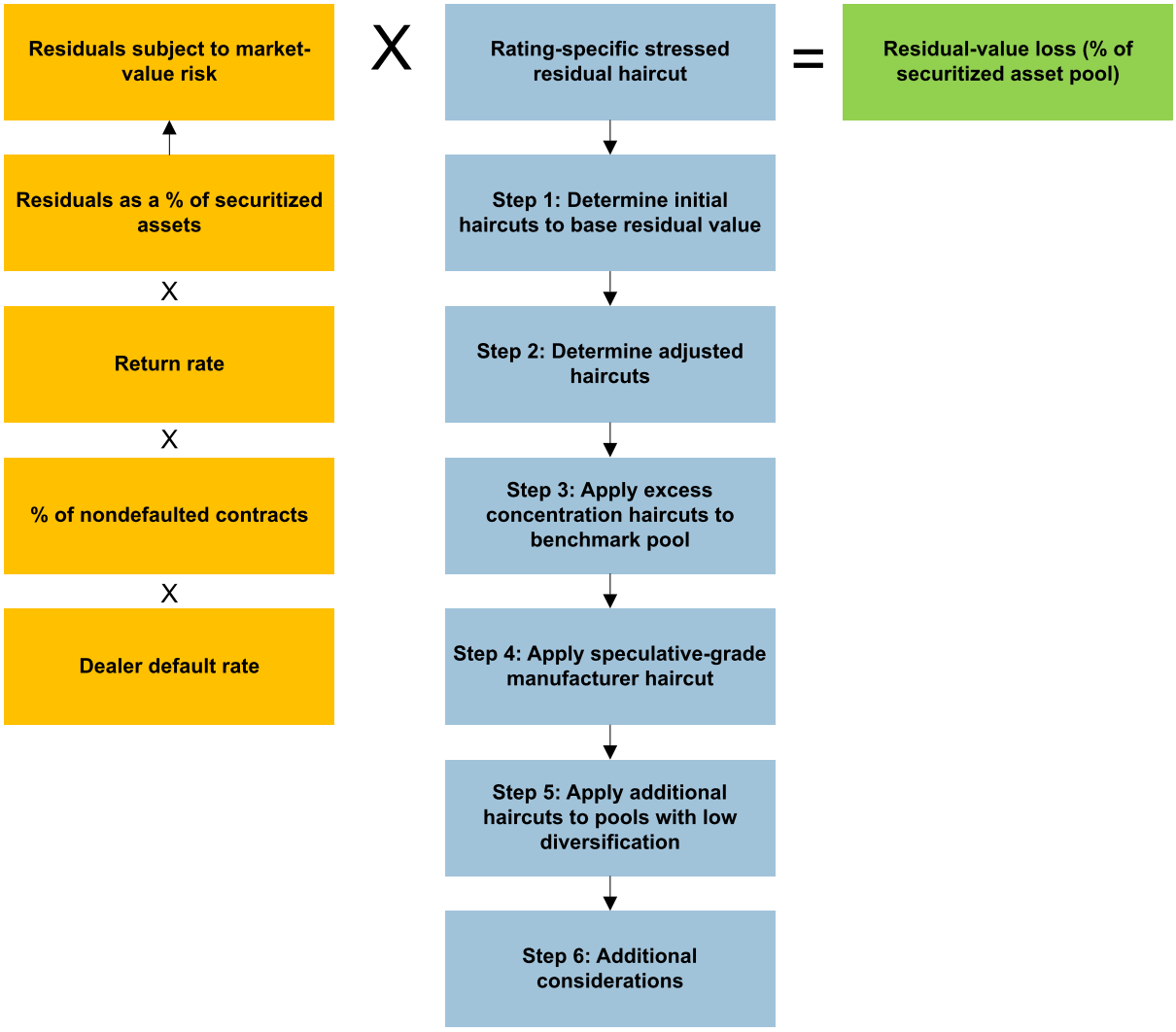
69. We take a multi-step approach to assessing the residual-value risk in auto ABS transactions. Our stressed residual value losses for non-defaulted receivables are a product of the following five factors:

- The percentage of the securitized pool that is composed of the residual values;
- The percentage of non-defaulted contracts for a given stress scenario;
- The rating scenario-specific return rate;
- The dealer default rate, where relevant; and
- The rating-specific total haircut to the base residual value.

70. We use the first four factors to calculate the residuals that are subject to market-value risk; the fifth factor is our assumed stress to cover that risk. To assess the fifth factor, we follow a six-step process to derive the rating-specific total haircut that we apply to the residual-value. Chart 2 delineates the framework for assessing residual-value losses in auto ABS (see Appendix 1 for an example of our residual-value loss assumptions calculation).

Chart 2

Overview Of Residual-Value Framework For Auto ABS



Residual values as a percentage of securitization value

71. We apply our residual-value loss analysis only to the residual portion of a securitization's assets, which may be anywhere from 0% to 100% (in certain limited cases). This is the aggregate of the base residual values of each contract divided by the total securitization's assets.

72. We may adjust base residual values based on an analysis of the accuracy of the originator's and third party's forecasts by comparing them against auction values of used vehicles. If warranted, we reflect these adjustments by increasing or decreasing the haircuts applied to the base residual

values under Table 5.

73. This analysis of the base residual value takes into consideration the basis for any differences between the historical actual used vehicle values and the forecast. For example, the quality of a model or the brand perception of that model may have changed significantly from the previous versions of that same model, or the minimum suggested retail price (MSRP) for the current model may be significantly different from the MSRPs for the prior version of that same model.

Non-defaulted contracts (obligor credit risk)

74. We apply our residual-value loss analysis to loans or leases that have not defaulted or been prepaid. We determine the amount of loan or lease assets that may default in a given rating scenario as outlined in the Stressed Default and Loss Assumptions section of this article. We generally model a low--or even a zero--voluntary prepayment rate when stressing residual values because that tends to be more conservative.

Return rate

75. The rating level-specific ranges of the return rates in Table 3 reflect the increasing likelihood of the return of the vehicle to the lessor in more stressed economic environments, when vehicle prices are more likely to be depressed and, therefore, below contract residual values.

Table 3

Typical Rating Level-Specific Return Rates

Rating level*	Return rate (%)
AAA	90-100
AA	85-100
A	80-100
BBB	75-100
BB	65-95
B	50-90

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level stress return rates. A return/turn-in rate of 100% assumes that all vehicles associated to non-defaulted contracts are returned and subject to residual losses. This table is applicable for leases or loans that have an option to buy. In some European auto ABS transactions, the return rate may go up to 100% in all rating scenarios, as the lessee or obligor is required to return the vehicle at the end of the lease or loan term.

76. The actual return rate assumptions applied to a particular transaction are generally based on originator-specific considerations, such as the lessor's or lender's use of incentive programs (for example, subvention on the lease rate or using an optimistic contract residual value to reduce monthly lease payments) and historical return rate experience. For example, return rates at the upper end of the ranges would apply to an originator that had relatively high rates of return historically or used lease subvention extensively to make lease payments affordable for its customers. Conversely, return rates at the lower end of the ranges would likely apply to an originator with historically low return rates and a strategy of limited or no subvention.

Dealer default rate (repurchase obligation)

77. In some transactions/jurisdictions, the financing contract may contain a provision that requires

the seller of a financed vehicle (the car dealer) to repurchase any returned vehicle at loan or lease termination at a contractually pre-determined price. In such situations, we may assume a certain portion of dealers will satisfy this obligation, which would reduce the portion of the pool that is exposed to residual value risk.

78. The portion of dealers that we assume will satisfy this obligation is 100% minus our dealer default rate assumption. Our dealer default assumptions vary based on our view of the degree of correlation between the manufacturer and the dealers. Table 4 shows the typical minimum dealer default rates that we apply for each rating level.

Table 4

Minimum Dealer Default Rate Assumptions

Rating level*	Minimum dealer default rate (%)
'AAA'	85
'AA'	70
'A'	60
'BBB'	50
'BB'	40
'B'	35

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level dealer default rates.

Rating level-specific total haircut to residual value.

79. To account for the potential loss due to market-value fluctuations relative to the stipulated residual values at the end of the contracts, we typically apply one or more haircuts to the base residual values of non-defaulted assets based on a number of considerations that reflect the local/regional market for the asset as well as originator- and transaction-specific features.

