MOODY'S INVESTORS SERVICE

RATING METHODOLOGY

Moody's Global Approach to Rating Securities Backed by Aircraft and Associated Leases

Table of Contents:

Analyst Contacts:

NEW YORK +1.212.553.1653

Karen Ramallo-Rodriguez +1.212.553.0370
Senior Vice President / Manager
karen.ramallo@moodys.com

Amelia (Amy) Tobey +1.212.553.7922
Senior Vice President
amelia.tobey@moodys.com

Giyora Eiger +1.212.553.4379
Vice President – Senior Credit Officer
giyora.eiger@moodys.com

Tracy Rice +1.212.553.4115
Vice President – Senior Credit Officer
tracy.rice@moodys.com

» contacts continued on the second to last page

This rating methodology replaces *Moody's Global Approach to Rating Securities Backed by Aircraft and Associated Leases* published in December 2019. We added a footnote for further transparency on our approach to monitoring transactions, and we made limited editorial updates. The updates do not change the substantive approach of the methodology.

1. Introduction

In this methodology, we describe our global approach to rating asset-backed securities (ABS) backed primarily by aircraft and their associated leases, which we refer to as aircraft lease ABS.[1] For ABS transactions backed by loans with aircraft as collateral, we generally apply our methodologies related to equipment loans and leases, or others, as applicable.[2]

Aircraft lease ABS generally are repaid by cash flows from lease payments and proceeds of aircraft dispositions (aircraft sales). These transactions are usually backed by pools of aircraft and have long legal final maturities. Aircraft leasing companies generally originate the leases, sponsor the transactions and act as the servicer of the leases and aircraft.

In a typical aircraft lease ABS transaction, the issuer – usually a bankruptcy-remote special purpose vehicle (SPV) – issues securities and uses the proceeds from the bonds to directly or indirectly[3] purchase aircraft with leases attached. The servicer's responsibilities include collecting lease payments, monitoring the financial health of the lessees, and remarketing and repossessing aircraft globally, as well as other functions.

Our global approach for rating aircraft lease ABS combines a simulation-based aircraft leasing asset model (asset model) with a cash-flow-based model of the transaction structure. We use the asset model to obtain the cash flows generated from each lease and aircraft as well as expenses associated with re-leasing aircraft. We then aggregate these individual asset cash flows to generate portfolio cash flows. The portfolio cash flows are then used in conjunction with the

THIS RATING METHODOLOGY WAS UPDATED ON MAY 9, 2023. IN THE "MOODY'S RELATED PUBLICATIONS SECTION" ON PAGE 24, WE HAVE REVISED THE TITLE OF THE DATA REPORT AND UPDATED ITS HYPERLINK.

1 This methodology also generally applies to transactions backed by leases on aircraft engines, with differences as noted in Appendix A.

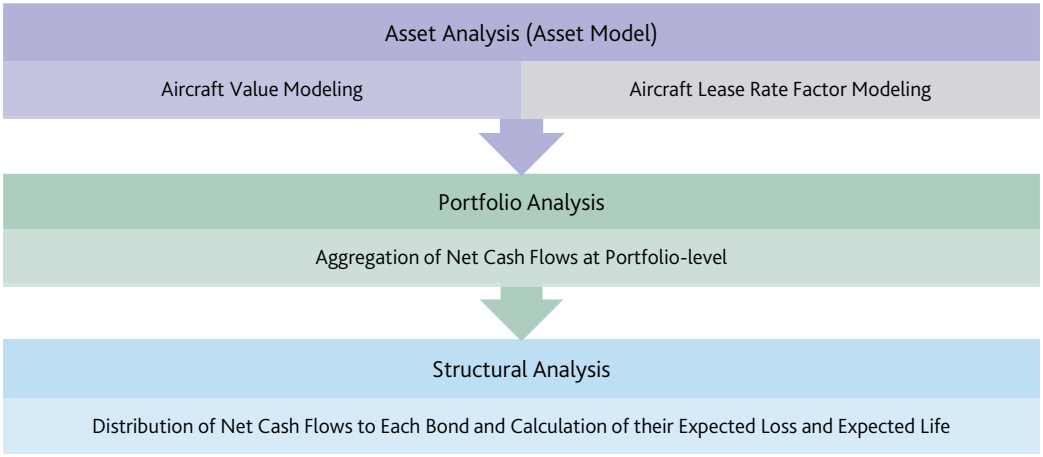
2 For more information, see our approach to rating transactions backed by equipment loans and leases. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

3 For example, via a bankruptcy-remote special purpose entity such as a trust, a limited liability company or other type of entity that owns the aircraft.

model of the transaction structure to determine how the aggregate cash flows are distributed to the investors in each rated security. We calculate the expected loss for each class of bonds to determine a model output for each class.

Exhibit 1 below shows the sequence of the analysis performed in our analytical approach.

EXHIBIT 1
Aircraft Lease ABS Analytical Framework



Source: Moody's Investors Service

In our approach, we simulate the net cash flows generated by each aircraft at each period of its economic useful life. If the final lease extends beyond the aircraft's economic useful life,[4] but not beyond the bonds' legal final maturities, we simulate the net cash flows generated until the end of this lease. Gross revenues primarily consist of aircraft lease payments and the proceeds from the disposition of an aircraft at the end of its last lease (scrap value). Net cash flows for each aircraft are determined by subtracting from gross revenue the assumed aircraft-related expenses incurred by the transaction, including remarketing costs, repossession, reconfiguration and certain maintenance expenses. The simulation incorporates a variety of assumptions described in the "Asset-level Analysis" section below.

For each simulation path, we aggregate the net cash flows for each aircraft to produce the portfolio-level net cash flows at each point in time for the life of the transaction. We then apply the aggregate net cash flows to the modeled transaction structure to project the cash flows available to each class of bonds and the extent of any expected loss on the bonds. For each class of bonds, we calculate the average bond loss and the weighted average life (WAL) across all iterations and compare them to our idealized expected loss tables at each rating level.[5]

As with all rating methodologies, in applying this methodology we consider all factors we deem relevant to our analysis. A rating committee ultimately assigns our ratings, taking into account the unique characteristics of each transaction. Therefore, although the model output is an important input to our rating committee process, our rating committees also consider other qualitative and quantitative factors in our analysis. For example, if actual historical performance or performance trends are not in line with the indicative assumptions described in this methodology, we may incorporate those differences in our analysis.

[4] In our asset model, the economic useful life assumption is the age of an aircraft after which no new leases will be entered into. However, leases that were initiated during the aircraft's economic useful life but extend beyond that point will remain in place and generate lease income until the earlier of the end of the assumed duration of the lease or a lessee default.

[5] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in the "Loss Benchmarks" section.

In addition, we incorporate analyses of the operational and legal risks of a transaction, which can have an impact on the ratings we ultimately assign.

2. Key Risks

In our assessment, the key risks when assessing securities backed by pools of aircraft and their associated leases are (1) re-leasing risk, (2) volatility in aircraft values and lease rates, (3) lessee default risk, (4) uncertainty in aircraft economic useful life, and (5) the ability of the servicer to maximize cash flow.

2.1. Re-leasing Risk

The main source of cash flows to the transaction is the aircraft lease payments from airline lessees. Typically, the lease durations are shorter than the durations of the bonds. Therefore, re-leasing is key for generating cash flows to repay the bonds. In aircraft lease securitizations, the servicer is generally responsible for re-leasing the aircraft once its lease expires or upon lessee default. Alternatively, the servicer may sell the aircraft instead of re-leasing it, if the issuer expects that the sale will maximize cash flows to the transaction.

Re-leasing aircraft to new airlines exposes the transaction to uncertainty regarding the terms of the subsequent leases (the lease rates, maintenance rents, duration of the lease, return conditions, etc.) as well as the credit quality and jurisdiction of the new lessees. Re-leasing aircraft to the same airline (lease renewals) eliminates uncertainty about the next lessee, however, the uncertainty around the lease terms remains.

