

Procedures and Methodologies for Determining Credit Ratings

Fitch's procedures and methodologies for assigning ratings are consistent with the Fitch Ratings Code of Conduct & Ethics, and documented in detail in a combination of the agency's published criteria and methodologies and its internal policies and procedures. A general summary of these procedures and methodologies can be found in the Special Report and Criteria Reports attached. Furthermore, a summary of the quantitative and qualitative metrics used to determine credit ratings are attached as well, broken down by sector.

"The Ratings Process", dated March 31, 2016, i) addresses Fitch's general approach to initiating and monitoring ratings including interactions with management of rated obligors, structuring and voting process of committees, informing rated obligors of the ratings and monitoring, reviewing and updating the ratings; ii) describes policies by which Fitch determines to initiate a rating on a new or complex transaction; and iii) and addresses the process for developing and evaluating criteria as well as how and when we apply material changes in criteria including, where relevant, changes to models. Please note that we see models as part of our criteria. Thus, where a model forms a key part of our rating process, the model and its applications are described within the relevant criteria report.

Fitch uses credit ratings of other credit rating agencies in assigning ratings to CLOs and CDOs, and, in rare instances, in its analysis of the credit quality of the assets in ABCP conduits. Fitch's methodology as it relates to the use of other credit rating agency ratings is described in the "CLOs and Corporate CDOs Rating Criteria," published July 19, 2018, and "Structured Finance CDOs Surveillance Rating Criteria," published June 27, 2018.

Corporates

Qualitative Metrics

The fundamental characteristics of each sector lead to varying typical rating ranges for each sectors depending notably on their inherent exposure to volatility and business risk, either past or prospective.

The qualitative factors differ per industrial sector but often include considerations related to sector competitive intensity (competition, barrier to entry/exit, power within the value chain), sector trends (growth potential, volatility of demand, threat of substitution), and diversification (product and geographic).

The analysis also factors in the operating environment in which a corporate issuer operates and includes the location of its revenues, operations and assets, its funding environment and the systemic governance in the respective location. Since companies can succeed and fail in various environments, it is neutral to the rating in most cases. However, the challenges posted by such factors in emerging markets could lead to lower ratings than would otherwise be the case. Overlaying quantitative approaches to credit analysis, a qualitative assessment of management quality, strategy, and idiosyncratic corporate governance factors may influence ratings.

Quantitative Metrics

The quantitative metrics measure cash flow, earnings, leverage and coverage to assess credit risk. Metrics include earnings before interest, taxes, depreciation or amortization (EBITDA)- or Funds from Operations-based profitability, leverage, and coverage ratios to assess a rated entity's cash flow generation relative to its debt service requirements. Liquidity analysis focusses primarily on the ability to generate sustainable internal cash generation from operations rather than a year-end cash position, where largely uncovenanted structures allow management to divert to equity thereby potentially creating imbalances versus debt stakeholders' interests.

Specific quantitative metrics can be used, and often are more appropriate in relation to different risk profiles derived from Fitch's qualitative assessment of the rated entity.

Banks / Financial Institutions

Qualitative Metrics

The qualitative metrics assess the entity's intrinsic creditworthiness and, in certain cases, the likelihood of receiving external support. The intrinsic creditworthiness considers the operating environment, company profile, management and strategy, risk appetite, and financial profile. Each factor is broken down into several sub-factors. Further, the factors are delineated into core and complementary groupings to highlight analytical significance. The operating environment considers the sovereign rating, economic and business environment, financial market development, and regulatory and legal framework. The company profile considers the franchise quality, business model, and organizational structure. Management and strategy consider management team strength, corporate governance, execution, and strategy. The risk appetite assessment evaluates underwriting standards, risk controls, growth and market risk. The financial profile analysis aligns with the type of financial institution as well as consideration of the operating environment. Support considerations evaluate the likelihood that the entity will receive extraordinary support - typically from either the owner(s) or sovereign. While sovereign support is often a rating factor for banks, it is less common for other non-bank financial institutions.

Quantitative Metrics

The quantitative metrics for banks are grouped into four primary areas: asset quality, earnings and profitability, capitalization and leverage and funding and liquidity. The core metric for each grouping is impaired loans to gross loans for asset quality, operating profit to risk-weighted assets for earnings, Fitch core capital to Fitch core capital-adjusted risk-weighted assets; and the primary metric for

funding and liquidity is loans-to-customer deposits. All primary bank metrics are reviewed in coordination with complementary metrics to form opinions on the issuer's risk profile. For each non-bank financial institution subsector - including securities firms, investment managers, business development companies, finance & leasing companies, and financial market infrastructure firms - Fitch uses a set of core and complementary metrics, which are consistent with bank primary and complementary metrics, that align with the entity's risk profile.

Insurance

Qualitative Metrics

The primary qualitative factors for insurance ratings are an assessment of industry profile and operating environment, business profile, ownership, and corporate governance and management. These elements can serve to limit or cap a rating as can be the case with corporate governance, establish a foundation for solid creditworthiness based on the need for financial strength and a strong regulatory environment in the industry profile and operating environment evaluation. The sector(s) that an insurance company operates within is an important aspect in the evaluation of the operating environment. The business profile takes into account competitive positioning and key business risks that help assess the sustainability of an entity's creditworthiness. Factor performance is compared to principals, guidelines, and relative to peers. Insurance ratings consider the nature of the regulatory regime, and the relative credit quality of various members inside the organization as well as various components of the capital structure.

Quantitative Metrics

The key quantitative factors for insurance entities are capitalization and leverage, debt service capabilities and financial flexibility, financial performance and earnings, investment and asset risk, asset/liability and liquidity management, reserve adequacy, reinsurance and risk mitigation, and catastrophe risk. Primary metrics include net premiums-to-capital, total liabilities-to-capital, capital adequacy ratios (both regulatory and per Fitch models), and financial leverage. Operating performance is considered through the combined ratio for non-life insurers and pretax return on assets for life insurers. Asset quality is reviewed by risky assets-to-equity, non-investment grade bonds-to-equity and unaffiliated common stock assets-to-equity. Liquidity is measured by liquid assets relative to liabilities. Reserve quality (for property/casualty) is considered by net leverage, reserve development-to-equity, reserves-to-earned premium, and calendar year paid losses-to-calendar year incurred losses.

Public Finance / Sovereigns

Qualitative Metrics

The qualitative metrics for public finance ratings are the institutional framework and sector risk profile, economy, revenues, expenditures, and debt. The institutional framework and sector risk profile considers the legal, structural, and regulatory environment as well as the macroeconomic factors that provide the backdrop against which the other key rating factors are evaluated. Revenues are considered, and the demand and pricing characteristics that influence revenue volatility, and the tools available to the issuer to respond to fluctuation in demand. The issuer's expenditure framework, including predictability and volatility of costs are considered. Operating/financial performance considers the level of financial flexibility an issuer can sustain as it encounters stresses expected to occur over the relevant forecast period. Other risks, such as debt structure, management and governance, and legal and regulatory risks are also considered when assigning a rating. These risk factors are not scaled, and only weaker characteristics affect the rating.

Sovereign credit analysis emphasizes the structural features of the economy that render it more or less vulnerable to shocks, including the risks posed by the financial sector, political risk and governance factors; and macroeconomic performance, policies and prospects, including growth prospects, economic stability and the coherence and credibility of policy. Sovereign ratings consider an issuer's finances, including budget balances, the structure and sustainability of public debt and

fiscal financing; the sustainability of current account balances and capital flows, and the level and structure of external debt.

Quantitative Metrics

The quantitative metrics for U.S. tax-supported credits include historical tax revenues, direct debt, and adjusted net pension liability. The long-term liability burden is calculated as direct debt+adjusted net pension liability as a percentage of personal income. For revenue-supported credits, leverage is considered by net debt plus other liabilities to CFADS (or EBITDA), which provides an indication of the cash flow from core operations which is available for the payment of debt service. Days cash on hand measures the number of days that an organization could continue to pay its average daily cash obligations from its current cash position.

Sovereign ratings use a model that considers several metrics, such as GDP per capita, inflation, government debt levels and reserve currency flexibility. The rating model output is supplemented by additional qualitative analysis which can adjust the model output up or down three notches to reach a final rating conclusion.

Infrastructure and Project Finance

Qualitative Metrics

The qualitative metrics address the issuer's ability to generate a stable cash flow based on its legal framework and fundamental economics. Where material to the rating, risks that may cause the facility not to be completed on time, on budget, and/or up to the performance standards assumed for the operating period credit profile (completion risk) are evaluated. Operating cost, demand, revenue, and infrastructure renewal risks that affect the ability to make debt service payments (operation and revenue) are considered. Financial analysis considers each of the issuer's rated debt instruments separately, taking into account the debt structure, including priorities, amortization, maturity, interest risk and associated hedging, liquidity, reserves, financial covenants, and triggers in the context of the facility's operating environment. The level of financial flexibility that a facility demonstrates is considered as it encounters stresses expected to occur over the relevant forecast period. Counterparty risk (off-takers, concession grantors, warranty providers) is assessed for each risk factor. Country risk factors, industry specific risks, and the facility's exposure to event risks and mitigating factors to such risks are accounted for in the final rating.

Quantitative Metrics

The quantitative metrics considered are the DSCR; leverage ratio, which is the ratio of net debt to CFADS or net debt to EBITDA; project life coverage ratio, which is the net present value (NPV) of CFADS over the remaining project life, divided by the principal outstanding on the rated debt instrument (plus all equal-ranking and senior debt) at the calculation date; and loan life coverage ratio, which is the NPV of the cash flow available for debt service, from the calculation date to the maturity of the rated debt instrument.

Structured Finance

Qualitative Metrics

The qualitative metrics consider qualitative components of asset quality – such as measures of physical quality and opinions on potential volatility; strength of transaction participants, including originators, servicers, and counterparties, as well as a legal analysis analyzing the isolation of the collateral pool from the originator which forms the assumption that the credit analysis is based on the collateral itself, rather than the originator.

Quantitative Metrics

The quantitative metrics for structured finance are an estimate of expected losses, which typically consists of two sub-components: a probability of default and loss severity/expected recovery. Both of

these sub-components are typically related to the collateral of the transaction. Expected losses at the asset level are also influenced by quantitative assumptions on multiples (extrapolation between expected losses under an expected case and under higher stresses), and transaction-wide metrics, such as portfolio concentration.

Other important quantitative factors are cash flow related, including timing of the cash flows of both the transaction's assets (collateral) and liabilities (bond structure) and interest rates assumptions.

The Ratings Process

The Ratings Process under Fitch Criteria Special Report

This report replaces the report of the same title dated March 30, 2015.

Fitch Ratings provides forward-looking credit opinions that reflect its expectations of credit behavior over a range of scenarios as indicated by its ratings. To achieve its objectives, Fitch follows standardized procedures, as described in this report, to ensure a globally consistent approach to its rating processes. Additional information related to structured finance is included in Appendix I. For purposes of this report, an “issuer” denotes an issuer, rated entity or transaction.

Start of the Ratings Process: The rating process begins when an arranger, issuer, sponsor, or underwriter contacts a member of Fitch’s Business Relationship Management (BRM) group with a request to engage Fitch. Fitch may alternatively choose to initiate rating coverage on an unsolicited basis where sufficient public information is available to broaden industry coverage or provide insight to subscribers or the public debt market.

Assignment of the Analytical Team

Manager’s Role: The manager leading the relevant product group will assign a primary and secondary analyst to lead the analysis, formulate a rating recommendation and, outside of the Structured Finance and select U.S. Public Finance groups, continue surveillance of the rating.

Structured Finance Ratings: For structured finance, once an initial rating is assigned, surveillance is typically transferred to a dedicated surveillance analyst, although for some assets, day-to-day surveillance activities may remain with the primary analyst.

U.S. Public Finance Ratings: For U.S. public finance, the primary analyst is responsible for leading the analysis and formulating a rating recommendation, but surveillance responsibilities vary by sector.

Analyst Role: Fitch analysts conduct their analyses in a manner consistent with published criteria applicable to the particular entity, transaction type, asset class, region or sector. Analysts and committee members are required to consider relevant qualitative and quantitative factors as defined in applicable criteria and methodologies. Analysts may rotate coverage responsibility over time as deemed appropriate by analytical group managers and in accordance with applicable laws and regulations.

Related Research

[Fitch Ratings Code of Conduct \(August 2014\)](#)

[Global Securities Trading and Conflicts of Interest Policy \(March 2015\)](#)

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Information Used to Determine a Rating

The rating process incorporates information provided directly by the rated issuer, arranger, sponsor or other third party. This may include background data, forecasts, risk reports or factual feedback on proposed analytical research and other communications. In most cases, issuer management participates in the ratings process via in-person management and treasury meetings, on-site visits, teleconferences and other correspondence. In addition, analysts consider macroeconomic conditions, market events and any other factors deemed relevant, such as information from an issuer's peers or provided by other analytical groups within Fitch.

The analytical team conducting the analysis will determine if sufficient information is available to recommend a view on the creditworthiness of the issuer. Collectively, the rating committee will also consider whether there is sufficient information to support a rating. If Fitch believes that the information available, both public and private, is insufficient to form a rating opinion, no credit rating will be assigned or maintained. If sufficient information ceases to become available, Fitch will withdraw the rating.

Fitch relies on information it receives from sources believed to be credible. Fitch conducts a reasonable investigation of data accuracy and obtain(s) reasonable verification of that information from independent sources. Issuers (or arrangers/sponsors) may choose not to share certain information with external parties, including rating agencies, at any time. While Fitch expects that each participating issuer in the rating process, or its agents, will supply promptly all information relevant for evaluating both the ratings of the issuer and all relevant securities, Fitch neither has, nor would it seek, the right to compel the disclosure of information by any issuer or any agents of the issuer.

Pre-Committee Process

If necessary, a transaction screening committee (TSC) may be held to determine whether a full rating process should proceed. A TSC is not itself a rating committee but is rather a cross-disciplinary committee that provides an additional layer of review to consider certain rating proposals for a new security, transaction or issuer types early in the rating process. Such proposals may have unique or complex features or characteristics that require a broader, interdisciplinary review to assess how certain credit risks should be considered. The primary purpose of the TSC is to determine the feasibility of assigning an international scale rating to a new security. Committees are selected from a designated pool of senior members of Fitch's analytical groups and Credit Policy group.

The Committee Process

Ratings are assigned and reviewed through a committee process. Once information has been collected and the issuer analyzed in accordance with Fitch's criteria and methodologies, the primary analyst makes a rating recommendation and documents his/her analysis and rationale in a committee package. Committees consider the information and rating recommendation presented in the committee package and discuss the primary analyst's recommendation.

Voting members are chosen based on relevant experience, with seniority and experience thresholds incorporated into Fitch's committee quorum requirements. The minimum committee size for international credit rating decisions is generally five analysts, although committees often include more members. Committees include:

- A chair that moderates the committee and ensures it is conducted in accordance with Fitch's policies and procedures.

- At least one independent member from outside the immediate asset class, subsector or geographic area of the entity under review, since peer analysis (on a transaction or entity basis) is a central element of the rating committee's discussion.

In limited circumstances in Structured Finance, committees may have reduced quorum requirements — with a few examples listed below.

- For affirmations based on a standard screening tool.
- For confirmations in response to non-material transaction changes.
- To assign ratings to tap issuances where there have been no credit-related changes to the issuer.
- To downgrade an existing rating of 'CC' or below to 'D'.

The rating committee considers the relevant quantitative and qualitative issues, as defined in Fitch's established criteria and methodologies, to arrive at the rating that most appropriately reflects both current conditions and prospective performance.

A rating committee may adjust the application of the criteria to reflect the risks of a specific transaction or entity. Such adjustments are called variations. All variations will be disclosed in the respective rating action commentaries, including their impact on the rating where appropriate.

A variation can be approved by a ratings committee where the risk, feature, or other factor that is relevant to the assignment of a rating and the methodology applied to it are both included within the scope of the criteria, but where the analysis described in the criteria requires modification to address factors specific to the particular transaction or entity.

If the committee agrees on a rating and also agrees that the information supporting that rating decision is sufficient and robust, a rating is assigned.

Committee decisions are reached by consensus, and neither individual committee member votes nor individual views expressed are recorded with the exception of a rating appeal. In the event that the chairperson determines that further analysis or information is required before the committee can move to a vote, the committee will be suspended to allow this material to be gathered.

Analysts maintain a dialogue with the participating issuer during and following the rating process to resolve any outstanding issues and to request additional information, where applicable, in continuing with monitoring activity.

In limited circumstances, ratings that have been determined by a rating committee may subsequently be applied to new debt issues without holding an additional rating committee provided that: i) the rating determined by the previous committee is applicable to the specific class of debt concerned; and ii) there have been no material changes to the credit profile of the issuer since the previous rating committee. In all such cases, Fitch identifies the date of the relevant rating committee in the new debt issue rating announcement. In addition, assuming publication is within four weeks of the committee that assigned the rating and there have been no subsequent credit events, rating committees are not required to convert i) a new unpublished rating to a public rating and ii) an expected rating to a final rating.

Issuer Notification and Rating Dissemination

Once the committee concludes, the outcome is communicated to the issuer or, where applicable, its arranger/sponsor. The issuer notification requirement is subject to certain exceptions where necessary and appropriate including i) to address time-sensitive, event

driven rating actions — for example, in response to the public announcement of an issuer debt default. In such cases, issuer notification is given as soon as practical after publication of the rating, ii) to address bulk rating action reviews in U.S. structured finance, iii) to address cases where Fitch does not have an appropriate contact (e.g. certain non-participating issuers), and iv) to address rating actions taken on existing dependent ratings — for example, rating actions taken on bank letter-of-credit enhanced debt following a bank rating action.

In communicating the rating to the issuer (or arranger/sponsor), the primary analyst explains the key ratings drivers and sensitivities to these drivers to facilitate the issuer's understanding of the principal grounds on which the rating is based, as well as the sensitivity and potential volatility of the rating. Typically, analysts use a draft rating action commentary (or a draft presale report in structured finance), which includes the committee's ratings decisions, to convey this information. The primary analyst provides the issuer (or arranger/sponsor) with the opportunity to review Fitch's rating action commentary (or presale report) prior to publication to allow the issuer (or arranger/sponsor) to check for factual accuracy and the presence of non-public information.

Fitch evaluates any feedback or comments from issuers but nevertheless retains full editorial control over its commentaries. Fitch typically aims to publish rating actions on existing public ratings by the end of the next business day following the conclusion of the committee, unless the rating is subject to appeal or subject to other constraints, such as credit rating agency regulations governing the timing of rating announcements — for example those relating to sovereign and international public finance rating actions in the European Union (EU) or issuer notification requirements. Fitch also aims to publish new public ratings shortly after the rating committee and subject to the same considerations as outlined above. However, the exact timing of new rating announcements can also be affected by other factors. For example, if the rating relates to a new debt issue, Fitch's internal procedures require that it delay its rating announcement until knowledge of the debt issue is in the public domain.

When the primary analyst is based in an EU-registered entity or a branch of an EU-registered entity, notification of any rating action is given in writing to the issuer (or arranger/sponsor) at least one full working day before publication of the credit rating or Rating Outlook. In other jurisdictions, notification is provided in writing at least 12 hours before publication of the rating decision. If the issuer provides feedback within the notification period that it has no outstanding comments, the rating may be published before waiting for the specific notification period to elapse.

The primary analyst records the issuer's response status in Fitch's publishing application before a rating action commentary is released. However, if the issuer provides verbal feedback, the primary analyst will contact the issuer representative in writing to confirm the nature of his/her feedback and that the rating will be published.

All rating actions for new or existing publicly rated issuers are published on Fitch's website and, as appropriate, are simultaneously released to major newswire services. These rating action commentaries provide a rationale for the rating decision based on the key ratings drivers and sensitivities and identify the criteria applied in the rating process. Any exceptions to Fitch's published criteria that occurred in determining the rating are clearly disclosed and explained in the commentary.

The timing of publication reflects the important balance between allowing sufficient time for the issuer to review the rating rationale for factual accuracy and the presence of confidential information and requirements of the users of ratings for timely and objective opinions. In

addition to Fitch's published rating action commentaries, a research report may be published about issuers individually or by industry and made available to subscribers on Fitch's website.

Differences of Opinion

An issuer may request an appeal, referred to as an external appeal, of a rating decision; however, there is no specific right to an appeal. Appeals will only be granted when an issuer provides new or additional information in a timely manner that Fitch believes is relevant to the rating.

Where an appeal review is deemed appropriate, a new committee is convened to reconsider the rating decision in light of the new information. This committee is composed of the chair of the original committee, senior-level analysts who did not attend the previous committee and certain members of the original committee to reconsider the rating analysis. Fitch endeavors to complete the appeal review of new ratings as quickly as possible and preferably within two business days. In cases where the review of an existing rating is not finalized during the two-day time frame, the rating may be placed on Rating Watch.

In the event that an external appeal committee results in a rating decision that is different from the original committee decision that was appealed, this fact will be disclosed in the rating action commentary. Specifically, the commentary will note that the original rating outcome was subject to appeal and that, following the appeal, the rating outcome is different from the original decision. However, the original rating committee decision will not be included in the published commentary.

Surveillance of Ratings

Fitch's ratings are typically monitored on an ongoing basis and the review process is a continuous one. Monitored ratings are subject to regular scheduled reviews by a rating committee, typically annually, although the review frequency may vary if deemed appropriate by Fitch or where required by applicable local law. Point-in-time ratings are not monitored on an ongoing basis. Such ratings are rarely published, but where they are, they are clearly disclosed as "point-in-time" in the accompanying rating action commentary.

Analysts will convene a committee promptly to review the rating instead of waiting for the next scheduled review if a business, financial, economic, operational or other development can reasonably be expected to result in a rating action. For example, operational or fiscal deterioration, an acquisition, a divestiture or the announcement of a major share repurchase may trigger an immediate rating review.

Fitch's surveillance process incorporates the use of market indicators where available and a broader array of financial information, systemic risk and operational risk analyses. Fitch continues to develop tools appropriate to the surveillance task.

Peer analysis is another surveillance method that is used primarily to assess the relative performance of comparable corporate entities and financial institutions over time. Peer groups are created based on similar fundamentals and rating levels, among other factors. Results of Fitch's peer analysis are included in research such as Ratings Navigator, a peer comparison tool used by the Corporate and Financial Institutions groups, which provides a graphical representation of key rating drivers against peer expectations for a given rating category.

Scenarios for structured finance are generally based on quantitative metrics. In addition, ratings performance will be monitored with surveillance techniques to evaluate the impact of stress scenarios on multiple transactions. Such tools will typically track data from surveillance

reports provided by the trustee and compare the information against original and stressed expectations to “flag” transactions where performance has diverged from established parameters.

Base and Stress Cases

Ratings reflect Fitch’s forward looking views of future performance based on historical performance through various economic cycles. Fitch typically analyses credit characteristics under several scenarios to determine the likelihood that current ratings expectations will be met and, if not, the extent of the change. Scenarios include a base case that reflects Fitch’s current outlook and stress cases. Stress cases include the probability of deteriorating credit metrics, the degree of flexibility in adjusting to a stress scenario and the impact a stress case would have on ratings. Stress cases are based on historical events that are outside normal business cycles. Event risk is not considered in most ratings, and as a result, ratings may change due to a merger, acquisition, sudden weather changes or political events that alter expected financial performance in the near term.

Timing of the Process

The time required to assign a new rating varies and will partly depend on the time required by the issuer (or arranger/sponsor) to respond to information requests from Fitch if information is not publicly available, as well as the time it takes the issuer to review Fitch’s draft research for factual errors and the presence of non-public information.

Depending on the sector and type of credit analysis involved, Fitch typically assumes a time frame of four to eight weeks to provide a full corporate, financial institution, sovereign or structured finance rating.

Rating Withdrawals

Fitch’s ratings remain its property at all times. As such, Fitch has full discretion to determine if and when to withdraw a rating. Fitch can choose to withdraw a rating at any time and for any reason. Rating withdrawals are generally determined by convening a rating committee in accordance with Fitch’s established procedures

It is Fitch’s policy in such cases to publish a rating action commentary that includes the current rating(s) and states that the rating(s) has been withdrawn, that Fitch will no longer provide rating(s) or analytical coverage of the issuer and the rationale for the withdrawal. However, withdrawal announcements are not issued for ratings that relate to obligations that have matured, been redeemed, paid in full or to issuers that have ceased to exist.

Product Range

In addition to published international and national scale ratings, Fitch offers a number of additional services within the core rating business.

Fitch prepares a limited number of private ratings (i.e. unpublished ratings) for entities, if a rating is requested. These ratings are typically provided directly to the rated entity. Private ratings undergo the same analysis, committee process and surveillance as published ratings, unless otherwise disclosed as “point-in-time” in nature (*see the Surveillance of Ratings section, page 5*).

Fitch also provides a rating assessment service (RAS) to rated entities under certain circumstances. A RAS indicates what rating level that an issuer and its obligations would likely

receive given a set of hypothetical assumptions provided by the assessed entity. This assessment is conducted under the same procedural standards as other ratings and is performed by the analytical group responsible for that entity. Rating feedback is provided to the assessed entity or its agent or the entity's majority owner or its agent, in writing, including a detailed list of assumptions and limitations applied in the assessment. Ratings from RAS are not made public as they are based on hypothetical, rather than actual, scenarios. However, in accordance with EU regulatory requirements, Fitch discloses cases where it has provided such a service and the primary analyst is based in an EU-registered entity or a branch of an EU-registered entity.

Finally, Fitch provides credit opinions on entities and transactions where one or more characteristics of a full rating are omitted or meet a different standard. This form of opinion may be based on more limited information and is subject to an abbreviated committee process. Credit opinions are delineated by either an asterisk (e.g. 'BBB+*') or a suffix (cat) indicating that the opinion is conditional and not comparable in all regards to published ratings at that level. In most cases, credit opinions are provided on a confidential basis. Credit opinions are not formal ratings and should not be employed by rating users without consideration of any limitations that they may have or any conditions attached to their use.

Unsolicited Ratings

Fitch believes that investors benefit from increased rating coverage by Fitch, whether such ratings are solicited by issuers or investors or are unsolicited.

The criteria, committee procedures and minimum information standards are no different for unsolicited and solicited ratings. Therefore, ratings assigned to issuers with similar credit characteristics are comparable; solicitation status has no effect on the level of the ratings assigned.

Quality Standards for Ratings

To ensure the quality of its product, common processes apply in assigning ratings to entities globally within all Fitch offices, irrespective of size or location. Methodologies for each of its businesses are generally constructed on a global basis. Sector criteria are developed to allow for specific qualitative or quantitative thresholds that may vary between jurisdictions.

All published criteria reports are reviewed and approved prior to use by a Criteria Review Committee (CRC) at least annually and proposals to amend criteria between annual reviews are required to be approved by a CRC. The CRC is an independent forum that evaluates the sufficiency, transparency and rigor of criteria for international credit ratings.

Fitch's Chief Risk Officer, who is independent from the analytical groups, is responsible for risk management for Fitch Group. Fitch's Credit Policy group (CPG) and Global Compliance group report to the Chief Risk Officer. Together these groups ensure that Fitch's credit ratings criteria, policies and procedures are consistently executed, that ratings are comparable across the firm and that the firm complies with applicable laws and regulations.

CPG is a global, centralized function with a cross-sector mandate to identify sustained shifts in risk profiles, review the performance of Fitch's ratings and respond to complaints relating to the rating process. The group includes the Chief Credit Officer, Group Credit Officers, Regional Credit Officers, a Chief Criteria Officer, a Director for Model Management and a Credit Market Research team. The Chief Credit Officer, Chief Criteria Officer and Director of Model Management each report to the Chief Risk Officer for Fitch Group.

The Global Compliance group identifies and provides advice on compliance risks facing Fitch, creates a control environment to ensure compliance with laws, regulations, guidelines and specifications relevant to Fitch's business and monitors employee activity to ensure effectiveness of controls, including those to mitigate conflicts of interest.

Within Fitch's Global Compliance group, the Compliance Audit group (CAG) conducts a compliance audit program designed to continually assess Fitch's compliance with the Code of Conduct and other established policies, procedures and controls with respect to Fitch's credit ratings and related activities.

Criteria Reports Defined

Criteria reports describe Fitch's analytical methodology used to assign ratings. The consistent application of criteria facilitates the comparability of Fitch's ratings across regions and sectors.

Fitch's criteria are designed to be used in conjunction with experienced analytical judgment exercised through individual analysts and the committee process. The combination of transparent criteria, analytical judgment applied on a transaction-by-transaction or issuer-by-issuer basis, and full disclosure via rating commentary strengthens Fitch's rating process while assisting market participants in understanding the analysis behind our ratings.

Fitch's forward-looking ratings approach evaluates credit risks that could impact the future credit quality of a borrower or debt instrument. Criteria reports identify the credit factors considered in the rating process, prioritize those credit factors into key ratings drivers and describe the strengths and limitations of Fitch's analysis.

Scope of Criteria Reports

Each criteria report specifies the scope and sector to which the criteria apply, including a definition of the entity or securities to which the criteria apply. For example, if the scope of the report is specific to a geographic region, a report title that clearly reflects that point is used.

Explaining Rating Factors

Criteria identify and prioritize quantitative and qualitative credit factors relevant to each rating sectors and describe their relative importance by identifying key rating drivers. Fitch updates criteria where new and significant factors emerge or previous drivers are no longer relevant.

The relative importance of the rating factors identified is explained in each published rating action commentary.

Assumptions

Criteria reports define what critical factors are used to establish the assumptions on which a rating is based. Where multiple sensitivity analyses or forecasts are employed in the rating analysis, the criteria will describe in broad terms how these multiple analyses interact in the rating decision.

Where a rating is exposed to a limited number of key variables, such as the performance of a static pool of assets, the criteria will describe how sensitivity analyses would be applied to these variables. When an expected case and stress case analysis are appropriate for a sector, both cases would be described in the report.

Limitations

Criteria reports describe limitations in the criteria used to assign a rating, unless the limitations are already included in the Ratings Definitions section on Fitch's website at www.fitchratings.com.

Fitch provides clear public guidance on the following whenever criteria, models and key rating assumptions are first published and/or materially changed:

- The assumptions, parameters, limits and uncertainties surrounding models and criteria.
- Stress scenarios undertaken in the new or changed criteria, models and key rating assumptions.

Establishing Criteria and Methodologies

Rating criteria reports describe the methodology used in assigning ratings. Criteria are developed to be rigorous and systematic to maintain the high quality of Fitch's ratings and their comparability across sectors. Criteria describe the key credit factors in a way that would allow a financial market professional to review the criteria, look at published rating reports and commentary and understand how Fitch reached a given rating.

Models are tools that are often used to supplement qualitative ratings analysis. In many cases, quantitative models are developed to generate projections of the credit performance of issuers or issues under various scenarios, as defined by rating criteria. The rating of an issuer may not involve a model or may involve a single or multiple models. The importance of a model in generating rating opinions ranges from substantial to minor. Ratings are determined by committees and discussion. Rating criteria provide information on how model projections are used in the overall rating process.

Surveillance Criteria

When surveillance analysis differs from new issue rating criteria, Fitch will publish surveillance criteria either as a stand-alone report or as an extension of an existing report. New surveillance criteria describe how Fitch would evaluate a criteria change for existing ratings that are maintained using surveillance criteria. Such criteria are subject to the same procedures as all other criteria.