80. The criteria provide a framework for deriving stressed residual-value haircuts through a six-step process applied to our base residual-value haircuts:

- Step 1: Determine the initial haircuts to the base residual values.
- Step 2: Determine adjusted haircuts based on historical performance, current market conditions and our outlook, and other considerations.
- Step 3: Determine any additional haircut for an excess concentration.
- Step 4: Determine any additional haircut due to a speculative-grade manufacturer.
- Step 5: Determine if there's any additional haircut to reflect low diversification.
- Step 6: Incorporate any additional considerations.

81. **Step 1: Determine the initial haircuts to base residual values.** To address the risk that used vehicle prices may be depressed in a worsening economic environment and the realized residual value would be below the base residual value, the criteria apply rating-specific haircuts to the base residual value. Given the variety of exogenous and manufacturer-specific factors that can affect the market value of vehicles, we believe portfolio diversification mitigates residual-value risk, whereas portfolio concentration accentuates it. Accordingly, the portfolio-based residual value haircuts are a function of a pool's composition or our pool composition assumption for

revolving structures (see "Assumptions for revolving transactions/prefunding structures" section) and, more specifically, the degree of the pool's diversification, which is measured by comparing the securitized pool against the benchmark pool.

82. The initial haircuts that we apply to a benchmark pool depend on market- and transaction-specific characteristics. The following are among the characteristics we look for in determining the initial haircuts to be used for a particular transaction in a given market:

- Market depth and liquidity for used vehicles;
- Residual-value realization history;
- Whether the transaction references third-party forecasts of residual values; and
- Whether the forecasts are provided by established players with a solid track record.

83. Table 5 shows typical initial haircuts we apply in developed markets with a solid track record of residual-value realization. In the first case, the transaction references a long-established third-party forecaster of residual values with a solid track record of forecasting the residual values of the various types of vehicles in the pool (the typical U.S. auto lease ABS). In the second case, the transaction does not reference a third-party provider in setting the base residual values (the typical European auto ABS).

Table 5

Initial Haircuts Applied To Base Residuals

Rating level*	AAA	AA	A	BBB	BB	B
	--Haircut applied to base residual value (%)--					
Case 1	26.0	20.0	16.5	13.0	9.0	5.0
Case 2	34.0	26.0	21.5	17.0	12.0	7.0

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level initial haircuts.

84. In less-developed markets with weaker residual-value realization histories, we may use higher initial haircuts than the ones in Table 5.

85. The haircuts are typically based on a review, where available, of historical fluctuations in used vehicle prices and residual losses (on sales of used vehicles versus contract residual values) in the relevant jurisdictions. We base our analysis on data for a timeframe long enough to include an economic downturn. We then assess the stress scenario under which those losses occurred to calibrate other stress scenarios. In the absence of historical price data for a jurisdiction, we may rely on information from other regions as a proxy and make adjustments based on market differences, as appropriate.

86. **Step 2: Determine the adjusted haircuts.** We determine the adjusted haircuts by increasing or decreasing the initial haircuts in Table 5 based on a review of certain key factors. These include a review of the originator's historical residual value-setting performance and the accuracy of the third party's forecasts, when available. When applicable, we review the third party's forecasts against historical auction values for a majority of the pool; in the U.S, this analysis is typically applied to at least the top 75% most concentrated makes and models. For example, when the forecasts have repeatedly been higher than historical auction values, or when the originator repeatedly sets residual values higher than actual or historical realized values, we may increase the haircuts applied to the base residual value in Table 5, and vice versa. These adjustments are usually larger for higher ratings. When using the second case in Table 5, the adjustments that

lower the haircuts are typically limited to 25% from the applicable initial residual value haircut. Reductions of more than 12.5% typically reflect situations where originators have consistently set residual values lower than actual or historical residual realization values.

87. The analysis is transaction- and originator-specific and typically includes an assessment of the following factors, where applicable:

- The performance of the originator's historical residual value-setting policy against realized sale proceeds;
- The base residual value of updated, discontinued, and brand new vehicle makes and models in the pool;
- A comparison of the third-party forecast for the vehicles in the pool with historical used vehicle values;
- Changes in the brand or model quality perception of the pool mix;
- Idiosyncratic risks associated with the vehicles or the manufacturer producing the vehicles that could affect the resale values (such as pending litigation, safety issues, technological obsolescence, or a manufacturer's market practices); and
- Country-specific considerations.

88. **Step 3: Determine the excess concentration haircut.** Additional haircuts are applied to the base residual values if concentrations of certain features exceed those established for the benchmark pool described herein. The benchmark pool has the following characteristics:

- The pool consists of loans or leases for vehicles produced by a manufacturer with an investment-grade corporate credit rating.
- The pool has a relatively even distribution of residual maturities.
- The pool has relatively low vehicle concentrations based on model.
- The pool has a relatively low concentration of new or discontinued models.
- The pool has a relatively low concentration of vehicles in any given segment (compact, light commercial vehicles, sport utility vehicles, etc.).
- The pool has a limited concentration of plug-in electric vehicles--battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).
- A concentration limit of 75% to the portion of the total residuals on a discounted basis as a percentage of the total pool balance at issuance.

89. Some of these benchmark characteristics are common for all pools, while others reflect a particular market. Table 6 shows the characteristics of a benchmark pool that we believe are common for pools from different markets.

Table 6

Benchmark Pool Concentration Limits

	% of base residual value
Maximum maturities in any month	5
Individual model	20
New models	10

Table 6

Benchmark Pool Concentration Limits (cont.)

	% of base residual value
Discontinued models	10

90. Other benchmark characteristics may vary depending on the region and may need to be updated periodically to reflect changes in the auto market in each region. A hypothetical example of characteristics related to segmentation (such as compact versus large/full-sized SUVs, trucks and vans that have relatively low miles per gallon) and other characteristics that are specific to each market is shown in Table 7. For the concentration limits applicable to specific markets, please see "Sector And Industry Variables: Global Auto ABS Methodology And Assumptions."

Table 7

Example Of Market-Specific Characteristics

Large/full-size internal combustion engine (ICE) vehicles
Small/compact ICE cars
Plug-in hybrid or battery electric vehicle

91. Additional features may be relevant for the benchmark pool in a given jurisdiction, depending on market-specific considerations.

92. We apply additional haircuts to the amount of residuals that exceed the concentration limits applicable under the benchmark pool (i.e., to the excess concentrations). These additional haircuts--the excess concentration haircuts--are generally the lower of: (1) 50% of the adjusted haircuts that were determined in Step 2; and (2) 50% of the initial haircuts described in Table 5. (The values in Table 8 below are 50% of the haircuts in Table 5.)

Table 8

Additional Haircuts Applied To Excess Concentrations (Excess Concentration Haircut)

Rating level*	AAA	AA	A	BBB	BB	B
	--Haircut applied to base residual value (%)--					
Case 1	13	10	8.25	6.5	4.5	2.5
Case 2	17	13	10.75	8.5	6	3.5

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level additional haircuts.

93. There may be some instances where an individual vehicle exceeds the benchmark limits for more than one variable. Because of this, a concentration in multiple risk factors (risk layering) could result in a total excess concentration percentage that exceeds 100%.

94. **Step 4: Determine a speculative-grade manufacturer additional haircut.** The benchmark pool assumes the financed vehicles are produced by an investment-grade manufacturer. To account for the additional stress that a manufacturer bankruptcy could have on residual values, the criteria apply additional haircuts at each rating level to base residual values of vehicles from speculative-grade manufacturers. These haircuts are in addition to the haircut adjustments in Steps 2 and 3. Table 9 shows the additional haircuts we apply for scenarios in each rating level

based on the rating on the manufacturer.

95. If a pool includes vehicles from more than one manufacturer, we apply the weighted average of the applicable haircuts to the residual values in our analysis (based on each manufacturer concentration in the residuals pool). For unrated manufacturers, we may use a credit estimate to assess their creditworthiness, or otherwise we may assume the manufacturer is rated in the 'CCC' category.

Table 9

Speculative-Grade Manufacturer Haircuts (% Of Base Residual Value)

	--Rating level--					
Manufacturer issuer credit rating*	**AAA**	**AA**	**A**	**BBB**	**BB**	**B**
'BBB'	0	0	0	0	0	0
'BB'	6	5	4	3	0	0
'B'	8	7	5.5	4	2	0
'CCC' and below	10	9	6.5	5	3.3	2

*For manufacturer-specific rating levels (which include the +/- modifiers), we interpolate the haircuts for manufacturers rated 'BB+' and below.