Furthermore, re-leasing aircraft to a new airline or selling it could result in a period in which the aircraft is not generating lease income (remarketing downtime). The ability of the servicer to quickly re-lease or sell aircraft minimizes the remarketing downtime and the potential costs the transaction will likely incur associated with re-leasing (remarketing expenses). Lease renewals eliminate remarketing downtime and result in only nominal administrative expense.

2.2. Volatility in Aircraft Values and Lease Rates

Aircraft values and lease rates are highly correlated to aircraft supply and demand. During downturns in the commercial aviation industry, the overall demand for aircraft declines and airlines tend to reduce capacity, leading to an increase in supply of available aircraft for lease or sale. Furthermore, the development of new technologies generally reduces the future lease rates and values of the incumbent aircraft over time and shortens their economic useful lives. Industry downturns and the entry of new technologies have historically resulted in aircraft lease rate and value declines that surpass their long-term averages, reducing cash flow to the transaction. The magnitude of these declines in lease rates and aircraft values varies among aircraft models and age.

2.3. Lessee Default Risk

Lessee defaults expose the transaction to aircraft repossession and re-leasing risks. When a lessee defaults under its lease contract, the servicer must repossess the aircraft from the lessee, which typically results in the aircraft generating no lease income during its downtime (repossession downtime) and associated expenses (repossession expenses). The repossessed aircraft will likely also require maintenance and potentially refurbishment in order for the servicer to re-lease the aircraft to a new airline, resulting in additional expenses. The aircraft is also generating no lease income during the remarketing period (remarketing downtime) and the transaction incurs associated remarketing expenses.

In the case of an unexpected repossession, the servicer will not have as much time to remarket the aircraft in advance (as opposed to being able to remarket in advance of a planned lease expiry), and therefore the remarketing downtime is generally longer.

2.4. Uncertainty in Aircraft Economic Useful Life

The uncertainty in the economic useful lives of the securitized aircraft is particularly important because of the long tenors of the securitizations. The economic useful life of a particular aircraft model may be shorter than we expect at transaction closing, owing to reduced demand for the model or the introduction of new aircraft models with technological advances. However, in our modeling we typically assume the same economic useful life for all models within an aircraft type.

2.5. Ability of the Servicer to Maximize Cash Flow

Aircraft lease securitizations rely on the servicer's ability to maximize a pool's cash flow by promptly re-leasing or selling, at terms as favorable as possible, aircraft for which leases have expired, as well as repossessing and remarketing aircraft upon lessee default. Transactions also rely on the servicer to closely monitor the financial health of lessees in order to proactively manage the aircraft portfolio, monitor and manage the technical upkeep of the aircraft and secure the legal expertise required to repossess aircraft globally.

3. Asset-level Analysis

In this section, we describe the factors we consider in projecting future cash flows from the aircraft portfolio. The main source of cash flows to the transaction is the aircraft lease payments from global commercial airlines. The description included in this section is complemented with additional information provided in Appendices A through C. Appendix A describes the differences between aircraft lease securitizations and transactions backed by aircraft engines and associated leases. Appendix B describes details of the asset model. Appendix C provides indicative assumptions that we typically apply in modeling asset cash flows for aircraft lease securitizations.

In our approach, we first simulate the net cash flows generated by each aircraft at each point in time during the life of the transaction. Gross revenues primarily consist of aircraft lease rental payments, and the proceeds from the disposition of aircraft at the end of their economic useful lives. We determine the net revenue generated by each aircraft by subtracting the assumed aircraft-related expenses of the transaction – including remarketing costs, repossession expenses, certain maintenance and reconfiguration expenses – from its gross revenue. The simulation incorporates a variety of assumptions as described below.

We apply similar analysis to the various aircraft types (such as narrowbody, widebody, regional jets and freighters) that we see in ABS portfolios. However, the asset-level assumptions we apply in our analysis typically differ by aircraft type. For a particular aircraft type, the assumptions we apply are typically the same across sponsors; however, if a sponsor provides sufficient data for a specific transaction to support different assumptions, we may modify our assumptions.

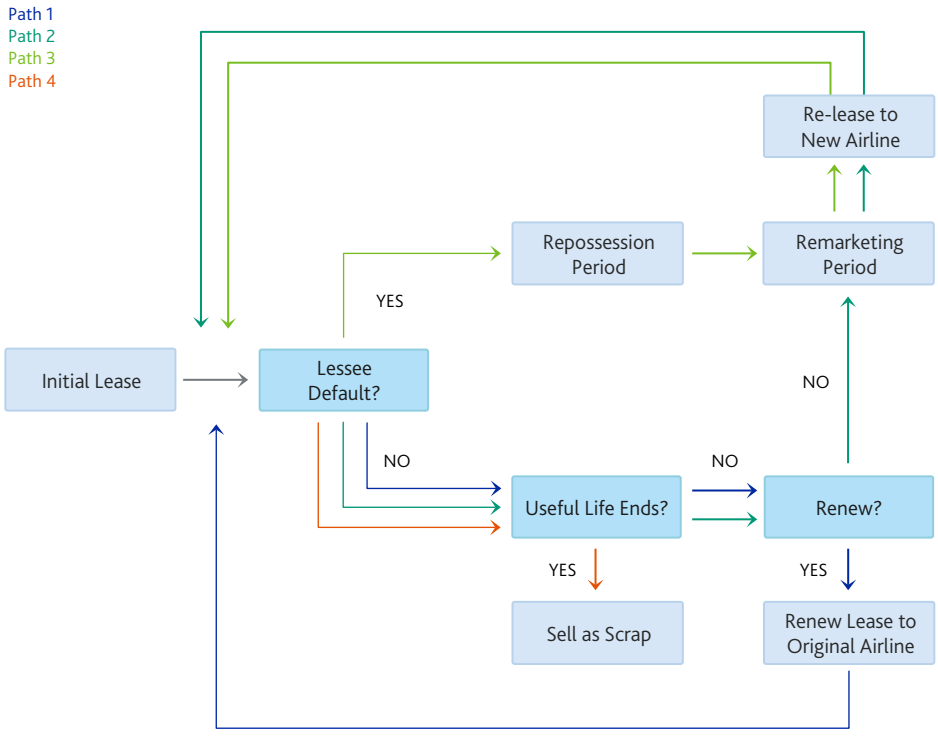
In the next sections, we describe our analysis of the five key risks in more detail, as well as other factors that affect cash flows.

3.1. Re-leasing Risk Analysis

In our analysis, we assume that the initial gross revenue generated by each aircraft is based on the contractual lease in place on the transaction's closing date, and that the aircraft generates lease revenue until the earlier of lease expiration or lessee default.

For each aircraft in the pool, we simulate four potential paths: (1) the lease expires and is renewed to the same lessee (lease renewal); (2) the lease expires and the aircraft is re-leased to a new lessee; (3) the lessee defaults under its lease contract and the aircraft is re-leased to a new lessee;[6] or (4) the aircraft has reached the later of the end of its economic useful life and the end of the last lease and is sold for scrap value (the sale of the engines, airframe and other parts). The terms of subsequent leases (lease rates and duration) as well as the creditworthiness and domicile of subsequent lessees are uncertain. Exhibit 2 shows the four paths of the aircraft lifecycle in graphical form.

EXHIBIT 2
Aircraft Asset Lifecycle



In the asset model, if the remarketing period (for Path 2) or repossession plus remarketing period (for Path 3) extends beyond the economic useful life, we assume the aircraft is sold for scrap value.
Source: Moody's Investors Service

For each subsequent lease, we project the new lease rate, and typically make assumptions for the credit quality of the new lessee (when the current lessee has not renewed the lease), the duration of the subsequent lease, and the aircraft's downtime and associated costs, such as repossession, remarketing, certain maintenance and reconfiguration expenses upon lessee default or remarketing and reconfiguration expenses at lease expiry. We discuss these factors in the following sections.