Criteria Variations

Exceptions to Fitch's criteria are not permitted. Variations in the application of criteria must be achieved through a change in scope by the criteria review process or an amended criteria assumption in the rating committee package for consideration by the rating committee.

A variation may only be applied and approved by a rating committee if the ratings variable and analytical methodology applied to it are both contemplated within the scope of the criteria. Variations must be disclosed in the press releases applying the variation and all ratings commentary as long as they exist.

Methodology Errors

Fitch has established procedures to address instances where a methodology or model error is suspected. Procedures delineate the range of potential and actual errors and describe the escalation, review, remediation and notification requirements for each.

Fitch's procedures describe the process for reviewing the affected methodology and/or model, including error correction, model revalidation and subsequent committee review. Further, the procedures describe how the methodology's and related model's use can continue or whether their use should be temporarily or permanently suspended.

Depending on the nature and magnitude of the error, affected ratings may be placed on Rating Watch until the issues are resolved. If the methodology error has extensive rating implications and cannot be resolved promptly, additional steps may be taken, including rating moratoriums and/or the withdrawal of existing ratings.

Applying Criteria Changes

Any approved criteria, model or key rating assumption changes are applied to both the new and the existing portfolio of outstanding ratings. Rating Outlooks or Rating Watches are considered the means of indicating that a review is under way following a change to applicable criteria. A review of the affected ratings will be completed within six months from the effective date of the criteria.

Communicating Criteria

Exposure Drafts

Exposure drafts for proposed criteria and any proposed changes to criteria, models or key rating assumptions that could cause material rating changes are published on Fitch's website with an invitation to third parties to submit comments for at least one month. The publication of these new or materially changed criteria, models or key rating assumptions includes a detailed explanation of the reasons for and the implications of the proposed material changes.

After Fitch has assessed the responses, it will publish the results of the consultation and the content of the responses unless the respondent has requested confidentiality about the contents of its response. The criteria arising from the consultation and an explanation will be published, including the date from which the revised criteria apply. Fitch will only publish the results of non-confidential submissions provided in writing; it will not publish oral submissions.

Criteria Changes

Credit rating criteria are publicly disclosed in full on Fitch's website at www.fitchratings.com. Publication of criteria will be accompanied by a press release describing the changes made, including any impact of the criteria change on outstanding ratings. Exposure drafts will be published seeking comment if material changes are proposed. Potential changes to criteria will be used to assign new ratings while the exposure draft is outstanding. Such publications will discuss the expected rating impact if the criteria are implemented as proposed in the exposure draft.

Minor changes to criteria that reflect characteristics of a particular transaction are communicated in the rating action commentary for the respective transaction or rated entity. Criteria changes are effective immediately upon publication unless an alternative effective date is stated.

Fees

Fitch has a dedicated BRM group that is responsible for managing the commercial aspects of issuer relationships. Fitch's policy is that all discussions with issuers and intermediaries

concerning rating fees and commercial matters be handled exclusively by its BRM team. In addition, references to any commercial aspect of Fitch's relationship with issuers are similarly not permitted during any analytical discussion.

Appendix I — Supplemental Information for Structured Finance

This appendix describes processes unique to structured finance and supplements information previously provided.

Information Used to Determine a Rating

Fitch obtains preliminary pool information and transaction term sheets either by accessing a password protected website as set forth by SEC Rule 17g-5 for U.S. transactions or directly from the arranger, issuer or sponsor.

As part of the transaction analysis, Fitch typically receives originator-specific historical performance data relevant to the securitized asset pool for the longer of the following: five years; or a period covering all phases of at least one economic cycle. If sufficient originator-specific information is not available, significant marketwide historical performance data covering at least the same time frame may often provide proxy information. This would be the case, in particular, for asset classes where the originator information may provide a limited contribution to the expected asset performance.

For some asset classes, such as U.S. CMBS, Fitch performs and relies on its own review for verifying certain underlying collateral information. The results of the review of the underlying pool, as well as the outcome of reasonable investigation into the information used in the analysis, are assessed and presented to the rating committee.

Information provided to Fitch includes not only data on the underlying assets for the initial rating, but also information used to:

- Assess the veracity of asset-level data.
- Assess the quality and viability of parties to the transaction.
- Assess the financial and legal structure of the transaction.
- Assess if the legal opinions are consistent with and supportive of Fitch's rating opinion.
- Assess the reasonableness of underlying performance assumptions.
- Assess the reasonableness and adequacy of the data received to maintain the ratings.

Asset Analysis

Fitch incorporates the results from the information review of the asset pool into the credit analysis and loss determination, including a review of the pool's credit characteristics, risk factors, model output and performance history and trends of similar collateral.

The next step is usually an analysis of the financial structure of the transaction. This includes the payment priority and credit enhancement structure proposed by the arranger based on the feedback it received from Fitch. For certain asset classes, the financial structure is provided early in the process and analyzed by Fitch as part of the asset-level analysis, while, with other asset classes the financial structure is analyzed as a separate step and presented in subsequent committees.

Specific issues such as those relating to the operational risk or transaction counterparties may also be addressed during the asset-level analysis or at a later point in the review, depending on the availability of information. Because of the impact on the credit profile of the transaction, these risk factors are brought to committee before an "expects to rate" decision is reached.

Analyzing the Financial Structure

Fitch analyzes the payment priority waterfall and credit enhancement structure provided by the arranger. For some asset classes, Fitch may use cash flow models, such as INTEX or internal models, to determine the adequacy of the credit enhancement structure using the default, recovery and/or loss expectations decided on by the asset analysis committee described above. Prepayment, interest rate, default timing and stress scenario assumptions, as described in published asset-specific and global criteria, are also applied as inputs into the models where applicable.

In addition, Fitch conducts sensitivity analyses using defined stresses to key rating assumptions that would reduce the relevant rating by a significant degree. For example, sensitivities analyzed for a security could include scenarios that would cause the ratings to be reduced by one full category, to non-investment grade or to 'CCCsf'. The results of the cash flow and sensitivity analyses are presented to the rating committee.

Assessing Operational Risk: Originator and Servicer Reviews

Fitch conducts periodic originator and servicer reviews to provide a qualitative indication of the risk in structured finance transactions attributable to an originator level of risk management and disclosure and the quality of the servicer's operations.

Fitch's originator reviews include periodic management meetings and disclosure of Fitch's opinion in presale and new issue reports. Each Fitch analytical group globally, in conjunction with relevant internal sector/asset specialists, has developed detailed methodology for conducting originator reviews for each major asset class. The originator methodology is published either as part of the respective ratings criteria reports for each market and asset class or as separate criteria. In addition, a separate methodology, emphasizing different risk factors, may be developed for subsectors within a given asset class.

Fitch's servicer reviews and ratings provide an indication of servicers' capabilities and include an evaluation and analysis of a number of key factors, including corporate stability, financial condition, management and staff experience, technological capabilities, policies and procedures, controls and historical servicing performance. Fitch assesses the information gathered throughout the review process and incorporates the agency's transaction surveillance data, as applicable, when performing its analysis. Based on its analysis and review of these key drivers, Fitch will derive an opinion and may assign a servicer rating, which is separate and distinct from a credit rating and reflects the servicer's operational strengths and weaknesses.

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CLOs and Corporate CDOs Rating Criteria

Sector-Specific Criteria

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This report replaces the criteria titled *CLOs and Corporate CDOs Rating Criteria*, dated 23 February 2018.

Related Criteria

[Structured Finance and Covered Bonds Counterparty Rating Criteria \(May 2017\)](#)

[Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria \(February 2018\)](#)

[Global Structured Finance Rating Criteria \(May 2018\)](#)

[Structured Finance and Covered Bonds Country Risk Rating Criteria \(September 2017\)](#)

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Scope

This criteria report details Fitch Ratings' methodology for analysing portfolios of corporate credit for rating collateralised loan obligations (CLOs) and other collateralised debt obligations (CDOs). It outlines the qualitative and quantitative factors considered in Fitch's analysis of portfolios of corporate credit. These criteria are also applicable to the rating of combination notes, where the underlying tranches are CLOs or corporate CDOs.

This criteria report is also the framework for rating project finance (PF) CDOs. The Fitch portfolio credit model (PCM) is the primary tool for analysing the credit risk of PF credit portfolios. The default probability assumptions and recovery rates are based on asset-specific credit opinions and recovery ratings provided by Fitch's Global Infrastructure Group. Portfolio default rates are based on bespoke correlation assumptions.

Key Rating Drivers

The order of the following key rating drivers for these criteria reflects their relative importance for CLOs, for which Asset Credit Quality is the most important.

Asset Credit Quality: Asset quality is a primary driver of the default probability of the underlying corporate assets. Asset quality is based on corporate Issuer Default Rating (IDR) and term.

Asset Security: Asset security is determined by the seniority of the corporate obligation and includes the jurisdiction of the issuer. Asset security is a primary driver of recovery rate assumptions. Average recovery rates, based on historical market data, may be applied in the absence of explicit asset Recovery Ratings (RRs) or recovery estimates provided by Fitch's corporate group.

Portfolio Composition: Portfolio performance in terms of portfolio default rates depends on the level of diversity by industry and obligor, and geographic concentrations, which determine the expected volatility in portfolio default rates. The key volatility parameter for credit portfolio performance is correlation.

Adverse Selection and Portfolio Management: Ongoing portfolio management and trading may result in an evolving portfolio credit profile, extension risk, and other portfolio changes not represented by the closing portfolio. The investment guidelines and permitted management terms are analysed to evaluate the potential risk factors of a managed portfolio.

Cash Flow Analysis: CDO structural features and hedging strategies, and the timing of defaults and recoveries, are important considerations in cash flow modelling and have a meaningful impact on CDO performance.

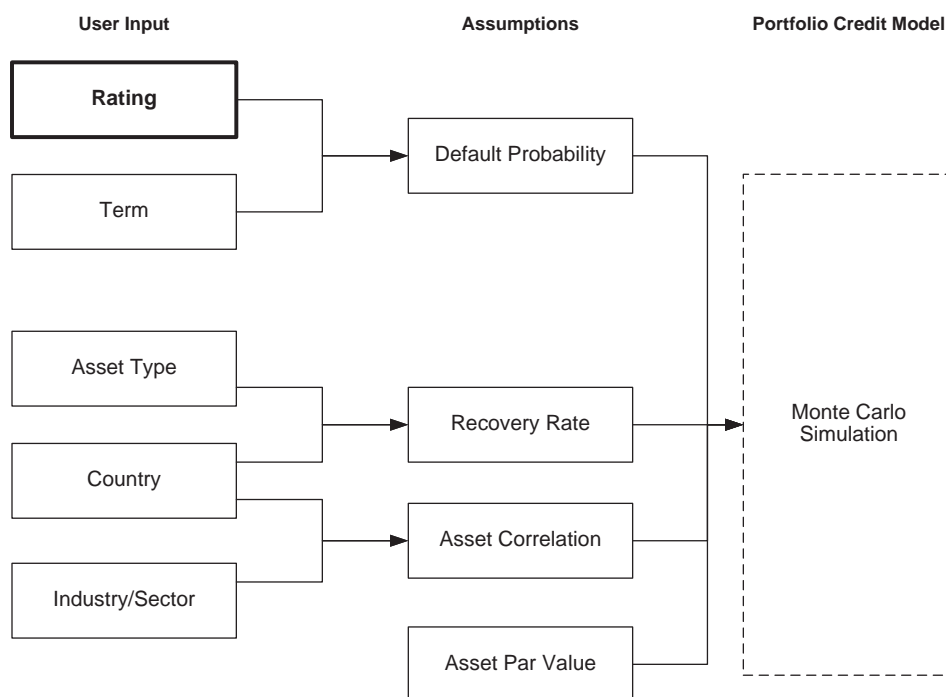
Portfolio Performance; Surveillance: The extent and magnitude of changes to portfolio quality and composition are primary drivers of rating movement. The final rating actions are based on the described methodology, as well as committee discretion to reflect performance where the methodology alone may imply rating action. Methodology-implied rating actions will not be applied by a committee where a permanent change in performance is not expected, or where such a change would be expected to be reversed, to avoid undue rating volatility.

Quantitative Models and Data

Fitch's primary tool in assessing the primary rating factors of corporate CDOs is the Fitch PCM. The model is available for download on the Fitch website at www.fitchratings.com. The model is updated from time to time, and a release log is maintained on the site to indicate the updated features and assumptions. A description of the source data used to derive the assumptions is detailed in each respective section of this report.

Figure 1

Overview of the Portfolio Credit Model Process



Source: Fitch

The PCM is used for analysing the joint default behaviour within credit portfolios. The model is based on the Gaussian copula function, which is based on the multivariate normal distribution. An important benefit of the Gaussian copula is its analytical tractability. The dependence structure is fully described by the pair-wise linear correlation assumption. For example, zero correlation in the Gaussian copula means all default events are independent.

The two main functions of the model are: (1) map generic issuer and asset attributes to corresponding default probability and recovery rate assumptions; and (2) generate portfolio default rate and loss rates for each rating scenario as multiples of the base default rate and loss rate.

The key output of the model is the distribution of possible portfolio default rates and loss rates. The base-case default rate is given by the distribution mean, which is equal to average default probability weighted by asset notional.

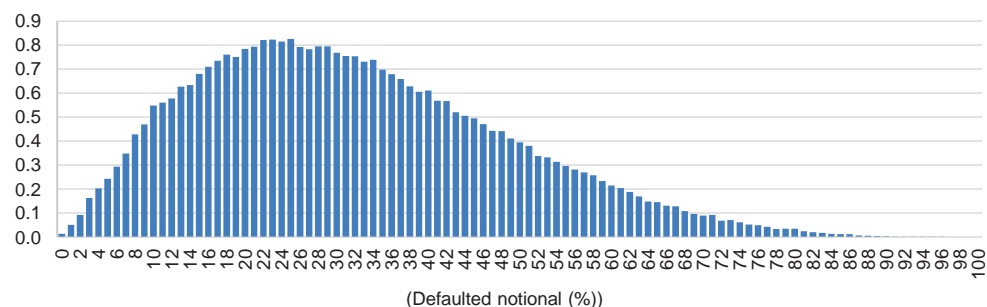
The portfolio performance is uncertain and can deviate significantly from expectations. The volatility of possible portfolio default rates depends on the portfolio composition. Diversified portfolios in terms of number of obligors, industry or region would be expected to show lower volatility and hence default rates that are closer to the expected case. In contrast, more concentrated portfolios would be expected to exhibit more volatile default rates.

The Gaussian copula only has one volatility parameter, which is correlation. Higher correlation corresponds to more volatile portfolio default rates, which is reflected in a model distribution with fatter tails. In other words, portfolio default rates that are significantly higher than the expected default rate are more likely.

Figure 2

Default Distribution – Probability Mass Function

(Probability (%))



Source: Fitch

The portfolio default rate (Rating Default Rate – RDR) and loss rate (Rating Loss Rate – RLR) assumptions for each rating level are determined as percentiles of the default and loss distribution. The percentile levels are based on CDO target default rates as explained below.

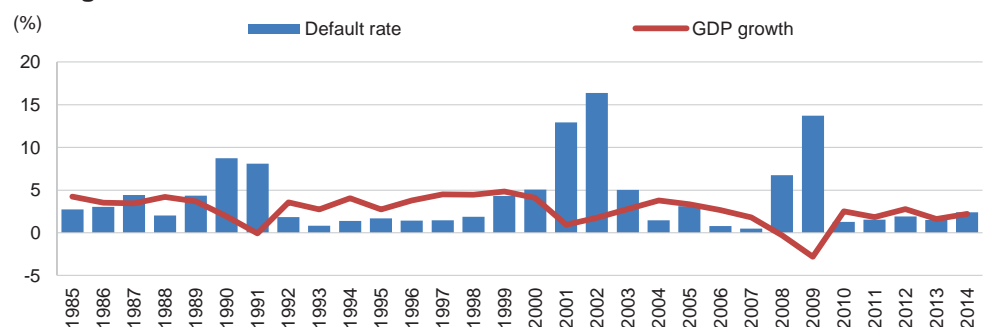
Portfolio Asset Quality

Asset Default Probabilities

Fitch uses “rating” and “term” as the primary determinants of an asset’s expected default probability. There is a substantial history of data related to the default experience of a wide spectrum of corporate entities, rated over the past three decades. Importantly, Fitch uses the corporate default rates made available by all three major rating agencies. This data set reflects the broadest set of default statistics available, and minimises the risk of any variances in ratings approach or industry coverage.

Figure 3

US High Yield Par Default Rates & GDP Growth



Source: Fitch

Importantly, the period examined was marked by the emergence of the modern debt markets, including the growth of a true high-yield debt class. The period also includes a number of moderate and severe economic downturns, with accompanying surges in corporate bankruptcies and defaults across a range of industries.

Figure 21 in *Appendix 1* shows the expected default probabilities assumed for different ratings and terms. The assumptions are based on historically observed average default rates as far back as the early 1980s. The assumptions closely reflect the actual observed default rates.

In this report, the terms Fitch Issuer Default Rating or Fitch Issuer Default credit opinion will be referred to together as the Fitch IDR.

The rating is based on the Fitch Issuer Default Rating or Fitch Issuer Default credit opinion (together, referred to herein as the Fitch IDR) provided by Fitch's corporate or financial institutions ratings group. In the absence of a Fitch IDR, the agency may use public ratings from either Moody's or Standard & Poor's (S&P). For a detailed description of the rating derivation, please see *Appendix 5*.

Rating Mapping for Mid-Cap Portfolios

Mid-cap borrowers do not have public ratings and it is often not practically feasible to assign credit opinions due to the size of the portfolios (100+ companies). This section applies only to borrowers for which no Fitch IDR Equivalency as outlined in *Appendix 5* can be established. Historical data shows few defaults despite spanning a significant period, making it impossible to infer a default probability based on that data alone.

For bank balance sheet portfolios the originating bank would typically use a bank internal rating model to assess the borrower's credit risk. The bank may be able to provide a comparison of the bank internal ratings to available agency ratings because it either also applies the model to its larger customers, or for internal backtesting the bank may have run a sample of larger companies with available financial data through its rating model.

For granular portfolios with more than 100 borrowers, where at closing the largest borrower represents less than 1.5% of the portfolio, Fitch may assess the credit quality based on financial ratios and the bank's internal rating tool. Committees may decide that the approach is also applicable to a more concentrated portfolio taking into account other transaction features. In such cases the agency would disclose the variation in line with its policies.

The agency will first determine the average credit quality of the portfolio at a rating category level, which will be no higher than 'BB'. Financial ratios of the borrowers and a rating mapping correlation will both be considered to establish the average credit quality of the securitised portfolio on a rating category basis. For example, for a 'BB' rating category Fitch expects financial ratios such as the total debt to EBITDA ratio to be comparable with or better than the ones reported in Fitch's Leveraged Loan Chart Book for 'BB' borrowers in the same jurisdiction.

Fitch would then perform a rating mapping between Fitch, S&P or Moody's and the bank internal rating model, based on the available sample comparison, to distribute the ratings around the established average credit quality of the portfolio.

This rating methodology for mid-cap portfolios will only be used if all conditions below are satisfied:

- Only for bank-originated portfolios where the bank retains a large share on balance sheet.
- Minimum of five years of historical default history and performance in line with or better than the expected performance based on the rating mapping.
- Bank internal rating model subject to regulatory approval (typical for the internal ratings-based approach) for capital relief purposes, and ratings updated frequently, typically within 12 months. Fitch will also assess the performance of the models by looking at the volatility of rating transition matrices and will analyse the bank's processes to validate its internal rating model.
- Only for portfolios comprised primarily of first-lien senior-ranking loans that have been tested through a credit cycle. The securitised portfolios must be broadly in line with the bank balance sheet and be reasonably diverse in terms of number of obligors and obligor exposure.

For transactions that fall outside the above criteria the agency would apply criteria variation that may lead to a rating cap. In such cases the criteria variation and the rating cap will be disclosed.

The surveillance approach for transactions rated under this framework will primarily rely on the rating mapping, but the portfolio average rating will be capped at the rating level established at closing. If the correlation between Fitch, S&P or Moody's and the bank internal rating model remains relatively unchanged since closing, and the transaction has performed in line with Fitch's initial expectation, the rating mapping established at closing will be used for the transaction review. However, if the average credit quality inferred from the initial mapping is higher than at closing then the rating mapping will be adjusted downward so that the average portfolio rating corresponds to the one established at closing.

CDO Target Default Probabilities

Fitch's CDO ratings correspond to a value at risk (VaR) measure, which looks primarily at the probability of exceeding the available credit enhancement. The exceedance probability is usually expressed by the level of confidence, which is determined as one minus the exceedance probability. For credit risk management under the Basel regulation, the level of confidence is usually chosen to be 99.99% (1bp probability of exceeding the VaR). However, a single confidence level is not sufficient to differentiate between different rating categories. Therefore the risk tolerance for each rating level and term is determined by CDO target default rates. Figure 4 shows the one- and 10-year CDO target default rates used in the model.

Figure 4

One-Year and 10-Year CDO Target Default Probabilities

	CDO target DP (%) 1 year	Confidence level (%) 1 year	CDO target DP (%) 10 years	Confidence level (%) 10 years
AAAsf	0.01	99.99	0.03	99.97
AAsf	0.01	99.99	0.26	99.74
Asf	0.07	99.93	1.60	98.42
BBBsf	0.19	99.81	4.50	95.46
BBsf	1.16	98.84	17.43	82.57
Bsf	5.36	94.64	32.18	67.82

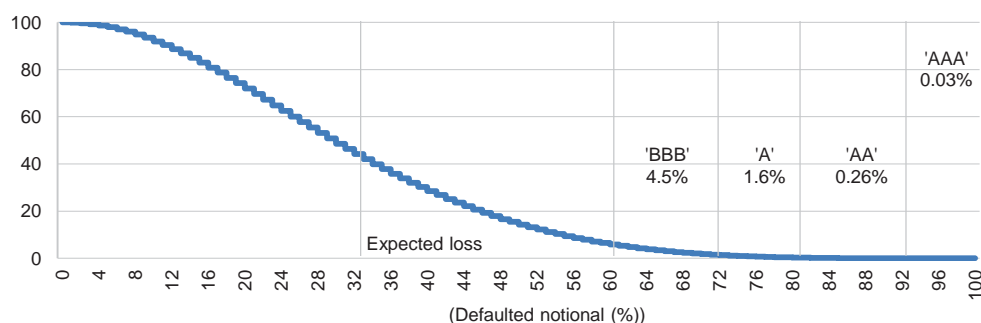
Source: Fitch

For example, the corresponding CDO rating for a 99.99% confidence level over one year would be 'AAsf'. In contrast, for a 'BBsf' rating over one year, the target CDO default rate is much higher, yielding a lower confidence level of 98.84%.

Figure 5

Default Distribution - Exceedance Probability

(Probability (%))



Source: Fitch

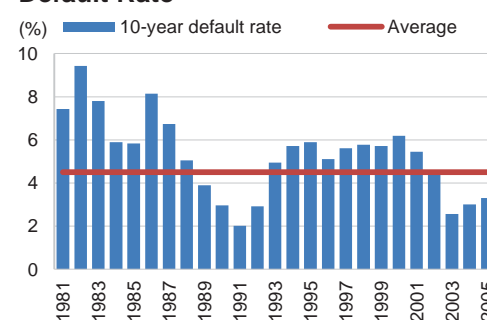
Figure 5 illustrates the VaR measure graphically. The curve, which is derived from the portfolio loss distribution, shows the probability of exceeding a certain level of portfolio losses. This allows one to determine the VaR directly from the respective risk tolerance levels or CDO default rates.

For credit risk management, the risk horizon is usually one year. CDOs have a much longer risk horizon, of between three and 10 years. Generally, the risk tolerance expressed in the CDO target default rates increases for longer risk horizons. Since the assets in CDO portfolios may have different maturity dates or even amortisation schedules, the risk tolerance is determined by the weighted average life of the CDO portfolio.

Fitch's approach applies target default probabilities equal to the input default probabilities for all rating categories below the 'AAsf' category. The approach applies target default probabilities lower than the input default probabilities for the rating categories 'AAAsf' and 'AAsf'. As stated in the prior section, Fitch looks to long-term empirical statistics for its input default probabilities. The sample size of the data cohorts for the 'AAA' and 'AA' categories contained fewer observations relative to the other observed cohorts. Fitch believes it is therefore prudent to reduce the target default probability, or raise the threshold, when determining the level of support necessary to achieve these highest of ratings. The effect of the adjustment is to increase the Credit Enhancement in order for securities to achieve 'AAAsf' and 'AAsf' ratings.

Figure 6

10-Year Rolling Cohort 'BBB' Default Rate



Source: Fitch

Correlation Framework – Benchmarking to Historical Peak Default Rates

The correlation assumption in PCM is the parameter that determines the volatility of possible portfolio default rates and the resulting multiple of RDRs relative to the base case. Given the choice of model and having specified the input default probability assumptions as well as the CDO target default rates, correlation is the only remaining parameter.

Fitch has calibrated a correlation framework to match the model-implied volatility of portfolio default rates to the historically observed default rate volatility.

For example, Figure 6 shows the default rate for 10-year cohort portfolios with an initial credit quality of 'BBB'. The chart highlights the volatility observed in the empirical default rate around the longer-term average. The highest observed default rate or peak default rate was 9.3%, compared to an average default rate of 4.5%.

Based on the empirical data, Fitch calibrated the correlation framework to achieve an appropriate coverage of the rating default rates produced by the model over the observed peak default rate for a portfolio that resembled the cohort portfolio. More details of the calibration methodology are provided in *Appendix 3*.

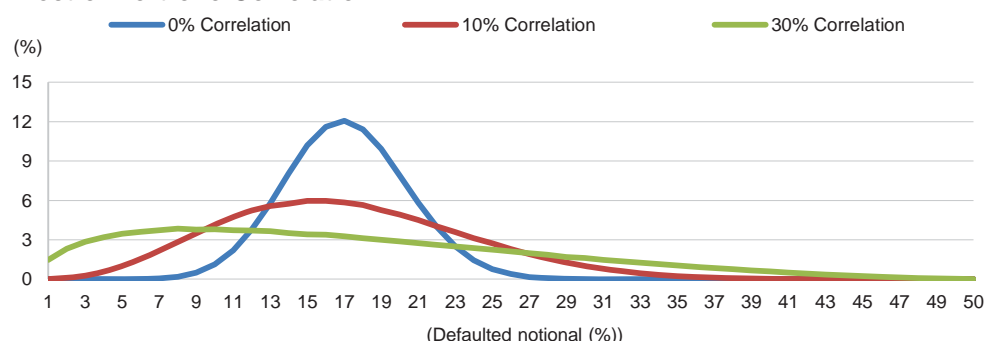
Fitch views it as important that the model output can be tied to a fundamental view of credit risk. A primary credit view held is that CDO notes carrying an investment-grade rating should perform robustly, even in periods of peak corporate default rates.

Furthermore, Fitch believes that CDO notes rated in the 'Asf' category and above should perform well in a stress with similar severity as the recession that generated the peak default rates, with little vulnerability to default. In other words, the calibration was designed so that the protection afforded CDO notes rated in the 'Asf' category and above was at or above historical peak default rates.

- The correlation assumption in PCM is the parameter that determines the volatility of possible portfolio default rates and the resulting multiple of RDRs relative to the base case.
- Fitch has calibrated a correlation framework to match the model implied volatility of portfolio default rates to the historically observed default rate volatility.

Figure 7

Effect of Portfolio Correlation



Source: Fitch

This concept of backtesting and benchmarking the model output against “multiples” of historical default data is an important concept in understanding the rationale for how correlation was set, and has the effect of embedding some explicit and easy-to-understand deterministic overlays onto the simulation-derived results.

Figure 8

Portfolio Default Rate and Model Output Coverage

RDR (%)	BBB (RDR) peak 9.3%			BB (RDR) peak 29.7%			B (RDR) peak 49.5%		
	Diverse	Peak portfolio	30% single industry	Diverse	Peak portfolio	30% single industry	Diverse	Peak portfolio	30% single industry
AAAsf	15.3	17.7	20.7	39.0	42.0	44.0	58.0	60.7	62.0
AAsf	12.7	14.3	16.0	34.3	37.0	38.7	53.3	55.7	56.7
Asf	10.3	11.3	12.0	30.0	31.7	33.0	48.0	50.0	51.0
BBBsf	8.7	9.3	9.7	27.0	28.0	29.0	44.3	46.0	47.0
BBsf	6.3	6.7	6.7	22.3	22.7	23.0	38.7	39.3	40.0
Bsf	5.3	5.3	5.3	19.3	19.7	19.7	35.3	35.7	35.7
Exp	4.5	4.5	4.5	17.5	17.5	17.5	32.2	32.2	32.2

Source: Fitch

Industry and Regional Diversity

In addition to the fundamental credit views relating to the observed default-rate volatility, Fitch further believes that credit portfolios that are less diversified with higher concentrations in terms of industry and region compared to the cohort portfolio underlying the base calibration could exhibit higher volatility of default rates relative to the base case.

Therefore, the correlation framework was extended to differentiate correlation levels between industries and within a single industry as well as between regions and within regions.

Unfortunately, the historical data available was not detailed enough to compute cohort default rates for portfolios with different industry and regional composition. The correlation levels were calibrated to match Fitch's credit views with regards to the relative increase in the rating default rate between calibration portfolios with higher levels of industry and regional concentration compared to the cohort portfolio (see *Appendix 3*).

The final correlation framework seeks to differentiate CDO portfolio concentrations that may impact performance. It does this through a combination of four correlation adjustments. There is a base level of correlation that is applied to all assets. The second layer is a sector correlation that is applied to assets from the same sector. The third layer is an industry correlation that is applied to assets from the same industry. Finally, the fourth correlation adjustment is applied to the largest obligors in the portfolio to stress for obligor concentrations.

The framework groups industries into six sectors, each containing one to 11 industries. The example in Figure 8 refers to a US portfolio. The base level of correlation is set to 2%, with a 2% correlation (total correlation of 4%) between assets in the same sector. If assets are also in the same industry class within a sector, the correlation is assumed to be even higher, set at 24%.

The deepest empirical data set on defaults is available only for the US, and therefore not representative of multi-country diversity. However, Fitch believes there is a significant level of regional diversification within the US.

In order to vary correlation assumptions to reflect geographic diversity or concentration, Fitch began with the following guiding principles.

- Advanced-economy countries smaller than the US would not benefit from the same level of regional diversification. Therefore, the base correlation between companies in countries other than the US should be higher than the 2% US assumption.
- The global economy results in relatively limited benefit within a region. For example, a portfolio diversified within western Europe should not yield materially different portfolio default rates than a US portfolio.
- Different industries benefit from geographic diversification to varying degrees.

With these guiding principles, the correlation framework is applied, with a base level of correlation for companies located in different regions, with add-ons for commonality of country, sector and industry.

Figure 9

Correlation Framework

(%)	Base level ^a	Sector add-on	Industry add-on		
			High	Medium	Low
Same country	4 (2 if US)	+2	+20	+20	+20
Same region, different countries	2	+2	+20	+15	+10
Different regions	1	+2	+20	+15	+10
Banking and finance assets	As above	+14	8%		

For a full list of countries and industries in the portfolio credit model, please see Figures 29 and 30

^a Includes global base of 1% plus regional uplift of 1% and country uplift of 2% (except US where country uplift is 0%)

Source: Fitch

Sovereign-Related Risk

Transactions may have partial exposures to countries whose Country Ceiling is below the highest rating of the notes and/or where Fitch applies a cap to its structured finance (SF) ratings, pursuant to the *Structured Finance and Covered Bonds Country Risk Rating Criteria*.