96. Because the criteria link the additional haircuts to the creditworthiness of the manufacturer, it is possible that the rating on the security may be affected if the manufacturer's credit quality changes.

97. **Step 5: Determine a low diversification additional haircut.** The benchmark pool is one that is well diversified with respect to month of residual maturity, vehicles types, models, and new and discontinued models. As described in Step 3, if the securitized pool exceeds the benchmark pool thresholds, we apply additional haircuts to the portion of the pool that exceed the concentration benchmarks. However, in more extreme scenarios, the securitized pool can exceed those thresholds by a significant amount; we call these "low diversification pools."

98. For pools with low diversification, as described below, residual-value haircuts are typically further adjusted by adding an additional component. This component is generally equal to 50% of the excess concentration haircut determined in Step 3. For example, if the excess concentration haircut determined in Step 3 is 13%, then the additional low diversification haircut is 6.5%.

99. This additional haircut usually applies to residual pools that have one or more of the following characteristics:

- Over 20% of the pool maturing in any single month;
- Over 50% of the residuals maturing in any three-month period;
- Three or fewer individual models in the pool;
- The pool contains more than 20% new models;
- The pool contains more than 20% discontinued models.

100. In addition, we typically also apply the low diversification haircut to pools with characteristics -such as vehicle size or powertrain type- that may differ by region and may need to be updated periodically. For example, if the pool exceeds certain threshold for large and full size- internal combustion engine (ICE) vehicles or for small and compact ICE cars. For the concentration limits applicable to specific markets, please see "Sector and Industry Variables: Global Auto ABS

Methodology And Assumptions."

101. If, in our view, the characteristics of a pool are somewhere near but do not quite breach the thresholds, we may add a low diversification component that may be lower than or up to 50% of the excess concentration haircut described above. This is to reflect the increased risk of the pool compared to pools that are better diversified.

102. **Step 6: Additional considerations.** If the vehicles securing the loans or leases of an auto ABS pool relate to more than three manufacturers, we may reduce our stressed residual-value haircut by up to 10%. The amount of the reduction, if any, is determined by an assessment of the level of diversification and degree of correlation among auto manufacturers. For example, if a pool consists of loans or leases of four manufacturers, and the top three account for 90% of the pool (with the remaining manufacturer contributing 10%), then we likely would not give the full 10% reduction due to the low degree of diversification. In addition, if manufacturers have a similar mix of vehicles that they sell in the related market, we may limit the reduction due to the relatively high degree of correlation.

103. In the surveillance analysis of rated auto ABS with residual-value risk, as the loans and leases become more seasoned, we may place more weight on actual residual-value realization performance and other relevant market developments, and less weight on the pool concentrations. During a surveillance review, we also analyze factors that could change our base residual-value stresses, including the current used vehicle auction market, the economic environment, and the consumer perception of the vehicles.

104. The criteria cannot envision or capture facts and circumstances for all auto ABS transactions. Therefore, a specific transaction's stressed residual value haircut could be higher than indicated by application of the framework based on the facts specific to a transaction and analytical judgment.

Other Analytical Considerations

Assumptions for revolving transactions/prefunding structures

105. Transactions that have revolving structures allow for the reinvestment of principal collections for a specified period, followed by an amortization period where the principal collections are passed-through to pay down securities. Similarly, prefunding structures generally use a portion of the proceeds from the sale of securities to purchase assets within a specified period.

106. We view revolving and prefunding structures as riskier because their credit profile is more uncertain. Indeed, in a prefunding structure, assets may be added to the pool after closing, while in a revolving transaction, funds may be reinvested in new assets that might have different characteristics from those that were previously redeemed. As a result, the credit risk that investors are exposed to may deteriorate due to an adverse change in pool composition (receivable or obligor characteristics) affecting the pool's credit profile or the pool's cash-flow profile (for example, the pool's weighted average coupon).

107. The analysis of transactions with revolving or prefunding structures may differ in several ways from that undertaken for the typical amortizing transaction that does not allow for asset purchases after closing. To mitigate the increased risks in these structures, these transactions typically include eligibility criteria and portfolio parameter conditions for the purchase of new assets during the revolving or prefunding period. For example, the eligibility criteria may include the minimum credit score, interest rate, maximum tenor of the assets, and delinquency status.

The purchase of new receivables may also be subject to portfolio parameter conditions related to portfolio characteristics or concentration limits.

108. These structures also typically have amortization events related to asset performance, seller insolvency, and servicer default that, if triggered, will cause the amortization period to begin early. In our analysis of these structures, we typically consider these parameters to determine the potential portfolio composition allowed under the transaction documents--both in terms of credit risk and cash flow profile--at the time it enters amortization. In establishing rating-specific credit and cash-flow assumptions for each performance variable, we consider relevant transaction-specific eligibility criteria, portfolio parameter conditions, payment allocation provisions, amortization events, historical asset performance, and the term of the revolving or reinvestment period. As a result, all else being equal, we typically assume higher losses on these structure types relative to static pools.

Other legal and bespoke risks

109. As stated before, these criteria mainly cover the credit quality of the securitized assets as well as the payment structure and cash-flow mechanics. They should be read in conjunction with other criteria that cover the last four pillars and our overarching criteria, as appropriate. However, we also include some asset-specific considerations or bespoke risks herein that could result in higher loss assumptions or a cap on the ABS rating. Some of these risks include (i) executory or performance risk or other features that could increase the reliance on the originator, transaction sponsor or another entity; (ii) unique legal features that could result in increased losses; and (iii) other factors that might not be common in the typical consumer ABS.

110. When transactions have risks derived from or associated with legal features that are unusual to consumer auto ABS, we may supplement the analysis herein. Some transactions (for example, auto dealer advance ABS) securitize loans to auto dealers that in turn are secured by a pool of consumer auto receivables instead of securitizing the receivables themselves. Depending on the nature of the security interest over the receivables (for example, pledge versus true sale), such transactions could be subject to additional risks if the originator of the auto receivables went bankrupt and an automatic stay is not promptly lifted. If this were the case, it would limit the financing source's access to the collections, thus jeopardizing the issuer's ability to make timely payment on the rated securities. Because of this, we treat the consumer auto loan receivables securing the related dealer advances as defaulted.

111. To address such risks, we may supplement our analysis with an alternative loss scenario based on the potential concentrations to such originators of consumer auto receivables (which are the obligors in this example) or a hybrid approach of a concentration test and the methodology described in these criteria (see "Dealer advance transactions" section under North America in Appendix 2). Under such scenarios, we may also use more stressful loss-severity assumptions if, in our view, there is uncertainty with respect to the duration of the bankruptcy process or the quality and nature of the security interest over the consumer receivables. When compared with a similar pool backing a typical indirect auto loan ABS securitization, all else being equal, these assumptions generally result in higher assumed cumulative net losses in rating scenarios above the 'B' rating category.

Waived payments/early termination risks

112. When applicable, a waived payment stress is applied in the cash-flow analysis. Lease payments are reduced by nonreimbursed waived payments that would have been made by lessees who instead accepted the terms of an early termination incentive program. Typically, the captive

finance servicer or the auto dealer are required to reimburse the securitization for waived payments, and credit enhancement can be used in the event of a default under the reimbursement obligation. The analysis of early termination programs focuses on (i) the time when waived payments are commenced during the life of a transaction, (ii) the remaining lease payments that can be waived under the early termination program, and (iii) the percentage of customers that could accept the waived payment offer. Where the risk of waived payments exists but data is not available, we may add an additional stress to address this risk.

113. Some jurisdictions have pools with distinct loans that carry a VT right. This carries an additional risk because for such loans, when they don't default, the pools could still suffer a loss associated with the VT. To cover this risk, we may determine a base-case voluntary termination loss (VTL) assumption and apply rating-specific stress multiples. (See "Loans with voluntary termination rights" under Europe in Appendix 2.)

Cash Flow Analysis

114. As part of our rating analysis, we also conduct an analysis of the transaction's payment structure and cash flows, in application of our cash-flow analysis criteria (see the Related Criteria section) alongside these criteria; our detailed assumptions are found in Appendix 2. The primary purpose of this cash-flow analysis is to determine if a transaction has sufficient credit and liquidity enhancement to pay its obligations under rating-specific stress scenarios. It may also be used to test a transaction's credit stability under a moderate economic stress scenario in accordance with our ratings definitions (see Related Research).