[6] We assume for conservatism in our modeling assumptions that the lease contract is not affirmed in case of airline default.

3.1.1. New Lease Rate

Market lease rates are primarily influenced by the market value of the aircraft, which is affected by its age, type, whether the aircraft type is still in production (production status), the health of the global commercial aviation industry and the level of inflation.

We project market lease rates throughout the life of the transaction using our asset model. The projected market lease rate of an aircraft in each period is equal to its projected market value multiplied by its projected lease rate factor (i.e., the monthly lease rate as a percentage of an aircraft's market value. See Aircraft Value Model and Aircraft Lease Rate Factor Model in Appendix B).[7]

» **Initial aircraft value**: For the initial market value of an aircraft, we consider recent third-party appraisals of the aircraft's market value provided in conjunction with the securitization, and potentially other independent third-party appraisals. The transaction sponsor typically provides appraisals of the value of each aircraft in the portfolio from three International Society of Transport Aircraft Trading (ISTAT)-certified appraisers, including an appraised half-life market value,[8,9] half-life base value,[10] and maintenance-adjusted market value,[11] if available. To estimate the initial market value for the asset model, we consider (1) the lower of the mean or median (LMM) of the half-life market value appraisals provided by the sponsor, and (2) an estimate based on half-life market value appraisals we obtain from independent third-party appraisal firms and use the lowest of those two estimates.

» **Projected changes in aircraft values**: We simulate changes in half-life market values for each aircraft in each period of a transaction based on the aircraft's type (such as narrowbody, widebody, regional jets, and freighters), age and production status based on our assumption of when it will go out of production,[12] as well as our simulated rates of inflation (measured by the US Consumer Price Index or CPI) and assumed economic condition of the commercial aviation industry (i.e., whether or not we have projected a downturn in the industry). The simulated values are based on a regression analysis of changes in half-life market values, which we developed using historical appraisals from an independent, ISTAT-certified, third-party appraisal firm. The value of an aircraft in each period is equal to its projected value in the prior period multiplied by one plus the projected change in the projected value in the current period.

» **Projected lease rate factors**: We simulate lease rate factors (LRF) for each aircraft in each period of a transaction based on the aircraft's type, age and production status based on our assumption of when it will go out of production, as well as our simulated risk-free interest rate and assumed economic condition of the commercial aviation industry. The simulated LRFs are based on a multivariate regression analysis of lease rate factors, which we developed using historical LRFs from an independent ISTAT-certified third-party appraisal firm.

7 For more information on how we project lease rates, see Appendix B.

8 Market value is the appraiser's opinion of the most likely trading price that may be generated for an aircraft under the current market conditions that are perceived to exist at the time in question, i.e., inflated or depressed markets and whether there is an imbalance between supply and demand. The market value assumes that the transaction was, or is, made on the basis of a single unit bought for cash by a willing buyer from a willing seller.

9 Half-life represents the value of an aircraft for which the most significant components of the aircraft are half-way between major overhauls and for which any life-limited part has used half of its life.

10 Base value is the appraiser's opinion of the underlying economic value of an aircraft in an open, unrestricted, stable market environment with a reasonable balance of supply and demand.

11 Maintenance-adjusted market value is the appraiser's opinion of the most likely trading price that may be generated for an aircraft under current market conditions and accounts for the current maintenance status of the most significant components (engines, engine life-limited parts, landing gear, auxiliary power units and airframe).

12 If the aircraft model is not out of production at transaction closing, we define its production status based on our assumption of when it will go out of production.

3.1.2. Credit Quality of New Lessees

When an aircraft is re-leased to a new lessee, we assume in our asset model that the new lessee has a default risk equivalent to a low speculative-grade rating. When a lessee renews an existing lease, we assume no change in the credit quality of the lessee, which is based on the lessee's credit rating. For lessees that are not rated, their credit quality will be based on a credit estimate. If a credit estimate cannot be obtained, we typically assume a default risk equivalent to a low speculative-grade rating.[13]

3.1.3. Duration of Subsequent Leases

Shorter lease durations typically mean the associated aircraft must be remarketed more often, which increases the transaction's exposure to lease rate volatility, remarketing downtime and related expenses. We assume the duration of a new lease varies by aircraft type and age, the economic condition of the commercial aviation industry, and whether the lease is a renewal to the same airline or made to a new airline. Specifically, we assume that the lease duration is shorter for older aircraft; lease renewals versus new leases; and if the associated aircraft is re-leased during industry downturns.

3.1.4. Aircraft Downtime and Other Costs of New Leases

When a lessee chooses not to renew an expiring lease, the lessor typically remarkets the aircraft ahead of lease expiration and seeks to ensure that the current lessee fulfills the return condition obligations under the lease contract. Doing so can reduce both the potential downtime of the aircraft once the existing lease expires and the costs of remarketing the aircraft.

Despite these proactive remarketing efforts, there still may be some downtime and costs involved in the process. Therefore, when an aircraft is re-leased to a new lessee at the expiry of its current lease, we assume a period of downtime, remarketing costs and certain reconfiguration costs associated with placing the aircraft with a new airline. We assume the downtime period is longer if the lease expires during a commercial aviation industry downturn. Remarketing costs vary by aircraft type.

When a lessee defaults, in addition to remarketing costs and downtime, we assume an additional period of downtime while the aircraft is being repossessed, as well as expenses associated specifically with the repossession process and performing required maintenance and reconfiguration to allow the servicer to re-lease the aircraft to a new airline.

Repossession expenses include items such as legal fees, court costs, insurance, costs of transporting crews, fuel, storage, and documents for deregistration. Given the global nature of the aircraft leasing industry, local law, rules and regulations governing the issuer's direct or indirect interest in the aircraft can affect the timing of repossession upon lessee default.[14] We may adjust our repossession downtime and expense assumptions based on our analysis of the local laws, rules and regulations of the jurisdictions in which the lessees are located at transaction closing, and for subsequent lessees.

We combine our assumptions for remarketing costs, repossession expenses and certain maintenance and reconfiguration expenses into one expense assumption applied when a lessee defaults. This expense assumption varies by aircraft type and the economic condition of the commercial aviation industry.

[13] See our cross-sector credit rating methodology on the use of credit estimates in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[14] Significant work has been done to create a common framework for equipment financings among signatory nations to the Cape Town Convention on International Interests in Mobile Equipment. Although the Cape Town provisions have the potential to reduce losses for some non-US aircraft financings, the scope of adoption of the Cape Town Convention is not uniform across nations, and there is limited case law testing its effectiveness in many implementing nations. As a result, the overall efficacy of the agreement in creating uniformity of risk across the signatory countries is limited.

We also give credit in the model to the initial security deposits,[15] if any, to cover lessees' unpaid obligations, including missed lease payments during the remarketing and repossession periods following a default of the initial lessees only.

We provide further details in Appendix C on our indicative assumptions regarding downtime and the costs associated with lease expirations and defaults. The downtime and cost assumptions we apply in any specific case will also incorporate the servicer's historical experience.

3.1.5. Global Commercial Aviation Industry Downturns

Aircraft lease rates and values are highly correlated to the economic condition of the global commercial aviation industry, which is highly cyclical and tied to the level of global air travel demand growth and aircraft supply. Therefore, as part of our re-leasing risk analysis, we incorporate the likelihood of industry downturns. We typically assume a downturn occurs once every 10 years and lasts for 3 years, roughly consistent with historical experience. Consequently, in our analysis, a typical aircraft lease securitization will experience two or three downturns during its lifetime.

We assume that a downturn has the following consequences:

- Larger declines in aircraft values, which reduce lease rates for new leases executed during this period and reduce scrap value for aircraft parted out during this period.
- Declines in lease rate factors, which also reduce lease rates for new leases executed during this period.
- Shorter duration of new leases.
- Longer aircraft downtime between leases.
- Greater expenses associated with lease defaults.