Currently, this is the case for the Fitch-rated high-yield CLOs that have exposure to peripheral eurozone countries (Italy, Portugal and Greece), which follows the *Structured Finance and Covered Bonds Country Risk Rating Criteria*. For these transactions, the agency will increase correlation levels and reduce recovery rates to reflect expected higher asset performance volatility, especially at rating levels above the cap.

The updated correlation and recovery assumptions are calibrated to match the expected loss at the country rating cap level to the 'AAAsf' level. The currently applicable recovery rate assumptions are shown in *Appendix 4*. Figure 10 shows the calibration of the correlation assumptions and the implied RDR for the respective countries compared to the standard assumptions for the peak calibration portfolio, as described in *Appendix 3*.

For Italy, for example, the current country cap is in the 'AAsf' rating category. The correlation was increased from 4% to 6% and as result the RDR at the 'AAsf' rating level increased to 54%, which matches the 'AAAsf' RDR under the standard correlation assumptions.

Figure 10

Model RDR for 1991 Peak Portfolio – Single Country (Non-US) – See Appendix 3

Country level correlation (%) Country SF Rating cap ^a	4 AAAsf Base	6 AAsf category Italy/Portugal	10 Asf category	27 BB-sf category Greece
AAA	53.7	59.0	67.3	90.3
AA	49.3	54.0	62.0	84.7
A	44.3	48.3	54.7	75.7
BBB	39.7	42.7	48.0	65.7
BB	32.0	33.7	36.3	45.7
B	27.3	28.3	29.3	33.7
Mean	21.6	21.6	21.6	21.6

^a As of the publication date of these criteria
Source: Fitch

Furthermore, the Country Ceiling for these countries is currently below the highest rating Fitch can assign to the senior notes in high-yield CLOs. Therefore, in line with the *Structured Finance and Covered Bonds Country Risk Rating Criteria*, the agency assumes a possible exit of these countries from the euro in rating scenarios above the Country Ceiling. This would cause at the very least significant performance volatility for underlying borrowers, currency transfer and convertibility (T&C) issues and FX risk for any proceeds from outstanding loans.

Fitch believes that the borrowers would likely default in such a scenario and as a result the T&C and FX risk following a euro exit would primarily apply to any recovery proceeds. Fitch applies a haircut to the recovery proceeds of 50% to assets from these countries at rating levels above the relevant Country Ceiling in order to address the possible FX risk that could result from the depreciation of a new currency following redenomination of loans.

For example, for a European CLO with a 20% investment limit in countries with a Country Ceiling below 'AAA' or sovereign rating below 'A-', the usual projected default rate for the 'AAAsf' scenarios is about 60%. This would be assumed to include a 20% exposure to Italy, which is currently the only country with a Country Ceiling below 'AAA' with significant volumes of outstanding leveraged loans. The remaining 40% of defaults would be spread across other countries, which is consistent with Fitch's typical 'AAAsf' default expectations for portfolios not exposed to countries with a Country Ceiling below the target rating. The total default rate assumption would remain unchanged in this instance.

The expected recovery rate at a 'AAAs' rating for the 20% exposure bucket would be reduced by 50% assuming a depreciation of the new currency against the euro. As a result, the aggregate recovery assumption for a 'AAAs' rating scenario for a typical second-generation CLO would decline to 29% from about 35%.

It should be noted that the haircut for redenomination risk is not included in the PCM model analysis and has to be applied separately to the model results.

However, European CLOs are generally precluded from investing in large exposures to countries with a Country Ceiling lower than 'AAA'. Fitch considers the redenomination risk in second-generation European CLOs with the typical limit of 10% or lower a secondary risk. For example, the 'AAA' recovery rate would go down from 35% to 32%, with a minimal impact on the break-even default rate. Therefore the agency would not apply any additional stresses during the rating process for a typical European CLO. This may change as the Country Ceilings, the loan market (more issuance from new countries) or the CLO limitations change.

Additional stresses contemplated in the *Structured Finance and Covered Bonds Country Risk Rating Criteria* are generally not applied during the rating process for typical US CLOs. US CLOs are generally precluded from investing in companies domiciled in peripheral eurozone countries. Therefore, T&C risk would not be considered a risk factor in these instances.

Emerging Markets

The correlation framework was further developed to incorporate assets from emerging-market countries and reflect the following additional credit views.

- Corporate credit portfolios in EM countries are likely to have more volatile portfolio default rates, indicating a higher level of correlation than similarly rated portfolios in advanced economies, regardless of region and country. Therefore, the criteria apply a 10% uplift to the correlation of any two EM assets.
- Regional diversity is particularly important for portfolio performance within EMs, and as a result EM assets from the same region are subject to an additional 10% correlation uplift. Fitch has created four broad EM regions to implement this: EM Americas, EM Asia, EM Europe and Central Asia, and EM Africa and Middle East.
- Country diversity within the same region is of lesser benefit than regional diversity, and assets from the same country are subject to an additional 5% correlation uplift.
- The same credit views with regard to industry concentration apply to EM and advanced economies.

Fitch believes that a small amount of EM exposure in a well-diversified portfolio of debt from advanced economies should add geographical diversity and reduce volatility. However, it is the agency's view that large EM exposures increase the risk to the portfolio, especially in high rating scenarios, and this outweighs any diversity benefits.

By way of illustration, the correlation between Russian assets in different sectors is 26%. This is made up from the sum of 1% global base correlation, 10% EM base correlation, 10% EM region correlation and 5% EM country correlation. In comparison, the correlation between US companies would be 2% (1% global base and 1% for being in the same region).

Figure 11

EM Geographical Correlation Framework

Location (%)	Global base level	Location			Total EM add-on
		EM base add-on	EM region add-on	EM country add-on	
Same EM country	+1	+10	+10	+5	+26
Same EM region and different EM countries	+1	+10	+10	+0	+21
Different EM regions	+1	+10	+0	+0	+11

Note: Fitch would also apply sector and industry correlation uplifts of 2% and 20%, respectively, as per the advanced economy table above

Source: Fitch

If the Russian assets are also in the same industry, they will attract a further uplift up to 22%, which would give a total correlation for such a portfolio of 48%. For EM assets from different geographical regions and sectors – for example, a Russian utilities company and an Indonesian finance company – the correlation will be 11%, ie 1% global base plus 10% EM base.

Transactions with a material share of EM assets with high regional concentration are unlikely to support 'AAAs' ratings, especially if many of the assets are from low-rated sovereigns. Such concentrated structures, as well as single country EM transactions, will be subject to specific rating caps (*Structured Finance and Covered Bonds Country Risk Rating Criteria*). The correlation framework may be adjusted through a criteria variation to further reflect any specific risks or protections related to the underlying portfolio.

A similar approach will be used for transactions where ratings are only assigned on a national scale, where the correlation framework will also be amended to reflect the particularities of the relevant jurisdiction.

Asset Security

Observations from the recent high yield default period in 2009 highlighted the pro-cyclical nature of defaults and recoveries, with lower recoveries occurring during periods of higher defaults. Fitch incorporates pro cyclicity by applying lower recovery for higher rating scenarios.

For defaulted securities, Fitch would also consider the post default trading prices as well as any feedback received from the manager, when decided the applicable recovery assumptions.

Corporate Recovery Ratings

Although fundamental characteristics – such as seniority level, security, jurisdiction, issuer and industry idiosyncratic characteristics – are the main drivers of recoveries, asset-specific RRs issued by Fitch's corporate ratings group are Fitch's best metric for determining recovery expectations for CDO assets.

Fitch's RRs scale provides market participants with additional recovery information for all entities whose Issuer Default Rating is 'B+' and below. RRs range from 'RR1', which indicates an outstanding level of recovery, to 'RR6', which reflects a poor recovery. Fitch's RRs largely represent ultimate recoveries following the work-out process. In addition to recovery ratings, Fitch's corporate ratings group may also conduct a bespoke analysis and assign specific recovery estimates that may be used in Fitch's analysis of a CDO. More information on Fitch Recovery Ratings and recovery estimates is available in the report entitled *Recovery Ratings and Notching Criteria for Non-Financial Corporate Issuers* (see *Related Criteria*).

Figure 12

Recovery Ratings

Rating	Description	Range (%) ^a
'RR1'	Outstanding	91-100
'RR2'	Superior	71-90
'RR3'	Good	51-70
'RR4'	Average	31-50
'RR5'	Below average	11-30
'RR6'	Poor	0-10

^a The recovery percentage corresponds to a 'Bsf' stress. For higher stresses, please see *Appendix 4*
Source: Fitch

Seniority

In the absence of asset-specific recovery ratings or recovery estimates, Fitch generally looks to the seniority and security of the actual debt instrument as its primary indicator for the recovery prospects in its analysis of a CDO portfolio. Fitch will assign a recovery rate category corresponding to its view on the asset's recovery prospects, if asset-specific recovery rate assumptions from Fitch's corporate credit analysts are not available.

There are three categories that describe the relative recovery prospects. Categorisation will primarily be based on the seniority of the actual debt instrument, with senior secured loans and bonds generally corresponding to "strong recovery prospects" and senior unsecured bonds corresponding to "moderate recovery prospects". Other debt instruments, including second-lien loans, will commonly be categorised as having "weak recovery prospects". However, where actual recovery experience is less than might be expected for the level of seniority, a lower categorisation may be used in specific cases. For example, for Japan the recovery rate for senior unsecured debt has been below 'moderate' recovery rates. As a result, Fitch would apply a 'weak' recovery rate for senior unsecured debt in Japan.

Furthermore, seniority and security do not fully explain Fitch's recovery expectations for any given asset. The distribution of current US corporate RRs by seniority shows wide variance in the recovery expectations; this may be due to issuer-, industry- or market-related factors. Issuer-specific factors include financing decisions on optimal capital structures by management. Other factors may impact the recovery prospects for particular companies operating in specific industries. From time-to-time, there may be macro-factors that impact the types of debt instruments available to issuers. In 2009 and into 2010, there were limited financing options, resulting in many companies issuing senior secured bonds to refinance existing loan facilities. The future recovery prospects for these bonds will likely vary, based on the security and covenant protections associated with the debt instrument.

Therefore, the portfolio composition and associated recovery prospects of the underlying assets are reviewed by the relevant credit analyst as part of the CDO rating process, if deemed necessary. Fitch will make adjustments to the recovery category classification to reflect Fitch's forward-looking view on the recovery prospects for each asset in the portfolio, if deemed necessary.

Jurisdictional Considerations

Another important determinant of recovery prospects is jurisdiction. Fitch determined country groupings, based on comparable levels of expected recoveries. Obligors from Group 1 countries (see Corporate Recovery Rate Assumptions table and *Appendix 4*) are mostly expected to exhibit recovery prospects consistent with those of US obligors, while Group 2 and Group 3 are expected to exhibit decreasing levels of recovery.

Figure 13

Corporate Recovery Rate Assumptions^a

Recovery prospects (%)	Group 1	Group 2	Group 3
	US; Canada among others		
Strong recovery	80	70	35
Moderate recovery	45	45	25
Weak recovery	20	20	5

^a The recovery percentage corresponds to a 'Bsf' stress. For higher stresses, please see *Appendix 4*

Source: Fitch

A full list of Fitch's base recovery assumptions and the tiering applied at different CDO rating stresses can be found in *Appendix 4*.

Finally, Fitch may use additional information, like the notching differential between the instrument rating and Issuer Default Rating (IDR), to better inform its decision on the appropriate recovery assumption for any given asset.

Covenant-Lite Loans

A loan may be considered covenant-lite (cov-lite) if the loan facility lacks a financial maintenance covenant in its documents. A cov-lite loan typically contains debt incurrence covenants only. Incurrence covenants included in cov-lite loan documents may include restrictions on issuing further debt, or taking action that dilutes the collateral package supporting the secured loan. Maintenance covenants that are excluded from cov-lite loan documents typically require maintenance of an EBITDA measure or other financial ratio. A failure of these metrics in a fully covenanted loan agreement which includes maintenance covenants would typically result in the borrower making concessions to their lenders, in the form of higher coupon or fees, to waive the covenant violation.

To date, there is little evidence that the presence of maintenance covenants in loan documents preserves enterprise value in the event of insolvency. The limited data supporting default and recovery rates experienced from cov-lite loans have been included alongside senior secured loans, which include maintenance covenants in Fitch's recovery studies that support its general recovery rates for "strong" recovery-prospect assets. The data does not support a consistently lower recovery rate for cov-lite loans. As a result, currently Fitch does not make any additional adjustment to its recovery assumptions for cov-lite loans, since the recovery data set is included in its criteria.

The current prevalence of cov-lite loans in primary the US market is symptomatic of a general loosening of credit standards from the lending institutions, similar to tightening of spreads or increased leverage. Ultimately, the recovery on senior secured loans is a function of the amount of senior debt outstanding relative to the issuer enterprise value at the time of default. Fitch notes that cov-lite loans still maintain incurrence covenants which limit the amount of extra debt that can be taken on and which could dilute recoveries.

Fitch will continue to monitor the default and recovery experience of cov-lite loans versus fully covenanted loans with maintenance covenants. In the event that substantiated data is obtained that indicates cov-lite recoveries are significantly diverging from those on covenanted loans, Fitch may apply an adjustment to its baseline recovery assumptions in its analysis of cov-lite loans.

Pro-Cyclical Nature of Defaults and Recoveries

Fitch's default and recovery studies show that the relationship of recoveries by seniority generally holds true over time. However, the average recovery for a given seniority has been very variable over time. Market-wide systemic factors play a role in the well-established inverse relationship between default rates and recovery rates, whereby low recovery rates are associated with high default rates.

Fitch stresses the recovery rate assumptions in higher rating stresses to account for the procyclical nature of defaults and recoveries. Recovery observations from the most recent peak default period were more in line with the modelling assumptions used at high rating stresses.

As stated earlier in this report, Fitch believes that CDO notes rated in the 'Asf' category and above should still be expected to perform in periods of peak default rates. For this reason, the recovery assumptions for 'BBBsf'/'Asf' stresses are set to match observed recoveries from peak default periods.

Obligor Concentrations

Portfolios with a small number of assets, or those where individual asset balances represent a disproportionate exposure within the portfolio, carry the risk that portfolio performance may be adversely impacted by a few assets that may under-perform expectations based on ratings and debt characteristics. Fitch's methodology applies additional stresses to certain inputs to mitigate the risk to CDO portfolio performance posed by outsized assets.

For example, individual assets may recover less upon default than expected, based on historical average recovery rates for individual debt classes. Outsized individual assets experiencing low recoveries will cause them to erode a disproportionate amount of support available to rated noteholders. To take this into account, Fitch applies 0.75 times to the assumed recovery rate of the largest risk contributors. This stress is applied within the model framework to standard recovery assumptions only, and has an impact on the portfolio loss distribution. The stress is not applied to asset-specific recovery estimates, which are assigned to individual assets, but it is applicable to assets with recovery ratings.

While the risk with respect to recovery rates is relatively apparent, the obligor coverage produced by the methodology is a function of the correlation assumptions and much less straight forward. Similar industry and geographic diversity portfolios with a larger number of obligors are expected to be subject to lower volatility in terms of default rates. The PCM model framework is already sensitive to obligor concentrations in that the rating default-rate increases because portfolios contain fewer assets.

Furthermore, the CDO target default probabilities are the same as or lower than the input default probabilities (see CDO Target Default Probabilities in Figure 4 above). This ensures that the RDR for each liability rating level covers at least the largest obligor with a lower rating and a term equal to or longer than the weighted average life (WAL) of the portfolio. This approach creates what can be thought of as a floor in the assumed default rate, such that CDO investors are protected in the event that the larger assets default. This is particularly important where the portfolio credit quality is relatively high, and individual assets can represent a large proportion of the support available to a particular class of rated notes.

The joint coverage of a number of the largest obligors is a function of the correlation assumption.

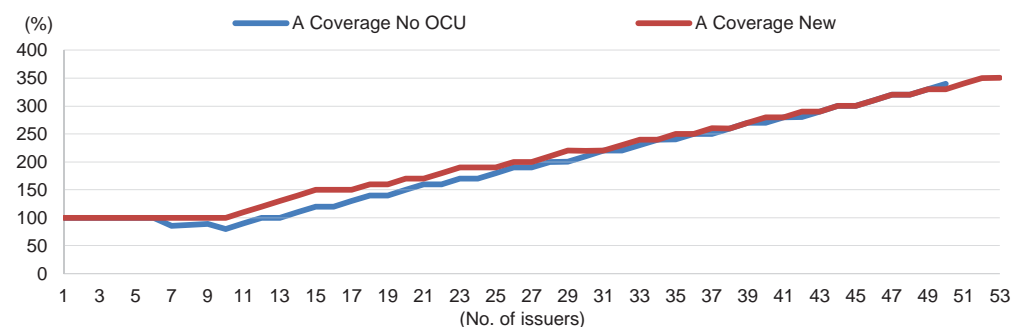
In order to address the idiosyncratic risk with respect to the default behaviour of the largest obligors, Fitch applies a correlation stress of 50% to the largest risk contributors.

The largest risk contributors are determined based on the notional size of individual issuers in the portfolio. The stresses are applied to the largest issuers up to a maximum of 15 for which the aggregate notional size is in excess of 30% or any individual issuer that is at least 6.5% of the portfolio notional size. For example, for an equally weighted portfolio of 15 issuers the stress would be applied to all 15 issuers, because each is 6.7%. On the other hand no stress would be applied if the largest 10 issuers represent 20% or less of the portfolio notional size, as the largest 15 would have to be 30% or less.

The methodology ensures an appropriate coverage of the largest risk contributors. For example, Figure 14 shows that the approach would ensure that the 'Asf' RDR always covers at least the largest 10 'B-' issuers.

Figure 14

Asf RDR Coverage of the Largest 10 Issuers for Equally Weighted Portfolio of B- Assets



Source: Fitch

Excessive Obligor Concentration

The correlation and recovery stresses outlined above address the idiosyncratic risk with regards to larger obligors in reasonably diverse portfolios. However, despite these stresses it would theoretically be possible to have a 'AAAsf' rating on a portfolio with only a few loans, albeit with very high credit enhancement. Even though the loans may be assumed to default the methodology still assumes recovery proceeds at the 'AAAsf' stress level.

In Fitch's view such excessive obligor concentration bears too much idiosyncratic risk with regards to achievable recovery rates and the agency would not assign high investment-grade ratings. For example, Fitch would not assign a new rating or upgrade an existing rating higher than 'BBBs' for a portfolio with fewer than 10 obligors, all rated 'B'.

Fitch would also assess whether a transaction would be reasonably expected to comply with the excessive obligor concentration view during its life and in particular during the tail end. However, transactions may become more concentrated at the end of their lives as a result of unexpected default or prepayment behaviour. Fitch would apply the principles above but a committee may decide not to downgrade a rating if, for example, there are other mitigating factors such as short remaining life for the notes or performance history of the transaction.

Adverse Selection

Adverse selection is less significant for leveraged loan CLOs. These transactions are typically actively managed and have restrictions on the purchase of discounted assets, as well as caps on the proportion of 'CCC' rated assets. Furthermore, the average credit quality of these portfolios is in the 'B' category. For leveraged loan CLO transactions, to address the risk of early CDO downgrade due to excessive underlying portfolio migration Fitch incorporates the use of a Rating Watch. For all assets subject to Negative Rating Watch, the credit rating minus one notch will be applied.

Fitch will assess the risk of adverse selection in the initial portfolio, as well as over the life of the transaction for managed structures. Fitch will take into account qualitative and quantitative factors that could indicate adverse selection, such as the manager's track record. An over-proportionate share of ratings on Outlook Negative in the initial or indicative portfolio relative to the entire population of similar ratings may also indicate adverse selection.

If Fitch believes the portfolio to be adversely selected, the agency will increase the default probability assumptions for the portfolio by using default probability multipliers or additional notching.

Fitch will continue to monitor the proportions of Outlook Negatives during surveillance to assess adverse selection on an ongoing basis.

For other CDOs backed by corporate debt, the approach still calls for the use of the Fitch CDS-IR for those assets subject to Negative Watch or Negative Outlook status. If the rating applied was subject to a Negative Watch or a Negative Outlook (before adjustment), it will be compared to the Fitch CDS-IR (where available), and the lower of the two will be applied. The method used to derive the asset rating is described in the Fitch IDR Equivalency Map in *Appendix 5*.

Portfolio Management

Transactions may be static or managed. Fitch considers that there may be additional risk in managed transactions, given that the portfolio may deteriorate not only by natural credit migration but also by substitution of assets during the revolving period. Available CE may be affected by realised gains or losses that result from trades, as well as from defaults and amortisation. When analysing transactions that include portfolio covenants and eligibility criteria in their documentation, Fitch will consider all covenants and all aspects of the management guidelines, including asset eligibility criteria and the manager's ability to:

- substitute assets freely or subject to defined covenants;
- substitute impaired credits freely or not;
- withdraw or monetise "surplus" CE; and
- obtain quotes or trade with dealers other than the arranging bank.

Actively managed portfolios are initially rated based on a hypothetical Fitch stressed portfolio that is created based on the terms and conditions in the indenture or offering circular. Fitch maintains its ratings on actively managed portfolios by monitoring the performance and credit profile of the actual portfolio relative to the initial stressed portfolio analysis. In instances where there is limited or no portfolio management, Fitch assigns and maintains ratings based on the analysis of the static portfolio of identified assets.

Fitch Stressed Portfolio

In its analysis of transactions with managed portfolios, Fitch analyses stressed-case portfolios with the aim of testing the robustness of the transaction structure against its covenants and portfolio guidelines. Typically, Fitch starts with the initial "indicative" portfolio provided by the arranger and then makes adjustments to account for certain concentration limitations. The indicative portfolio provides a good indication of the portfolio the manager is likely to purchase, at least for US CLOs with a broader universe of leveraged loans.

In the case of most European CLOs, Fitch uses a standardised stress portfolio that is customised to the specific portfolio limits for each transaction as specified in the transaction documents. European CLOs tend to have a high overlap in terms of issuers and loans, due to the limited universe of eligible assets. As a result, managers have significantly less choice in the portfolio selection for European CLOs compared to US CLOs backed by broadly syndicated loans. Similarly, Fitch's analysis may not rely upon an indicative portfolio for analysing US middle market CLOs. The stressed portfolio for these CLOs may be created by Fitch in line with the various concentration and collateral quality limitations specified by the transaction, as further described herein.

The following are the most common adjustments applied to the indicative portfolio for typical CLOs; the same principals are also reflected in the standard stress portfolio in the case of European CLOs. However, this list is not inclusive, as some CLOs may allow for limited exposure to certain asset types or other risk factors that Fitch may choose to stress in its analysis. The Fitch stressed portfolio will be agreed upon in Fitch's committee process.

Fitch will also consider the expected ability of the manager to create a portfolio at the limit of its covenants. The absolute limit of some covenants may not be achievable in reality. An example would be the absence of a covenanted country concentration limit in a European CLO, where historically no portfolio had more than 35% exposure per country. In such cases, Fitch will create a stressed-case portfolio that may have less than 100% single country concentration, despite the lack of a country limit. Another example would be the exposure to assets rated in the 'CCC' category or worse in US middle market CLOs, which may be set at a level Fitch believes would be very unlikely to be maximised and therefore Fitch models less than the permitted maximum exposure.

Obligor Size

A typical CLO will cap the size of the obligors, with an allowance that a specified number may be a larger percent. Fitch assumes that managed portfolios are generally managed towards permitted concentration limitations that can lead to increased portfolio concentration. This may lead to more volatile portfolio performance, resulting in higher default expectations under high investment-grade rating stresses.

With regard to obligor size, the stress portfolio is constructed to include obligors that match the maximum limits. For instance, the indenture may specify each obligor to be 2.0% of the portfolio, with the exception that up to five obligors may each be up to 2.5%. In this instance, the Fitch Stressed Portfolio assumes these exceptions are maximised, with the top five obligors concentrated to represent 12.5% of the portfolio.

For US middle market CLOs, Fitch typically maximises the permitted exposure to the 10 largest obligor concentrations, to further account for the greater concentration often seen in such portfolios.

Portfolio Credit Quality

Fitch stresses the credit quality of the portfolio by increasing the exposure to assets rated in the 'CCC' category or worse, based on the proportion permitted by the concentration limits. For broadly syndicated loan CLOs for example, the limit is set relatively low and Fitch would maximise the permitted amount or, if the indicative portfolio already exceeds the permitted 'CCC' allowance when mapping to Fitch ratings, such proportion would be maintained.

Typically, limitations for assets rated in the 'CCC' category or worse are calculated based upon the current rating of assets. Where the definition of the limitation of 'CCC' category or worse rated collateral varies from this, Fitch may apply additional stresses to the credit quality of the portfolio which would be described in our rating report. If the transaction structure also includes a collateral quality test based on the Fitch weighted average rating factor (WARF), then the credit quality of the stressed portfolio is matched to the covenanted test level. This stressed assumption increases the portfolio default probability assumptions in PCM.

Assets without a Fitch rating or credit opinion and without a public rating from another agency would be considered 'CCC', as explained in *Appendix 5*. However, for the purpose of determining the WARF the manager may treat such assets as 'B-'. Fitch would not adjust the stress portfolio analysis if this exceptional treatment is conditional on the asset being privately rated (for the avoidance of doubt, full ratings only excluding credit opinions) by Moody's and/or S&P and the exposure is limited to no more than 10% of the portfolio notional amount. The agency would expect that the use of this bucket is included in the regular transaction reporting.

Asset Security

A typical CLO allows for some portion of the portfolio to be invested in assets that are not senior secured loans, which could be second-lien loans or other instruments that have historically experienced low recoveries. Fitch's stressed portfolio analysis assumes the maximum allowance for non-first-lien collateral, thereby giving no benefit for recoveries for this portion of the portfolio in high investment-grade rating stresses (see Figure 39; note: assets that are not senior secured loans are assumed to have weak recovery prospects). We also

assume the remainder of the portfolio has similar seniority and recovery prospects to the indicative portfolio provided and use recovery ratings or recovery estimates where available.

If the transaction structure also includes a collateral quality test based on the Fitch weighted average recovery rating (WARR), the recovery assumption of the stressed portfolio is matched to the covenanted test level. The initial covenanted WARR is typically set below the weighted average recovery of the indicative portfolio, giving managers the flexibility to buy assets with weaker recovery prospects. Where a WARR is included, a homogenous portfolio distributed around the WARR is usually more conservative than a barbelled portfolio including the maximum allowance of non-first-lien collateral. The agency will only test a barbelled portfolio where a WARR is present if the share of non-first-lien collateral is greater than 15%. Fitch would base the RRR on the Interpolation Grid in *Appendix 10*, which is based on a typical portfolio without barbelled seniority distribution.

Industry Concentration

CLOs typically have limitations on exposure to any one industry, with exceptions for a certain number of industries to exceed this limit. For instance, the indenture may specify each industry is limited to 10% of the portfolio, except three industries may be 12% and one may be 15%. The stressed portfolio is typically created maximising the permitted exposure to the three largest permitted industries. This stressed assumption increases portfolio concentration, which could cause more volatility in portfolio performance, leading to higher default rate assumptions at higher rating levels. If there are no Fitch specific industry limits and the industry limitations prescribed in the documentation are exceeded in Fitch's determination of industry composition for the indicative portfolio, the stressed portfolio would maintain the same industry exposure for those outsized industries.

Risk Horizon

Managed CLOs have a defined reinvestment period that often extends the WAL of the CLO notes beyond the WAL of the initial "indicative" portfolio. The manager can usually reinvest between payment dates and continue to reinvest on a 'maintain or improve' basis, even if portfolio profile tests are not met. In Fitch's stressed portfolio analysis, the WAL of the assets is extended to match the WAL permitted by the terms of the CLO, in order to appropriately address the additional default risk inherent with a longer risk horizon. This stressed assumption increases the portfolio default probability assumptions in PCM.

Cash Flow Stresses

Certain covenants and portfolio guidelines may allow for exposures that Fitch may stress in its cash flow analysis. For instance, if the transaction allows for some portion of the portfolio to be invested in fixed-rate assets, Fitch will analyse the impact of this allowance being maximised. In a rising interest rate environment the fixed rate assets could be a negative drag on interest proceeds available to the notes. Additionally, Fitch analyses the potential risk of cash flow timing mismatches associated with allowances for assets that pay less frequently than quarterly (in a quarterly pay transaction); it does so by maximising the potential for these types of exposures and assuming that 75% of assets pay in quarters one and three and 25% of assets pay in quarters two and four.

Fitch stresses the portfolio weighted average spread (WAS) and weighted average coupon (WAC) to the minimum level specified by the collateral quality tests. These stressed assumptions limit the amount of credit applied for excess spread and influence the break-even default rate analysis (see *Cash Flow Modelling* below).

Asset Repayment Assumptions

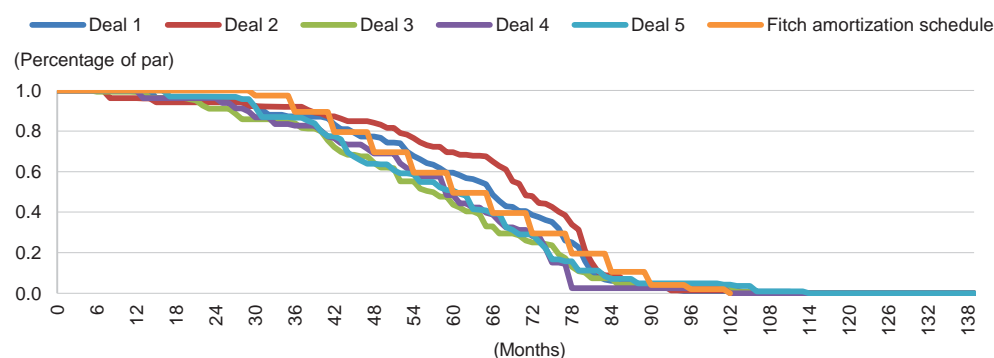
In modelling CLO note amortisation Fitch generates an assumed principal payment schedule. Fitch uses the actual maturity profile of the identified portfolio assets as a proxy for the expected portfolio repayment profile as the CLO enters the note amortisation period. In the stress portfolio analysis, the WAL of the assets is extended to match the WAL permitted by the

terms of the CLO. For European CLOs, Fitch uses a standardised amortisation profile (Figure 15) together with a standardised stress portfolio. European CLOs tend to have a high overlap in terms of issuers and loans, due to the limited universe of eligible assets. As a result, managers have significantly less choice in terms of portfolio selection for European CLOs compared to US CLOs.

The amortisation assumed for US middle-market CLO portfolios may consist simply of a smooth amortisation profile over a number of periods. The applied assumptions would be described in Fitch's rating report.

Figure 15

Amortisation Profile CLO 1.0



Source: Fitch

Portfolio Trading Limitations

Limitations on portfolio trading are expected in managed CLO structures. Typically, these triggers are based on collateral quality tests established at the onset of the transaction. If the performance of the actual portfolio significantly deteriorates, such that certain collateral quality tests fail, then the trading activity is expected to either maintain or improve the pre-trade test levels.

Structures that refer to Fitch portfolio metrics normally include a Fitch WARF Test and a Fitch WARR Test. These two tests, along with the Minimum Weighted Average Spread (WAS) Test, form the basis for dynamic portfolio management, via a Fitch Test Matrix. The calculations for a Fitch WARF and Fitch WARR are included in *Appendix 6*.