115. The key variables we typically consider in our cash-flow analysis of auto ABS include:

- Default or loss amounts and timing;
- Delinquencies, charge-off lags, or other liquidity stresses arising from payment delays;
- Recovery amounts and timing;
- Residual-value losses;
- Voluntary prepayments that are not rating-dependent;
- Waived payments;
- Pool weighted average interest rate compression, if appropriate; and
- If appropriate, interest rate and foreign currency stresses, through the application of our criteria for stressed interest rates and for foreign exchange risk, respectively (see Related Criteria).

116. In addition, when relevant, we may apply cash-flow stresses to account for legal, operational, counterparty, and bespoke macroeconomic or sector risks that might not be mitigated by the transaction structure (see Related Criteria).

117. Both the amount and timing of cash flows are important considerations in the rating analysis. The amount and timing of losses (or defaults and recoveries) and voluntary prepayments may positively or negatively affect the issuer's ability to meet its payment obligations in a timely manner. Pool characteristics (such as credit quality, loan term, payment status, and interest rate) and the historical performance of similar pools are generally considered when determining the loss timing, prepayment rates, and weighted average interest rate compression to be applied in the cash-flow analysis for a rating scenario.

118. We typically customize our cash-flow assumptions (such as by applying loss-timing curves and

voluntary-prepayment assumptions that are faster or slower than historically observed) to test the robustness of the transaction structure and determine if there is sufficient enhancement to absorb losses from credit stresses and prevent interest shortfalls from liquidity stresses to the degree consistent with our ratings definitions.

119. We may use either a deterministic or a breakeven approach when performing our cash-flow analysis to determine if available credit enhancement is sufficient to cover losses that are commensurate with the ratings. By using a cash-flow model, we can test the amount of soft credit enhancement (excess spread) that may be realized and available to absorb credit losses. The break-even loss is equal to the sum of soft and hard credit enhancement that is available to absorb losses. Once the cash-flow model calculates the maximum level net loss (or break-even), it is compared to our stress case net loss assumption for a specific rating. If the break-even is equal to or exceeds the stress-case net-loss assumption, the proposed capital structure can withstand that rating scenario. The break-even net loss is a function of four major drivers in our cash-flow model:

- The capital structure proposed;
- The existing hard credit enhancement and estimate of excess spread;
- The payment structure, which consists of the priority of payments and any associated triggers and targets; and
- Our stress assumptions for the level of prepayments, the timing of defaults (the loss curve), and the timing and level of recoveries.

Loss timing

120. We may vary the timing of defaults or losses (the loss curve) in our cash-flow analysis to test the payment structure. Applying losses at a faster rate than the historical average stresses excess spread generated in the cash flows. Applying losses at a slower rate than the historical average tests the payment structure for releases of credit enhancement, which reduces the break-even levels or the amount of maximum losses the transaction can withstand without causing the notes to default.

Excess spread stress and purchase above par assumptions

121. To stress the amount of excess spread available to absorb credit losses, we typically run prepayments at a higher level than historical experience. In the surveillance reviews of outstanding securities, when running a model may provide additional information, we typically apply model inputs that reflect actual prepayment experience for a specific pool. As the credit seasons, we should have a better indication of actual prepayment behavior for the pool and may use this data to form our assumptions.

122. Scheduled payments, prepayments, and defaults can affect the weighted average interest rate generated by a securitized pool. We may model transactions in a way that stresses this interest rate, such as by modeling the interest rate compression, by over-allocating defaults and prepayments to the portion of the pool with the higher weighted average interest rate (by splitting the pool and running the segments with different assumptions, for example), or by applying an additional haircut to the excess spread.

123. Where the portfolio is purchased using a net present value (NPV) mechanism and a receivable is purchased above par (which are common in Europe and Asia-Pacific), if the obligors have the right

to prepay without fully compensating for the loss of future interest collections, excess spread or other forms of enhancement in the transaction may be needed to address the potential shortfall between the amount of principal received on a prepaid contract and the remaining purchase price (the NPV of the receivable using the fixed discount rate). In addition, all else being equal, the recovery received on a defaulted contract that has a purchase price above the contractual principal balance (NPV using a discount rate that is below the contract's interest rate) is typically lower.

124. Further details associated with assumptions for assessing the cash flows are set out in Appendix 2.

125. Furthermore, we believe that not all risks can be addressed as part of the cash-flow analysis and that some amount of event risk remains that cannot be addressed through modelling. For this reason, we generally expect auto ABS transactions to benefit from a liquid source of funds (for example, a reserve or a liquidity line) covering senior transaction fees and interest on the rated notes to provide for timely payment thereof over one note interest payment period, or more if we identify specific risk factors in the transaction such as liquidity risk arising from commingling or other disruption in collections. This applies unless we believe other relevant mitigating factors are present.

Minimum Credit Enhancement

126. These criteria establish rating-specific minimum credit enhancement levels based on our view that there are limits on the predictability of auto receivable performance. These minimum levels are 4% for 'AAA' ratings and 0.80% for 'B' ratings (see Table 10). The 4% minimum credit enhancement for 'AAA' rated auto ABS corresponds to 25x leverage. We believe that leverage above that level creates vulnerabilities that are inconsistent with the degree of creditworthiness associated with a 'AAA' rating. Moreover, the minimum credit enhancement levels can't be funded solely through soft credit enhancement for the rating categories of 'A' and higher, and the minimum amount of hard credit enhancement supporting an 'AAA' rating is 2.5%. Hard credit enhancement generally includes such sources as subordination, overcollateralization, letters of credit, reserve funds, and, in some cases, yield supplement overcollateralization.

Table 10

Minimum Credit Enhancement

Rating level*	Minimum overall credit enhancement (%)
AAA	4.0
AA	3.2
A	2.4
BBB	1.6
BB	1.2
B	0.8

*For notched rating levels (i.e. with +/- modifiers), we interpolate the rating-level minimum credit enhancements.

127. In addition, if credit enhancement can decrease over time, we also expect its absolute amount to be subject to a floor to mitigate potential tail risk toward the latter part of the transaction.

APPENDIX 1: RESIDUAL-VALUE HAIRCUT EXAMPLE

Example of the application of haircut to a hypothetical pool with excess concentrations and low diversification

128. The example below shows how the rating-specific stressed residual value haircuts for various rating levels of the hypothetical pool described in Table 11 are determined. This example assumes the hypothetical pool has excess concentration amounts in maturities, individual model, and BEVs/PHEVs (with respect to the illustrative benchmark limits in the penultimate column). It also assumes the transaction references residual values from an established forecaster (Case 1) but that the forecasts have historically been optimistic with respect to actual performance (an adjustment to the initial haircuts that is progressively higher for higher rating scenarios).

Table 11

Example Application Of Haircuts To A Pool With Excess Concentrations

	% of base residual value (%)	Benchmark pool concentration limit (%)	Excess concentration (%)
Month 7 maturities	5.5	5	0.5
Month 13 maturities	6.5	5	1.5
Total excess maturities(i)			2
New models	25	10	15
Discontinued models	5	10	0
Individual model	34	20	14
Large/Full-size ICE vehicles	25	40	0
Small/compact ICE cars	20	30	0
Plug-in hybrid/Battery electric vehicles	15	10	5
Total excess concentration			36

Note: This example is for illustrative purpose only. Please see the Additional Benchmark Pool Concentration Limits and Additional Low-Diversification Limits sections in the associated Sector And Industry Variables report (referenced in the Related Research section near the end of this article). (i)Calculated by adding each month's excess over 5%. This assumes only Month 7 and Month 13 were over 5%.

129. Table 12 shows the low diversification characteristics and the applicable amounts for the hypothetical pool. In the example, the individual model breaches not only the excess concentration benchmark limit but also the low diversification limit.

Table 12

Low Diversification Characteristics

(% of base residual value)	Low diversification characteristic	Pool	Does low diversification apply?
Residuals maturing in any one month	20	6.5	No
Residuals maturing in any three months	50	15	No

Table 12

Low Diversification Characteristics (cont.)

(% of base residual value)	Low diversification characteristic	Pool	Does low diversification apply?
Number of individual models	Three or fewer individual models	10 individual models	No
New models	20	25	Yes
Discontinued models	20	5	No
Large/full-size ICE vehicles	75	25	No
Small/compact ICE cars	75	20	No

Note: This example is for illustrative purpose only. Please see the Additional Benchmark Pool Concentration Limits and Additional Low-Diversification Limits sections in the associated Sector And Industry Variables report (referenced in the Related Research section near the end of this article).