The analytical framework incorporates these effects in the asset model.

3.2. Assessing Volatility in Aircraft Values and Lease Rates

As we indicated above, the economic condition of the commercial aviation industry and the development of new technologies typically result in aircraft lease securitizations being exposed to volatility in aircraft values and lease rates. As a result, we incorporate these two factors into our simulation of changes in market values for aircraft in half-life condition and the level of lease rate factors to project half-life market lease rates for new leases.

We derive half-life market lease rates at any point in time during the life of the transaction as the product of the projected half-life market aircraft value (see Appendix B for a description of our Aircraft Value Model) and the projected market lease rate factor (see Appendix B for a description of our Aircraft LRF Model). Our projected lease rates are based on historical half-life market lease rates, recent developments in lease rates for different aircraft models, and aircraft market fundamentals and trends.

Market lease rate factors are primarily influenced by aircraft type and age, the production status of the aircraft, risk-free interest rate and the state of the global commercial aviation industry (see Appendix B for a description of our Aircraft LRF Model). Consistent with historical experience, projected market lease rates decline as aircraft age, their production ceases, risk-free interest rates decline and during assumed downturns.

[15] For monitoring, we give only credit in the model to any security deposit in place at the time of evaluation of the transaction.

The production status of an aircraft model can be a key factor that affects its demand profile. Once a manufacturer announces that it will stop producing a particular aircraft model, that model will typically experience greater declines in lease rates and values over time, which we reflect in the asset model.

The estimate of an aircraft value, as described above, is used as the starting point of each simulated aircraft value path.

3.3. Incorporating Lessee Default Risk

A lessee default could have three different negative effects on a transaction. First, the aircraft is not earning lease income while it is being repossessed after default and while a new lease for the aircraft is being secured. Second, the transaction incurs repossession, remarketing, and potential maintenance and reconfiguration expenses. Third, the lease rate, the duration of a new lease and the creditworthiness of a new lessee are unknown.

To simulate lessee defaults, we use a Monte Carlo simulation that accounts for each airline's default probability, as well as default correlations among the airlines. For airlines with leases in place at transaction closing, we usually infer the probability of default of the airline from its credit rating. If a credit rating is not available, we may use a credit estimate. If neither a credit rating nor a credit estimate is available, we typically assume a low speculative-grade rating equivalent default probability.

For subsequent leases, we generally assume a low speculative-grade rating equivalent default probability because the new lessee is not known, as noted in the section "Credit Quality of New Lessees."

3.4. Economic Useful Life Assumptions

Our indicative assumption regarding the length of the economic useful life of a particular aircraft depends on the aircraft type, and generally ranges from 16 to 26 years from the date of manufacture.[16] We may adjust our assumptions for the economic useful life of certain aircraft models based on changes in market conditions, market trends, and technological advancements.

In our analysis, we assume each aircraft is not re-leased beyond the end of its economic useful life. However, we allow for a lease that was initiated before the end of the aircraft's economic useful life to run for the life of the lease, even if it is beyond the end of the economic useful life. At the end of the last lease, we assume the aircraft is sold for scrap value (the sale of the engines, airframe and other parts).

When aircraft reach the end of their economic useful lives, most of the value is in the engines, with the remainder in the metal from the airframe. Therefore, the key drivers of scrap value are the demand for, and maintenance condition of the engines. We typically assume the scrap value is 40% of the projected then-current market value of the aircraft at the end of the last lease, owing to the considerable uncertainty regarding the future demand for a particular engine model, as well as an engine's maintenance condition at the end of an aircraft's economic useful life. This assumption is largely based on observed data from appraisal firms.

3.5. Performance of Transaction Servicer

The strength of an aircraft lease securitization depends on the effective ongoing performance of the transaction servicer. The transactions rely on the servicer's ability to maximize cash flows by promptly (1) re-leasing or selling, at terms as favorable as possible, aircraft with expired leases, and (2) repossessing and remarketing aircraft upon lessee default. Transactions also rely on the servicer to collect lease and

[16] For more information, see Appendix C.

maintenance rents, proactively monitor the financial health of lessees, manage and monitor the technical upkeep of the aircraft, and secure the legal expertise required to repossess aircraft globally.

We commonly perform operational reviews to evaluate the servicer's ability, experience and expertise in performing the above-mentioned duties. We also analyze the servicer's historical performance information, including its remarketing and repossession history, when available. We typically compare the results of our analysis of the transaction servicer to those of other aircraft leasing companies.

We also analyze the transaction servicer's alignment of interests with that of bondholders to assess potential conflicts, because a servicer typically services the securitized portfolio and its own aircraft portfolio. We review the servicer's obligations under the transaction documents, including whether the servicer is obligated to service the collateral backing the securitization with the same care and diligence as if it were the owner of the assets. We also consider whether the servicing fee is tied to lease revenues and aircraft sale proceeds, the servicer retains equity interest in the securitization and the servicer has a long-term commitment in the aircraft leasing business.

A servicer default could require higher servicing fees to attract a successor servicer. We assess whether the transaction's servicing fee or the replacement servicing fee is consistent with the market rate and sufficient to attract a successor servicer. In cases where we deem the servicing fee insufficient, we will likely model a higher servicing fee that is consistent with the market rate.

Based on our overall analysis of the servicer, we may adjust some of our modeling assumptions including for example, the rate of lease renewal, the duration of renewed leases and the downtime between leases.

The ratings a rating committee determines for a particular transaction are based on, among other things, the type, quality and length of data that the transaction sponsor provides, our assessment of the originator, the track record and expertise of the servicer in repossessing aircraft around the world and remarketing aircraft to airlines, and the risk of payment disruption. A rating committee may decide that a transaction with a servicer that has limited historical performance and track record could not achieve the highest ratings.[17]

3.6. Other Factors Affecting Transaction Cash Flows

3.6.1. Maintenance Expenses

Aircraft maintenance expenses are substantial, and include costs to maintain engines, engine life-limited parts, landing gear, auxiliary power units and airframe. Lessees are typically responsible for maintenance, repairs and the related expenses during the terms of their leases. At lease expiry, lessees are obligated to ensure the aircraft meet specified minimum return conditions under the lease agreement. Airlines deemed to be of weaker credit quality by a lessor typically pay for maintenance in the form of periodic maintenance rent (maintenance reserves) along with their lease payments, while airlines deemed as higher credit quality by the lessor generally pay for maintenance at lease expiry according to the return conditions in the lease.

We typically assume routine aircraft maintenance expenses are paid by the lessee and not incurred by the transaction. However, we do assume a securitization incurs a certain amount of maintenance expenses upon a lessee's default and repossession of an aircraft that requires maintenance to allow the servicer to re-lease the aircraft, to the extent that these costs have not been accrued and reserved for by the transaction.

For anticipated aircraft maintenance expenses, aircraft lease securitizations typically have maintenance reserve accounts (MRAs) that accrue maintenance rents paid by the lessees. The MRAs are generally funded

[17] For more information, see our cross-sector methodology for assessing counterparty risks, including operational risks in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

to a required amount, and any excess amounts above the required level flow through the transaction's waterfall. As part of our analysis, we evaluate the adequacy of the reserve mechanism to ensure sufficient funds are available for maintenance expenses when needed.

Our assessment of the adequacy of a transaction's maintenance reserve is based on its mechanism and the historical maintenance expenses incurred by the lessor's managed portfolio. We also consider the availability of liquidity to cover spikes in maintenance expenses, if they aren't accrued for by the reserve mechanism. If we deem the reserve mechanism to be weak, we may adjust our maintenance expense assumptions.

Our assessment may also consider analyses of aircraft maintenance cash flows provided by independent, ISTAT-certified, third-party appraisal firms, if any. These assessments may also be made available in connection with an aircraft lease securitization.