To analyse the Fitch Test Matrix, Fitch creates a stress portfolio for one WARF in the matrix, which is then used to linearly extrapolate the default assumption for the other Matrix WARFs. A one point increase in the WARF corresponds to approximately one percent increase in RDR at all rating levels. This relationship between WARF and RDR holds for typical CLO portfolios with WARF in the range between 25 and 50. Fitch would create bespoke stress portfolios for each WARF outside of this range. Since the test matrices often include several thousand different WARR points, Fitch interpolates the recovery rates for each rating level based on the WARR and the asset-specific recovery assumptions, as shown in *Appendices 4 and 10*.

The agency aims to analyse all different combinations of WARF, WAS and WARR in the matrix. However, arrangers may specify highly granular matrices with incremental increases in the WAS of less than 20bp. In these cases, Fitch will analyse a grid of rows with WAS increments of at least 20bp.

These tests are typical for Fitch-rated European CLOs and US Middle Market CLOs, as the analysis primarily relies on credit opinions provided by Fitch's corporate group. These tests may not be present in US broadly syndicated CLOs, where other collateral quality tests are present. In instances without specific Fitch tests, the agency will consider the collateral quality tests included in the transaction documentation when building a stressed portfolio.

Operational Risk Considerations

Operational risk considerations for a managed portfolio apply equally to substitution agents, portfolio advisors, liquidation agents and other parties that perform “manager” functions. The agencies’ ratings are based on transaction covenants as stipulated in the transaction documents. Fitch reviews parties performing manager functions to establish whether they have sufficient experience and appropriate systems and procedures that they can reasonably be expected to manage the CLO in compliance with the transaction documents. Fitch will not rate transactions managed by parties that are not viewed as acceptable, unless there are other mitigants, such as a back-up manager.

The initial operational risk assessment is an on-site review and covers the manager’s company, controls, investments, operations and technology, as described in *Appendix 9*. Fitch will update its assessment of managers when assigning ratings to new transactions if any of the following are materially changed since its last assessment:

- ownership structure;
- key employee departure;
- regulatory actions or criminal/civil actions levied against firm or employees; and
- external audit or regulatory exam findings.

Additionally, organisations may undergo multiple operational reviews or updates to assessments if they maintain multiple business lines that issue corporate CDOs, like US broadly syndicated CLOs, US middle-market CLOs and European CLOs, as each business line may have different operations, technology, etc. In the event a manager is being replaced in a transaction, Fitch needs to be notified of the proposed change and will review the successor manager; Fitch may decide to withdraw or downgrade the ratings if the new parties are not viewed as acceptable to manage a Fitch-rated CDO or CLO.

Cash Flow Modelling

To determine the rating of a given tranche of notes, Fitch analyses a series of stress scenarios to determine whether the payment of interest and principal according to the terms and conditions of such notes is fulfilled across all scenarios. In its rating reports, Fitch discusses the indications given by the cash flow model runs in the scenarios summarised in Figure 16, and the related rating considerations. While the cash flow model analysis is an important consideration in determining the final rating, ratings are ultimately assigned by a Fitch rating committee that also considers other quantitative and qualitative factors.

Break-even default rates (BDRs) are an output of Fitch’s cash flow model that show the maximum portfolio default rates a class of notes can withstand in stress scenarios without experiencing a loss. BDRs for a class are then compared to PCM rating default rates (hurdle rates) at the corresponding rating stress. The committee considers the BDR compared to the hurdle rate as the key quantitative factor for assigning a rating.

A credit committee may assign a particular rating to a note even if the note’s lowest BDR is lower than the target rating hurdle rate. In such cases, the note’s lowest BDR is expected to exceed the rating level one-notch below the target rating hurdle rate using the Fitch stressed portfolio analysis; the note’s lowest BDR is expected to exceed the target rating hurdle rate using the indicative portfolio analysis. Additionally, Fitch may choose to rate a note at a rating level below the highest rating level achieved by the cash flow modelling. The occurrence and basis of such decisions would be described in our rating reports and may include consideration of the magnitude of the difference between the BDR and the hurdle rate at the assigned rating, as well as the frequency of scenarios in which the BDR exceeds the hurdle rate. Figure 16 shows the standard scenarios Fitch runs for a corporate CLO in the absence of FX risk.

Figure 16

Summary of Standard Scenarios

Default distribution	Interest rate trend
Front-loaded	Rising Stable Decreasing
Middle-loaded	Rising Stable Decreasing
Back-loaded	Rising Stable Decreasing

Source: Fitch

Fitch's approach to cash flow modelling is based around determining whether a class of notes pays according to its terms, under a series of defined interest rate and default timing stress scenarios for a given rating level. If a particular class of notes has received payment in full in a given stress scenario, it is deemed to have passed that stress scenario.

Based on the outputs of PCM and the defined stress scenarios, Fitch's cash flow analysis determines whether the CDO liabilities receive principal and interest in accordance with the terms of the transaction documents. Fitch uses a proprietary Excel-based cash flow model, customised for rating-relevant structural features for each transaction, based on information and transaction documents provided to Fitch by the issuer, originator, or third-party agents on their behalf. Fitch's cash flow model is not publicly available.

Each transaction's customised cash flow model accounts for the CDO's capital structure and unique structural features, including but not limited to:

- the interest and principal priority of payments, including provisions for various fees and expenses;
- coverage tests (e.g. OC tests, IC tests, reinvestment OC tests);
- any interest rate or currency swaps or hedges; and
- other relevant structural features.

Timing of Defaults

Fitch utilises different default timing scenarios to assess the ability of the structure to withstand various clusters of defaults. Fitch's default timing scenarios apply peak defaults over a two-year period, which is consistent with research on historical default patterns. Fitch will test the structure for front-loaded, middle-loaded, and back-loaded peak default scenarios. The total amount of defaults will always be the same for each default timing stress.

The timing of the default peak is adjusted according to the portfolio's weighted average life (WAL – see *Appendix 7* for default timings for portfolios with a WAL from 3.5 years to 10 years). As an example, the default timings used for a portfolio with a WAL between 7.75 and 8.75 years would be as set out in Figure 17.

Figure 17

Default Timing for Rounded^a WAL of 8 or 8.5 Years
 (% share of RDR)

Year	Front	Mid	Back
1	33	-	-
2	22	9	9
3	9	9	9
4	9	22	9
5	9	33	10
6	9	9	10
7	9	9	20
8	-	9	33

RDR – Rating Default Rate

^a Rounded to the nearest 0.5 years

Source: Fitch

For portfolios where the default patterns described in this report are not applicable — e.g. because the portfolio has a very short tenor or has an accelerated amortisation profile after the revolving period — Fitch may adjust the applied default patterns to account for the specifics of the analysed portfolio. Likewise, for portfolios with assets of notably long tenor exceeding 12 years (such as trust-preferred securities), multiple default peaks or extended default cycles may be applied to address the characteristics of the assets and the possibility the portfolio will experience multiple credit cycles.

Furthermore, if the analysis is based on the stress portfolio for which the portfolio life was extended to include the reinvestment period, Fitch would not run the back-loaded timing scenario for sub-investment-grade rating stresses. For example, for CLOs the portfolios have a typical weighted average life of 5.5 years, but the transaction including the reinvestment period can have a weighted average life of eight years or more.

Fitch would run the stress portfolio, in the portfolio credit model based on the transaction weighted average life of 8+ years, to factor in additional losses during the reinvestment period. The standard back-loaded scenario only allocates a small share of defaults during the reinvestment period, while the extension of the risk horizon of the stress portfolio would significantly increase the default rate assumption.

Interest Rate Stresses

Fitch analyses rising, falling, and flat interest rate scenarios in its cash flow analysis. Rising and falling scenarios are in accordance with Fitch's *Criteria for Interest Rate Stresses in Structured Finance Transactions and Covered Bonds*, available on Fitch's website at www.fitchratings.com. At the moment there is no difference for Euribor between the flat and the falling interest rate stress.

Timing of Recoveries

Recoveries are assumed to be received following a lag period after default. Recoveries may come from either work-out or sale of the defaulted asset. For cash flow scenarios, Fitch assumes that recoveries are produced as a part of a work-out, in line with the manner in which its relevant corporate teams assign recovery assumptions.

The agency considers it more stressful to assume lags, in order to maximise negative carry, particularly given positions may be illiquid and price determination difficult.

The timing of recoveries assumes no interest proceeds from defaulted assets over the time of the work-out period. This results in negative carry, as the liabilities have to be paid, while defaulted assets are assumed to generate no cash flow between default and recovery.

For US corporate loans and corporate bonds, the recovery lag is assumed to be 12 months. The recovery lag for European bonds and loans is 18 months for 'Asf' rating levels and higher,

Fitch's *Criteria for Interest Rate Stresses in Structured Finance Transactions and Covered Bonds* includes stresses to address the risk of negative interest rates in structured finance transactions. CLOs are unlikely to be affected by negative interest rates. Therefore, we apply the standard (positive) interest rate downward stresses in our CLO rating analysis.

acknowledging less favourable workout regimes across European jurisdictions. For 'BBBs' and below, the recovery lag in European jurisdictions is 12 months.

Additional Default Risk in Revolving Transactions

Managed transactions may also have the ability to reinvest recovery proceeds from defaulted assets, or from interest proceeds diverted via failure of an interest diversion test or other similar reinvestment OC test. These new assets are subject to default risk that is not reflected in the expected default rates derived by PCM. Instead, Fitch takes into account this additional default risk in its cash flow modelling approach.

Fitch assumes that proceeds reinvested during the reinvestment period are used to purchase assets with the same risk profile as the outstanding performing portfolio at the time of the reinvestment. This is achieved by modelling the reinvestment as an increase in the current portfolio size. To capture the default risk on these newly acquired assets, the periodic default rate applied on the outstanding performing portfolio is also applied to these assets, given that they share the same credit characteristics. An example of the methodology is provided in *Appendix 8*.

Available Cash Investments

Fitch assumes cash balances held in a transaction's interest and principal collection accounts between payment dates will earn a spread of minus 50bp to the relevant reference index (eg EURIBOR/LIBOR), floored at zero.

Fitch will adjust these assumptions if the contractual rates are less favourable to the issuer than the above assumption.

Senior Fees and Asset Spreads

For corporate CDOs, the cash flow modelling is based on contractual management fees, which reflect market rates. Fitch may stress the senior fees on a case-by-case basis, if the contractual rates are deemed to be below the market rate.

Asset spreads are based on the actual spread for static transactions and the covenanted minimum spread level for replenishing transactions.

Call Options

Historically, most CLO notes are repaid through the exercise of the call option, which typically is controlled by the CLO equity investors. Fitch's analysis assumes that the call option is not exercised and the CLO notes are repaid through asset repayments. Fitch's ratings are therefore de-linked from the creditworthiness of the call option holder. Fitch expects CLO indentures to specify that principal and accrued interest on all notes is paid in full as a condition to exercise the call option.

Long-Dated Assets

CLO structures that allow managers to invest in loans with maturity dates after the legal maturity of the bonds or perpetual bonds may expose the notes to the market value of those assets. The manager would have to sell the assets on the maturity date of the notes. Fitch expects limitations to be in place to restrict the ability of the manager to invest in such long-dated assets. If the CLO structure allows for assets with a tenor immediately prior to the final note payment or beyond, Fitch will assume the assets are subject to a fire sale during the last payment period and the CLO notes only receive the assumed asset recovery value immediately before the maturity of the notes. Transactions that permit greater than 5% long-dated assets would be exposed to greater market value risk. In these cases a credit committee will determine whether it is applicable to stress beyond the method described above.

Additionally, some CLOs allow for the limited reinvestment of unscheduled principal proceeds and proceeds from the sales of credit risk and/or credit improved assets after the reinvestment

period. In this case, Fitch expects the CLO structure to contain sufficient provisions to limit the amount of the investment portfolio that may be outstanding as the transaction reaches maturity. Typically, this is accomplished by reducing the WAL test value down to zero by the end of the note amortisation period.

Overcollateralisation (OC) and Interest Coverage (IC) Tests

Fitch evaluates the prescribed calculations of a transaction's coverage (OC and IC) tests to determine whether such tests will effectively divert cash proceeds to the senior notes upon negative rating migration and/or defaults in the portfolio. The OC tests for most high yield CLO transactions, for example, include multiple haircuts when calculating the par amount of collateral available to support the rated notes.

If Fitch believes such tests are calculated in a manner that renders them relatively ineffective, additional sensitivity scenarios or adjustments to Fitch's base case scenario may be warranted. Adjustments for inefficient OC measurements may include not modelling the OC tests during the reinvestment period, thereby not giving credit for excess spread while the asset manager can purchase additional assets.

CLO structures normally provide that assets rated in the 'CCC' rating category or lower, where above a certain threshold (typically 7.5%), are carried at an adjusted value. This may mean that OC tests become effective earlier than if they were to rely on defaulted assets alone. In lower rating stresses (categories 'Bsf' and 'BBsf') Fitch would expect obligors that ultimately default to first be rated 'CCC', causing OC tests to fail earlier.

In particular, Fitch assumes the proportion of 'CCC' assets in the portfolio to be a multiple of the projected default rate for the 12-month period ahead. Fitch assumes an average 12-month default rate for 'CCC' rated borrowers of 25%, which is consistent with empirical observations. This assumption implies a multiple of 'CCC' obligations to defaulted obligations of four times. For the 'BBsf' category scenarios, Fitch applies a multiple of 2.5x, and for the 'Bsf' / 'CCCsf' category scenarios the applied multiple is 3.5x. These multiples are set below the historical 4x average to account for the potential for higher-rated obligors "jumping" to default but without migrating to 'CCC' first. In both scenarios, the proportion of 'CCC' assets of the performing portfolio is capped at 50%.

The adjusted value for excess 'CCC' obligations in CLOs is typically the lower of par and their market value. Fitch does not model the market value explicitly but assumes that in lower rating stresses the recovery assumption is a good indicator for the market value.

For example, assuming an RDR of 30%, the front-loaded default timing for a weighted average life of between 7.5 and 8.5 years allocates 9% of the RDR to year three. This corresponds to an assumed 2.7% of the initial target par amount of the portfolio ($30\% \times 9\%$) expected to default during year three. For a 'Bsf' scenario, Fitch assumes 9.4% ($3.5x$ 'Bsf' multiple \times 2.7%) of the portfolio to be rated 'CCC' or worse during the second year of the transaction life and for a 'BBsf' scenario 6.75% ($2.5x$ 'BBsf' multiple \times 2.7%).

Defaulted assets are typically included at the lower of the market value or a predetermined recovery rate, defined in the transaction documents. Fitch believes these haircuts can serve as early indicators of deteriorating collateral performance and are important for preserving a minimum ratio of underlying collateral value available to the senior notes.

Multi-Currency Structures

Most European CLOs use perfect asset swaps to hedge FX risk for non-euro-denominated assets. Some structures can have limited exposure to UK pound and US dollar assets that are not covered by perfect asset swaps. The maximum currency bucket has been 10% to date, against 5% of liabilities, leaving a 5% of reinvestment target par mismatch between assets and liabilities (residual exposure). The approach outlined here only applies to transactions where the residual

exposure (the mismatch between the assets and liabilities) does not exceed 10% at closing of the transaction target par amount.

Market risk in the form of FX exposure should not be the primary rating driver in CLO structures. Therefore, the approach outlined below will be applicable where the size of the FX bucket is limited and/or the impact on the rating when compared to an all-euro structure with similar characteristics is limited. Such an asset/liability hedging strategy is not perfect and exposes the structure to residual currency risk. For example, defaults may reduce the assets and as a result the FX liabilities have to be repaid by converting euro proceeds at spot. Similarly, FX liabilities that rank pro rata with the corresponding euro tranche are less effective than, for example, variable funding notes. Unless the issuer receives the correct proportion of FX proceeds and euro proceeds, it will have to convert one or the other at spot in order to maintain the pro rata split of the liability structure.

If for example the UK pound sub-portfolio has a significantly longer WAL than the euro sub-portfolio, the effectiveness of the liability hedging could be significantly reduced, as the UK pound tranches would be repaid from euro proceeds prior to receiving the UK pound proceeds, leaving the structure unhedged. To mitigate this risk, European CLOs include specific WAL tests for each sub-portfolio.

To test the effectiveness of an imperfect asset/liability hedging, Fitch will test the structure by modelling stressed FX rates for each currency under the standard interest rate and default timing scenarios.

The FX stresses and the currency pair categorisation are published in an Excel file titled [Fitch's Foreign-Currency Stress Assumptions for Residual Foreign-Exchange Exposures in covered bonds and Structured finance](http://www.fitchratings.com), available at www.fitchratings.com. Both the definition of the stresses and the assignment of currency pairs to categories will be reviewed on a regular basis. A detailed description on Fitch's methodology for deriving these currency stresses is provided in the publication *Covered Bonds Rating Criteria*.

These stresses are applicable to transactions with a typical weighted average life of up to eight years. In addition, Fitch will typically limit the interest rate differential for FX structures. This applies to scenarios where one index is stressed up while the other is modelled down or flat. For example, in the case of UK pound/euro, Fitch would cap the difference between UK pound Libor and Euribor at 6%. Finally, market risk in the form of FX exposure should not be the primary rating driver in CLO structures.

In addition, if defaults were to occur unevenly across such a portfolio, the impact of FX rates and interest rates on unhedged risks can be magnified in the structure. Therefore, for CDOs with FX exposure, Fitch will also analyse the impact of defaults skewed toward each sub-pool within its cash flow modelling framework. The following default skew stresses would be used for a multicurrency transaction, or transactions with significant fixed/floating interest rate mismatches.

Figure 18

Default Skew Stresses for Foreign Exchange Mismatches

Rating scenario	Pool one	Pool two
AAA	62.5	37.5
AA	60.0	40.0
A	57.5	42.5
BBB	55.0	45.0
BB	52.5	47.5
B	50.0	50.0

Note: A 60%/40% default skew would imply that 60% of defaults would occur in Pool One if the pools were of equal weight. Please contact Fitch to obtain the default skew percentages for non-equally weighted portfolios
Source Fitch

Fitch will not rate new combination note structures on the basis of a “rated balance” that may differ from the “stated balance” of the notes over time as there is an elevated risk that the rating may be misconstrued or misunderstood by those relying on the rating like investors, risk managers or regulators.

For very small FX exposures, which could include only a few assets, the committee may also consider a more significant skew proportion in assigning the rating.

Combination Notes

Combination notes are notes where tranches from CLOs or corporate CDOs are combined, in whole or in part, to form new securities. Combination notes may also include other securities, such as government bonds. The cash flow modelling methodology outlined in this report is applied to determine the impact of the various scenarios described above on the principal and interest cash flows described in the terms and conditions of the combination note. Typically, the combination noteholders are entitled to all distributions of principal and interest on the underlying components. Combination notes may take many forms and each proposal needs to be evaluated on its specific merits. The factors used by Fitch when deciding if the combination note is rateable include ensuring:

- availability of sufficient information to analyse each of the underlying components; and
- the terms and conditions of the combination notes match the anticipated payment profile of the included notes.

The most common form of combination notes transforms bonds paying both principal and interest into principal-only notes. Credit enhancement is created by converting interest payments on highly rated notes to cover principal on lower-rated or unrated notes. The included components generate sufficient cash flows to satisfy repayment of the combination notes under the specified rating stress scenarios including use of the Fitch stressed portfolio and the indicative portfolio. If a potential principal shortfall exists in Fitch’s cash flow analysis associated with a specific rating level, then that rating level can be assigned to the combination notes only in the presence of some form of additional credit enhancement that mitigates the shortfall. Often, this additional credit enhancement will be one or more principal-only (PO) securities that are included to provide principal cash flows toward the end of the transaction. This would potentially offset potential shortfalls that occur in a stress scenario. In these instances, the combination notes’ ratings are determined through the application of the Two-Risk CLN Matrix in the *Global Rating Criteria for Single- and Multi-Name Credit-Linked Notes* (see *Related Criteria*), where the PO issuer and the combination notes are the risk-presenting entities.

Fitch assumes an additional administrative expense at the bottom of the CLO waterfall when calculating the cash flows available to CLO equity components of a combination note.

The same analytical framework applied in the combination note analysis is used when analysing structures backed by notes of more than one CLO. Each distinct CLO portfolio and structure will be analysed separately using the same rating level stress levels. Then cash flows from each component of the combination note are aggregated for each of the nine interest rate and default timing scenario combinations. The most conservative of the nine cash flow scenarios must be sufficient to repay the combination notes in accordance with their terms under the rating stress. For example, cash flows from the ‘Asf’-rating stress analysed in an “up” interest rate and “front” default timing scenario would be determined from each CLO. The resulting cash flows from all component notes, and other potential sources like pledged management fees, that secure the combination note would be applied to the combination note structure to test if cash flows are sufficient to support an ‘Asf’ rating.

Early redemptions, re-pricing or other features like allowances for additional indebtedness affecting the underlying component notes may lower cash flows to the combination note beyond those assumed in Fitch’s analysis of the indicative portfolio or Fitch stressed portfolio. To the extent these early redemption or re-pricing features exist in the underlying CLO, Fitch expects additional structural features to specifically address any potential adverse impact on the combination notes. The features may include: automatically exchanging the combination

Other structural considerations for combination noteholders include:

- Voting rights for supplemental indentures that may alter cash flows,
- Reporting and notifications to investors and rating agencies on distributions and outstanding balances.

note back to its component notes; the combination notes being paid in full; allowing for 100% combination noteholder consent; or relying on confirmation that no rating changes would be expected in order to mitigate the risk of redemptions, re-pricing, or other features adversely affecting the combination notes.

The combination note structure should also clearly define what happens to the underlying component notes after all the payments are paid or if the combination note is terminated early. The two most common structures involve either automatically exchanging the combination notes back into the underlying component notes or creating a structure with a residual class of notes. In exchangeable note structures Fitch will withdraw the rating on the combination notes after they are exchanged or mark them “Paid in Full” if the balance is reduced to zero. In residual class structures, once sufficient proceeds are received (or set aside as cash or highly rated and liquid securities) to repay that nominal balance of the combination note, Fitch will mark the combination notes ratings “Paid in Full”.

Transaction Specific Disclosure

In its initial rating report or Rating Action Commentary Fitch would expect to disclose the following:

- any variation to the rating mapping approach outlined in this report, for example if the mapping approach is applied to portfolios that fall outside the listed criteria
- correlation framework for emerging-market portfolios if different from the one outlined in this report
- any adjustments to the recovery rate assumptions including adjustments due to covenant-light structures;
- any adjustment to the base default probability assumption due to adverse selection, as indicated by an over proportional share of Negative Outlooks;
- any specific stresses applied to the Fitch stress portfolio for risk factors other than those outlined in this report; examples include ‘CCC’ limits, the amortisation profile for middle market CLOs and long-dated assets;
- if and why a committee assigned a rating different to the model implied rating, together with the shortfall in terms of breakeven default rate of the assigned rating relative to the model implied rating;
- adjustments for inefficient OC tests;
- adjustments to the applied default patterns;
- any mitigating factors to concentration risk (for example short remaining life for the notes, or performance history of the transaction) if a committee decided not to downgrade a transaction with excessive obligor concentration.

Variations From Criteria

Fitch’s criteria are designed to be used in conjunction with experienced analytical judgment exercised through a committee process. The combination of transparent criteria, analytical judgment applied on a transaction-by-transaction or issuer-by-issuer basis, and full disclosure via rating commentary strengthens Fitch’s rating process while assisting market participants in understanding the analysis behind our ratings.

A rating committee may adjust the application of these criteria to reflect the risks of a specific transaction or entity. Such adjustments are called variations. All variations will be disclosed in the respective rating action commentaries, including their impact on the rating where appropriate.

A variation can be approved by a ratings committee where the risk, feature, or other factor relevant to the assignment of a rating and the methodology applied to it are both included

within the scope of the criteria, but where the analysis described in the criteria requires modification to address factors specific to the particular transaction or entity.

Limitations

Ratings, including Rating Watches and Outlooks, assigned by Fitch are subject to the limitations specified in Fitch's Ratings Definitions, available at <https://www.fitchratings.com/site/definitions>.

In addition, ratings within the scope of these criteria are subject to the following specific limitations:

The criteria report does not cover any market value risk associated with corporate bonds or loans.

Sensitivity Analysis

Fitch will run a range of sensitivity analyses on key input parameters to examine the rating stability of each rated note. The objective of this stress testing is not to eliminate rating migration through unrealistically conservative assumptions, but rather to test that a small change in input parameters does not result in a multi-category downgrade. The sensitivity analysis results will be published in the agency's presale and new issue reports for each rated transaction.

The sensitivity analysis is performed for initial ratings or material restructurings. For surveillance reviews or CLO refinancings analysed based on the surveillance approach outlined in the next section the initial sensitivity analysis is typically still appropriate and Fitch will refer to the results of the initial sensitivity analysis.

Fitch will review the impact on the rating for the following sensitivities.

- Rating sensitivity to default probability: multiplier of 125% and 150% applied to the mean RDR, with the increase in the Mean RDR added to all other rating level RDRs.
- Rating sensitivity to recovery rates: multiplier of 75% and 50% (i.e. 25% and 50% haircuts, respectively) applied to the RRR for all rating levels.
- Combined stress: default probability multiplier of 125% applied to the mean RDR, with the increase in the mean RDR added to all other rating-level RDRs and recovery rate multiplier of 75%.
- Combined stress: default probability multiplier of 150% applied to the mean RDR, with the increase in the mean RDR added to all other rating-level RDRs and recovery rate multiplier of 50%.

A rating committee will review the stability of the proposed rating under such stresses and determine whether the results are commensurate with the rating(s) being proposed for the structure.

Figures 19 and 20 show the sensitivity results for two example portfolios. The analysis is only based on the asset performance, excluding structural features and cash flow modelling.

Figure 19

Portfolio One: Leveraged Loan CLO

- Geographic location: UK (19.5%), Germany (21.75%), Others (58.75%).
- 76 borrowers.
- Asset quality 'B-' (21.5%), 'B+' (23.5%), 'B' (27%), 'CCC' (7.5%).
- 90% senior secured loans.
- Seven-year bullet loans.
- Largest industry 12.5%.

Initial Rating	Base RLR (%)	Indicative Rating					
		RDR+25% x mean	RDR+ 50% x mean	0.75xRRR	0.5xRRR	RDR+ 25% x mean; 0.75xRRR;	RDR+50% x mean; 0.5xRRR
AAA _{sf}	37.6	AA+ _{sf}	A+ _{sf}	AA _{sf}	A _{sf}	A	BB
AA _{sf}	31.2	A+ _{sf}	BBB+ _{sf}	A- _{sf}	BBB- _{sf}	BBB+	B+
A _{sf}	25.5	BBB+ _{sf}	BB+ _{sf}	BBB- _{sf}	BB _{sf}	BB+	
BBB _{sf}	19.4	BB+ _{sf}	BB- _{sf}	BB _{sf}	CCC _{sf}	B-	
BB _{sf}	12.8	B+ _{sf}		CCC			
B _{sf}	10	CCC					

Source: Fitch

Figure 20

Portfolio Two

- Geographic location: US.
- 150 equally weighted assets.
- 'BBB' rated assets.
- 100% senior unsecured loans.
- Five-year bullet loans.
- Diversified industry exposure.

Initial Rating	Base RLR (%)	Indicative Rating					
		RDR+25% xMean	RDR+ 50% xMean	0.75xRRR	0.5xRRR	RDR+ .25% Mean; 0.75xRRR;	RDR+ .50% Mean; 0.5xRRR;
AAA _{sf}	12	AA+ _{sf}	AA+ _{sf}	AA+ _{sf}	AA+ _{sf}	AA+ _{sf}	AA+ _{sf}
AA _{sf}	9.1	AA- _{sf}	A+ _{sf}	AA- _{sf}	A+ _{sf}	A+ _{sf}	A+ _{sf}
A _{sf}	6.9	A- _{sf}	BBB+ _{sf}	A- _{sf}	BBB+ _{sf}	BBB+ _{sf}	BBB _{sf}
BBB _{sf}	5.0	BBB- _{sf}	BBB- _{sf}	BBB- _{sf}	BBB- _{sf}	BBB- _{sf}	BB+ _{sf}
BB _{sf}	2.4	BB- _{sf}	B+ _{sf}	BB- _{sf}	B _{sf}	B _{sf}	CCC
B _{sf}	1.5	CCC _{sf}	CCC _{sf}	CCC _{sf}	CCC _{sf}	CCC	

Source: Fitch

Portfolio Performance and Surveillance

Outstanding ratings are reviewed at least annually. In addition, transactions may be taken to credit committee more frequently, as warranted by performance or structural changes due to amendment activity, to maintain timely ratings on all Fitch-rated CDOs.

Surveillance Approach to Cash Flow Analysis

The surveillance approach is substantially similar to the approach for rating new issues, but differs in basing the analysis on a transaction's current portfolio, rather than the Fitch Stressed Portfolio. Another difference in the surveillance approach is that cash flow analysis is performed only when preliminary analysis indicates that the current ratings on the transaction notes may no longer be appropriate, as further detailed below.

Fitch will not cash flow model a CLO that is still in its reinvestment period, if the RDR and RLR for the current portfolio, plus losses to date, are still lower than the RDR and RLR modelled for the most recent stress portfolio from closing or for example when the Fitch Test Matrix was last updated. For any upgrades during the reinvestment period, Fitch will apply its Fitch Stressed Portfolio analysis, as described earlier in the report. Fitch will also consider the impact of a decline in weighted average spread, when applicable, below the stressed level. When such a decline is considered material, measured relative to the change in (CE-PCM RLR) cushion between current and Fitch Stressed Portfolio, a cash flow model analysis will be performed.

Model-Implied Rating

Represents the highest rating at which the note is passing all stress scenarios in the modelling.

For transactions that have exited the reinvestment period, a surveillance analyst evaluates the combined effect of deleveraging, portfolio migration, and any par losses since the last rating action. Cash flow analysis will not be performed if the implied rating, based on comparing the current credit enhancement against the PCM RLR (Asset Model-Implied Rating), is within the same category as the current rating. If the Asset Model-Implied Rating is in a rating category higher or lower than the current rating category, Fitch will cash flow model the transaction.

Assigning Different Ratings Than Model-Implied Ratings

The committee can assign ratings that are different from the Model-Implied Rating if: (i) the committee believes that there is a significant likelihood that a rating action may be reversed in the near term, due to potentially volatile performance; or (ii) the committee has concerns over specific sectors/issuers that the committee believes are not adequately addressed under the methodology. The assigned ratings cannot be more than three notches higher or lower than the Model-Implied Rating.

Specific examples include the following.

The committee could decide not to upgrade to the Model-Implied Rating if the transaction is exposed to a significant concentration risk. The committee would base the decision to assign a different rating from the Model-Implied Rating on sensitivity analysis, which assumes additional stresses for one or more of the largest performing obligors.

Another example would be if a committee expects near-term asset prepayments to counter credit deterioration, so maintaining the rating above the Model-Implied Rating. The committee would base the rating decision on sensitivity analysis which incorporates, for example, historically observed prepayment spikes.

The committee could also assign a different rating from the Model-Implied Rating on the basis of sensitivity analysis, which incorporates additional stresses to certain issuers and/or sectors. This may occur if the committee believes these issuers and/or sectors may be subject to near-term performance volatility that is not adequately addressed under the standard recovery and default assumptions.