130. Table 13 shows how the rating level-specific stressed residual-value haircut is determined for the hypothetical pool by adding haircuts for excess concentration amounts, a single manufacturer rated 'BB', and for low diversification.

Table 13

Example Application Of Stressed Residual-Value Haircuts To A Pool With Excess Concentrations, A Speculative-Grade Manufacturer, And Low Diversification

Rating level	Initial haircut (% of residuals on returned vehicles) A	Adjusted haircut determined according to Step 2 B	Additional haircut applied to 36% excess concentrations per Step 3 C = lower of: 1) percentages in Table 8*, or 2) 50% of B	Excess concentration addition (% of residuals on returned vehicles) D = C*36%	Speculative-grade manufacturer addition per Step 4 E	Low diversification addition (% of residuals on returned vehicles) per Step 5 F = 50% of C	Total haircut (% of residuals on returned vehicles) G = B + D + E + F
AAA	26	28	13	4.7	6	6.5	45.2
AA	20	21.7	10	3.6	5	5	35.3
A	16.5	17.8	8.25	3	4	4.1	28.9
BBB	13	14	6.5	2.3	3	3.3	22.6
BB	9	9.6	4.5	1.6	0	2.3	13.5
B	5	5.2	2.5	0.9	0	1.3	7.4

*Percentages in Table 8 are 50% of the initial haircuts (A).

APPENDIX 2: REGION-SPECIFIC ANALYTICAL CONSIDERATIONS

North America

Application of stress multiples

131. Table 1 applies to pools with low to modest expected losses, which typically corresponds to pools with an expected CNL of approximately 13% or less in North America. For subprime pools with an expected CNL greater than this threshold, we typically use lower stress loss multiples, for example, 2.0x-3.5x in a 'AAA' scenario. Among subprime pools, we apply the low end of this range for those with higher expected net losses (such as a CNL of about 25% or higher) and the higher end of the range for pools with lower expected net losses (such as a CNL of about 10%-13%).

Recovery and cash-flow analysis

132. In North America, we typically do not apply different recovery assumptions for different stress scenarios, and therefore we do not apply the recovery haircuts in Table 2. Our credit analysis is based on CNL data, but we use historical and recent recovery rate data as one of the variables to size our base-case CNL rate assumption, and we typically use break-even cash-flow modeling to determine if available credit enhancement is sufficient to cover losses that are commensurate with the ratings. For our cash-flow analysis, we apply a recovery-rate assumption for the transaction consistent with the information for the same or similar originators. Our typical recovery assumptions for prime auto loans in North America is between 40%-60% in our break-even cash-flow analysis.

133. When applying our loss stresses in the cash-flow model, we assume that the defaulted loans are delinquent three to four months prior to charge-off in accordance with the servicing and collections policy specific to the originator/servicer (charge-off lag). When these loans are charged off, we assume that the recoveries are realized at the time of charge-off. This charge-off lag is a stress in the cash flows because nonperforming loans continue to be financed by the rated securities instead of being liquidated to pay down the bonds, thereby creating negative carry. We generally do not utilize charge-off lags in a post-close surveillance review because we would expect that the transaction is already recognizing defaults and receiving recoveries monthly from previously charged-off collateral. For the same reason, we generally do not lag recoveries for revolving transactions once they go into amortization.

Prepayment speeds

134. Prepayments are assumed to be voluntary, and our stressed prepayment rates vary based on the credit segment in auto loans. For example, for pools of loans with a higher yield than the bonds, we may run a voluntary absolute prepayment speed of 1.5%-1.7% for North American prime (generally an expected CNL of 3% or less), 1.4%-1.6% for North American nonprime (generally an expected CNL of 3.1%-7.5%), and 0.75%-1.2% for North American subprime (generally an expected CNL greater than 7.5%). However, we may go outside of these ranges based on originator-specific data indicating that other prepayment levels might be more appropriate. Subsidized loans, also commonly called subvened or incentive-rate loans, are below-market interest rate loans that the financing arms of the auto manufacturers offer to spur sales. For the subvened portion of these pools, we typically run between 0% and 0.5% absolute prepayment speed. For the non-subvened portion, we may run a higher prepayment speed so that the weighted average prepayment speed is higher than expected considering the pool's composition. In auto

leases, we typically run a zero voluntary absolute prepayment when stressing residual values.

Time-tranched securities

135. Time-tranched securities are securities with legal final maturities that are not necessarily coterminous with the cash flows of the underlying assets, such as a money market tranche. Money market tranches are structured to be eligible for purchase by money market funds and therefore must be fully repaid within 397 calendar days (approximately 13 months). These tranches are typically structured with either a 12-month or a 13-month legal final and typically carry short-term ratings to denote their inherent liquidity.

136. For auto loan transactions, to test whether the proposed money market tranche can be repaid by its stated legal final maturity date, we run cash flows using assumptions designed to delay the principal collections during the stated time period. We typically simulate a rolling 30-day delinquency to delay principal payments and carry out the simulation by excluding the last month of principal due within the money market period. For auto lease transactions, we assume a one-month delay in lease payment receipts and a two-month delay in residual liquidation proceeds.

137. Because voluntary prepayments accelerate the paydown of money market tranches, we generally stress prepayment rates by running either a low or zero prepayment rate. For auto loans, if the historical prepayment data indicate a high average voluntary prepayment speed, we may instead assume a prepayment speed that is moderately higher than zero (generally up to 0.5% ABS). However, incentive rate contracts often offered by the automotive captive finance subsidiaries, may prepay more slowly than non-incentive rate contracts due to their low APRs. As a result, we usually ascribe less credit to voluntary prepayments on these types of loans (0%-0.25% ABS). For auto lease pools, we generally assume zero prepayments.

138. In stressing money market tranches, we typically run zero defaults. Defaults can cause acceleration of principal to the extent liquid credit support and recoveries are available to pay principal to the money market tranche in an amount equal to the monthly gross loss. As a result, defaults would benefit the paydown of principal, and therefore a zero-loss scenario is typically used when sizing the money market tranche.

139. When stressing cash flows to test whether a money market class can pay off by its legal final maturity date, we typically do not give credit to excess spread or reserve account draws.

140. The approach used to test the legal final maturity is similar for tranches that bear long-term ratings. In general, the legal final maturity date should be consistent with the later of (1) the notes' expected pay off date under a zero default and zero to low prepayment rate cash flow run plus a few months cushion (generally between three and six months), and (2) the notes' expected payoff date under its rating stress scenario. For auto leases, we typically assume zero prepayments. Further, for the longest-dated security, the legal final maturity is normally set equal to the tenor of the longest receivable in the pool, plus the prefunding or revolving period if any, plus usually approximately six to nine months to accommodate extensions and recoveries on the receivables. No credit is given to any payments, recoveries, or residual proceeds that occur after the legal final maturity date in the rating stress scenario.

Asset yield in North America (yield supplement stress and differentiated/multipool cash flow analysis)

141. When a pool has a significant concentration of loans with a lower interest rate than the rated securities, the notes are potentially exposed to negative carry risk. The magnitude of this risk

depends on the percentage of low interest rate loans in the pool and on the magnitude of the difference between the interest rate on the loans and the trust's cost of funds. For example, a pool with only 10% of very low-interest rate loans (0%, for example) will have higher negative carry risk than a pool with 25% low interest rate loans if the interest rate on those loans are only a few basis points lower than the trust's cost of funds. Negative carry risk also increases when the remaining weighted average maturity of the underwater loans is greater than that of the loans that are not underwater. If negative carry risk is material, sponsors generally add a yield supplement account or overcollateralization amount to address this risk.

142. The yield supplement is designed to raise the yield of underwater loans to a hurdle rate that is greater than or equal to the trust's cost of funds. Because the amount of yield supplement is determined without regard to the above-water loans (high interest rate loans that pay a higher rate than the cost of funds), the excess interest generated by these high interest rate loans--coupled with the yield supplement amount--typically more than compensate for the negative carry of the low-interest rate underwater loans. Consequently, the excess yield supplement can then be used to cover credit losses, which increases the available credit enhancement and break-even net loss.

143. To stress the amount of yield supplement that is realized as additional credit enhancement, we often apply different stresses to different loan groups in the pool based on the interest rate. We apply a faster prepayment speed and loss curve to the high-interest rate loan group, which amortizes this segment faster than the low-interest rate loan group. As a result, the weighted average interest rate of the overall pool declines each month such that interest collections on the pool are not sufficient to pay fees and interest owed on the notes. The yield supplement must then be used to cover this negative carry rather than be used as credit enhancement.