3.6.2. Security Deposits and Letters of Credit

Lessors may require a security deposit in the form of cash or a letter of credit (LOC) from certain lessees. In the event of a lessee default under an aircraft lease, the associated security deposit may be available to the securitization to cover lost cash flows during the repossession period and associated expenses.

We typically give credit to security deposits provided by lessees under leases in place at transaction closing provided that under the transaction documents (1) the lessor has assigned its rights to the security deposits to the securitization SPV, and (2) the cash is held in a trust account at an eligible bank or the LOC is provided by an eligible bank.[18] However, we do not give credit in our cash flow analysis to potential security deposits from future lessees under subsequent leases.

3.6.3. Insurance

We evaluate the breadth of insurance coverage against potential events of loss and liability, as required by the covenants provided by the sponsor. Our analysis includes whether the transaction documents stipulate whether insurance must be in place both when the aircraft is on-lease and off-lease during the life of the transaction.

4. Pool-level Analysis

We aggregate the results from the asset-level analysis to obtain the portfolio cash flows. We use these portfolio cash flows in conjunction with the modeling of the transaction structure and the priority of payments to evaluate the performance of the bonds. Our portfolio analysis assesses the range of possible cash flows from the portfolio of aircraft and their leases, assuming transaction parties perform their roles as intended.

Several factors may affect the cash flows from an aircraft portfolio, such as the number and diversity of aircraft models, the aircraft types, age and production status, as well as the number, credit quality and geographic diversity of the lessees. The modeling of the portfolio will account for the composition and main characteristics of the aircraft pool and associated leases.

[18] For more information, see our cross-sector methodology for assessing counterparty risks, including account bank risks in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

5. Structural Analysis

We apply the aggregate net cash flows from each iteration to the transaction structure to determine how these cash flows are distributed to the investors in rated bonds. For a class of bonds, we calculate the average expected bond loss and the weighted average life (WAL) across all iterations and compare them to our Idealized Expected Loss table[19] at the relevant rating level to determine a model output.

The results of our quantitative modeling are important inputs to our rating committee process. However, ratings assigned by rating committees incorporate those inputs and other factors, including, for example, the model results of sensitivity analyses to certain assumptions and the loan-to-value (LTV) ratio over the life of the transaction. Additionally, we consider qualitative aspects relating to a variety of other factors, including operational, servicing and legal risks.

To derive cash flows available to redeem the bonds, we use a cash flow model that incorporates the key features of the liability structure of a transaction, such as fees, triggers, hedges, capital structure, priority of payments, and trust accounts such as the maintenance reserve account (MRA), liquidity facility and cash reserve accounts, if applicable.

Triggers can affect the repayment of bonds and losses allocated to bonds by accelerating repayments of certain classes of bonds, while slowing or halting altogether the payments to other classes of bonds or equity holders. Some triggers, if breached, can result in early amortization of the bonds, trapping of cash, and/or partial cash sweeps, which provides additional credit support in particular to the senior class of bonds outstanding. Triggers can be based, for example, on pool performance metrics, debt service coverage ratios, failure to refinance the bonds at their respective expected final payment dates, or an indenture event of default. Conversely, modeling a transaction's waterfall and considering the sensitivity analysis of the model output to various timings of recession can also help capture potential underperformance of a transaction due to cash leakage to equity holders early in a transaction's life.

Losses allocated to bonds also depend on a transaction's credit enhancement. High levels of credit enhancement can compensate for uncertainty in cash flows over the life of the transaction. Credit enhancement includes, among others, over-collateralization, subordination of junior bonds and certificates, and cash reserve accounts. In aircraft lease securitizations, over-collateralization is generally measured with a loan-to-value (LTV) ratio, which is the ratio of (1) the outstanding balance of the bonds, and (2) the aggregate value of the aircraft in the securitization pool.[20] We use the portfolio-level half-life market value to calculate the LTV ratio.

We typically incorporate into our analysis other structural features and risks of the transaction, such as liquidity risk and interest rate risk, as described in the following sections.

5.1. Liquidity Risk

In our structural analysis, we analyze whether the available liquidity support in the transaction is sufficient to cover senior transaction expenses, interest on the bonds and unanticipated spikes in maintenance expenses. Liquidity support is often provided by a liquidity facility, a cash reserve, or both. Liquidity facilities are generally provided by highly-rated banks or other financial institutions.[21]

[19] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions* (a link can be found in the "Moody's Related Publications" section) and in the "Loss Benchmarks" section.

[20] The aircraft value that transaction sponsors use in the LTV ratio calculation is typically either the half-life base value or the half-life market value.

[21] For more information, see our cross-sector methodology for assessing counterparty risks in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

5.2. Interest Rate Risk

The interest rate earned on an aircraft lease may be either fixed or floating rate, and the interest rate on the bonds or certain fees (for example, fees on liquidity facilities) may be either fixed or floating rate, creating the potential for interest rate mismatches. To address interest rate risk in transactions, we model the reference interest rates on the initial aircraft leases and the bonds. We typically assume the interest rates on subsequent leases are fixed rate. Historically the majority of executed leases have been fixed rate. However, we may assume subsequent leases are floating rate, if a lessor has historically favored floating rate leases.

We give credit to interest rate hedges in place at transaction closing by modeling them until their expiration. In our assessment of the hedge's impact, we account for the implied linkage of the transaction's credit quality to the credit quality of the hedge counterparty using our cross-sector approach for assessing hedges.[22] We do not give credit to a servicer's responsibility to maintain hedges because the terms of the future hedges are unknown.

5.3. Aircraft Sales

Aircraft lease securitizations typically permit the servicer on behalf of the issuer to sell aircraft during the life of the transaction, subject to certain conditions stipulated by transaction documents. This flexibility allows the servicer to manage residual value risk of the securitized portfolio, and to maximize cash flows to the transaction by selling aircraft when it is more economical than re-leasing. Aircraft sales lead to a faster paydown of the bonds. However, the sale of aircraft could pose risks to investors in the rated bonds. For example, aircraft sales could be negative for investors if a portion of the sale proceeds is paid to the transaction's equity holders, without appropriately compensating the bondholders for a potential deterioration in the portfolio's quality and increased pool concentration.

To factor such a risk into our analysis, we analyze the conditions under which transaction documents allow aircraft sales, and potential negative effects of sales on simulated collateral cash flows. If some of the sales proceeds can be leaked to the equity holders under the transaction waterfall, we use an approximation in the model to account for the potential risks of aircraft sales to investors since we do not model the occurrence of aircraft sales from the securitization portfolio. When simulating the portfolio aircraft value, we cap it at an approximation[23] to the aggregate note target price as defined in the transaction documents during the period when sales proceeds can be leaked to the equity holders, to reflect the actual sale proceeds that are paid to the bondholders.

We may also assess the effect of aircraft sales on the bonds by running sensitivity analyses that consider the sale of certain aircraft from the portfolio subject to the aircraft sales conditions in the transaction documents.

5.4. Aircraft Substitutions

Some aircraft lease securitizations allow the issuer to use aircraft sales proceeds to purchase new aircraft, subject to certain conditions. In our analysis, we examine substitution criteria in transaction documents to assess whether aircraft substitutions could lead to a decline in the quality,[24] or an increase in the concentration, of the pool with respect to its aircraft or lessees.

In addition, using aircraft sales proceeds to acquire aircraft instead of repaying bonds could extend the tenor of the transactions, exposing the transaction to more uncertainty. Rating committees will incorporate an assessment of the materiality of these risks in their rating analysis.

[22] For more information, see our cross-sector methodology for assessing counterparty risks in structured finance transactions, including swaps counterparty-related risks. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[23] We approximate the aggregate note target price by using the scheduled targeted principal balance of the bonds defined in the transaction documents increased by the specified premium.

[24] Quality of an aircraft pool refers to relevant characteristics of its aircraft such as age, liquidity and production status, among others.