CLO Note Refinance Analysis

CLOs have the ability to refinance one or more tranches of notes once the transaction exits the non-call period. The existing notes would be redeemed in full at their par value and new notes with similar terms but a lower spread issued. Refinancings without any material changes other than the lower coupon on the notes would be analysed in line with the surveillance approach outlined above. Fitch may on this basis also assign expected ratings before the issuance of the new notes. These would typically be the same as the existing ratings for the notes to be redeemed.

Fitch Analytical Inputs in CLO Reporting

Fitch monitors CLO portfolios using analytical inputs sourced from various sources that are normalized across CLOs to ensure consistent analytical treatment across all CLOs. These inputs include:

- Fitch Issuer Default Ratings (IDR) or credit opinions;
- Fitch Recovery Ratings (RR) or credit opinions;
- Fitch PCM Industry classification.

Fitch encourages the publication of its analytical inputs in the regular CLO reporting for investors as it further strengthens our core principles — objectivity, independence, integrity, and transparency. *Appendix 11* contains a full list of asset attributes that should be made available to investors in the reporting. For the avoidance of doubt, failure to make these asset attributes available to investors will not be considered a variation of criteria.

Appendix 1: Asset Default Rates

Figure 21

Cumulative Asset Default Rates

Fitch IDR	Term (years)									
	1	2	3	4	5	6	7	8	9	10
AAA	0.01	0.01	0.01	0.037	0.082	0.135	0.174	0.190	0.192	0.193
AA+	0.01	0.01	0.02	0.060	0.118	0.186	0.247	0.293	0.328	0.350
AA	0.01	0.02	0.05	0.097	0.169	0.257	0.350	0.452	0.560	0.638
AA-	0.01	0.04	0.09	0.157	0.256	0.372	0.493	0.623	0.760	0.863
A+	0.03	0.08	0.15	0.254	0.387	0.538	0.695	0.859	1.031	1.168
A	0.07	0.16	0.27	0.411	0.586	0.779	0.978	1.185	1.398	1.580
A-	0.10	0.23	0.40	0.611	0.869	1.154	1.442	1.727	2.009	2.246
BBB+	0.14	0.33	0.59	0.907	1.289	1.711	2.126	2.517	2.887	3.192
BBB	0.19	0.49	0.87	1.348	1.913	2.536	3.134	3.669	4.149	4.536
BBB-	0.34	0.97	1.77	2.667	3.611	4.546	5.380	6.082	6.673	7.130
BB+	0.75	2.07	3.63	5.261	6.869	8.365	9.649	10.698	11.550	12.193
BB	1.16	3.12	5.40	7.753	10.026	12.112	13.896	15.355	16.535	17.434
BB-	1.49	4.00	6.90	9.887	12.785	15.465	17.816	19.806	21.469	22.805
B+	2.89	7.15	10.83	14.106	17.186	20.024	22.513	24.620	26.381	27.795
B	5.36	11.16	15.17	18.490	21.572	24.410	26.899	29.007	30.767	32.182
B-	8.35	18.74	24.31	27.663	30.585	33.265	35.616	37.607	39.269	40.605
CCC+	25.228	37.337	43.817	47.727	51.130	54.252	56.990	59.308	61.245	62.800
CCC	25.228	37.337	43.817	47.727	51.130	54.252	56.990	59.308	61.245	62.800
CCC-	25.228	37.337	43.817	47.727	51.130	54.252	56.990	59.308	61.245	62.800
CC	50.500	56.500	62.500	68.500	74.500	80.500	86.500	92.500	98.500	100
C	75.50	81.50	87.50	93.50	100	100	100	100	100	100
D	100	100	100	100	100	100	100	100	100	100

The full 30-year table of default probability assumptions is available in the Portfolio Credit Model
Source: Fitch

The table includes 'CCC+' and 'CCC-'

The default probability assumptions used in the CDO analysis for 'CCC+' and 'CCC-' are the same as for 'CCC'. As a result – and as part of the analysis by Fitch's CDO analysts – an issuer rated 'B-' that is on Rating Watch Negative would be notched to 'CCC+' but would be assigned the same default probability assumptions as a 'CCC' rated issuer.

Appendix 2: The Portfolio Credit Model

The portfolio credit model (PCM) is used for analysing the joint default behaviour within credit portfolios. The model is based on the Gaussian copula function which is based on the multivariate normal distribution Φ_{Σ} with pair-wise correlation matrix Σ . An important benefit of the Gaussian copula is its analytical tractability. The dependence structure is fully described by the pair-wise linear correlation assumption. For example, zero correlation in the Gaussian copula means all the default events are independent.

The key inputs to the model are default probabilities, correlation and recovery rates. The key output of the model is the default or loss distribution for a given credit portfolio.

A correlation structure can be implemented in factor form. For example, the one factor representation of the Gaussian copula is given by the following equation:

$$Y_i = \beta X + \sqrt{1 - \beta^2} \varepsilon_i$$

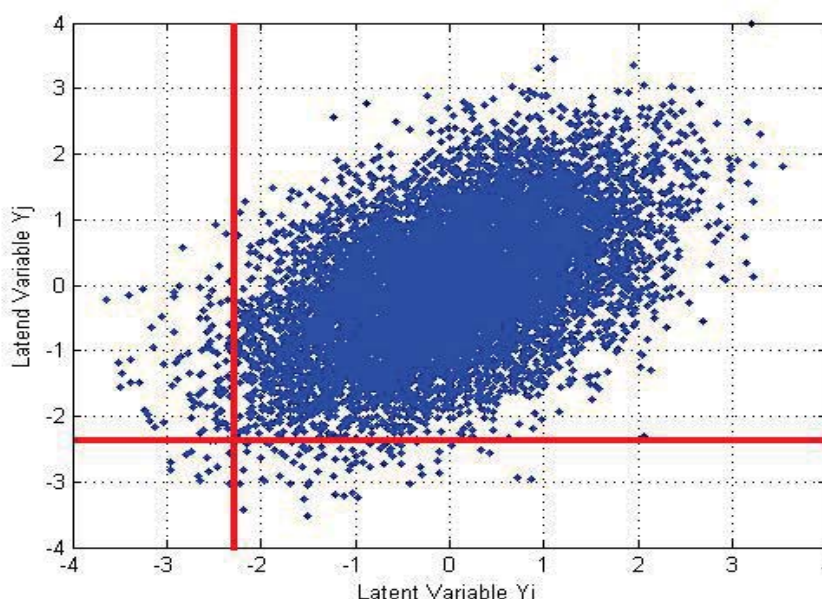
Here Y_i is a latent variable associated with credit i in the portfolio.

The Gaussian copula is often interpreted as a structural form model, which was pioneered by Merton. This model holds that a company defaults if the value of its assets falls below the value of its liabilities at debt maturity. Depending on the assumption with respect to the asset value process, it can be proven that the structural form model and the Gaussian copula are equivalent, if the default occurs at maturity. Therefore the latent variable Y_i can be interpreted as the standardized asset value for company i .

A default occurs if the latent variable Y_i falls below a threshold K_i . In the Gaussian copula the factor X as well as the idiosyncratic risk ε_i are standard normal random variables with zero mean and a standard deviation of one. The specific functional form of the factor model Y_i is also a standard normal variable with a mean of zero and standard deviation of one. Therefore, to match the default probability p_i the threshold K_i is computed as the inverse of the cumulative random normal distribution of the default probability, ie $K_i = \Phi^{-1}(p_i)$. Company i defaults if,

$$Y_i < \Phi^{-1}(p_i) \Leftrightarrow \Phi(Y_i) < p_i$$

Figure 22



Source: Fitch

Dependence is introduced by correlating the Y variables through the common factor X. The pair-wise correlation between Y_i and Y_j is given by β^2 .

The one-factor model can be extended to a multi-factor model, which allows a more asset-specific correlation structure. The PCM incorporates a multi-factor correlation model which will be described in more detail in *Appendix 3*. For a portfolio of just two credits (bi-variate case) the Gaussian copula function can be illustrated graphically, as shown in Figure 22.

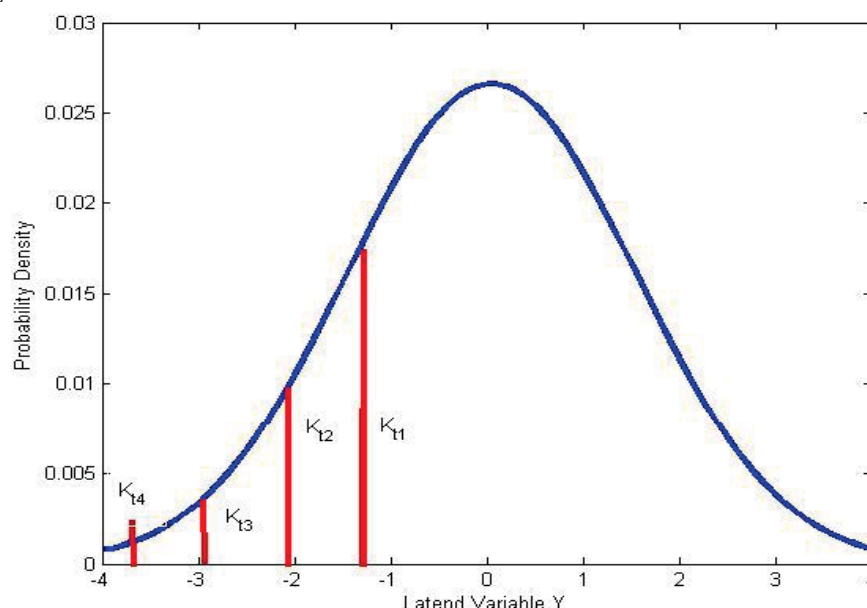
The scatter plot shows the joint distribution of the two latent variables (asset values) Y_i and Y_j . The red lines illustrate their respective default thresholds. The bottom left hand corner of the scatter plot shows the occurrences when both credits default.

So far this paper has focused on a model with a specified fixed maturity T. The model can also be used to infer the joint time to default for all the credits in the portfolio. Given a term-structure of default probabilities F_i for a specific credit in the portfolio, the time to default τ_i is given by

$$\tau_i = F^{-1}(\Phi(Y_i))$$

In other words, rather than specifying just one threshold K to determine whether an asset defaults at time T, the latent variable Y is compared to a specific threshold for each point in time.

Figure 23



Source: Fitch

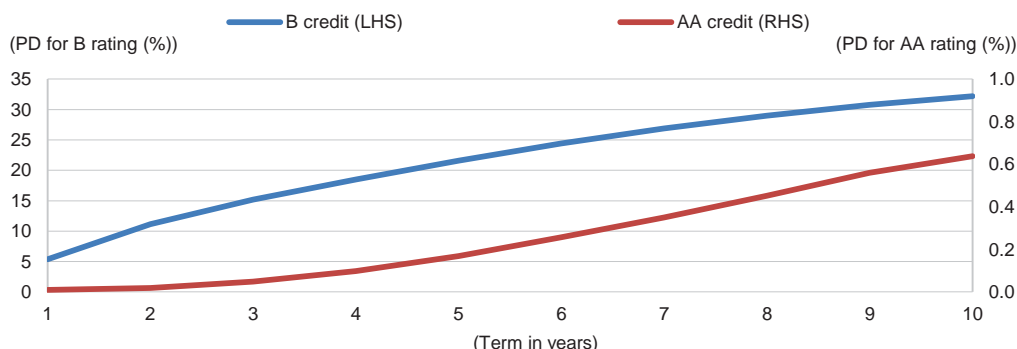
In the PCM, the default probability term structures are derived from historical default rates rather than implied by spread or price levels. Figure 24 shows the term structure of default probabilities for a 'AA' and a 'B' rated asset.

The portfolio loss distribution for a fixed time horizon T can be generated using the Monte Carlo Simulation as follows¹.

¹ Of course, the loss distribution of the one factor Gaussian copula can be derived much faster by semi-analytic techniques such as recursion or fast Fourier transform methods. The model also has a close form large homogeneous portfolio approximation. Nevertheless, all of these can only be used in a single factor framework. For multi-factor extension, which the PCM is based on, Monte Carlo Simulation is the most efficient numerical scheme.

Figure 24

Term Structure of Default Probabilities



Source: Fitch

1. Calculate the thresholds $K_i = \Phi^{-1}(p_i)$ for each credit. Here p_i is the default probability for name i that corresponds to the time horizon T .
2. Simulate a vector of independent standard normally distributed random variables ε_i (one for each credit in the portfolio).
3. Simulate a scalar standard normally distributed random variable for the factor value X .
4. Compute $Y_i = \beta X + \sqrt{1 - \beta^2} \varepsilon_i$; for equal pair-wise correlation ρ between all credits $\beta = \sqrt{\rho}$.
5. The default time $\tau_i \leq T$, if the latent variable $Y_i \leq K_i(T)$.
6. Compute the portfolio loss as the sum up the loss given default of all credits (LGD) that defaulted prior to T . The PCM uses deterministic recovery rates.
7. Repeat steps 2 to 6 several thousand times. Compute the loss distribution as the histogram of portfolio losses over all simulation scenarios. The histogram is an approximation of the exact loss distribution and the numerical accuracy improves the larger the number of simulations.

CDO portfolios often include assets with different maturity dates or even amortising assets. The loss given default for a specific issuer in the CDO portfolio is derived from the outstanding notional of all assets in the portfolio at the time of default. Therefore, the simulation time horizon is effectively equal to the maturity of the longest asset in the portfolio.

Appendix 3: Correlation Calibration

Given the choice of model (Gaussian copula) and the corporate and CDO default rates, the only remaining parameter that would impact the default distribution produced by the model is the correlation.

Correlation has been a much discussed concept and a lot of research was devoted to estimate and model it. Nevertheless, it still is a relatively opaque concept and heavily model-dependent. For example, although in the Gaussian copula the dependency between defaults is fully expressed by the pair-wise correlation input, other copula function, such as the t – copula or Clayton copula, have other or additional parameters that determine the default dependency (joint probability of default).

Generally, Fitch's credit view assumes that the RDR for higher rating levels of 'Asf' and above should cover the historical peak default rate.

In order to calibrate the correlation model, Fitch used large homogenous, randomly selected portfolios that resembled the cohort portfolios underlying the historical default studies. The objective was to find a single pair-wise correlation parameter, in line with the stated credit views.

Figure 25 shows the RDR at each rating category for portfolios with different underlying credit qualities and tenors. These were generated using the PCM with the following assumptions:

- historical corporate default rates;
- CDO default rates equal to historical corporate default rates;
- Gaussian copula model; and
- 6.5% equal pair-wise correlation between all assets in the portfolio.

Figure 25

Model RDR for Equally Weighted Portfolio of 300 Assets with 6.5% Flat Pair-Wise Correlation, Historical Corporate and CDO Default Tables

RDR	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	51.7	62.0	32.0	42.7	10.3	17.0	4.7	8.0
AA _{sf}	49.3	58.0	30.0	38.7	9.3	14.7	4.0	6.7
A _{sf}	45.0	54.3	26.3	35.0	7.7	12.7	3.3	5.3
BBB _{sf}	40.3	49.3	22.7	30.7	6.0	10.0	2.3	4.3
BB _{sf}	32.0	41.3	16.7	23.7	4.0	7.0	1.3	2.7
B _{sf}	27.3	36.3	13.3	20.0	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6
Coverage of mean								
AAA _{sf}	2.4	1.9	3.2	2.4	5.4	3.8	8.1	5.1
AA _{sf}	2.3	1.8	3.0	2.2	4.9	3.2	6.9	4.2
A _{sf}	2.1	1.7	2.6	2.0	4.0	2.8	5.7	3.4
BBB _{sf}	1.9	1.5	2.2	1.8	3.1	2.2	4.0	2.7
BB _{sf}	1.5	1.3	1.7	1.4	2.1	1.5	2.2	1.7
B _{sf}	1.3	1.1	1.3	1.1	1.4	1.2	1.7	1.3
Coverage of peak								
AAA _{sf}	1.3	1.25	1.6	1.4	2.3	1.8	2.9	2.0
AA _{sf}	1.3	1.17	1.5	1.3	2.1	1.6	2.5	1.7
A _{sf}	1.16	1.1	1.34	1.18	1.7	1.4	2.05	1.32
BBB _{sf}	1.042	1.0	1.153	1.032	1.336	1.074	1.429	1.070
BB _{sf}	0.8	0.83	0.8	0.8	0.9	0.8	0.8	0.7
B _{sf}	0.7	0.73	0.7	0.7	0.6	0.6	0.6	0.5

Source: Fitch

The table shows historical peak default rate for each rating category and term. The peak default rates were based on the published data from three rating agencies.

The second and the third tables show the multiple of the model RDR over the respective mean and peak default rate at each rating level. For example, a portfolio of 300 equally-weighted 'BBB' assets with a 10-year term has a portfolio default rate (RDR) at 'AAAsf' of 17%. The historical 'BBB' 10 year mean and peak default rates are 4.5% and 9.3%, respectively. The resulting multiple coverage of the mean default rate is 3.8 times and of the peak default rate is 1.8 times.

These results highlight some interesting properties of the model. Firstly, the multiples increase for shorter tenors and higher credit quality, which is mainly a result of the historical term structure and peak default rates. The multiple coverage of the base default rate for sub-investment-grade ratings with the same correlation is less than three times because of the higher base case. Secondly, the coverage of the mean and peak default rates at the 'BBBs' rating levels appear high relative to the 'AAAsf' coverage and the implied tiering between 'AAAsf' and 'BBBs' CDO ratings is very linear.

Therefore the following adjustments were applied to the model.

1. Reduce correlation from 6.5% to 4%, in order to address the relatively high multiples at liability ratings of 'BBB' and below.
2. Lower the CDO default rates for 'AAAsf' and 'AAsf' (increases the level of confidence). This adjustment will compensate for the lower correlation assumption and maintain the RDR for 10 year 'AAAsf' and 'AAsf' rating levels. The two tables below show the empirical default rates and the target CDO default probability assumptions.

Figure 26

Historical Default Rates

Adjusted Fitch composite

(%)	1	2	3	4	5	6	7	8	9	10
AAA	0.01	0.01	0.01	0.04	0.08	0.14	0.17	0.19	0.19	0.19
AA+	0.01	0.01	0.02	0.06	0.12	0.19	0.25	0.29	0.33	0.35
AA	0.01	0.02	0.05	0.10	0.17	0.26	0.35	0.45	0.56	0.64
AA-	0.01	0.04	0.09	0.16	0.26	0.37	0.49	0.62	0.76	0.86

Source: Fitch

Figure 27

Adjusted CDO Target Default Rates

Adjusted Fitch composite 'AAAsf', 'AAsf' CDO default rates

(%)	1	2	3	4	5	6	7	8	9	10
AAAsf	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.03
AA+sf	0.01	0.01	0.02	0.04	0.08	0.08	0.08	0.08	0.08	0.08
AAsf	0.01	0.02	0.04	0.08	0.14	0.14	0.14	0.18	0.22	0.26
AA-sf	0.01	0.03	0.08	0.14	0.23	0.33	0.44	0.56	0.68	0.78

Source: Fitch

3. Floor the CDO default rates at 1bp, which mainly affects the short maturities. This adjustment was not part of the calibration but rather required to achieve convergence within the Monte Carlo Simulation. A level of confidence greater than 99.99% would require a very large number of simulations in order to achieve convergence.

Figure 28

Model RDR for Equally Weighted Portfolio of 300 Assets with 4% Flat Pair-Wise Correlation, Adjusted CDO Default Tables

RDR	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	47.3	60.3	28.3	41.3	9.0	16.7	4.0	8.0
AA _{sf}	43.7	55.3	25.7	36.3	7.7	13.7	3.3	6.3
Asf	40.0	49.7	22.7	31.3	6.3	10.7	2.7	4.7
BBB _{sf}	36.0	45.7	19.7	27.7	5.3	9.0	2.0	3.7
BB _{sf}	30.0	39.3	15.3	22.7	3.7	6.7	1.3	2.7
B _{sf}	26.3	35.3	13.0	19.7	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6
Coverage of mean								
AAA _{sf}	2.2	1.9	2.8	2.4	4.7	3.7	6.9	5.1
AA _{sf}	2.0	1.7	2.5	2.1	4.0	3.0	5.8	4.0
Asf	1.9	1.5	2.2	1.8	3.3	2.4	4.6	3.0
BBB _{sf}	1.7	1.4	2.0	1.6	2.8	2.0	3.5	2.3
BB _{sf}	1.4	1.2	1.5	1.3	1.9	1.5	2.3	1.7
B _{sf}	1.2	1.1	1.3	1.1	1.4	1.2	1.7	1.3
Coverage of peak								
AAA _{sf}	1.2	1.2	1.4	1.4	2.0	1.8	2.5	2.0
AA _{sf}	1.1	1.1	1.3	1.2	1.7	1.5	2.1	1.6
Asf	1.03	1.0	1.15	1.05	1.4	1.1	1.66	1.16
BBB _{sf}	0.931	0.9	0.999	0.931	1.189	0.968	1.248	0.915
BB _{sf}	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7
B _{sf}	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5

Source: Fitch

While the adjustment to the CDO target default probabilities relative to historically observed default rates may appear arbitrary, Fitch believes that this adjustment is appropriate. This is because the historical rates for these rating levels are based on small cohort portfolios with very few defaults. As a result, the historical default rates at 'AAA' and 'AA' are strongly influenced by event risk in the cohort portfolios.²

Moreover, the adjustment to correlation and the CDO target default rates is equivalent to tiring the correlation assumptions by rating stress. In other words, for rating levels of 'Asf' and below, Fitch assumes an equivalent correlation of 4%, while for higher rating levels the effective equivalent correlation is higher, between 6% and 7%.

The results are shown in Figure 28. The RDRs for a 'BB' portfolio have increased as a result of raising the base default rates, covering the historical peak at the 'Asf' rating level. The 'AAA_{sf}' and 'AA_{sf}' RDRs for the 'BBB' portfolio and 'B' portfolios did not change significantly, while the RDRs below 'AA_{sf}' are lower. This leads to a more significant distinction between 'AAA_{sf}'/'AA_{sf}' and the remaining rating levels. Also, the five-year RDRs are lower, leading to multiples over the base default rates which are more in line with Fitch's credit view.

Industry Concentration and the Corporate Correlation Model

This report has so far focused on randomly selected portfolios diversified across industries. However, a flat pair-wise correlation is not sufficient to distinguish between well diversified portfolios and those with concentrations in particular industries or countries. Fitch believes that industry concentration within credit portfolio could significantly increase the volatility of portfolio default rates.

² The input default probabilities for 'AAA' and 'AA' are nevertheless based on the empirically observed default rates, in order to incorporate possible event risk among the underlying corporates.

In order to distinguish between diversified and concentrated portfolios the one factor model was extended to a multi factor model. All of the factors are independent standard normal random variables. The following equation illustrates the correlation model.

$$Y_i = \alpha F_{Global} + \beta F_{Region} + \gamma F_{country} + \kappa F_{Glob_IndSector} + \delta F_{Glob_Industry} + \varphi F_{Local_Industry} + \omega \varepsilon_i$$

$$\omega = \sqrt{1 - \alpha^2 - \beta^2 - \gamma^2 - \kappa^2 - \delta^2 - \varphi^2}$$

The correlation assumptions are differentiated based on geography (region and country) and industry sector/industry. Industries are further separated depending on their exposure to global and local performance drivers. The correlation framework is additive and any additional commonality between two assets adds a correlation uplift to the pair-wise correlation level of these two assets. The uplifts are given as the square of the factor exposures, ie $\alpha^2; \beta^2; \gamma^2; \delta^2; \varphi^2$.

Figure 29

PCM Industry Sectors and Industries; Main Countries and Regions

Sectors and industry breakdown	Correlation band	Country	Region
Telecom media and technology		Australia	Australia & New Zealand
Computer and electronics	High	New Zealand	Australia & New Zealand
Telecommunications	Medium	Hong Kong	Developed Asia
Broadcasting and media	Medium	Japan	Developed Asia
Cable	Medium	Singapore	Developed Asia
		South Korea	Developed Asia
Industrials		Taiwan	Developed Asia
Aerospace and defence	High	Austria	Europe Central
Automobiles	Medium	Belgium	Europe Central
Building and materials	Low	France	Europe Central
Chemicals	Medium	Germany	Europe Central
Industrial and manufacturing	Medium	Liechtenstein	Europe Central
Metals and mining	High	Luxembourg	Europe Central
Packaging and containers	Medium	Netherlands	Europe Central
Paper and forest products	Medium	Switzerland	Europe Central
Real estate	Low	Denmark	Europe North
Transportation and distribution	Low	Finland	Europe North
Retail leisure and consumer		Iceland	Europe North
Consumer products	Medium	Norway	Europe North
Environmental services	Medium	Sweden	Europe North
Farming and agricultural services	Medium	Cyprus	Europe South
Food, beverage and tobacco	Medium	Gibraltar	Europe South
Retail food and drug	Low	Greece	Europe South
Gaming and leisure and entertainment	Medium	Italy	Europe South
Retail	Low	Malta	Europe South
Healthcare	Medium	Portugal	Europe South
Lodging and restaurants	Low	Spain	Europe South
Pharmaceuticals	Medium	Ireland	Europe UK & Ireland
Textiles and furniture	Medium	Jersey	Europe UK & Ireland
Energy		United Kingdom	Europe UK & Ireland
Energy oil and gas	High	Canada	North America
Utilities power	Low	United States	North America
Banking and finance			
Banking and finance	High		
Business services			
Business services	Medium		

Source: Fitch

Figure 30

Other Countries and Regions in the Portfolio Credit Model

Country	Region	Country	Region
Argentina	America	Albania	Europe
Bahamas	America	Bosnia and Herzegovina	Europe
Barbados	America	Bulgaria	Europe
Brazil	America	Croatia	Europe
Chile	America	Czech Republic	Europe
Colombia	America	Eastern Europe Others	Europe
Costa Rica	America	Estonia	Europe
Dominican Republic	America	Hungary	Europe
Ecuador	America	Kazakhstan	Europe
El Salvador	America	Latvia	Europe
Guatemala	America	Lithuania	Europe
Jamaica	America	Macedonia	Europe
Mexico	America	Moldova	Europe
Other Central America	America	Poland	Europe
Other South America	America	Romania	Europe
Panama	America	Russia	Europe
Peru	America	Serbia and Montenegro	Europe
Puerto Rico	America	Slovakia	Europe
Uruguay	America	Slovenia	Europe
Venezuela	America	Ukraine	Europe
Asia Others	Asia	Egypt	Middle East and Africa
China	Asia	Iran	Middle East and Africa
India	Asia	Israel	Middle East and Africa
Indonesia	Asia	Liberia	Middle East and Africa
Malaysia	Asia	Middle East and North Africa Others	Middle East and Africa
Marshall Islands	Asia	Morocco	Middle East and Africa
Mauritius	Asia	Other Sub Saharan Africa	Middle East and Africa
Pakistan	Asia	Qatar	Middle East and Africa
Philippines	Asia	Saudi Arabia	Middle East and Africa
Thailand	Asia	South Africa	Middle East and Africa
Vietnam	Asia	Tunisia	Middle East and Africa
		Turkey	Middle East and Africa
		Bermuda	North America
		Cayman Islands	North America

Source: Fitch

For example, the pair-wise correlation between the latent variables of two assets from the same region but different countries and industries is given by $\alpha^2 + \beta^2$. Similarly, if two assets come from different regions but the same industry, their pair-wise correlation is equal to $\alpha^2 + \delta^2$. The uplift for local industries is only applied if two assets come from the same country and the same industry. The final correlation uplifts are detailed in Figure 9.

Figure 29 shows the country and industry mapping in the PCM. Every non-emerging market country is mapped to one of seven regions and one of six industry sectors. The six industry sectors are further broken down into 29 industry classes, which are differentiated among high, medium and low in terms of their exposure to global performance drivers. Two assets within an industry classified as 'High' receive the same uplift in correlation regardless of whether they are within the same country or not. The global industry effect is assumed to dominate the performance of these credits. A good example would be two oil companies that are heavily dependent on the spot price of oil.

Calibration of Industry and Industry Sector Correlation for a US Portfolio

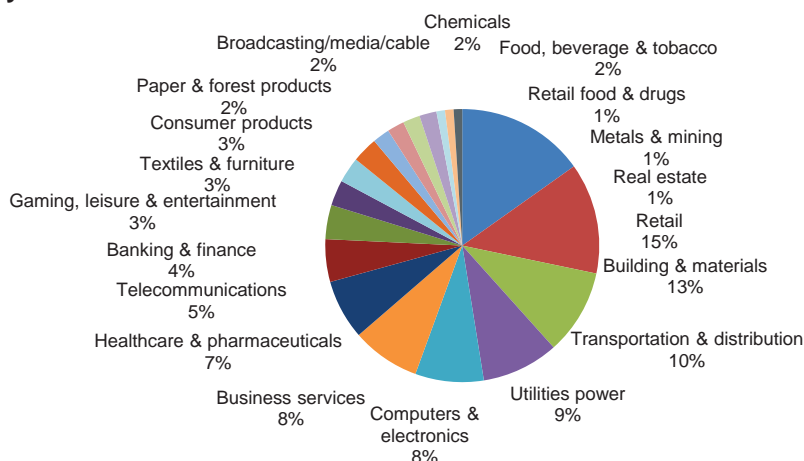
The calibration of the industry correlation model was again based on historical default rates as published in cohort studies. Since the majority share of the data is US-based, the calibration of the intra and inter industry correlation assumptions was done for a large randomly selected US portfolio, thereby replicating the cohort portfolios of historical default studies.

The base calibration in the previous section was focused on historical mean and peak default rates. For example, the objective was to cover the historical peak default rate at the 'A' rating level. Since the historical peak default rates included some industry concentration this had to be taken into account for calibrating the industry correlation model. While the largest industry

concentration was observed in 2001/2002 cohorts which had a large exposure to telecommunications, previous peak cohorts did not exhibit the same level of concentration. Therefore, Fitch used the less concentrated industry distribution of the 1991 peak cohort as shown in the chart below.

Figure 31

Industry Distribution for 1991 Historical Peak



Source: Fitch

The calibration of the industry correlation model was intended to: (i) yield results for the 1991 peak portfolio that were the same or close to the RDR levels given by the base calibration in the previous section; and (ii) produce adequate increases in the RDR and the multiple coverage for industry and sector concentrations when compared to a diverse portfolio³. The calibration was based on three benchmark portfolios.

Portfolio One – 1991 Peak

- 300 equally weighted assets with the same term and rating.
- Single-country US portfolio.
- Industry distribution as observed during the 1991 peak cohort.

Portfolio Two – Diverse

- 300 equally weighted assets with the same term and rating.
- Single-country US portfolio.
- Equal share in each of the 29 corporate industries.

Portfolio Three – 30% Industry Concentration

- 300 assets with the same term and rating.
- Single-country US portfolio.
- 30% in banking and finance; remainder diverse across other industries.

³ Since the historical default data is insufficient to obtain statistically significant differences by industries, Fitch assumed that the performance of different industry classes would be similar in a stressed environment. Therefore, in the model, the intra industry correlation was assumed to be the same for each of the industries and industry sectors.