144. For example, we may bifurcate a pool using an interest rate that we consider as a dividing line for market loans. For the loan group with the below-market interest rate (below the dividing line), we apply slow prepayment speeds (typically ranging from 0% to 0.25% ABS based on historical prepayment data), decelerate the timing of losses, and apply a disproportionately low percentage of losses to these loans. Lower-interest rate loans may prepay and default less frequently than higher-interest rate loans (greater than the dividing line). For the high-interest rate loan group, we apply fast prepayment speeds (see the "prepayment speeds" section), accelerate the timing of defaults, and apply a disproportionately high percentage of defaults to this sub-pool. The different stresses will extend the average life of the low-interest rate loans and reduce the average life of the high-interest rate loans, causing a downward drift in the overall pool interest rate. The negative carry that results will siphon away funds or collections from the yield supplement that would otherwise be applied toward credit losses. In general, the bifurcated approach noted above and similar differentiated stresses across multiple pool stratifications are more onerous than running uniform stresses on a single pool, particularly when a pool has loans with widely diverging interest rates such that there are very high interest rate loans as well as loans with low interest rates. To the extent available, we use updated collateral stratifications in our surveillance analysis to apply differentiated stresses.

Dealer advance transactions

145. In a dealer advance securitization, we typically assume that collections on the consumer auto loan receivables (including recoveries on any defaulted receivables) pledged by a non-bankrupt dealer to the financing source is available to service the payments due on the rated securities.

146. In the case of a bankrupt dealer, we believe that the automatic stay, unless promptly lifted, would limit the financing source's access to the collections, thus jeopardizing the issuer's ability to make timely payment on the rated securities. To address this risk in our loss assumptions, we assume

that for each rating category, a certain number of dealers will become subject to a bankruptcy proceeding in which the automatic stay is not promptly lifted. In turn, this means that we treat the consumer auto loan receivables securing the related dealer advances as defaulted. When compared with a similar pool backing a typical indirect auto loan ABS securitization, all else being equal, these assumptions generally result in higher assumed cumulative net losses in rating scenarios above the 'B' rating category (see Table 15). The amount of the relative increase in cumulative net losses reflects the level of dealer concentration. In our view, dealer advance securitizations with high dealer concentrations have a higher risk profile than those that are more diversified.

147. The analysis uses a two-prong approach for establishing our rating scenario-specific assumptions for cumulative net losses that may result from dealer defaults or defaulted consumer receivables that secure the dealer advances. Our rating-specific cumulative net loss assumption is equal to the greater of: (1) the largest dealer default amount and (2) the hybrid default amount. The largest dealer default amount is the amount obtained by applying a 95% loss severity (5% recovery) to the consumer auto loan receivables securing the dealer advances associated with a specified number of the largest dealers (see the second column in Table 14). The hybrid default amount is the sum of: (a) the amount obtained by applying a 95% loss severity to the receivables securing the dealer advances associated with a lower number of the largest dealers (the last column in Table 14) and (b) the amount obtained by applying the methodology for regular auto loans (non-dealer advance) in these criteria to the portion of the consumer auto loan receivables associated with the remaining dealers--those not defaulted in (a).

148. The largest dealer default amount calculation assumes a larger number of dealer defaults than in the hybrid default amount calculation. It is intended to address single-industry event risk that may be present in rated transactions backed by advances to auto dealers. The minimum number of dealer defaults with a 95% loss severity under the largest dealer default amount and the hybrid default amount are outlined in Table 14. When stressing the largest dealers for bankruptcy stay risk, using either the largest dealer default amount or the hybrid default amount, we assume an average 95% loss severity (5% recovery) on the underlying consumer auto loan receivables. This reflects our view of the uncertainty about the duration of the bankruptcy process and the possibility that less-liquid assets could be substituted for the pledged consumer auto loan receivables.

Table 14

Minimum Assumed Dealer Defaults In The Largest Dealer Default Amount And The Hybrid Default Amount For Dealer Advance Securitizations*

Rating level	Number of dealers for the largest dealer default amount	Number of dealers for the hybrid default amount
AAA	24	5
AA	20	4
A	8	3
BBB	6	2
BB	4	1
B	3	0

*The number of assumed dealer defaults may be higher than the minimum specified in this table based on our analysis of the historical dealer bankruptcy stay experience and the impact on the overall consumer auto loan receivables performance.

149. The number of assumed dealer defaults in the largest dealer default amount and the hybrid

default amount, specified in Table 14, reflect our view of a dealer advance financing source that demonstrates a satisfactory track record of managing the bankruptcy process of dealer bankruptcies while also maintaining overall consistent performance for the consumer auto loan receivables backing the dealer advances. Depending on our view of a particular financing source's track record, the number of assumed dealer defaults for a particular transaction may be higher than the minimum specified in Table 14.

150. All else being equal, a dealer advance securitization has higher stressed cumulative net loss rates than the typical auto loan securitizations in rating levels above the 'B' rating category. Table 15 shows an example under an 'AAA' stress scenario assuming two identical pools of dealer advances that are secured by consumer auto loan receivables (Row E) but with different maximum dealer concentration limits (one with a 2% limit per dealer and one with a 3% limit per dealer). It contrasts that with a 'AAA' stress scenario for a pool of similar consumer auto loan receivables backing a typical consumer auto loan ABS (Row A). Example 1 in Table 15 assumes a dealer concentration limit of 2%, and each dealer's concentration percentage of the related consumer auto loan receivables is also at 2%. As discussed above, to address dealer bankruptcy stay risk, we assume a 95% loss severity on the auto loan receivables associated with the dealers that are defaulted under the rating-specific largest dealer default amount and the hybrid default amount. Example 2 uses the same assumptions except for a slightly higher dealer concentration limit of 3%.

Table 15

Examples Of Largest Dealer Default Amount And Hybrid Dealer Default Amount Applications

Assumptions		Example 1 (%)	Example 2 (%)
Expected-case cumulative net losses (CNL) on the consumer auto loans		20.00	20.00
'AAA' stress scenario CNL on consumer auto loans (2.5x expected case)	A	50.00	50.00
Adjustment for dealer advances			
Dealer advance concentration limit	B	2.00	3.00
Largest dealer default amount result (AAA)	C = B*24*95%	45.60	68.40
Hybrid default amount result (AAA)	D = [(B*5)*95%]+[(1-(B*5))*A]	54.50	56.80
Minimum 'AAA' scenario CNL	E = higher of C and D	54.50	68.40
Minimum CNL increase based on dealer default risk	F = E-A	4.50	18.40

151. Using the hypothetical scenario in Table 15 as an example, for a pool consisting of dealer advances secured by subprime auto loans, in which our 'AAA' scenario of CNL is 50% and the maximum dealer concentration limit in the pool is 2% (example 1), the expected net losses would be the higher of 45.6% (the top 24 dealers, each having a 2% concentration, file for bankruptcy with 5% recoveries) and 54.5%. The 54.5% is based on our 'AAA' assumption of five dealers filing for bankruptcy, each having a 2% concentration (a total of 10%) and a 95% severity of loss. This 9.5% net loss level would be added to consumer auto loan receivable credit losses on the remaining 90% of the pool, which equals 45% (90% multiplied by 50%). Therefore, the total amount of expected net losses in this example would be 54.5% (9.5% + 45%). This represents a 4.5 percentage point increase over the 50% amount of expected net losses that we would assume for a comparable pool in a typical indirect consumer auto loan ABS transaction.

Europe

Loans with voluntary termination rights

152. Certain financial contracts governed by the U.K. Consumer Credit Act and the Irish Consumer Credit Act permit borrowers to voluntarily terminate their obligations by returning the vehicle once the outstanding contract balance is less than 50% of the total amount owed. A transaction that includes loans with VT rights could be exposed to additional losses (VTLs) if the sales proceeds of the vehicle are less than the value outstanding on the contract at the time of termination.

153. To account for this incremental risk, we establish base-case and rating-specific stress scenario assumptions for voluntary termination gross losses, which are then added to our gross loss assumptions. Our VTL assumptions are typically based on an analysis of the following:

- Historical performance;
- Loan and collateral characteristics most likely to affect LTV over the life of the loan, such as the initial LTV, loan term, and balloon payment features; and
- Forward-looking considerations, such as the economic outlook and industry trends.