6. Operational Risks

Operational risks stem from uncertainty regarding the continued viability and financial stability of important parties to a transaction, and the likelihood that their financial distress could result in disruptions to cash flows to the transaction (financial disruption risk). In our analysis of financial disruption risk in aircraft lease securitizations, we consider the roles of the servicers, administrators, trustees, hedge counterparties, liquidity providers and account banks who are responsible for payment continuity in a transaction. To assess this financial disruption risk, we follow the framework in our cross-sector methodology describing how we assess counterparty risks in structured finance.[25]

In evaluating these risks, we consider any relevant structural mitigants that may be included in a transaction. Examples of structural mechanisms in aircraft securitization transactions that may reduce operational risks have included:

» Third parties who are responsible for facilitating continuity in servicing, such as finding a new servicer, if required, or providing back-up to some or all of the servicer's functions;

» Governance aspects, such as (1) the issuer's board of directors, which oversees key activities of the issuer including selling or substituting aircraft, the appointment of new servicers in the event of a servicer termination, and the termination of the servicer in certain instances, or (2) the monitoring of the performance of the servicer and other service providers by a third party with direct reporting to the issuer's board of directors; and

» The routing of cash flows from the lessees directly to the issuer's accounts, and the degree to which independent third parties to the transaction control the cash and have the authority and ability to direct payments.

The incorporation of structural mechanisms like these reduces the risk of counterparty non-performance in a transaction.

7. Legal Risks

Our analysis focuses on the legal risks posed by the potential bankruptcy of the transaction sponsor and securitization vehicle, servicer, collections account bank and other relevant parties.[26] We review legal opinions at closing to further inform our views on the key legal risks identified in a transaction.

7.1. Bankruptcy of the Sponsor

Our analysis of a potential bankruptcy of the sponsor (aircraft lessor) incorporates an assessment of the following key factors:

» Whether the assets have actually been sold, referred to as "true sale."

» Whether the owner of the assets (the securitization trust or trusts) would be substantively consolidated with the sponsor in the event of the sponsor's bankruptcy, referred to as "substantive consolidation."

» Whether the securitization trustee can enforce its ownership or security interest in the collateral once the sponsor has filed for bankruptcy protection, referred to as "perfection."

[25] For more information, see our cross-sector methodology for assessing counterparty risks in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[26] For more information, see our cross-sector methodology for assessing bankruptcy remoteness for special purpose entities in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

We assess the likelihood that the bankruptcy of a sponsor – whether voluntary or involuntary – would delay or reduce the payments on the bonds. The securitization's degree of protection against these risks determines whether a rating committee assigns a rating to the bonds that could be higher than the sponsor's rating or credit quality. Our analysis of these factors depends on the applicable jurisdiction and includes a review of legal opinions rendered by transaction counsel.

In some circumstances, the bankruptcy of the sponsor can pose other risks that could reduce the cash flow available to repay the bonds, such as set-off risk and cash commingling risk.[27]

7.2. Risk Arising from Aircraft Repossession

Upon a lessee default under the lease contract, the ability of the servicer to promptly recover the aircraft is subject to the pursuit of remedies in the local jurisdiction of the defaulting airline, and often governed by multi-jurisdictional treaties. Since the legal, commercial and registration systems for aircrafts differ across jurisdictions, we typically assess the impact of a lessee's default on a case-by-case basis.

The country in which the lessee is domiciled could introduce systemic, economic, legal or political risks to the transaction, particularly when a large proportion of the transaction's aircraft leases may be concentrated in a single country. In that case, we will incorporate such risks in our analysis. A rating committee may also consider modifying appropriate assumptions when determining the ratings of the bonds.

8. Monitoring

When monitoring aircraft lease securitizations, we generally apply the key components of the approach described in this methodology, relying on a combination of transaction-specific performance data and information about industry trends. Changes in key performance metrics may lead us to perform a more detailed analysis, including modeling the transaction with revised inputs from updated data, where applicable.[28] Certain components of our assessment, such as reviews of legal structures of existing transactions or true sale opinions, are static and will generally not be re-reviewed unless circumstances warrant.

Environmental, social and governance (ESG) considerations may also affect the ratings of aircraft lease securitizations. For example, carbon and fuel efficiency standards for airplanes could make older and fuel-inefficient aircraft more expensive to operate or require retrofits that may make them less attractive to lessees. As aircraft lease securitizations have long maturities, these issues may affect transactions cashflows and their expected performance. For information about our approach to assessing ESG issues, please see our methodology that describes our general principles for assessing these risks.[29]

We commonly incorporate into our monitoring analysis information that becomes available to us over time. We monitor performance of aircraft lease securitizations based mostly on information obtained from servicer reports, which include pool-level data such as rental income, maintenance reserve, and expenses. It

[27] For more information, see our cross-sector methodology for assessing counterparty risks in structured finance transactions, including set-off and commingling risks. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

[28] For example, in methodologies where models are used, modeling is not relevant when it is determined that (1) a transaction is still revolving and performance has not changed from expectations, or (2) all tranches are at the highest achievable ratings and performance is at or better than expected performance, or (3) key model inputs are viewed as not having materially changed to the extent it would change outputs since the previous time a model was run, or (4) no new relevant information is available such that a model cannot be run in order to inform the rating, or (5) our analysis is limited to asset coverage ratios for transactions with undercollateralized tranches, or (6) a transaction has few remaining performing assets

[29] A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

may also include updated aircraft-level information, such as appraised values, lessees and lease expiry dates.[30]

We may also track any material developments regarding the servicer and other key participants in the transaction. With regard to counterparty risk, our monitoring analysis also includes an assessment of the stability of the servicer and of swap counterparties or credit support providers, if present. If these entities become unable to fulfill their obligations to the transaction, the risk of decline in the cash flows to investors increases. Thus, changes to the financial stability of an entity that has a weight in the rating of the securities can result in a rating action on the securities.

In addition to periodic notices and reports that we receive from the transaction parties, we may request additional information on a case-by-case basis, including, but not limited to, individual lease rates and future leasing prospects for an aircraft. On this basis, we typically evaluate a combination of the following transaction performance drivers and information:

» loan-to-value ratios

» aircraft types, ages, and other factors that influence aircraft marketability over time

» lease status, expiry date, and credit quality of lessees

» trends in lease and sale income

» principal paydown rates

» trends in expenses

» lease payments by aircraft (when available)

» pool aircraft disposal trends and sales proceeds compared to appraised values (if applicable)

» structural protections, such as reserve funds and other forms of available credit enhancement

Rating committees may also consider other factors, such as aviation industry trends, aircraft market value and lease rate information.

Changes in key performance metrics may lead us to perform a more detailed analysis, including remodeling a transaction with updated aircraft information and revised model inputs.

Bonds with a loan-to-value (LTV) ratio higher than 100% are typically considered as impaired. In general, for transactions with LTV ratios higher than 100% where all the bonds, including senior bonds, are impaired, we generally rely mostly on a bond recovery analysis, and the ratings reflect our expectations for recovery of principal and interest as well as the uncertainty around that recovery.[31] For transactions where every bond fits this category (for example, LTV ratio greater than 100% and a commensurate low rating), we typically do not run a model.[32]

For transactions where bonds are rated higher (for example, Caa/B/Ba or higher) and have LTV ratios of less than 100%, we monitor the bonds' LTV ratios along with other performance drivers. We may also rerun

[30] If not routinely provided by a servicer, we typically request this information periodically.

[31] See the Long-Term Credit Ratings for Defaulted or Impaired Securities discussion in *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

[32] Similarly, for transactions where any bond has an LTV ratio of less than 100%, but we believe the valuations are unlikely to be realized (for example, when realized prices for sale of similar aircraft or engine from the transaction are far lower than indicated by valuations), we may focus on an adjusted LTV and recovery analysis and not rerun our model.

our model, or perform a static cash flow analysis if appropriate, rather than rely predominantly on the LTV ratios.