Figure 32

Model RDR for 1991 Peak Portfolio

RDR	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	48.0	60.7	29.3	42.0	10.0	17.7	4.7	9.0
AA _{sf}	44.3	55.7	26.3	36.7	8.3	14.3	4.0	6.7
A _{sf}	40.3	50.0	23.0	31.7	7.0	11.0	3.0	5.0
BBB _{sf}	36.3	46.0	20.0	28.0	5.7	9.3	2.3	4.0
BB _{sf}	30.0	39.3	15.3	22.7	3.7	6.7	1.3	2.7
B _{sf}	26.3	35.7	13.0	19.7	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6
Coverage of mean								
AAA _{sf}	2.2	1.9	2.9	2.4	5.2	3.9	8.1	5.7
AA _{sf}	2.1	1.7	2.6	2.1	4.4	3.2	6.9	4.2
A _{sf}	1.9	1.6	2.3	1.8	3.7	2.4	5.2	3.2
BBB _{sf}	1.7	1.4	2.0	1.6	3.0	2.1	4.0	2.5
BB _{sf}	1.4	1.2	1.5	1.3	1.9	1.5	2.3	1.7
B _{sf}	1.2	1.1	1.3	1.1	1.4	1.2	1.7	1.3
Coverage of peak								
AAA _{sf}	1.2	1.2	1.5	1.4	2.2	1.9	2.9	2.2
AA _{sf}	1.1	1.1	1.3	1.2	1.9	1.5	2.5	1.7
A _{sf}	1.0	1.0	1.2	1.1	1.6	1.2	1.9	1.2
BBB _{sf}	0.9	0.9	1.0	0.9	1.3	1.0	1.5	1.0
BB _{sf}	0.8	0.8	0.8	0.8	0.8	0.7	0.8	0.7
B _{sf}	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5

Equally weighted portfolio of 300 US assets with correlation assumptions: Base 2%; industry sector uplift 2% and industry uplift of 20%
Source: Fitch

Figure 33

Model RDR for Diverse Portfolio

RDR	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	45.0	58.0	26.7	39.0	8.7	15.3	4.0	7.7
AA _{sf}	41.7	53.3	24.0	34.3	7.3	12.7	3.3	6.0
A _{sf}	38.0	48.0	21.3	30.0	6.0	10.3	2.7	4.7
BBB _{sf}	34.7	44.3	19.0	27.0	5.0	8.7	2.0	3.7
BB _{sf}	29.3	38.7	15.0	22.3	3.7	6.3	1.3	2.3
B _{sf}	26.0	35.3	12.7	19.3	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6

Equally weighted portfolio of 300 US assets with correlation assumptions: Base 2%; industry sector uplift 2% and industry uplift of 20%
Source: Fitch

Figures 32, 33 and 34 show the results for each of the benchmark portfolios with a base level correlation of 2%, an industry sector uplift of 2% and an industry uplift of 20%. For example, two assets in the same industry would have a pair-wise correlation of 24%, while two assets from different industries but within the same industry sector would have a pair-wise correlation of 4%. As a result of the higher intra industry correlation and the sector correlation uplift, the base level correlation for the US was reduced to 2% from the 4% in the examples above, in order to maintain the results from the previous section for portfolio one. The chosen correlation levels replicate closely the results shown in Figure 28.

The same correlation assumptions were also applied to the second calibration portfolio which was fully diverse and included an equal share in each of the 29 corporate industries.

Figure 34

Model RDR for Industry Concentrated Portfolio (30% Industry Concentration)

RDR	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAAsf	49.7	61.7	32.0	43.7	12.3	20.3	6.0	11.3
AAsf	46.0	56.7	28.7	38.7	10.0	16.0	4.7	8.0
Asf	41.7	51.0	24.7	33.0	7.7	12.0	3.3	5.3
BBBsf	37.7	47.0	21.3	29.0	5.7	9.7	2.3	4.0
BBsf	30.7	40.0	15.7	23.0	3.7	6.7	1.3	2.7
Bsf	26.7	35.7	13.0	19.7	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6

Equally weighted portfolio of 300 US assets with correlation assumptions: Base 2%; industry sector uplift 2% and industry uplift of 20%

Source: Fitch

The RDRs for portfolios with sizable industry concentrations are significantly higher compared to a fully diversified portfolio.

Calibration for Regionally Diverse Portfolios

The available default data outside the US is limited and does not prove whether a regionally diverse portfolio would perform differently to a portfolio of only US assets. However, it is Fitch's credit view that diversification can be achieved across regions. Therefore, the base level correlation for assets from different regions is lowered to one percentage point, with an uplift of 1% for all non-emerging market regions. This recovers the 2% base level correlation for North America, while giving limited diversification benefit for assets from different regions. The results shown in Figures 32, 33 and 34 remain unchanged for an all US portfolio.

Furthermore, Fitch believes that portfolios concentrated in any single country outside the US could have more volatile default rates than a portfolio diversified across the US. Therefore the base level correlation in the model for any two non-US assets within the same country is increased by 2%. For example, the pair-wise correlation between two German assets from different industries would be 4%, which compares to the 2% between two similar US assets.

Since western Europe is split into four regions in the PCM (see Figure 29) the regional benefit, together with the country correlation uplift, balance each other out and ensure that a portfolio diversified across western European countries is treated similar to an all US portfolio of similar assets.

Finally, Fitch believes that for assets within the same industry, country diversity depends on the industry in question. Some industries, such as banking and finance or energy (oil in particular), are predominately affected by industry-specific factors. These industries have been classified as global and country diversity is of limited benefit. On the other hand, industries such as utilities are driven primarily by local factors and as a result, two assets within such an industry but from different countries would be expected to be far less correlated.

Fitch recognizes that the proposed correlation structure is only a model and like other models relies on assumptions. However, in the absence of sufficient data, the model is designed to differentiate between concentrated and diverse portfolios.

Fitch's corporate correlation assumptions are shown in Figure 9 above.

Figures 35 and 36 provide the results for the large homogenous and randomly chosen benchmark non-US portfolios, using the full correlation structure.

Figure 35 shows the results for a single country portfolio, outside North America, which compares to Figure 32. The RDRs are higher for non US single country concentrations, reflecting Fitch's credit view that such portfolios may be subject to more volatile portfolio default rates than a diversified US portfolio.

Figure 35

Model RDR for 1991 Peak Portfolio – Single Country (Non-US)

	Asset Rating: B		Asset Rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	53.7	66.7	34.3	47.7	12.0	20.7	5.7	10.7
AA _{sf}	49.3	60.3	30.3	41.3	10.0	16.3	4.7	8.0
A _{sf}	44.3	53.7	26.0	34.7	8.0	12.7	3.3	5.7
BBB _{sf}	39.7	49.0	22.3	30.3	6.3	10.0	2.7	4.3
BB _{sf}	32.0	41.0	16.7	23.7	4.0	7.0	1.3	2.7
B _{sf}	27.3	36.0	13.3	20.0	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6

Source: Fitch

Figure 36 shows the results for a portfolio with no industry concentrations, which is diversified across western European countries. Here the results are comparable to a diversified US portfolio, as shown in Figure 33.

Figure 36

Model RDR for 1991 Peak Portfolio – Diversified Across Five European Countries

	Asset Rating: B		Asset rating: BB		Asset Rating: BBB		Asset Rating: A	
	5 year	10 year	5 year	10 year	5 year	10 year	5 year	10 year
Model output (%)								
Peak	38.7	49.5	19.7	29.7	4.5	9.3	1.61	4.02
AAA _{sf}	46.3	59.3	28.3	40.7	9.7	17.0	4.7	8.7
AA _{sf}	43.0	54.3	25.3	35.7	8.3	13.7	3.7	6.7
A _{sf}	39.3	49.0	22.3	31.0	6.7	11.0	3.0	5.0
BBB _{sf}	35.7	45.3	19.7	27.7	5.3	9.0	2.3	4.0
BB _{sf}	29.7	39.0	15.3	22.3	3.7	6.7	1.3	2.7
B _{sf}	26.3	35.3	13.0	19.7	2.7	5.3	1.0	2.0
Expected	21.6	32.2	10.1	17.5	1.9	4.5	0.6	1.6

Source: Fitch

Appendix 4: Standard Recovery Rate Assumptions

The assumptions are applied per rating category (eg for the 'A+sf' rating level, the assumption shown in the column 'Asf' is applied). In instances where Fitch provided asset-specific recovery rates and a specific recovery estimate, then the recovery rate assumption will be interpolated based on the assumptions for the recovery ratings, as shown in Figure 42.

Figure 37

Asset-Specific Recovery Rate Assumptions Group 1 and 2

Recovery Rating (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
RR1 (outstanding: 91-100%)	60	70	80	90	95	95
RR2 (superior: 71-90%)	45	55	65	75	80	85
RR3 (good: 51-70%)	30	35	45	55	60	65
RR4 (average: 31-50%)	10	15	20	25	40	45
RR5 (below average: 11-30%)	0	5	10	15	20	25
RR6 (poor: 0-10%)	0	0	0	0	5	5

Source: Fitch

Figure 38

Asset-Specific Recovery Rate Assumptions – Group 3

Recovery Rating (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
RR1 (outstanding: 91-100%)	5	10	30	50	70	90
RR2 (superior: 71-90%)	5	10	20	35	50	70
RR3 (good: 51-70%)	0	5	15	25	35	50
RR4 (average: 31-50%)	0	0	5	10	20	30
RR5 (below average: 11-30%)	0	0	0	0	5	10
RR6 (poor: 0-10%)	0	0	0	0	0	0

Source: Fitch

Categorisation will primarily be based on the seniority of the actual debt instrument with senior secured loans and bonds generally corresponding to “strong recovery prospects” and senior unsecured bonds corresponding to “moderate recovery prospects”. Other debt instruments, including second-lien loans, will commonly be categorised as having “weak recovery prospects”. However, where actual recovery experience is less than might be expected for the level of seniority, a lower categorisation may be used in specific cases.

The portfolio credit model also includes recovery assumptions for sovereign exposures, which may be used for, e.g. state-owned enterprises. The recovery assumptions are published in the Criteria Report [Covered Bonds and CDOs Public Entities Asset Analysis Rating Criteria](#).

Figure 39

Recovery Rate Assumptions

Recovery prospects (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Group 1 – US mainly						
Strong recovery	40	50	55	60	70	80
Moderate recovery	10	15	20	25	40	45
Weak recovery	0	0	5	10	15	20
Group 2 – Europe						
Strong recovery	35	40	50	60	65	70
Moderate recovery	10	15	20	25	40	45
Weak recovery	0	0	5	10	15	20
Group 3 – other						
Strong recovery	5	10	15	20	30	35
Moderate recovery	0	0	5	10	20	25
Weak recovery	0	0	0	0	5	5

Source: Fitch

Group 1

Australia, Bermuda, Canada, Cayman Islands, New Zealand, Puerto Rico, United States.

Group 2

Austria, Barbados, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Gibraltar, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Jersey, Latvia, Liechtenstein, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, United Kingdom.

Group 3

Albania, Argentina, Asia Others, Bahamas, Bosnia and Herzegovina, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Dominican Republic, Eastern Europe Others, Ecuador, Egypt, El Salvador, Greece, Guatemala, Hungary, India, Indonesia, Iran, Jamaica, Kazakhstan, Liberia, Macedonia, Malaysia, Malta, Marshall Islands, Mauritius, Mexico, Middle East and North Africa Others, Moldova, Morocco, Other Central America, Other South America, Other Sub Saharan Africa, Pakistan, Panama, Peru, Philippines, Qatar, Romania, Russia, Saudi Arabia, Serbia and Montenegro, South Africa, Thailand, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, Vietnam.

The following tables show the recovery rates for Portugal and Italy, adjusted in accordance with the principles stated in the section *Sovereign-Related Risk*. In all three cases, the recovery rate assumptions at the rating level of the country cap were equal to the 'AAAsf' recovery assumptions described above; the base case continues to be based on the country group. Note that recoveries may change as the country cap changes.

Figure 40

Asset-Specific Recovery Rate Assumptions – Italy/Portugal

Recovery Rating (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
RR1 (outstanding: 91-100%)	50	60	70	75	85	95
RR2 (superior: 71-90%)	35	45	55	60	75	85
RR3 (good: 51-70%)	25	30	35	40	55	65
RR4 (average: 31-50%)	5	10	15	25	40	45
RR5 (below average: 11-30%)	0	0	5	10	15	25
RR6 (poor: 0-10%)	0	0	0	0	0	5

Source: Fitch

Figure 41

Recovery Rate Assumptions – Portugal/Italy

Recovery prospects (%)	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Italy/Portugal						
Strong recovery	30	35	40	50	60	70
Moderate recovery	5	10	15	20	30	45
Weak recovery	0	0	5	10	15	20

Source: Fitch

Interpolation Example for Specific Recovery Estimates

In instances where Fitch is provided with a specific recovery estimate by the corporate analyst, the recovery assumptions will be interpolated between the closest two recovery ratings, based on the 'BBsf' column, which corresponds to the mid-point recovery rate for each recovery rating band. The agency has defined interpolation rows in 5 percentage point increments (Figure 42). The interpolation is linear and based on the closest two rows. The last row in the table shows the resulting recovery rates for a recovery estimate of 67%.

Figure 42

Asset-Specific Recovery Rate Assumptions

Recovery Rating (%)	Interpolation boundary	AAAsf	AAsf	Asf	BBBs	BBsf	Bsf
	100	60	70	80	90	100	100
RR1 (outstanding: 91-100%)	95	60	70	80	90	95	95
	90	55	65	75	85	90	90
	85	50	60	70	80	85	90
RR2 (superior: 71-90%)	80	45	55	65	75	80	85
	75	40	50	60	70	75	80
	70	35	45	55	65	70	75
	65	35	40	50	60	65	70
RR3 (good: 51-70%)	60	30	35	45	55	60	65
	55	25	30	40	45	55	60
	50	20	25	35	40	50	55
	45	15	20	25	35	45	50
RR4 (average: 31-50%)	40	10	15	20	25	40	45
	35	5	10	15	20	35	40
	30	0	5	10	15	30	35
	25	0	5	10	15	25	30
RR5 (below average: 11-30%)	20	0	5	10	15	20	25
	15	0	0	5	10	15	20
	10	0	0	0	5	10	15
RR6 (poor: 0-10%)	5	0	0	0	0	5	5
	0	0	0	0	0	0	0
Recovery estimate -	67	35	42	52	62	67	72

Source: Fitch

Appendix 5: Fitch IDR Equivalency Map

For the purposes of analysing corporate CDOs, the Fitch IDR is one of the primary drivers of default probability for the underlying portfolio assets. In the absence of an IDR, Fitch will map to the equivalent IDR rating from the security rating of another instrument within the issuer's capital structure. Ratings assigned to guaranteed instruments will only be taken into account to the extent the underlying guarantee relates to the issuer, rather than the specific debt instrument. For example, a guarantee by a parent to a subsidiary which leads to a higher rating for the debt issued by the subsidiary would be considered. On the other hand, a guarantee provided by a sovereign on the specific bond of a bank would be disregarded when deriving the IDR from the instrument rating.

In the event that Fitch does not provide any ratings or credit opinions (CO) for the issuer, public or private, Fitch will look to the public ratings provided by Moody's or S&P. To determine the equivalent IDR rating from either Moody's or S&P ratings, Fitch will apply the mapping illustrated below. If there are public ratings provided by both agencies, the lower of the two IDR equivalent ratings will be applied. Otherwise, the sole IDR equivalent rating from either Moody's or S&P will be applied.

The IDR equivalent rating takes into account adjustments for assets that are on Rating Watch Negative or negative credit watch, as well as Negative Outlook as described earlier in this report (see sections *Adverse Selection*). These adjustments are made prior to mapping from the issue rating to the IDR equivalent rating.

Furthermore, Fitch may provide a CO on the issuer or attribute a rating of 'CCC' as deemed appropriate depending on the issuer and/or portfolio characteristics. For example, if Fitch is aware that other agencies have a private rating higher than 'CCC', unrated assets may be considered as 'B-' instead of 'CCC' if the share of unrated assets is sufficiently large to become a driver of the rating. Another example would be if an entity is classified as defaulted by any manager and there is insufficient public information available, Fitch would typically treat such credit exposures as 'D'.

COs are assigned by committees in Fitch's corporate and financial institutions groups in accordance with their established policies and procedures. In assigning COs, Fitch may use its Corporate Credit Opinion Tool (CCOT). The results of the tool are presented to a corporate credit committee, which assigns the final COs. COs used for rating CLOs are updated at least annually, in line with the public ratings assigned to CLOs.

The purpose of the CCOT is to give the corporate analyst an initial indicative IDR on corporate entities. In order to derive the indicative IDR level, key corporate credit metrics specific to the company being examined are effectively related to a large recent sample of actual COs/ratings and/or metric levels.

Figure 43

Fitch IDR Equivalency Map from Corporate Ratings

Rating type	Rating agency(s)	Issue Rating	Mapping rule
Corporate family Rating LT issuer Rating	Moody's	n.a.	0
Issuer credit Rating	S&P	n.a.	0
Senior unsecured	Fitch, Moody's, S&P	Any	0
Senior, senior secured or subordinated secured	Fitch, S&P	BBB- or above	0
	Fitch, S&P	BB+ or below	-1
	Moody's	Ba1 or above	-1
	Moody's	Ba2 or below	-2
	Moody's	Ca	-1
Subordinated, junior subordinated or senior subordinated	Fitch, Moody's, S&P	B+, B1 or above	1
	Fitch, Moody's, S&P	B, B2 or below	2

Source: Fitch

Figure 44

The Following Steps are Used to Calculate the Fitch IDR Equivalent Rating

- 1 Fitch IDR^a
- 2 If Fitch has not issued an IDR, but has an outstanding Long-Term Financial Strength Rating, then the IDR equivalent is one rating lower.
- 3 If Fitch has not issued an IDR, but has outstanding corporate issue ratings, then the IDR equivalent is calculated using the mapping in the table above.
- 4 If Fitch does not rate the issuer or any associated issuance, then determine a Moody's and S&P equivalent to Fitch's IDR pursuant to steps 5 and 6.
- 5a A public Moody's-issued Corporate Family Rating (CFR) is equivalent in definition terms to the Fitch IDR. If Moody's has not issued a CFR, but has an outstanding LT Issuer Rating, then this is equivalent to the Fitch IDR.
- 5b If Moody's has not issued a CFR, but has an outstanding Insurance Financial Strength Rating, then the Fitch IDR equivalent is one rating lower.
- 5c If Moody's has not issued a CFR, but has outstanding corporate issue ratings, then the Fitch IDR equivalent is calculated using the mapping in the table above.
- 6a A public S&P-issued Issuer Credit Rating (ICR) is equivalent in terms of definition to the Fitch IDR.
- 6b If S&P has not issued an ICR, but has an outstanding Insurance Financial Strength Rating, then the Fitch IDR equivalent is one rating lower.
- 6c If S&P has not issued an ICR, but has outstanding corporate issue ratings, then the Fitch IDR equivalent is calculated using the mapping in the table above.
- 7 If both Moody's and S&P provide a public rating on the issuer or an issue, the lower of the two Fitch IDR equivalent ratings will be used in PCM. Otherwise the sole public Fitch IDR equivalent rating from Moody's or S&P will be applied.

^a Refers to the terms Fitch Issuer Default Rating or Fitch Issuer Default credit opinion referred to together as the Fitch IDR as noted on page 4 of this report
Source: Fitch

Appendix 6: Calculation of Fitch WARF and Fitch WARR

The Fitch WARF is a numerical value that describes the weighted average credit quality of the portfolio. Each asset is assigned a numerical value with respect to the credit quality of that particular issuer. Fitch's rating factor scale ranges from 0 to 100 and equates to the 10-year asset default rate used in Fitch's Portfolio Credit Model (PCM).

The first step in calculating the Fitch WARF is to determine the Fitch IDR Equivalency Rating for each collateral obligation in the portfolio, in accordance with the process described in *Appendix 5*. We then multiply the notional balance of the asset by the Rating Factor associated with the appropriate Fitch IDR Equivalency Rating from Figure 45 and sum these products. Finally, we divide the sum by the total notional balance of the portfolio.

The Fitch WARR is a numerical value that describes the weighted average recovery rate of the portfolio. Each asset is assigned a numerical value that reflects the recovery prospects of that particular security in a base scenario. The rate to be used is either the recovery estimate provided by the corporate team, or the 'B' rating stress assumption for the recovery categories (i.e. Strong/Moderate/Weak) as shown in Figure 39. If a recovery rating is provided instead of a recovery estimate, the midpoint of the corresponding rating band should be used, as shown in Figure 45.

The first step in calculating the Fitch WARR is to determine the Fitch Recovery Classification or Recovery Estimate for each collateral obligation in the portfolio.

We then multiply the notional balance of the asset by the Recovery Factor associated and sum these products. Finally, we divide the sum by the total notional balance of the portfolio.

Figure 45

Fitch WARF and WARR Scales

Fitch IDR equivalency Rating	Rating factor
AAA	0.19
AA+	0.35
AA	0.64
AA-	0.86
A+	1.17
A	1.58
A-	2.25
BBB+	3.19
BBB	4.54
BBB-	7.13
BB+	12.19
BB	17.43
BB-	22.80
B+	27.80
B	32.18
B-	40.60
CCC+	62.80
CCC	62.80
CCC-	62.80
CC	100.00
C	100.00
D	100.00

Fitch recovery classification	Recovery factor
RR1	95.00
RR2/strong	80.00
RR3	60.00
Moderate	45.00
RR4	40.00
RR5/weak	20.00
RR6	5.00

Source: Fitch

Appendix 7: Default Timings

Figure 46

Share of RDR (%)

Year	0.5, 1, 1.5 WAL	2, 2.5 WAL	3, 3.5 WAL	4, 4.5 WAL	5, 5.5 WAL	6, 6.5 WAL	7, 7.5 WAL	8, 8.5 WAL	9, 9.5 WAL	10+ WAL
Front-loaded default timing										
1	100	75	50	50	40	35	35	33	33	30
2	—	25	25	25	25	25	25	22	22	20
3	—	—	25	12.5	15	10	10	9	9	8.3
4	—	—	—	12.5	10	10	10	9	9	8.3
5	—	—	—	—	10	10	10	9	9	8.3
6	—	—	—	—	—	10	10	9	9	8.3
7	—	—	—	—	—	—	—	9	9	8.3
8	—	—	—	—	—	—	—	—	—	8.3
9	—	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—	—
Mid-loaded default timing										
1	100	50	25	17.5	10	10	5	—	—	—
2	—	50	50	25	15	10	10	9	—	—
3	—	—	25	40	25	25	10	9	9	8.3
4	—	—	—	17.5	35	35	25	22	9	8.3
5	—	—	—	—	15	10	35	33	22	8.3
6	—	—	—	—	—	10	10	9	33	20
7	—	—	—	—	—	—	5	9	9	30
8	—	—	—	—	—	—	—	9	9	8.3
9	—	—	—	—	—	—	—	—	9	8.3
10	—	—	—	—	—	—	—	—	—	8.3
Back-loaded default timing										
1	100	25	25	12.5	10	10	5	—	—	—
2	—	75	25	12.5	10	10	10	9	—	—
3	—	—	50	25	10	10	10	9	9	8.3
4	—	—	—	50	25	15	10	9	9	8.3
5	—	—	—	—	45	20	10	10	9	8.3
6	—	—	—	—	—	35	20	10	10	8.3
7	—	—	—	—	—	—	35	20	10	8.3
8	—	—	—	—	—	—	—	33	20	8.3
9	—	—	—	—	—	—	—	—	33	20
10	—	—	—	—	—	—	—	—	—	30

Source: Fitch

Appendix 8: Allocation of Defaults to Reinvestments

Figure 47 illustrates how defaults are allocated to reinvestments. The example consists of a portfolio with an eight-year bullet maturity and a 30% default rate, applied over a mid-loaded default timing scenario. For simplicity, Fitch assumes USD10 of recovery proceeds are received and reinvested in year four.

The periodic default rate relative to the outstanding, rather than initial, performing balance of the portfolio is used to derive defaults in the reinvestment portfolio. This ensures that the relative default rate applied to the remaining original portfolio from year four onward (when reinvestment occurs) is also applied to the reinvestment portfolio.

The relative default rate on the remaining portfolio from year four onwards is equal to the sum of the portions of the initial 30% default rate applied in years four to seven (9.9%, 2.7%, 2.7%, and 2.7% for a total of 18%) divided by the remaining portfolio balance in year four; this indicates a relative default rate on the remaining portfolio of $18/88 = 20.5\%$. This 20.5% default rate is then applied to the reinvestment portfolio over years four to seven, as displayed in row h in Figure 47.

Figure 47

Default Methodology Example

Row	Calculation								
a	Total default rate (%)	30.0	—	—	—	—	—	—	—
b	Year	1	2	3	4	5	6	7	8
c	Default timing (% of initial portfolio)	9.0	9.0	22.0	33.0	9.0	9.0	9.0	—
d	Outstanding performing portfolio (USD)	100.0	97.3	94.6	88.0	78.1	75.4	72.7	70.0
e	(c)x(a) Periodic default rate (% of initial portfolio)	2.7	2.7	6.6	9.9	2.7	2.7	2.7	0.0
f	(e)/(d) Periodic default rate (% of outstanding portfolio)	2.7	2.8	7.0	11.3	3.5	3.6	3.7	0.0
g	Outstanding reinvestment portfolio (USD)	—	—	—	10.0	8.9	8.6	8.3	8.0
h	(g)x(f) Default amount using periodic default rate (USD)	—	—	—	1.1	0.3	0.3	0.3	0.0

Source: Fitch

Appendix 9: Sample Asset Manager Operational Assessment Agenda

Organisation

- Legal/ownership structure overview
- Strategy and business plan (eg CLO issuance, risk retention, warehousing)
- Staffing: turnover, new hires, key employee departures

CLO Portfolio Management and Loan Investment Process

- Team structure and process
 - Team composition – number of portfolio managers (PMs)/analysts/support staff
 - Profile of key executives and PMs
 - PM/analyst responsibilities, lines of communication, team meetings
 - Team workload - number of credits per analyst
 - Articulation of loan investment process
 - Asset screening/deal flow
 - Credit write-up example
 - Investment committee (composition and authority)
 - CLO management strategy and positioning
- Loan monitoring
 - Analyst responsibilities
 - Frequency of credit meetings (scheduled or ad hoc)
 - Full portfolio review
 - Internal process for managing credits
 - Determining buy/sell, internal scoring/ratings
 - Early warning system, sale indicators
 - Distressed credits
- Portfolio Management Tools
 - Front-end system, dashboards, other PM reports (demo or screenshots)
 - Proprietary or third party applications
 - Interaction between PMs/credit team and systems and tools used
 - Planned enhancements

Technology/CLO Administration

- IT infrastructure and staff overview
 - In-house vs. outsourced functions (CLO specific)
- Front/middle/back office systems integration
 - Overview of key individuals and role
 - CLO compliance monitoring – updates regarding systems used
 - Pre-trade compliance process and PM communication with operations team
 - Trustee monitoring (data files, frequency, reconciliation process)
 - Data feeds used for pricing, ratings, etc

- Disaster recovery and business resumption plans
 - Backup routines
 - Cybersecurity measures

Procedures and Controls (Specific to CLO Operations)

- Internal audit process
- External audits, recent SEC examinations and material findings
- Review frequency of policies and procedures manuals
- Compliance overview

Appendix 10: RRR Interpolation Grid for Market Standard European Leveraged Loan CLOs and US Middle Market CLOs

European CLOs and US Middle Market CLOs include a matrix of different combinations of WARR, WARF and WAS covenants. Due to the size of the matrix it is not feasible for Fitch to create a bespoke stress portfolio for each WARR point. In order to analyse the covenant matrix Fitch would create an interpolation table based on the minimum required senior secured exposure under the transaction documents. The following table shows the interpolation table for a typical transaction with a minimum of 90% senior secured exposure.

For example, for a WARR covenant of 62.5% the interpolation grid points for a WARR of 60% and 65% will be used. At a 'BBB' rating stress level the interpolated RRR will be 53.35%, ie the average between 50.2% and 56.5%, which are the RRR levels for the interpolation points.

Figure 48

RRR Grid for WARR<50%

WARR covenant (%)	0	5	10	15	20	25	30	35	40	45
AAA	0.00	0.00	0.00	0.70	2.60	4.30	6.10	7.90	9.70	14.40
AA	0.00	0.00	1.40	3.40	5.70	7.80	9.90	12.30	14.70	19.40
A	0.00	0.00	3.20	6.20	8.90	11.50	14.10	16.90	19.90	25.40
BBB	0.00	0.00	4.80	8.90	12.20	15.20	18.30	21.70	25.00	32.00
BB	0.00	4.60	9.70	14.60	20.00	25.10	29.50	34.60	40.00	44.60
B	0.00	4.90	12.00	18.00	23.70	29.10	34.00	39.40	44.90	50.00
CCC	0.00	4.90	12.00	18.00	23.70	29.30	33.90	39.20	44.90	50.20

Source: Fitch

Figure 49

RRR Grid for WARR≥50%

WARR covenant (%)	50	55	60	65	70	75	80	85	90	95
AAA	19.00	23.30	27.70	32.50	36.70	40.50	44.90	50.30	54.30	59.50
AA	24.20	29.00	33.70	38.90	44.00	48.70	53.80	59.50	64.10	69.40
A	31.40	36.60	41.90	47.70	53.10	57.90	63.40	69.20	74.20	79.50
BBB	38.70	44.30	50.20	56.50	62.20	67.00	72.80	78.70	83.70	89.10
BB	49.50	54.10	58.70	63.80	68.70	73.30	78.50	84.40	89.00	94.40
B	54.90	59.40	64.00	68.60	73.40	77.70	82.60	87.10	91.40	94.90
CCC	54.80	59.70	64.30	68.90	73.50	78.10	82.70	87.30	91.20	95.10

Source: Fitch

Appendix 11: Fitch Reporting

The publication of Fitch's analytical inputs in the regular CLO reporting for investors further strengthens our core principles — objectivity, independence, integrity, and transparency. The following is a list of asset-specific attributes to be included in the regular reporting.

- Asset name
- Asset identifier (CUSIP, ISIN, LX ID, LIN, or FIGI)
- Obligor name
- Obligor identifier (CUSIP, ISIN, LX ID, LIN, or FIGI)
- Notional balance of asset
- Asset maturity date
- Fitch industry and sector in line with Figure 29
- Fitch country and region in line with Figure 29
- Fitch IDR or IDCO*, Watch or Outlook status and effective date, if publicly available
- Fitch IDR Equivalency in line with *Appendix 5*
- Fitch Recovery Rating, if publicly available
- Fitch Rating Factor in line with Figure 45
- Fitch Recovery Classification in line with *Appendix 6*
- Fitch Recovery Factor in line with Figure 45 or Fitch Recovery Estimate in line with *Appendix 4*

* Fitch IDCO should be shown in lower case with an asterisk. For example, b-.*.

- The following is a list of portfolio-specific attributes to be included in the regular reporting. Total notional balance of all assets
- Total balance of cash
- Total notional balance of defaulted assets
- Concentration of defaulted assets expressed as a Percentage of all assets
- Total notional balance of assets with a Fitch IDR or IDCO of 'CCC+' or lower
- Concentration of assets with a Fitch IDR or IDCO of 'CCC+' or lower expressed as a percentage of all assets
- Total notional balance of assets with a Fitch IDR Equivalency of 'CCC+' or lower
- Concentration of assets with a Fitch IDR Equivalency of 'CCC+' or lower expressed as a Percentage of all assets
- Largest Fitch Industry concentration expressed as a Percentage of all assets
- Second-largest Fitch Industry concentration expressed as a percentage of all assets
- Third-largest Fitch Industry concentration expressed as a percentage of all assets
- Current Fitch weighted average rating factor (WARF) in line with *Appendix 6*
- Maximum Fitch WARF test covenant, if applicable
- Current Fitch weighted average recovery rating (WARR) in line with *Appendix 6*
- Minimum Fitch WARR test covenant, if applicable

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Structured Finance CDOs Surveillance Rating Criteria

Sector-Specific Criteria

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This report replaces the criteria report titled "Structured Finance CDOs Surveillance Rating Criteria," dated June 6, 2017. The rating analysis in this report is substantially the same as that in the previously published report.