154. The typical stress-case VTL rates, as a multiple of the base-case VTL rate under the criteria, are within the ranges summarized in Table 16. This table applies to loans governed by the Consumer Credit Act in the U.K. and may also apply to certain finance contracts governed by the Irish Consumer Credit Act, to the extent they exhibit risks associated with voluntary termination that are similar to those in the U.K. and the base voluntary termination rate determined based on an analysis of historical performance is within the same range as what we have observed in the U.K.

Table 16

Typical Stress-Case VTL Rates

Rating level*	Typical stress-case VTL rates as a multiple of the base case for pools of auto loans¶
AAA	2.00–3.00
AA	1.75–2.75
A	1.50–2.50
BBB	1.25–2.25
BB	1.10–2.00
B	1.00–1.75

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level stress multiples. ¶Subject to adjustments based on the sovereign rating on the country where the obligors reside (see Related Criteria). VTL--Voluntary termination losses.

155. Pool-specific base-case and stress-case VTL rates reflect factors that we consider likely to affect the level of future VTLs--generally those that would affect the loan-to-vehicle value over the life of the transaction. Examples include the initial LTV, the term of the loan, and whether the loan has a balloon payment due or the option to return the vehicle instead at the end of the loan term. For example, when the loans eligible for VT also include residual-value risk (like in case of personal contract purchase [PCP] loans), the residual-value analysis typically drives our stress assumptions, and we may assume a lower VTL base-case than for transactions with no residual-value risk.

156. VTL rates assumed in our cash-flow analysis may be a higher multiple of the base case than the typical range outlined in Table 16 when loan amortization is unusually slow or the LTV of the contract is unusually high at origination. All else being equal, setting a higher balloon balance or longer loan term would result in slower loan amortization. We may also adjust the ranges if there is limited historical information available from an originator for specific product types, as may be the case for new product offerings.

Additional assumptions for balloon loans

157. Balloon loans represent a specific risk that is present in many European auto ABS. Where the final balloon payment is a contractual obligation, when adjusting the rating-specific cumulative gross loss (CGL) rates, we typically apply rating level-specific balloon losses on nondefaulted and nonprepaid balloon payments that are in the range outlined in table 17. For the avoidance of doubt, where the final balloon payment can also be settled by returning the financed vehicle instead, this introduces residual-value risk (see the "Residual risk in U.K. and Irish auto ABS" section below).

Table 17

Typical Balloon Gross Loss Assumptions

Rating level*	Typical range of additional gross losses on balloon payments (%)
AAA	5–10
AA	4–8
A	2–5
BBB	1–3
BB	N/A
B	N/A

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level additional gross losses. N/A--Not applicable.

158. In the application of the additional loss rate in our cash-flow analysis, the aggregate balloon payments on loans securitized are adjusted to reflect stress scenario defaults and prepayments to establish an adjusted balloon payment amount. The applicable additional balloon loss rate is multiplied by the adjusted balloon payment amount as a percentage of the total pool balance to calculate the incremental balloon gross loss rate. The incremental balloon gross loss rate is then added to the stress scenario CGL rate (and stress scenario VTL, where applicable). For example, if the stress scenario additional loss rate on balloon payments was 8% and the adjusted balloon payments represented 25% of the pool principal balance, then 2 percentage points would be added to the stress scenario CGL rate (and stress scenario VTL, where applicable) prior to the application of recoveries in our cash-flow analysis.

159. Balloon loss rates that are outside the above range may be applied, for example, in situations where the above-mentioned characteristics are significantly different (such as where third-party agreements could be seen as fully mitigating the risk, or the originator sets unusually high or low balloon payments). Higher balloon loss rates may be applied in situations where data is limited. We do not expect balloon loss rates that are more than double the upper end of the range in Table 17.

Assumptions for timing of defaults

160. The loss curves applied in our cash-flow analysis reflect consideration of the structure of the transaction.

161. For sequential pay structures, we typically apply loss curves where all of the gross losses are assumed to occur in the first 18 to 36 months of the transaction, depending on the weighted average life of the securitized auto receivables pool. Applying losses at a faster rate than the historical average reduces the amount of stressed excess spread that can be used in the cash-flow waterfall to pay amounts due on the rated securities.

162. For pro rata structures or transactions with significant balloon payments concentrated in later times, we typically apply a slower loss curve, as credit enhancement can be amortized and may be unavailable if losses occur later in the transaction. In addition, for transactions where pro rata payment starts on Day 1, or isn't preceded by a meaningful sequential pay period, we may also delay the loss curve's start date.

Assumptions for recovery timing

163. The amount of time it takes to realize recoveries (recovery time lag) is, in our view, another important cash-flow modelling assumption. After default, an asset does not produce interest collections, thus reducing the amount of interest collections available to pay interest on outstanding notes (negative carry). In addition, some transactions have net loss triggers that limit the release of credit enhancement from the transaction, and a delay in recognizing a net loss (gross loss net of recoveries) may delay the breach of any such trigger.

164. In our stressed cash-flow modelling analysis under the criteria, we generally assume that recoveries are received between six months and 18 months after default. Transaction-specific assumptions are based on an analysis of originator-specific historical recovery data as well as peer group comparisons. Proceeds from the sale of a repossessed vehicle are the primary source of recoveries for most auto ABS. Servicer-specific repossession and collateral sale policies and procedures vary and have an impact on the recovery time lag.

165. Country-specific considerations within Europe could also influence the recovery timing assumptions. The jurisdiction-specific legal framework, for example, may affect the servicer's ability to foreclose on the receivable and repossess the vehicle. Country-specific considerations also include the liquidity of the secondary market. For example, the availability of a large, active regional auction market for used vehicles where repossessed vehicles can be quickly sold is considered a positive factor.

166. As with other cash-flow assumptions, the level of granularity and timeframes of the historical servicer-specific recovery rate data affect the level of stress applied to the timing of recoveries assumed in our cash flow analysis under the criteria. Longer recovery lags may be applied when historical recovery timing data is limited.

Delinquencies

167. We typically assume that delinquencies equal two-thirds of the stressed gross defaults applied in a given month, and we assume that obligors become current on their loans again after/within six months.

Prepayment rate assumptions

168. Prepayments occur whenever an obligor repays an obligation in full prior to the final payment date on the receivable contract or makes additional payments that are not yet due. Generally, the prepayment of a receivable would reduce the amount of excess spread available to the securitization to cover losses. To stress the amount of excess spread available to absorb credit losses for a new issuance, in transactions where the obligors have the right to prepay without fully compensating for the loss of future interest collections, we generally run the high prepayment speed at a high level relative to historical experience. For most European auto ABS transactions, a high prepayment speed of 24% annualized constant prepayment rate (CPR) is applied in our cash flow analysis to stress the amount of excess spread available. Low prepayment speed scenarios are typically run with a 0.5% CPR per annum. Low prepayments are more stressful where balloon losses or residual-value losses are stressed, as those losses are typically not applied to prepaid receivables. We may adjust the high CPR assumption up or down, such as if observed levels are at or above two-thirds of the benchmark level of 24% (upwards adjustments) or if they have historically been significantly lower or if obligors have no contractual right to prepay their obligations (downwards adjustment).

Weighted average interest rate compression and purchase above par stress assumptions

169. Under the criteria, we generally assume that in transactions where the obligors have the right to prepay without fully compensating for the loss of future interest collections, the weighted average interest rate on the pool of receivables declines (also referred to as weighted average coupon or WAC compression) because the higher interest rate contracts have a higher prepayment than lower interest rate contracts. This is based on our view that borrowers with higher contractual interest rates have more of an incentive to prepay their receivables. To address the risk that the WAC could decline over the life of the transaction, we generally assume that voluntary prepayments would be biased toward higher-yielding contracts. We typically reduce the WAC modelled in our cash-flow analysis over the weighted average life of the pool. The WAC reduction is intended to approximate the effect of having 50% of the voluntary prepayments in our cash-flow stress scenario applied to the highest-coupon receivables.

170. In our cash-flow modelling of transactions where the portfolio is purchased using an NPV mechanism, we generally assume half of the prepayments are concentrated in receivables with interest rates that are above the discount rate. This prepayment stress is then reduced to zero over the weighted average remaining term of the portfolio. This reflects our view that higher interest rate receivables are more likely to be prepaid. In addition, we adjust the stress-case recovery rates to reflect situations where the portfolio is, on average, purchased above par.