9. Loss Benchmarks

In evaluating the model output for aircraft lease securitization, we select loss benchmarks referencing the Idealized Expected Loss table[33] using the Standard Asymmetric Range, in which the lower-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the next higher rating category and the Idealized Expected Loss of the given rating category, respectively. For initial ratings and upgrade rating actions, the upper-bound of loss consistent with a given rating category is computed as an 80/20 weighted average on a logarithmic scale of the Idealized Expected Loss of the given rating category and the Idealized Expected Loss of the next lower rating category, respectively. When monitoring a rating for downgrade, the upper-bound of loss is computed as a 50/50 weighted average on a logarithmic scale. That is, the benchmark boundaries of loss appropriate for evaluating rating category R are given by:

[1] $$Rating\ Lower\ Bound_R = exp\{0.8 \cdot \log(Idealized\ Expected\ Loss_{R-1}) + 0.2 \cdot log(Idealized\ Expected\ Loss_R)\}$$

[2] $$Initial\ Rating\ Upper\ Bound_R = exp\{0.8 \cdot \log(Idealized\ Expected\ Loss_R) + 0.2 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

[3] $$Current\ Rating\ Upper\ Bound_R = exp\{0.5 \cdot \log(Idealized\ Expected\ Loss_R) + 0.5 \cdot log(Idealized\ Expected\ Loss_{R+1})\}$$

Where:

- $Rating\ Lower\ Bound_R$ means the lowest Idealized Expected Loss associated with rating R and the expected loss range of rating R is inclusive of the $Rating\ Lower\ Bound_R$.
- $Initial\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating R that is either initially assigned or upgraded and the expected loss range of rating R is exclusive of the $Rating\ Upper\ Bound_R$.
- $Current\ Rating\ Upper\ Bound_R$ means the highest Idealized Expected Loss associated with rating R that is currently outstanding and the expected loss range of rating R is exclusive of the $Rating\ Upper\ Bound_R$.
- $R\text{-}1$ means the rating just above R.
- $R+1$ means the rating just below R.
- The Rating Lower Bound for Aaa is 0% and the Rating Upper Bound for C is 100%. These are not derived using the formula.

[33] For more information, see the discussion of Idealized Probabilities of Default and Expected Losses in *Rating Symbols and Definitions.* A link can be found in the "Moody's Related Publications" section.

Appendix A: Transactions Backed by Aircraft Engines and Associated Leases

Our approach to rating transactions backed by aircraft engines and associated leases is broadly similar to that for aircraft lease securitizations, with some adjustments to accommodate specific market and lessor data as well as the unique aspects of engines. There are a few key differences between engine and aircraft leasing:

» We typically assume engine half-life values will start declining once production for their host aircraft winds down. This is different from assumptions used in aircraft lease securitization, where aircraft values are assumed to start declining from their year of manufacture, because engines can typically be repaired (with related maintenance cost), and their economic useful lives can be extended. For aircraft engines, we typically assume the engine half-life values decline to scrap value over the course of their economic useful life after host aircraft production ends, or demand for the engine drops significantly (e.g. as more fuel-efficient engines come to market, or in case of technical/safety issues with a specific engine).

» Engine leasing strategies can also differ from aircraft-related strategies. While aircraft lessors typically try to lock in long-term leases, some engine lessors specialize in short-term leasing while others target long-term leases. To incorporate the strategies, we use in our analysis and modeling different inputs for different types of leases that correspond to a lessor's strategy. For those lessors targeting short-term leases, the percentage of engines that are off-lease is typically larger than for lessors with a longer-term lease strategy.

If the portion of a pool consisting of engines and related leases is relatively small (e.g., less than 5% of the initial pool value), we will typically apply more conservative assumptions for lease rates, lease terms, values and economic useful life for that portion than for the aircraft that hosts the engines, also considering the lessor's strategy and historical data as well as publicly available market data. For transactions backed by pools that consist of a larger portion of engines and related leases, we expect to receive detailed market and lessor data in order to adjust the assumptions in a more precise manner.

Appendix B: Overview of the Aircraft Leasing Asset Modeling Framework

Our analytical framework is based on projecting market lease rates for subsequent leases attached to each aircraft in the securitization pool over the life of the transaction. For each aircraft, we simulate changes in half-life market values, and lease rate factors for each period during the aircraft's economic useful life. The value of an aircraft in each period is equal to its projected value (or assumed value at transaction closing) in the prior period multiplied by one plus the projected change in value in the period. The projected market lease rate at any point in time is the product of the then-current aircraft value and the corresponding lease rate factor. We apply the projected market lease rate at the start of a lease renewal or new lease to a new airline for an assumed duration of the lease.

We also include lessee defaults in the simulation model. The simulation of lessee defaults is based on the lessee's credit rating or a credit estimate.[34] In the absence of a credit rating or a credit estimate, we assume a default probability equivalent to a low speculative-grade rating. We also assume correlation among defaulting lessees based on their industry, using a framework which is similar to the approach used in Moody's CDOROM™ (CDOROM).

Aircraft Value Model

We simulate the changes in half-life market values for an aircraft over its economic useful life. The aircraft value model differentiates four aircraft types: narrowbody, widebody, regional jets and freighters. The model was developed using appraisals from an independent ISTAT-certified third-party appraisal firm to calibrate the model for each aircraft type.

FORMULA 1

The change in value is given by the following formula:

$$dV_t = \left(\frac{V_t}{V_{t-1}} - 1\right)$$

Where:

» dV_t is the change in value at time t,

» V_t is the aircraft value as of time t, and

» V_{t-1} is the aircraft value as of time $t-1$.

Source: Moody's Investors Service

FORMULA 2

From this formula, we determine the aircraft value at any time t (equivalent to a depreciation curve), such that:

$$V_t = V_{t-1} * (1 + dV_t)$$

Source: Moody's Investors Service

Key variables in our model of the changes in aircraft values include aircraft type, aircraft age, the change in the US CPI, the occurrence of commercial aviation industry downturns, and the production status of each aircraft model in the pool, including our estimation of when each aircraft will go out of production, if it is in production at the time of transaction closing. For the modeling of economic cycles in the commercial

[34] For more information, see our cross-sector methodology on the use of credit estimates in structured finance transactions. A link to a list of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

aviation industry, we assume that each cycle lasts for 10 years, and that there is a 3-year downturn in each 10-year cycle.

Initial Aircraft Values

Each simulated path of the aircraft value model starts with an initial value, $V_{t=0}$, which corresponds to the estimate of the initial aircraft value at the time of the model run. In conjunction with the transaction, the sponsor typically provides appraisal values of each aircraft from three ISTAT-certified appraisers. For the assessment of the initial aircraft value, we use the lower of (1) the LMM of the half-life market value appraisals provided by the sponsor, and (2) an estimate based on half-life market value appraisals we obtain from independent third-party appraisal firms.[35] We may further adjust the estimate based on input from industry experts and industry trends.

Aircraft Lease Rate Factor (LRF) Model

We project future lease rates based on simulating future aircraft lease rate factors and future aircraft values. The future lease rates at any point in time, t, are obtained from the product of aircraft value, V_t, and the corresponding lease rate factor, LRF_t.

The explanatory variables included in the lease rate factor simulation model are: aircraft type, aircraft age, the production status of each aircraft model in the pool (including our estimation of when each aircraft will go out of production, if it is still in production at the time of transaction closing), a risk-free interest rate (3 month T-Bill rate) and the occurrence of commercial aviation industry downturns.

[35] See the "Asset-level Analysis" section.

Appendix C: Indicative Modeling Assumptions for Securitizations Backed by Aircraft and Associated Leases

This appendix describes indicative assumptions we ordinarily use in modeling asset cash flows in aircraft lease securitizations.