Scope

This criteria report outlines the framework that Fitch Ratings uses to monitor and analyze outstanding structured finance collateralized debt obligations (SF CDOs) backed by portfolios of ABS, RMBS, CMBS and CDO bonds as well as REIT TruPS CDOs. The analysis of CDOs that were issued between 2004 and 2007, where collateral is predominantly U.S. Commercial Real Estate Loans (CREL), is addressed under the "U.S. CREL CDO Surveillance Criteria."

Key Rating Drivers

The ratings of existing SF CDO transactions are based on various key rating drivers. These drivers determine the appropriate rating actions and drive the implementation of certain rating caps.

Default Probability of Assets: An asset's individual rating and term to maturity are the main parameters for its likelihood of default. Along with default correlation, these characteristics determine the magnitude of defaults in the portfolio over the life of a CDO.

Correlation Impact: High default correlation results in a higher portfolio default for a given confidence interval. Higher rated notes must be able to withstand a wider range of defaults with a higher correlation. In Fitch's SF Portfolio Credit Model (SF PCM), correlation is driven by sector and geographical concentration of the underlying assets. Fitch will generally apply a rating cap for transactions where a predominant (>50%) share of the collateral is represented by same sector/same vintage grouping assets from a single country, with the few exceptions listed on page 5.

Recovery on Defaulted Assets: Recovery rates for defaulted assets are primarily driven by an underlying asset's tranche thickness and seniority within its respective capital structure.

Amortization Impact: Both the default rate and timing are sensitive to the amortization profile of the underlying portfolio. The impact is analyzed in the SF PCM model. Amortization also affects the amount of excess spread in a transaction and availability of principal proceeds to cover any potential interest shortfalls.

CDO Structure and Cash Flow Analysis: CDO structural features and hedging strategies, as well as the timing of defaults and recoveries, have a meaningful impact on CDO performance. Fitch analyzes these factors under the framework described in the Cash Flow Analysis section.

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Overview

In the absence of material changes, Fitch will conduct a performance review for each transaction at least once every 12 months. In addition to these annual reviews, the existing ratings are subject to interim reviews as described in the Frequency of Reviews section. Rating reviews will include portfolio analysis generally using SF PCM and structural analysis, which may employ Fitch's cash flow model (CFM). For some transactions with a majority of the portfolio rated at distressed rating levels, an alternative review process may be warranted, as described in the Review of Distressed Transactions section.

As part of Fitch's performance review, the transaction is taken to a surveillance committee, where the results of the described methodology are evaluated in detail. However, the final ratings are ultimately assigned by a rating committee that may take into account other qualitative factors. Any material transaction-specific variations from the assumptions outlined in this criteria report will be disclosed in the related rating action commentary.

The committee would upgrade or downgrade ratings to full category levels only. For a rating to be upgraded to the next higher category, the model implied rating would have to be equal or higher than the "+" notching level of the category above. For example, in order to upgrade to 'BBBsf', the model implied rating would have to be 'BBB+sf' or higher.

For a rating to be downgraded, the model implied rating would have to be equal to or lower than the rating category below. For example, in order to downgrade to 'BBBsf', the model implied rating would have to be 'BBB+sf' or lower.

When upgrading or downgrading ratings, the committee would only assign notch-specific ratings if the transaction is subject to a rating cap or credit linked as a result of, for example, counterparty risk or sovereign risk, among others.

Quantitative Models and Assumptions

Fitch's primary tool in assessing key rating factors of SF CDOs is its SF PCM. The model is updated from time to time, and a release log is maintained on the website to indicate the updated features and assumptions. A description of the data used to derive the assumptions of the Fitch SF PCM is described generally above and in more detail within the respective sections discussing the rating factors.

Default Probabilities

Base Assumptions

Empirical corporate default statistics are used as input default probabilities for underlying SF assets. The Fitch international long-term credit rating scale is used as a benchmark measure of probability of default and is intended to be equivalent across a broad range of market sectors.

Asset default probabilities used for the SF PCM are based on a three-decade-long default experience, an observation period longer than the one available for SF assets and covering several economic cycles. Corporate default observations also reflect the experience of a wide spectrum of corporate entities. Appendix 1 includes an abbreviated version of the full default statistics table, which is published in the SF PCM and available for download and installation at www.fitchratings.com.

Observed over a long-term and broad sample, default probabilities for a given rating and term should be similar. However, over shorter periods and/or smaller samples, default probabilities for a

Related Criteria

[Global Structured Finance Rating Criteria \(May 2018\)](#)

[CLOs and Corporate CDOs Rating Criteria \(February 2018\)](#)

[Exposure Draft: Structured Finance and Covered Bonds Counterparty Rating Criteria \(May 2018\)](#)

[Structured Finance and Covered Bonds Counterparty Rating Criteria: Derivative Addendum \(May 2018\)](#)

[Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria \(February 2018\)](#)

[Fitch Portfolio Credit Model](#)

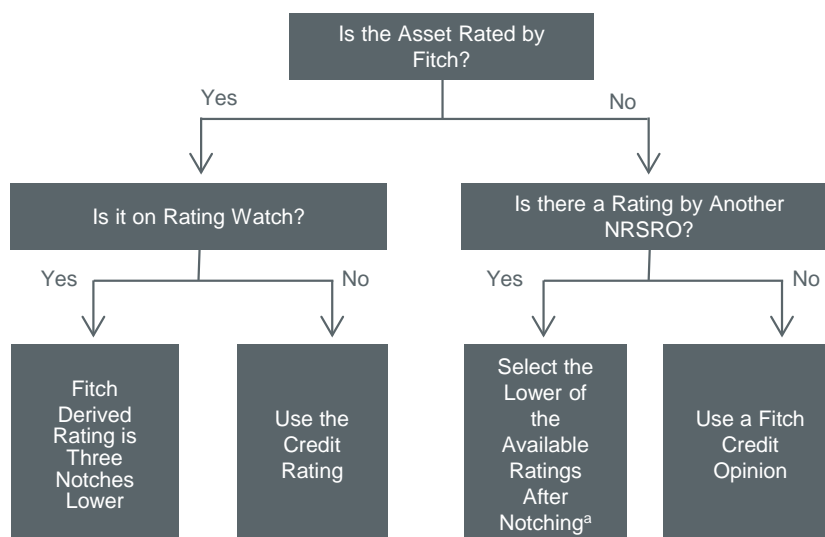
given rating and term may be different. Several SF asset types have experienced default rates above their long-term averages in 2007–2013 and also above default rates experienced by corporate ratings.

Another factor contributing to these differing default rates is cyclical, which may lead to peaks in default rates occurring at different times. This may lead to short-term variability but should not lead to significant changes in long-term average rates. However, the poor performance of individual SF sectors highlights the high risk of correlation in SF CDOs, which is further examined in the Default Correlation section on the following section.

Additional Considerations

The approach calls for the use of a Fitch rating where available. Where a particular asset is not rated by Fitch, the lowest of the ratings assigned by other rating agencies will be applied, as shown on the chart below if an asset carries a Negative Rating Watch, the credit rating will be reduced by an assumed three notches for the purpose of determining the appropriate input default probability.

Fitch-Derived Rating Structure



^a If a rating is on Rating Watch Negative by any NRSRO, Fitch adjusts the rating down by three notches before selecting the lower of the available ratings.

For a CREL asset without a public rating, Fitch will assign a credit opinion in accordance with the CMBS criteria outlined in “CMBS Large Loan Rating Criteria” dated August 2017. An abbreviated review will be conducted if a CREL asset represents a relatively small proportion of the CDO collateral.

An abbreviated review includes a determination of net cash flow based on a review of the current and historical property operating performance and current rent roll, as applicable; a review of the basic loan terms, as provided by the collateral manager; a determination of the current and stressed refinance debt service coverage ratio; and a determination of the current and stressed loan-to-value ratio. The ratings would be assigned based on parameters outlined in the CMBS criteria. When updated operating performance is not received, Fitch may make conservative assumptions based on previous performance or assume a ‘CCCsf’ rating.

For other nonpublicly rated assets, Fitch will assume a 'CCCsf' rating unless a higher (or lower) rating is warranted in the analyst's opinion, based on information in the public domain and/or collateral manager discussions.

The SF PCM treats SF bonds rated 'CCsf' and 'Csf' as 'Dsf', consistent with Fitch's annual transition and default studies, which consider bonds at these rating levels impaired or nearly defaulted.

In instances where a sector experiences ongoing volatility with ratings under review, alternative adjustments may apply. In addition, ratings on assets or sectors with a Negative Rating Outlook may be lowered based on discussions with the underlying asset rating groups. Several scenarios with respect to the severity of potential negative migration of the underlying assets with a Negative Rating Outlook may be considered.

Fitch may perform sensitivity testing with respect to other model inputs when considering an upgrade. For example, additional scenarios with an extended weighted average life (WAL) for some assets may be included in the analysis to reflect a heightened extension risk.

Fitch will disclose adjustments described above in its rating action commentaries.

Default Correlation

Although the long-term average annual global SF default rates are expected to be commensurate with those of corporate debt, the SF sector shows greater variability around this annual average, particularly when looking within a single sector. This increased volatility and the clustering of defaults are indicative of the high level of correlation inherent in portfolios of SF assets; it is reflected in the calibration of the SF correlation framework.

Given the typically concentrated nature of SF CDO portfolios, Fitch uses the correlation input to express its credit view on a portfolio concentrated in the worst-performing SF sector, RMBS and then estimates benefits for diversification across SF sectors and the countries of the assets' origin.

The SF PCM output is defined in terms of the rating default rate (RDR). The RDR varies for rating stress and can be interpreted as the level of portfolio defaults that must be protected against to achieve a particular rating. Therefore, the 'Asf' RDR represents the level of defaults that a note is able to withstand to achieve an 'Asf' rating.

Fitch's credit view is that CDO notes rated 'Asf' or above should be protected against historical peak levels of defaults. Therefore, the SF PCM should produce an 'Asf' RDR level at or above the potential peak.

For the base calibration, Fitch used a 10-year portfolio of 100 'BBBsf' rated assets, all assumed to be from a single SF sector. Fitch's default studies track performance data by cohorts, defined as a static pool of bonds with ratings outstanding at the beginning of the year. For SF bonds, Fitch tracks the impairment rate, which includes a downgrade to a 'CCsf' and lower rating and represents defaults and near defaults. The Fitch framework was established using 70% as the target SF PCM RDR at the 'Asf' rating level for a single country, single sector and single vintage grouping portfolio of 'BBBsf' rated assets. This 'Asf' RDR level implies an 80% correlation of default between a pair of assets from the same-country, same-sector and same-vintage grouping.

While Fitch recognizes that the cumulative impairment rates for the worst-performing SF asset cohorts (CDOs and RMBS) have increased beyond the 70% target, the impairment rates have levelled off.

An upward revision of the target RDR would result in a correlation approaching 100%, treating the portfolio as if it were one asset. This treatment would mask even minimal levels of idiosyncratic risk inherent in the portfolio. While it is appropriate to have high correlation to properly account for high

volatility of portfolios concentrated in the same country, sector and vintage, some level of performance differentiation between the assets should remain. The proposed correlation target balances the high degree of the systematic risk present in a concentrated portfolio with protecting subordinate classes against some minimum level of idiosyncratic risk.

With this in mind, Fitch's surveillance methodology will apply a rating cap for transactions where a predominant (>50%) share of the collateral is represented by same sector/same vintage grouping assets from a single country. In such transactions, Fitch will limit the rating of the notes to a maximum of 'BBBs'. In addition, consideration will be given to portfolios with excessive obligor concentration risk. For example, Fitch will not upgrade the notes above 'BBBs' when the portfolio is comprised of fewer than 10 obligors.

This rating cap will not apply to senior notes that are likely to be paid in full within the next year, which are largely covered by cash and eligible investments available in the principal collection account, or in transactions where a look-through analysis of the underlying portfolio supports a higher rating. For example, a look-through analysis of a concentrated CRE CDO transaction involves a review of current risk factors of underlying loan pools within CMBS collateral (i.e. underlying loan delinquencies, pool and property type concentrations, etc.), which offers insight into the potential for future losses.

Correlation Framework

SF Base Correlation	Country Add-On	Sector Grouping Add-On	Sector Add-On	Vintage Grouping Add-On ^a	Total Correlation (%)
SF Asset + 20%	Same Country + 10%	Direct Residential Real Estate Exposure + 5%	RMBS + 15%	Same + 30%	80
			Residential REIT + 5%	N.A.	40
		Direct Commercial Real Estate Exposure + 5%	CMBS and CREL + 15%	Same + 30%	80
			Commercial REIT + 5%	N.A.	40
		No Direct Real Estate Exposure + 0%	Consumer ABS + 20%	Same + 30%	80
			Commercial ABS + 20%	Same + 30%	80
			Corporate CDOs + 50%	N.A.	80
			SF CDOs + 60%	N.A.	90
			RMBS, CMBS, CREL, Commercial REIT, Residential REIT, Consumer ABS, Commercial ABS + 0%	N.A.	20
			Corporate CDOs + 50%	N.A.	70
			SF CDOs + 60%	N.A.	80
	Different Country + 0%	N.A.			

^aVintage grouping add-on is applied to two bonds from the same vintage grouping. Current vintage groupings are: vintage 1 (2010 and later), vintage 2 (2005–2009) and vintage 3 (2004 and prior). N.A. – Not applicable.

Fitch recognizes the benefit of diversification across countries and SF sectors by lowering correlation between a pair of assets from different countries and sector groups. At each potential level of diversification, Fitch sought to estimate the impact such diversification may have on influencing the peak portfolio default rate. This approach does not seek to predict future peak portfolio default rates, but, rather, it expresses a relative view of diversification benefit. Fitch's correlation framework is summarized in the table above.

Diversification Benefit One: Sector Diversification

Sector diversification recognizes that assets from different sectors show different default statistics due to different risk factors driving the probability of default. The approach divides SF assets into eight broad sectors, as shown in the table below.

Structured Finance Portfolio Credit Model (SF PCM) Categories

1	Residential mortgages, including prime, Alt-A and subprime assets
2	CMBS
3	Consumer ABS (e.g. credit card assets and auto loans assets).
4	Commercial ABS (e.g. trade receivables and equipment leasing assets)
5	Corporate CDOs
6	SF CDOs (tranches from CDOs with exposure to structured finance assets)
7	Real estate investment trusts (REITs)
8	Commercial real estate loans (CREL)

Source: Fitch Solutions.

SF CDOs that have classes from other SF CDOs as underlying assets exhibit increased ratings volatility and clustered default characteristics due to the high level of systematic risk. This is because each individual CDO has diversified its idiosyncratic risk by reducing the level of dependence on any one asset; hence, there is little idiosyncratic risk but significant systematic remaining. The high systematic risk implies that these portfolios are driven by the same small number of risk factors and exhibit similar default characteristics during periods of stress. As a result, the target 'Asf' RDR of SF CDOs with exposure to SF CDOs has been set higher than for other asset classes at 87%. This reflects the increased probability of clustered default characteristics due to the high correlation of the assets to similar factors.

CREL are often included in the portfolios of Commercial Real Estate Structured Finance CDOs (CRE SF CDOs). The CREL exposure may range from senior debt (whole loans or A notes) to some form of subordinate debt (either B notes or mezzanine debt). Senior tranches of CMBS single-borrower transactions are treated as senior CREL debt. Nonsenior tranches of CMBS single-borrower transactions and so-called rake bonds are treated as subordinate CREL debt.

Diversification Benefit Two: Geographic Diversification

Geographic diversification is the most significant portfolio diversification benefit in the SF PCM. A portfolio diversified across countries reduces the correlation among the assets due to different economic risk factors driving the underlying assets. This is reflected in the correlation framework by not including country or sector add-ons. For example, two same-country RMBS assets would have 50% correlation, but two different-country RMBS assets would have only 20% correlation.

It is Fitch's view that the diversification benefit of mixing assets from different countries is greater than the diversification benefit of mixing assets from different sectors. In other words, portfolios of assets from different countries, even if from the same sector, represent lower credit risk than portfolios from the same country of origin diversified across sectors.

Structured Finance and Real Estate Investment Trusts

Commercial real estate investment trust (REIT) debt is often included with SF securities, particularly in CRE SF CDOs. The correlation structure recognizes that REITs, as a corporate industry with primary exposure to real estate markets, are more correlated to SF assets than other corporate industries. The structure also recognizes that some level of diversification benefit can be gained by adding REIT assets to a portfolio otherwise consisting solely of SF securities.

The base correlation between same-country REIT and SF assets is set at 30%. An additional 5% correlation (total 35%) is ascribed between RMBS and Residential REITs and between CMBS or CREL and commercial REITs.

The correlation assumption between two residential or two commercial REITs is assumed to be 40%, recognizing that common exposure to residential or commercial real estate markets

brings the potential for a higher level of systematic risk than is typical within a corporate industry (intra-industry corporate correlation assumptions typically range from 24%–26%). The correlation assumptions ascribed to REIT sectors not only recognize the potential for higher systematic risk, but also that REIT debt often appears in concentrated portfolios. The default correlation figures are set to penalize for the risk that a concentrated portfolio may exhibit default-rate variability beyond that observed in peak corporate portfolio default statistics.

For a portfolio of 100 'BBBsf' rated, 10-year single-country CMBS assets, the 'Asf' rated RDR is 70%. In contrast, the portfolio of 50 single-country CMBS assets and 50 single-country commercial REITs will have a 'Asf' rated RDR at 45%. The decrease in 'Asf' RDR represents the diversification benefit of adding REIT assets to an otherwise CMBS portfolio. The table below shows RDR coverage levels at the 'Asf' and 'AAAsf' rating levels for a sample of portfolios consisting of 100 'BBBsf' rated assets with a term of 10 years.

Asf and AAAsf Rating Default Rate Levels for Selected Portfolios

(%, Sample of Portfolios Consisting of 100 BBBsf Rated Assets with a Term of 10 Years)

Portfolio	Geographical Composition	Sector Composition	Portfolio Correlation	Asf RDR Coverage Level	AAAsf RDR Coverage Level ^a
1		Single Sector (RMBS, CMBS, Corporate CDOs, CREL or ABS)	80	70	100
2	Single Country	Single Sector (SF CDOs)	90	87	100
3		Equally Distributed Among Three SF Sectors	52	40	83
4	Mixed Country (Equally Distributed Among Three Countries)	Single Sector (RMBS, CMBS, CREL or ABS)	49	36	74
5	Highly Diversified (Equally Distributed Among 10 Countries)	Equally Distributed Among Three SF Sectors	24	24	49

^aFitch is unlikely to assign ratings in any category where the model rating default rate (RDR) output exceeds 90%.

The tables below show model RDR and RLR output for concentrated portfolios across various credit qualities. Each portfolio consists of 100 10-year assets concentrated in a single sector. The RLRs reflect recovery rate assumptions associated with the sample tranche sizes indicated.

Rating Default Rate — Single-Sector Portfolio

(%)

Rating Stress	AAAsf			AAsf		Asf		BBBsf		BBsf		Bsf	
	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
	—	>6	0–6	>6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6
AAAsf	62.0	62.0	62.0	88.0	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AAsf	19.0	19.0	19.0	51.0	79.0	97.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Asf	2.0	2.0	2.0	10.0	31.0	70.0	99.0	100.0	100.0	100.0	100.0	100.0	100.0
BBBsf	0.0	0.0	0.0	2.0	8.0	35.0	90.0	99.0	100.0	100.0	100.0	100.0	100.0
BBsf	0.0	0.0	0.0	0.0	0.0	3.0	41.0	80.0	100.0	100.0	100.0	100.0	100.0
Bsf	0.0	0.0	0.0	0.0	0.0	0.0	12.0	46.0	100.0	100.0	100.0	100.0	100.0

Source: Fitch.

Rating Loss Rate — Single-Sector Portfolio

(%)

Rating Stress	AAAsf			AAsf		Asf		BBBsf		BBsf		Bsf	
	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
	—	>6	0–6	>6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6
AAAsf	43.4	52.7	62.0	84.4	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AAsf	12.4	15.2	19.0	44.4	79.0	97.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Asf	1.2	1.5	2.0	8.3	31.0	70.0	99.0	100.0	100.0	100.0	100.0	100.0	100.0
BBBsf	0.0	0.0	0.0	1.4	8.0	35.0	90.0	99.0	100.0	100.0	100.0	100.0	100.0
BBsf	0.0	0.0	0.0	0.0	0.0	2.9	39.3	78.2	100.0	100.0	100.0	100.0	100.0
Bsf	0.0	0.0	0.0	0.0	0.0	0.0	11.4	44.2	100.0	100.0	100.0	100.0	100.0

Source: Fitch Solutions.

The tables below show model RDR and RLR output for highly diverse portfolios across various credit qualities. Each portfolio consists of 100 10-year assets from three different countries and three sectors. The RLRs reflect recovery rate assumptions associated with the sample tranche sizes indicated.

Rating Default Rate — Highly Diverse Portfolio

(%)

Rating Stress	AAAsf			AAsf		Asf		BBBsf		BBsf		Bsf	
	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
Rating Stress	—	>6	0–6	>6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6	0–6
AAAsf	10.0	10.0	10.0	18.0	29.0	49.0	80.0	93.0					
AAsf	6.0	6.0	6.0	11.0	19.0	36.0	69.0	85.0					
Asf	3.0	3.0	3.0	6.0	11.0	24.0	55.0	75.0					
BBBsf	1.0	1.0	1.0	4.0	7.0	17.0	45.0	66.0					
BBsf	0.0	0.0	0.0	1.0	3.0	8.0	29.0	50.0					
Bsf	0.0	0.0	0.0	0.0	1.0	5.0	21.0	39.0					

Source: Fitch Solutions.

Rating Loss Rate — Highly Diverse Portfolio

(%)

Rating Stress	AAAsf			AAsf		Asf		BBBsf	
	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
Rating Stress	—	>6	0–6	>6	0–6	0–6	0–6	0–6	0–6
AAAsf	7.0	9.0	10.0	17.2	29.0	49.0	80.0	93.0	
AAsf	3.9	5.1	6.0	10.3	19.0	36.0	69.0	85.0	
Asf	1.8	2.4	3.0	5.4	11.0	24.0	55.0	75.0	
BBBsf	0.5	0.8	1.0	3.0	7.0	17.0	45.0	66.0	
BBsf	0.0	0.0	0.0	0.6	2.9	8.0	29.0	50.0	
Bsf	0.0	0.0	0.0	0.0	1.0	5.0	21.0	39.0	

Source: Fitch Solutions.

Structured Finance and Banking/Finance

The SF PCM assumes the correlation between the SF sector and the banking and finance sectors is higher than that between the SF sector and other corporate sectors. Banks may have direct exposure to SF assets from purchasing them in the market or through indirect exposure, as the SF sector reflects a subset of the banks' balance sheet. The SF PCM assumes a 15% correlation level between the banking and finance sector and the SF sector. Hence, a correlation of 15% will be applied to a European bank and U.S. RMBS transaction. The SF PCM applies a 1% correlation level between most other corporate and SF sectors.

The impact of this higher correlation between the banking and finance sector and the SF sector can be illustrated in the example of two sample portfolios, each consisting of 100 'BBBsf' rated, 10-year assets. Both portfolios include 30 single-sector, single-country SF assets. However, the first portfolio also includes 70 single-sector, single-country corporate assets (concentrated in an industry other than banking and finance). The resulting 'Asf' rated RDR is 30%. The second portfolio includes 70 single-sector, single-country banking and finance assets. The resulting 'Asf' RDR is 32%.

Obligor Concentrations

Portfolios with a small number of assets, or those for which individual asset balances represent a disproportionate exposure within the portfolio, carry the risk that portfolio performance may be adversely affected by a few assets that may underperform relative to statistics suggested by their ratings. The basic model framework is already sensitive to obligor concentrations in that, as portfolios contain fewer assets, all else being equal, the portfolio default rate increases. In

the corporate PCM approach, Fitch applies additional stresses to correlation and recovery inputs for the five-largest credit-risk exposures in the portfolio.

In the SF PCM approach, however, no additional stresses are applied to the correlation and recovery assumptions. This is because correlation levels for SF assets are generally much higher than those used in the corporate PCM, and recovery rates have been stressed using the capital structure recovery rate adjustment.

If a portfolio contains a very small number of assets and/or assets representing a disproportionate amount of the overall portfolio balance, a look-through analysis of the individual assets may be used in place of SF PCM or as a complement to the PCM results.

Similar methodology (overlaying SF PCM results with analysis of a minimum number of discreet defaults) may be applied for rating liabilities with ratings lower than underlying asset ratings for portfolios with high correlation. For example, a portfolio with 'BBBs' rated assets from the same country of origin, same sector and same vintage grouping (resulting in 80% correlation for SF sectors other than SF CDOs and 90% for SF CDOs) would increasingly behave as a single asset, leading to low SF PCM RDRs at 'BBs' and lower rated levels.

For these levels, SF PCM output may be complemented by the steps described above. Any alternative or sensitivity scenarios will be detailed in transaction-specific rating action commentary.

Portfolio Default Distribution

Using input default probability and correlation assumptions described above, the SF PCM generates a portfolio default distribution. The SF PCM approach is consistent with the corporate PCM approach, which sets target default probabilities for rating stresses in the 'As' and lower rating categories equal to input default probabilities for the same-level rating categories. For the rating categories 'AAAs' and 'AAs', target default probabilities are set at levels lower than the input default probabilities because the sample size of data cohorts for the 'AAAs' and 'AAs' rated categories contained fewer observations relative to other observed cohorts. Therefore, it is prudent to reduce the target default probability, or raise the threshold, when determining the level of support necessary to achieve high-investment-grade ratings. The effect of a lower default tolerance for 'AAAs' and 'AAs' ratings is an increase in loss and default assumptions at these ratings.

Recovery Rates

Structured Finance Recoveries

The most appropriate determinant for the recovery of the tranche is its position in the liability structure of its respective transaction (seniority) and thickness relative to the original size of the portfolio (tranche thickness). For pro rata tranches, where losses are attributed proportionally to each tranche, their notional can be aggregated for the purpose of calculating the tranche thickness used in the recovery calculation. A tranche may be classified as senior only if it is the most senior tranche in a structure or pro rata to the most senior tranche in a structure. A security will not be considered senior if there is an unfunded portion of the asset portfolio ranking senior to the security.

Fitch developed recovery assumptions based on the relationship found between these two factors and recovery estimates observed across Fitch-rated distressed SF bonds. For the senior category, Fitch assumes 65% recovery for rating stresses at 'Bsf' and below, which are then tiered down to 50% at the 'BBBs' stress and 30% at the 'AAAs' rating stress, as seen in the table on page 10.

Recovery Assumptions

Seniority	Tranche Size (%)	Rating Stress (%)					
		AAAsf	Aasf	Asf	BBBsf	BBsf	Bsf
Senior ^a	—	30	35	40	50	60	65
Nonsenior	>6	10	15	20	25	40	45
Nonsenior	0-6	0	0	0	0	5	5

^aSenior is defined as the most senior tranche in a structure or a pro rata to the most senior tranche.

Source: Fitch.

For the nonsenior categories, Fitch considers two groupings — thin tranches with a tranche size between 0% and 6% and thick tranches with a tranche size larger than 6%. The assumption for nonsenior thick tranches is 45% for rating stresses at 'Bsf' and below; for nonsenior thin tranches, it is 5% for the stresses at 'Bsf' and below. These standard recovery assumptions are applied in the SF PCM when a senior tranche does not default in a given scenario. A zero recovery is assigned to a bond in the portfolio if its senior tranche defaults in a given scenario. See the Liability Structure and Recovery Rates section below for further explanation.

Liability Structure and Recovery Rates

The repayment of interest and principal in SF assets is typically sequential, meaning the most senior tranches are paid first. Likewise, losses are typically allocated in a reverse-sequential order. Therefore, when a tranche defaults, it is highly likely that all tranches ranking junior to it will have experienced a complete loss.

The SF PCM takes the reverse-sequential loss feature of SF securities into account. In each scenario of a given simulation, the SF PCM calculates whether a tranche has defaulted and applies the appropriate recovery level using the assumptions from the Recovery Assumptions table above. The model also calculates whether a senior tranche would have defaulted in the particular scenario. If a senior-ranking security defaults, a 0% recovery is assigned to the tranche.

This liability structure feature is applied for all assets, even when only one tranche from an SF transaction is included in the asset portfolio. This is done automatically by the model, as it compares the rating of the tranche with the default threshold drawn in each scenario. For each scenario where the asset defaults, the recovery rate applied is determined by one of two possible cases:

- The tranche defaults, and a senior-ranking security does not default, in which case, the relevant recovery rates shown in the table, *Recovery Assumptions* are applied.
- The tranche defaults, and a senior-ranking security also defaults, in which case a 0% recovery rate is applied.

Effective Recovery Rate

Because of the feature described above, the effective recovery rate for an SF portfolio can differ from those presented in the table above. The extent to which it will differ depends on two factors — the credit quality of the portfolio assets and the rating stress scenario. Lower credit quality assets increase the probability of default. A higher probability of default also increases the likelihood that a senior security would default.

The rating stress also plays a role in determining the portfolio's effective recovery rate. Higher rating stresses result in higher portfolio default rates. The higher portfolio default rate increases the number of assets for which the test of a senior asset defaulting will be performed. This

effectively increases the number of instances in which a 0% recovery will be assumed and decreases the effective portfolio default rate. The tables below illustrate the effective recovery rate for portfolios of two different credit qualities (BBBsf and AAsf), each consisting of 100 single-sector, single-country assets.

10-Year 'BBBsf' Portfolio Effective Recovery

(%)

Seniority	Tranche Size (%)	Rating Stress					
		AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Senior	—	45.0	55.0	60.0	70.0	80.0	80.0
Nonsenior	>6	0.7	7.8	28.6	42.9	63.3	65.0
Nonsenior	0–6	0.0	0.0	2.9	8.0	13.3	15.0

Source: Fitch.

10-Year 'AAsf' Portfolio Effective Recovery

(%)

Seniority	Tranche Size (%)	Rating Stress					
		AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf
Senior	—	45.0	55.0	60.0	70.0	0.0	0.0
Nonsenior	>6	10.2	25.5	40.0	55.0	0.0	0.0
Nonsenior	0–6	0.0	0.0	3.0	10.0	0.0	0.0

Source: Fitch.

Real Estate Investment Trust and Commercial Real Estate Loan Recovery Rates

REIT debt is assigned standard corporate recovery rate assumptions, described in Fitch Research on “CLOs and Corporate CDOs Rating Criteria”.

Senior CREL debt refers to the senior-most mortgage claim on a single property or a group of properties owned by a single borrower. The recovery rate assumptions applied to senior CREL are shown in the table, Recovery Assumptions on page 8. However, since CREL recovery rate expectations can vary depending on leverage (typically measured by the loan-to-value ratio), property quality, property type and location, there may be instances where an asset-specific recovery rate is assumed in place of a standard recovery rate assumption.