Residual risk in U.K. and Irish auto ABS

171. Residual-value risk is typically present in leases, but in some cases, the same risk applies to loans (such as PCP loans in the U.K. and Ireland). In such cases, we follow the same general approach for residual-value analysis as for auto leases.

Japan

Additional assumptions for balloon loans

172. Balloon loans represent a specific risk that is present in Japanese auto ABS. Where the final balloon payment is a contractual payment obligation, when adjusting the rating-specific CGL rates, we typically apply rating level-specific balloon losses on nondefaulted and nonprepaid balloon payments that are in the range outlined in Table 18.

Table 18

Typical Balloon Gross Loss Assumptions

Rating level*	Typical range of additional gross losses on balloon payments (%)
AAA	5–10
AA	4–8
A	2–5
BBB	1–3
BB	N/A
B	N/A

*For notched rating levels (ratings with the +/- modifiers), we interpolate the rating-level additional gross losses. N/A--Not applicable.

173. In the application of the additional loss rate in our cash-flow analysis, the aggregate balloon payments on loans securitized are adjusted to reflect stress scenario defaults and prepayments to establish an adjusted balloon payment amount. The applicable additional balloon loss rate is multiplied by the adjusted balloon payment amount as a percentage of the total pool balance to calculate the incremental balloon gross loss rate. The incremental balloon gross loss rate is then added to the stress scenario CGL rate. For example, if the stress scenario additional loss rate on balloon payments was 8% and the adjusted balloon payments represented 25% of the pool principal balance, then 2 percentage points would be added to the stress scenario CGL rate prior to the application of recoveries in our cash-flow analysis.

174. Balloon loss rates that are outside the above range may be applied, for example, in situations where the above-mentioned characteristics are significantly different (such as where third-party agreements could be seen as fully mitigating the risk, or the originator sets unusually high or low balloon payments). Higher balloon loss rates may be applied in situations where data is limited. We do not expect balloon loss rates that are more than double the upper end of the range in Table 18.

Assumptions for timing of defaults

175. The loss curve applied in our cash-flow analysis reflects consideration of the structure of the transaction. For pro rata structures or transactions with significant balloon payments concentrated in later times, a slower loss curve is typically applied, as credit enhancement can be amortized and may be unavailable if losses occur later in the transaction.

176. For sequential pay structures, we typically apply loss curves where all of the gross losses are assumed to occur in the first 18 to 36 months of the transaction, depending on the weighted average life of the securitized auto receivables pool. Applying losses at a faster rate than the

historical average reduces the amount of stressed excess spread that can be used in the cash-flow waterfall to pay amounts due on the rated securities.

Prepayment

177. We consider both the level and timing of prepayments in our cash-flow analysis. These may vary by the credit quality, tenor, and historical prepayments of the underlying assets. We typically evaluate the impact of multiple prepayment scenarios. For example, we may run higher prepayment rates to reduce positive excess spread, which shortens the weighted average life of the pool and diminishes the amount of available credit enhancement. Alternatively, in scenarios of negative excess spread, we may run lower prepayment rates to exacerbate the impact of any cash-flow drain.

CHANGES FROM PREVIOUS CRITERIA

178. Compared to our previous criteria for global auto ABS, these criteria (for more information in relation to the criteria revision, please see "Request For Comment: Global Auto ABS Methodology And Assumptions," Nov. 30, 2021):

- Include a range of default and loss multiples that apply globally.
- Introduce a recovery framework that has an originator- and market-specific expected-case recovery rate and increasingly stressful recovery rate haircuts at higher ratings (tiered recoveries).
- Standardize and simplify our prepayment stress framework by using voluntary prepayment assumptions that are independent of the rating stress scenario (untiered prepayments) to test a transaction's excess spread.
- In North America, when we split or bifurcate the pool between incentive-rate (subvened) loans and market-rate loans to stress the interest generated by the assets, we do so using a market rate.
- Establish a standardized approach to analyzing residual-value risk globally. For European auto ABS, this is a new way to analyze residual-value risk. For U.S. auto leases, this represents an update to several aspects of residual-value risk analysis to reflect industry shifts in vehicle segments, ongoing adoption of electric vehicles, interpolation of speculative-grade manufacturer haircuts, and stresses for low diversification pools.
- Clarify our considerations of event risk through the assessment of the availability of minimum liquidity coverage and, for amortizing enhancement/pro rata structures, credit enhancement floors to mitigate the tail risks associated with late defaults.

IMPACT ON OUTSTANDING RATINGS

179. As of March 1, 2022, the total outstanding portfolio globally to which the criteria apply includes approximately 1,626 ratings (from 469 transactions), of which approximately 80.2% are in North America, 15.1% in EMEA, 3.8% in Asia-Pacific, and 0.9% in Latin America. As a result of the adoption of these criteria, we expect the following impact (this impact assessment was updated to reflect changes in portfolio performance since we published the RFC):

- Up to 15% of ratings in EMEA could be raised by two to three notches on average on tranches

rated in the 'A' category and below, driven by lower recovery and residual-value stresses.

- No impact is expected on ratings in North America, Asia-Pacific, or Latin America.

180. This analysis is intended to serve as a broad, directional guide to the possible ratings impact of the criteria. The actual ratings impact may vary, depending on the specific characteristics and performance of the asset pool and the structural features of a particular transaction.

RELATED PUBLICATIONS

Fully superseded criteria

- Methodology And Assumptions For European Auto ABS, Oct. 15, 2015
- General Methodology And Assumptions For Rating Canadian Auto Loan ABS, April 26, 2013
- Revised General Methodology And Assumptions For Rating U.S. ABS Auto Lease Securitizations, Nov. 29, 2011
- General Methodology And Assumptions For Rating U.S. Auto Loan Securitizations, Jan. 11, 2011
- European Consumer Finance Criteria, March 10, 2000 (Fully superseded by these criteria together with "Global Consumer ABS Methodology And Assumptions," March 31, 2022)

Partly superseded criteria

- Global Methodology And Assumptions For Assessing The Credit Quality Of Securitized Consumer Receivables, Oct. 9, 2014 (in relation to the analysis of auto receivables in scope of these criteria; when these criteria and "Global Consumer ABS Methodology And Assumptions" become effective in all jurisdictions that require local registration, we plan to rename the partly superseded article "Global Credit Card ABS: Methodology And Assumptions.")

Related criteria

- Environmental, Social, And Governance Principles In Credit Ratings, Oct. 10, 2021
- Global Framework For Payment Structure And Cash Flow Analysis Of Structured Finance Securities, Dec. 22, 2020
- Methodology To Derive Stressed Interest Rates In Structured Finance, Oct. 18, 2019
- U.S. Structured Finance Asset Isolation And Special-Purpose Entity Criteria, May 15, 2019
- Counterparty Risk Framework: Methodology And Assumptions, March 8, 2019
- Incorporating Sovereign Risk In Rating Structured Finance Securities: Methodology And Assumptions, Jan. 30, 2019
- Foreign Exchange Risk In Structured Finance--Methodology And Assumptions, April 21, 2017
- Legal Criteria: Structured Finance: Asset Isolation And Special-Purpose Entity Methodology, March 29, 2017
- Global Framework For Assessing Operational Risk In Structured Finance Transactions, Oct. 9,

2014

- Country Risk Assessment Methodology And Assumptions, Nov. 19, 2013
- Criteria For Assigning 'CCC+', 'CCC', 'CCC-', And 'CC' Ratings, Oct. 1, 2012
- Global Investment Criteria For Temporary Investments In Transaction Accounts, May 31, 2012
- Principles Of Credit Ratings, Feb. 16, 2011
- Methodology For Servicer Risk Assessment, May 28, 2009
- Assessing the Risk of Pension Plan Terminations on U.S. Auto Lease Securitizations, Aug. 17, 2004
- Structured Finance Criteria Introduced for Cayman Islands Special-Purpose Entities, July 18, 2002

Related guidance

- Guidance: Methodology To Derive Stressed Interest Rates In Structured Finance, Oct. 18, 2019

Related research

- Sector And Industry Variables: Global Auto ABS Methodology And Assumptions, March 31, 2022
- S&P Global Ratings Definitions, Nov. 10, 2021
- ESG Industry Report Card: Auto Asset-Backed Securities, March 31, 2021
- Credit Rating Model: CIR Model, Oct.18, 2019
- Back-Testing U.S. ABS Auto Loan Performance, Oct. 18, 2016
- Investigating U.S. Auto Loan Credit Performance During Economic Downturns, 1925-2010, Jan. 5, 2011