Our assumptions may differ from transaction to transaction based on a number of factors, including:

» the type, quality and length of data that the transaction sponsor provides

» the pool's collateral characteristics

» the ability, experience, expertise, historical data, and credit quality of the servicer

» new commercial aviation industry developments or trends

Additionally, we typically use the following indicative assumptions as set forth in Exhibits 3 to 10. For transactions with a servicer that has limited historical performance and track record, we are likely to use the more conservative part of the assumption ranges included in Exhibit 6.

We may also adjust our repossession, reconfiguration, net maintenance or remarketing expense assumptions based on our assessment of the adequacy of the transactions' maintenance reserve mechanism, the servicers' historical performance and track record, and the analyses of aircraft maintenance cash flows provided by independent, ISTAT-certified, third-party appraisal firms, if any.

EXHIBIT 3

Lessee Default Risk

Parameter	Indicative Assumption
Initial lessee default rate	Default risk consistent with the lessee's rating or credit estimate, if available. If the lessee does not have a rating or credit estimate, we assume a low speculative-grade rating for the lessee, typically B3.[36] Lessee defaults are correlated using an approach similar to CDOROM.
Subsequent lessee default rate	Default risk consistent with a low speculative-grade rating, typically B3. We also run additional scenarios considering lower ratings for new lessees, typically Caa2, to examine the sensitivity of the results to this assumption

Source: Moody's Investors Service

EXHIBIT 4

Duration of New Leases to New Airlines

Age of Aircraft (years)	Aircraft Type	Outside Recession	In Recession
≤ 5	Narrowbody, regional jet, freighter	8 years	5 years
	Widebody	10 years	5 years
6-14	All	5 years	3 years
≥ 14 years	All	4 years	3 years

Source: Moody's Investors Service

We may adjust some of our assumptions based on our assessment of a servicer's historical performance and track record, in particular the assumptions on the rate of lease renewal and duration of renewed leases assumptions (Exhibit 5), downtime between leases (Exhibit 6), and remarketing and reconfiguration expenses (Exhibit 7).

[36] Further stresses or sensitivity analysis may apply.

EXHIBIT 5

Rate of Lease Renewal and Duration of Renewed Leases

	Lease Renewal Rate	Duration of Renewed Lease Term
At end of initial lease	50%	3 years
At end of subsequent leases	50%	2 years

Source: Moody's Investors Service

EXHIBIT 6

Remarketing and Repossession Periods

Event	Downtime	Downtime if Outside Recession	Downtime if In Recession
Lease is renewed	None	-	-
Return of aircraft at lease expiry	Assume a remarketing period only	[1 to 5] months	[4 to 8] months
Lessee default and aircraft repossession	Assume both a repossession period and a remarketing period	[4 to 8] months	[7 to 11] months

Source: Moody's Investors Service

When a lease expires, we typically apply the following remarketing and reconfiguration expenses (see Exhibit 7), which are the expenses associated with marketing and delivery of the aircraft to a new airline and a portion of the reconfiguration expenses that are likely to be incurred by the transaction in order to secure a new lease. Remarketing expenses typically include, for instance, costs for aircraft and records redelivery, records scanning, inspection of the aircraft, engine and auxiliary power unit, technical expenses during redelivery process, brokerage fees, legal fees, finance costs, and costs for ferrying, repainting, parking and insurance.

EXHIBIT 7

Remarketing and Reconfiguration Expenses to Place Aircraft with New Airline (no Airline Default)

Aircraft Type	Remarketing and Reconfiguration Expenses (Re-lease to New Airline; No Airline Default)
Narrowbody Aircraft	$750,000
Widebody Aircraft	$1,500,000 to $3,000,000
Regional Jet	$375,000*/$750,000**
Freighter Narrowbody	$500,000
Freighter Widebody	$850,000

* ≤ 70 seats

** > 70 seats

Source: Moody's Investors Service

When we simulate a lessee's default, we assume the servicer repossesses the aircraft and the transaction incurs repossession expenses, which include, for instance, costs for legal work, crew transportation, fuel, deregistration of the aircraft, and storage, if necessary. Following an aircraft repossession, we assume the transaction will also incur certain maintenance and reconfiguration expenses, as well as remarketing expenses as listed above in order to place the aircraft with a new lessee or sell it.

EXHIBIT 8

Repossession, Net Maintenance, Reconfiguration, and Remarketing Expenses Following an Airline Default

	Repossession, Net Maintenance, Reconfiguration, and Remarketing Expenses Following an Airline's Default	
Aircraft Type	Not During Downturn	During Downturn
Narrowbody Aircraft	$1,500,000	$2,250,000
Widebody Aircraft	$2,500,000	$4,500,000
Regional Jet	$1,000,000	$1,250,000
Freighter	$1,500,000*	$1,500,000*
	$2,500,000**	$2,500,000**

* Narrowbody

** Widebody

Source: Moody's Investors Service

In our asset model, we assume that each aircraft has an economic useful life after which no new leases will be undertaken. However, leases that were initiated prior to the end of the aircraft's economic useful life and extend beyond that point, will remain in place and generate lease income until the earlier of the end of the assumed duration of the lease or a lessee default.

EXHIBIT 9

Aircraft Economic Useful Life[37,38]

Aircraft Type	Economic Useful Life
Narrowbody	21 years
Widebody	21 years
Regional Jet	16 years*
	21 years**
Freighter	26 years

* ≤ 70 seats

** > 70 seats

Source: Moody's Investors Service

For an aircraft model that is no longer being produced, we generally assume that a model's out-of-production year is the last year the model was manufactured. For an aircraft model still in production at transaction closing, our assumption for the out-of-production year incorporates the aircraft manufacturer's product plans, which are typically announced years in advance, as well as qualitative factors, including the expected entry of new, more technologically advanced aircraft models and a model's position in its production lifecycle.

For the scrap value of an aircraft model, we assume on an indicative basis a percentage of the projected then-current market value.

EXHIBIT 10

Scrap Value at the End of the Economic Useful Life

Parameter	Indicative Assumption
Scrap value	40% of the projected then-current market value

Source: Moody's Investors Service

[37] Exceptions may be applied based on aircraft model, production status, expected replacement models and industry trends.

[38] As described in the "Asset-level Analysis" section, lease terms can extend beyond the economic useful life. For example, if a lease associated with a narrowbody aircraft expires just before age 21 and it is not renewed, the assumed new lease term would be 4 years outside of a downturn or 3 years in a downturn. Therefore, the aircraft may generate lease revenue until age 25 or 24, respectively.

Moody's Related Publications

Credit ratings are primarily determined through the application of sector credit rating methodologies. Certain broad methodological considerations (described in one or more cross-sector rating methodologies) may also be relevant to the determination of credit ratings of issuers and instruments. A list of sector and cross-sector credit rating methodologies can be found here.

A comprehensive technical description of the aircraft leasing asset model, can be found in the following data report: Aircraft Lease ABS: Modeling Lease Rates.

For data summarizing the historical robustness and predictive power of credit ratings, please click here.

For further information, please refer to *Rating Symbols and Definitions*, which includes a discussion of Moody's Idealized Probabilities of default and Expected Losses, and which is available here.

» contacts continued from page 1

Analyst Contacts:

NEW YORK +1.212.553.1653

Jian Hu +1.212.553.7855
Managing Director - Structured Finance
jian.hu@moodys.com

Dev Chatterjee +1.212.553.1329
Managing Director - Structured Finance
dev.chatterjee@moodys.com

FRANKFURT +49.69.70730.700

Thorsten Klotz +49.69.70730.734
Managing Director - Structured Finance
thorsten.klotz@moodys.com

HONG KONG +852.3551.3077

Jerome Cheng +852.3758.1309
Associate Managing Director
jerome.cheng@moodys.com

Author
Rodrigo Araya

Report Number: 1232482

ADDITIONAL CONTACTS:

Frankfurt:	+49.69.2222.7847
Madrid:	+34.91.414.3161
Milan:	+39.02.3600.6333
Paris:	+33.1.7070.2229

MOODY'S
INVESTORS SERVICE