Subordinate CREL debt on a property or group of properties is a junior mortgage claim or a mezzanine loan and is typically a thin slice relative to the overall debt secured on the property. Importantly, it is subordinate in terms of loss allocation. As such, the recovery rate assumptions for subordinate CREL are based on the size of the debt relative to the overall debt secured on the property. The recovery rate assumptions applied to subordinate CREL are shown in the table, Recovery Assumptions. As with SF assets, in each scenario where a subordinate CREL asset defaults, the model tests whether a senior-ranking asset would also have defaulted, in which case, a 0% recovery rate is applied.

For REIT trust-preferred CDOs, Fitch will assume zero recovery due to their deeply subordinated positions in the capital structure.

Amortization of the Underlying Assets

Portfolio default rate and timing are influenced by the amortization profile of the underlying assets. In general, a portfolio with a shorter average life will have a lower rate of default and more frontloaded default timing than a similar sector- and credit quality-composed portfolio with a longer average life.

While faster amortization benefits a transaction via a lower default rate, this is offset by the lower amount of excess spread available over the life of the transaction.

For U.S. SF CDOs and CRE SF CDOs, Fitch uses the WAL or expected maturity dates as reported by the trustee, supplemented with additional market data.

For European SF CDOs, the agency would apply an extension scenario, based on a time to maturity assumption for the portfolio determined as follows. For underlying assets that are not currently amortizing and for CMBS and CREL, Fitch will derive the asset bullet maturity as shown in the table below. Otherwise, a bullet average maturity date for currently amortizing assets will be derived by assuming a linear amortization between the analysis date and the assumed maturity date as determined based on the table. The calculated WAL will be floored at the WAL of the asset as reported by the trustee and subject to a maximum at the legal maturity of the asset. CMBS and CREL assets are always modelled assuming the maturity date determined from the table, without a floor or a maximum date.

European SF CDOs Maturity Extension

Sector	Estimated Time to Maturity from Issue Date of Underlying Asset
ABS	5 years
RMBS	25 years
SME/CLOs	10 years
SF CDO	25 years
CMBS	Legal maturity date
CREL	Legal maturity date extended by five years

The derived bullet maturity will be used in the asset analysis in SF PCM. In the cash flow modelling, Fitch may model the assets assuming an amortization profile equivalent to the derived WAL for those assets where there is evidence they are amortizing, in cases where modelling bullet maturities may cause the most senior notes to not pay timely interest.

For long-dated assets in REIT TruPS CDOs (loans with maturity dates after the legal maturity of the bonds), Fitch will assume the assets default and the CDO receives the assumed asset recovery value at the CDO legal maturity, to account for the risk of forced liquidation of the long-dated assets.

Cash Flow Analysis

Fitch's modeling analysis is based on the actual portfolio characteristics as of that time. The purpose of Fitch's cash flow analysis is to determine, based on the outputs of SF PCM and the defined stress scenarios, whether a given class in the SF CDO structure will receive principal and interest in accordance with terms of the transaction documents.

Fitch's CFM reflects how the various stress scenarios affect principal and interest proceeds as they are received from the underlying collateral portfolio through the life of a transaction. The CFM then allocates those payments to the various classes of notes, based on the transaction structure as detailed in the underlying documents. If the CFM shows that a particular class of notes has received principal and interest payments according to the terms and conditions of the notes under the stress scenario for a particular rating, then it is deemed to have passed that particular stress scenario.

Fitch uses a proprietary Excel-based CFM customized for each transaction based on the transaction documents provided to Fitch by the issuer, originator or third-party agents on their behalf. Fitch's CFM is not publicly available.

The outcome of the cash flow modeling analysis is a key factor in determining the final rating for each note in the structure. The rating committee considers the relevance of each scenario in the context of the rating level, time horizon and a degree of failure. Fitch's rating committee may decide to put more weight on results in certain scenarios or accept a small numerical tolerance for a given scenario, depending on a transaction's collateral or structural characteristics. For example, in the case of a transaction with an all-floating liability structure and an all-fixed underlying portfolio, Fitch may place more weight on the interest rate up scenarios to more accurately reflect the risk of payment shortfalls.

Default Timing and Interest Rate Stress Combinations

Fitch's cash flow modeling analysis includes up to nine stress scenarios, consisting of three default timing curves and three interest rate scenarios designed to test the impact of the interest rate environment, as described in Fitch Research on "Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria".

Timing of Defaults

Fitch will typically apply three different default timing scenarios, as described in the "CLOs and Corporate CDOs Rating Criteria".

In addition, most of the outstanding SF CDO portfolios are expected to have a relatively short remaining WAL. Consequently, even in the backloaded default timing scenarios, distribution of defaults would become compressed. Depending on transaction characteristics, Fitch may adjust the applied default patterns to account for the specifics of the analyzed portfolio. For example, in instances when a portfolio has a very short remaining life or an accelerated amortization profile.

Treatment of Distressed and Defaulted Securities

Defaulted assets are included in the SF PCM model and given standard default and recovery expectations. Specifically, the SF PCM defaults such assets in year one and assigns recoveries, as described in the Liability Structure and Recovery Rates section. The defaulted assets are also included in the cash flow model along with the rest of the portfolio.

Fitch assumes a timing lag for defaulted asset recoveries in the cash flow model. Principal recoveries are typically realized through periodic principal redemptions made through the remaining life of the defaulted bond. This timing is replicated in the cash flow model by assuming a recovery lag equal to each SF CDO's portfolio WAL and will vary for each transaction.

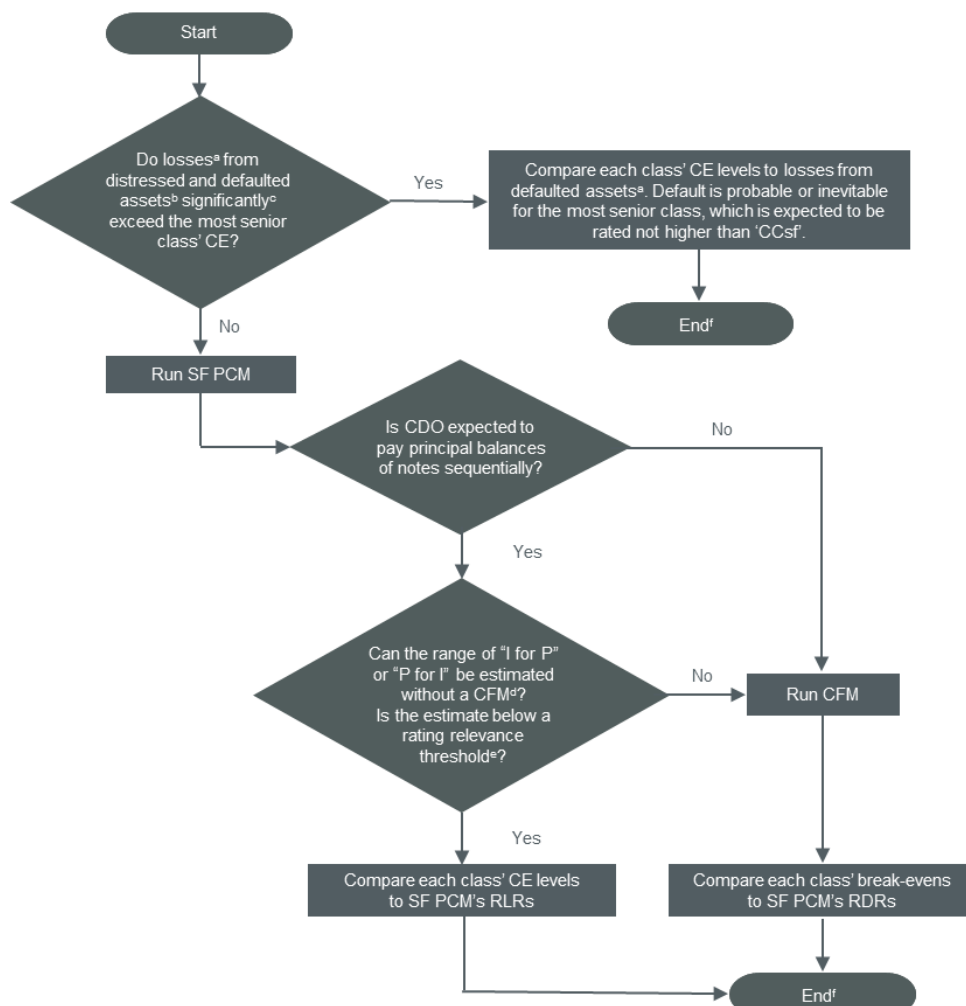
Review of Distressed Transactions

Currently, Fitch employs a full-scope cash flow modeling analysis for only a small number of SF CDOs. Some of the analytical elements in Fitch's rating framework described above are no longer relevant for distressed transactions. The analytical scope is determined as described by the decision tree presented on page 14.

Generally, cash flow modeling will be performed when the transaction's level of excess spread surpasses a rating relevance threshold and cannot be estimated without a cash flow model analysis within the context of the note's expected remaining life. This decision is ultimately confirmed by a credit committee that evaluates the robustness of the analysis presented.

Fitch will neither use the SF PCM to project losses from the portfolio nor conduct cash flow model analysis to analyze the impact of CDO structural features and cash flow timing when the most senior class of notes is expected to suffer a first-dollar loss stemming from the distressed assets alone.

Decision Process for a Rating Review Scope



^aUsing asset-specific or standard recovery rate assumptions for assets with a Fitch-derived rating for 'CCsf' and lower.

^bAssets with a Fitch-derived rating of 'CCsf' and lower.

^cSignificance is determined in the context of available interest for principal (if any), i.e. when the gap between expected losses from defaulted assets and most senior class' CE clearly exceeds even the high end of potential interest for principal.

^dBased on the trends from most recent payment reports combined with anticipated changes in a transaction's interest rate swap schedule, portfolio amortization, and interest shortfalls from underlying assets.

^eFor interest for principal ("I for P"), rating relevance threshold is defined in relation to the level of incremental CE from "I for P" required to move a rating up by at least one category. For example, with a bond with a 'BBsf' level CE, is the estimated cumulative future "I for P" commensurate with a difference between a 'BBsf' and 'BBBsf' SF PCM RLRs? For principal and interest ("P and I"), rating relevance threshold is determined by the level of CE erosion from P for I required to move a rating down by at least one rating category. For example, for a bond with a 'BBsf' level CE, is the estimated cumulative future P for I commensurate with a difference between the bond's CE and 'BBsf' level of SF PCM RLRs? When a CDO is expected to switch from "P for I" to "I for P" in the future, the net effect (if it can be estimated) is evaluated.

^fThis chart does not include potential further qualitative adjustments recommended by a credit analyst and credit committee.

When the expected losses from the distressed assets (those rated CCsf and lower) already significantly exceed the CE level of the most senior class of notes, projecting future defaults on a remaining balance of performing assets and analyzing the impact of structural features provide little analytical insight. In this case, Fitch will not perform SF PCM and cash flow model analysis. The loss is considered to significantly exceed the most senior class' CE level when the gap between them exceeds any potential cumulative benefit of interest proceeds expected to be diverted from subordinate notes to the most senior class due to the operation of the structural features of the CDO. In such transactions, Fitch will determine the appropriate ratings, which are unlikely to exceed 'CCsf', based on the relationship of the losses from distressed assets and each class' CE level.

For classes in which the CE level exceeds the expected losses from distressed assets but is lower than the losses projected at the 'CCCsf' rating stress under Fitch's SF PCM analysis, Fitch will consider the notes to be at a 'CCsf' level. For classes in which the amount of expected losses from the distressed and defaulted assets in the portfolio already exceeds the CE level, Fitch will consider the notes to be at a 'Csf' level.

Rating Sensitivity Analysis

Two hypothetical portfolios were created with varying compositions to test rating sensitivity against the key rating drivers.

Fitch will review the impact on the rating for the following stresses:

- Default probability multiplier of 125%, and recovery rate multiplier of 50%
- Default probability multiplier of 150%, and recovery rate multiplier of 50%
- Default probability multiplier of 125%, and recovery rate multiplier of 75%
- Default probability multiplier of 150%, and recovery rate multiplier of 75%
- Default probability multiplier of 125%, and correlation multiplier of 112.5%
- Default probability multiplier of 150%, and correlation multiplier of 112.5%

The tables below show the sensitivity results for two example portfolios. The analysis is only based on the asset performance, excluding structural features and cash flow modeling.

Portfolio One

- Geographic location: U.S.
- 100 equally weighted assets.
- 'BBB' rated assets.
- 100% Non-Senior thin tranche.
- 10 year maturity.
- Sector: RMBS (33%), CMBS (33%), Commercial ABS (34%).

Initial Rating	Base RLR (%)	Indicative Rating					
		125% x PD; 0.5 x RR	150% x PD; 0.5 x RR	125% x PD; 0.75 x RR	150% x PD; 0.75 x RR	125% x PD; 112.5% Base	150% x PD; 112.5% Base
AAAsf	84.0	AA+	AA	AA+	AA	AA	AA-
AAsf	63.0	AA-	AA-	AA-	AA-	A+	A
Asf	40.0	A-	BBB+	A-	BBB+	BBB+	BBB
BBBsf	28.0	BBB-	BB+	BBB-	BB+	BB+	BB+
BBsf	7.6	BB-	B+	BB-	B+	BB-	BB-
Bsf	1.9	B-	CCC	B-	B-	B+	B

Source: Fitch Solutions.

Portfolio Two

- Geographic location: U.S (50%), UK (50%).
- 50 equally weighted assets.
- Asset Quality: 'B+' (24%), 'B' (24%), 'B-' (24%), 'CCC' (28%).
- 100% Senior.
- Five-year maturity.
- 100% RMBS.

Initial Rating	Base RLR (%)	Indicative Rating					
		125% x PD; 0.5 x RR	150% x PD; 0.5 x RRD	125% x PD; 0.75 x RR	150% x PD; 0.75 x RR	125% x PD; 112.5% Base	150% x PD; 112.5% Base
AAAsf	70.0	BBB-	BB+	A+	A+	AAA	AAA
AAsf	65.0	BB+	BB+	BBB+	BBB+	AA+	AA+
Asf	58.8	BB+	BB	BBB-	BBB-	BBB+	BBB+
BBBsf	46.0	B+	B	BB+	BB	BB+	BB+
BBsf	27.2	CCC	<CCC	B-	CCC	B+	B+
Bsf	18.2	<CCC	<CCC	<CCC	<CCC	CCC	CCC

Source: Fitch Solutions.

Frequency of Reviews

Fitch typically reviews each transaction on an annual basis. However, there are several factors that may cause the need for an interim review:

- A change, if any, in critical CDO counterparties or collateral manager, counterparty downgrade or default.
- Acceleration or liquidation of a transaction.

Criteria Disclosures

In subsequent rating action commentaries related to surveillance actions, Fitch expects to disclose the following:

- Rating adjustments for a sector that experiences ongoing volatility with ratings under review.
- Lower ratings applied to assets or sectors with Negative Rating Outlook based on discussions with the underlying asset rating groups.
- Sensitivity scenarios when considering an upgrade to address potential life extension or concentration.
- Alternative scenarios when a CDO portfolio has unique characteristics.
- Alternative recovery assumptions, when the impact is material.
- Any variations to criteria.

Variations from Criteria

Fitch's criteria are designed to be used in conjunction with experienced analytical judgment exercised through a committee process. A rating committee may adjust the application of these criteria to reflect the risks of a specific transaction or entity. Such adjustments are called variations. All variations will be disclosed in the respective rating action commentaries, including their impact on the rating where appropriate.

A variation can be approved by a ratings committee where the risk, feature or other factor relevant to the assignment of a rating and the methodology applied to it are both included within the scope of the criteria, but where the analysis described in the criteria requires modification to address factors specific to the particular transaction or entity.

Limitations

Ratings, including Rating Watches and Rating Outlooks assigned by Fitch, are subject to the limitations specified in Fitch's Ratings Definitions.

Data Sources

Assumptions for default probabilities are based on historically observed average default rates as far back as the early 1980s, as described in "CLOs and Corporate CDOs Rating Criteria." The assumptions closely reflect the actual observed default rates.

Fitch tracks performance of corporate and SF assets through its annual default and rating transition studies. The "U.S. RMBS Loss Metrics" report is used to back test recovery assumptions.

These data serve as a basis for developing and validating the default, correlation and recovery assumptions utilized by this criteria report and the SF PCM. Fitch reviews the data to determine the need to update the assumptions at least annually.

Appendix: Probability of Default Inputs

Default Probabilities

(%)

Months	AAAsf	AAsf	Asf	BBBsf	BBsf	Bsf	CCCs/NR	CCsf	Csf	Dsf
1	0.01	0.01	0.01	0.01	0.04	0.14	15.69	45.00	70.00	100.00
12	0.01	0.01	0.07	0.19	1.16	5.36	25.23	50.50	75.50	100.00
24	0.01	0.02	0.16	0.49	3.12	11.16	37.34	56.50	81.50	100.00
36	0.01	0.05	0.27	0.87	5.40	15.17	43.82	62.50	87.50	100.00
48	0.04	0.10	0.41	1.35	7.75	18.49	47.73	68.50	93.50	100.00
60	0.08	0.17	0.59	1.91	10.03	21.57	51.13	74.50	99.50	100.00
72	0.14	0.26	0.78	2.54	12.11	24.41	54.25	80.50	100.00	100.00
84	0.17	0.35	0.98	3.13	13.90	26.90	56.99	86.50	100.00	100.00
96	0.19	0.45	1.18	3.67	15.35	29.01	59.31	92.50	100.00	100.00
108	0.19	0.56	1.40	4.15	16.54	30.77	61.24	98.50	100.00	100.00
120	0.19	0.64	1.58	4.54	17.43	32.18	62.80	100.00	100.00	100.00

Source: Fitch Solutions.

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Criteria Type	Criteria Title	Publication Date	Criteria Report Link		Changes
Sector Specific	U.S. RMBS Surveillance and Re-REMIC Rating Criteria	4-Jan-18	https://www.fitchratings.com/site/re/914409	https://www.fitchratings.com/site/pr/1034710	
Sector Specific	U.S. and Canadian Multiborrower CMBS Rating Criteria	5-Jan-18	https://www.fitchratings.com/site/re/914172	https://www.fitchratings.com/site/pr/1034768	
Sector Specific	U.S. Not-For-Profit Hospitals and Health Systems Rating Criteria	9-Jan-18	https://www.fitchratings.com/site/re/913974	https://www.fitchratings.com/site/pr/1034843	
Cross Sector	Non-Performing Loan Securitisations Rating Criteria	11-Jan-18	https://www.fitchratings.com/site/re/914141	https://www.fitchratings.com/site/pr/1034938	
Sector Specific	Asset-Backed Commercial Paper Rating Criteria	17-Jan-18	https://www.fitchratings.com/site/re/916217	https://www.fitchratings.com/site/pr/1035196	
Sector Specific	U.S. Public Finance Variable-Rate Demand Obligations and Commercial Paper Issued with External Liquidity Support Rating Criteria	22-Jan-18	https://www.fitchratings.com/site/re/916623	https://www.fitchratings.com/site/pr/1035348	
Sector Specific	DIP (Debtor-in-Possession) Rating Criteria	23-Jan-18	https://www.fitchratings.com/site/re/916739	https://www.fitchratings.com/site/pr/1035435	
Cross Sector	Non-Financial Corporates Exceeding the Country Ceiling Rating Criteria	23-Jan-18	https://www.fitchratings.com/site/re/916483	https://www.fitchratings.com/site/pr/1035416	
Bespoke	U.S. Public Housing Authority Capital Fund Housing Revenue Bonds Bespoke Rating Criteria	29-Jan-18	https://www.fitchratings.com/site/re/916759	https://www.fitchratings.com/site/pr/10017902	
Sector Specific	European RMBS Rating Criteria	2-Feb-18	https://www.fitchratings.com/site/re/916932	https://www.fitchratings.com/site/pr/10018679	
Cross Sector	Fitch's Interest Rate Stress Assumptions for Structured Finance and Covered Bonds - Excel File	2-Feb-18	https://www.fitchratings.com/site/re/917000	https://www.fitchratings.com/site/pr/10017184	
Cross Sector	Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria	2-Feb-18	https://www.fitchratings.com/site/re/916440	https://www.fitchratings.com/site/pr/10017184	
Cross Sector	Government-Related Entities Rating Criteria	7-Feb-18	https://www.fitchratings.com/site/re/917174	https://www.fitchratings.com/site/pr/10019598	
Bespoke	Exposure Draft: Slovenska Sporitelna Residential Mortgage Bespoke Rating Criteria	12-Feb-18	https://www.fitchratings.com/site/re/916108	https://www.fitchratings.com/site/pr/10020180	
Bespoke	Exposure Draft: Slovenska Sporitelna Residential Mortgage Bespoke Rating Criteria - Excel File	12-Feb-18	https://www.fitchratings.com/site/re/916452	https://www.fitchratings.com/site/pr/10020180	
Sector Specific	Investment Holding Companies Rating Criteria	12-Feb-18	https://www.fitchratings.com/site/re/916450	https://www.fitchratings.com/site/pr/10017202	
Cross Sector	Exposure Draft: Country-Specific Treatment of Recovery Ratings Criteria	14-Feb-18	https://www.fitchratings.com/site/re/916346	https://www.fitchratings.com/site/pr/10016966	
Sector Specific	Portuguese and Spanish Utility Credit Rights Securitisation Rating Criteria	14-Feb-18	https://www.fitchratings.com/site/re/917329	No material changes from the previous version.	
Sector Specific	U.S. State Housing Finance Agencies: General Obligation Rating Criteria	14-Feb-18	https://www.fitchratings.com/site/re/916322	https://www.fitchratings.com/site/pr/10016903	
Sector Specific	EMEA CMBS and CRE Loan Rating Criteria	15-Feb-18	https://www.fitchratings.com/site/re/917441	https://www.fitchratings.com/site/pr/10020710	
Cross Sector	Parent and Subsidiary Rating Linkage	15-Feb-18	https://www.fitchratings.com/site/re/917425	https://www.fitchratings.com/site/pr/10020578	
Sector Specific	Toll Roads, Bridges and Tunnels Rating Criteria	22-Feb-18	https://www.fitchratings.com/site/re/917961	https://www.fitchratings.com/site/pr/10021269	
Sector Specific	U.S. Public Finance Letter of Credit-Supported Bonds and Commercial Paper Rating Criteria	22-Feb-18	https://www.fitchratings.com/site/re/917718	https://www.fitchratings.com/site/pr/10020597	
Master	U.S. Public Finance Structured Finance Rating Criteria	22-Feb-18	https://www.fitchratings.com/site/re/917729	https://www.fitchratings.com/site/pr/10020625	
Sector Specific	Airports Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/918119	https://www.fitchratings.com/site/pr/10021616	
Bespoke	Bluestep (Swedish Non-Conforming RMBS) Bespoke Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/916410	https://www.fitchratings.com/site/pr/10017094	
Bespoke	Bluestep (Swedish Non-Conforming RMBS) Bespoke Rating Criteria Assumption Sheet	23-Feb-18	https://www.fitchratings.com/site/re/916493	https://www.fitchratings.com/site/pr/10017094	
Sector Specific	CLOs and Corporate CDOs Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/917758	https://www.fitchratings.com/site/pr/10021390	
Sector Specific	Ports Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/918128	https://www.fitchratings.com/site/pr/10021627	
Sector Specific	SME Balance Sheet Securitisation Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/917796	https://www.fitchratings.com/site/pr/10021597	
Bespoke	Slovenska Sporitelna Residential Mortgage Bespoke Rating Criteria	23-Feb-18	https://www.fitchratings.com/site/re/918048	https://www.fitchratings.com/site/pr/10021468	
Bespoke	Slovenska Sporitelna Residential Mortgage Bespoke Rating Criteria - Excel File	23-Feb-18	https://www.fitchratings.com/site/re/918050	https://www.fitchratings.com/site/pr/10021468	
Master	Rating Criteria for Public-Sector, Revenue-Supported Debt	26-Feb-18	https://www.fitchratings.com/site/re/917536	https://www.fitchratings.com/site/pr/10020114	
Sector Specific	Norway Residential Mortgage Rating Criteria Addendum	28-Feb-18	https://www.fitchratings.com/site/re/917801	https://www.fitchratings.com/site/pr/10020842	
Sector Specific	Renewable Energy Project Rating Criteria	28-Feb-18	https://www.fitchratings.com/site/re/917443	https://www.fitchratings.com/site/pr/10021993	
Sector Specific	U.S. Auto Loan ABS Rating Criteria	1-Mar-18	https://www.fitchratings.com/site/re/917920	https://www.fitchratings.com/site/pr/10022071	
Master	Covered Bonds Rating Criteria	2-Mar-18	https://www.fitchratings.com/site/re/918180	https://www.fitchratings.com/site/pr/10021722	
Sector Specific	U.S. Auto Lease ABS Rating Criteria	2-Mar-18	https://www.fitchratings.com/site/re/918037	https://www.fitchratings.com/site/pr/10022365	
Sector Specific	Exposure Draft: U.S. RMBS Loan Loss Model Criteria	7-Mar-18	https://www.fitchratings.com/site/re/916534	https://www.fitchratings.com/site/pr/10017387	
Sector Specific	Exposure Draft: U.S. RMBS Seasoned, Re-Performing and Non-Performing Loan Rating Criteria	7-Mar-18	https://www.fitchratings.com/site/re/916874	https://www.fitchratings.com/site/pr/10018201	
Sector Specific	U.S. Trust Preferred CDOs Surveillance Rating Criteria	9-Mar-18	https://www.fitchratings.com/site/re/918363	https://www.fitchratings.com/site/pr/10022230	
Sector Specific	Multi-Issuer Cedulas Hipotecarias Rating Criteria	13-Mar-18	https://www.fitchratings.com/site/re/918582	https://www.fitchratings.com/site/pr/10023542	
Sector Specific	U.S. RMBS Cash Flow Analysis Criteria	13-Mar-18	https://www.fitchratings.com/site/re/918624	https://www.fitchratings.com/site/pr/10023069	
Sector Specific	Single- and Multi-Name Credit-Linked Notes Rating Criteria	14-Mar-18	https://www.fitchratings.com/site/re/918660	https://www.fitchratings.com/site/pr/10023073	
Sector Specific	U.S. State Housing Finance Agencies: Single-Family Mortgage Program Rating Criteria	15-Mar-18	https://www.fitchratings.com/site/re/916323	https://www.fitchratings.com/site/pr/10016904	
Bespoke	Bank of Cyprus Residential Mortgage Bespoke Rating Criteria	19-Mar-18	https://www.fitchratings.com/site/re/918661	https://www.fitchratings.com/site/pr/10024120	
Master	Non-Bank Financial Institutions Rating Criteria	22-Mar-18	https://www.fitchratings.com/site/re/918796	https://www.fitchratings.com/site/pr/10024300	
Master	Bank Rating Criteria	23-Mar-18	https://www.fitchratings.com/site/re/918805	https://www.fitchratings.com/site/pr/10022593	
Master	Corporate Rating Criteria	23-Mar-18	https://www.fitchratings.com/site/re/918925	https://www.fitchratings.com/site/pr/10025597	
Sector Specific	Corporates Notching and Recovery Ratings Criteria	23-Mar-18	https://www.fitchratings.com/site/re/919231	https://www.fitchratings.com/site/pr/10024765	
Master	Sector Navigators	23-Mar-18	https://www.fitchratings.com/site/re/918927	https://www.fitchratings.com/site/pr/10025597	
Master	Sovereign Rating Criteria	23-Mar-18	https://www.fitchratings.com/site/re/919171	The only change to this criteria is the removal of the Appendix covering Embedded Market Risk, reflecting the withdrawal of that suffix from Fitch's rating definitions.	

Criteria Type	Criteria Title	Publication Date	Criteria Report Link	Changes
Master	Supranationals Rating Criteria	23-Mar-18	https://www.fitchratings.com/site/re/919174	The only change to this criteria report from the report dated 18 May 2017 is the removal of the Appendix covering Embedded Market Risk, reflecting the withdrawal of that suffix from Fitch's rating definitions.
Sector Specific	Aircraft Operating Lease ABS Rating Criteria	26-Mar-18	https://www.fitchratings.com/site/re/918863	https://www.fitchratings.com/site/pr/10025003
Sector Specific	Corporate Hybrids Treatment and Notching Criteria	27-Mar-18	https://www.fitchratings.com/site/re/919127	https://www.fitchratings.com/site/pr/10025123
Sector Specific	U.S. Public Finance Tender Option Bond Rating Criteria	28-Mar-18	https://www.fitchratings.com/site/re/919479	https://www.fitchratings.com/site/pr/10025306
Sector Specific	U.S. Public Finance Not-For-Profit Continuing Care Retirement Community Rating Criteria	30-Mar-18	https://www.fitchratings.com/site/re/919254	https://www.fitchratings.com/site/pr/10024855
Sector Specific	RMBS Lenders' Mortgage Insurance Rating Criteria	3-Apr-18	https://www.fitchratings.com/site/re/919522	https://www.fitchratings.com/site/pr/10025852
Master	U.S. Public Finance Tax-Supported Rating Criteria	3-Apr-18	https://www.fitchratings.com/site/re/919253	https://www.fitchratings.com/site/pr/10025789
Sector Specific	Canada Residential Mortgage Rating Criteria	11-Apr-18	https://www.fitchratings.com/site/re/919719	https://www.fitchratings.com/site/pr/10026550
Cross Sector	Country-Specific Treatment of Recovery Ratings Criteria	16-Apr-18	https://www.fitchratings.com/site/re/920039	https://www.fitchratings.com/site/pr/10026836
Sector Specific	U.S. RMBS Loan Loss Model Criteria	17-Apr-18	https://www.fitchratings.com/site/re/920003	https://www.fitchratings.com/site/pr/10026920
Bespoke	EMEA Equity Release Mortgage Bespoke Rating Criteria	20-Apr-18	https://www.fitchratings.com/site/re/920055	https://www.fitchratings.com/site/pr/10027604
Sector Specific	U.S. RMBS Seasoned, Re-Performing and Non-Performing Loan Rating Criteria	20-Apr-18	https://www.fitchratings.com/site/re/920224	https://www.fitchratings.com/site/pr/10027366
Sector Specific	U.S. State Housing Finance Agencies: MBS Pass-Through Bond Rating Criteria	26-Apr-18	https://www.fitchratings.com/site/re/920061	https://www.fitchratings.com/site/pr/10026904
Sector Specific	EMEA RMBS Rating Criteria	1-May-18	https://www.fitchratings.com/site/re/920736	https://www.fitchratings.com/site/pr/10028806
Sector Specific	Germany Residential Mortgage Rating Criteria Addendum	2-May-18	https://www.fitchratings.com/site/re/920550	https://www.fitchratings.com/site/pr/10029212
Sector Specific	Switzerland Residential Mortgage Rating Criteria Addendum	2-May-18	https://www.fitchratings.com/site/re/920551	https://www.fitchratings.com/site/pr/10029210
Bespoke	UK-Supported Student Loans Bespoke Rating Criteria	10-May-18	https://www.fitchratings.com/site/re/920639	https://www.fitchratings.com/site/pr/10028519
Sector Specific	European RMBS Rating Criteria	11-May-18	https://www.fitchratings.com/site/re/921217	https://www.fitchratings.com/site/pr/10030156
Master	Global Structured Finance Rating Criteria	15-May-18	https://www.fitchratings.com/site/re/921025	https://www.fitchratings.com/site/pr/10030678
Cross Sector	Public-Sector Counterparty Obligations in PPP Transactions Rating Criteria	17-May-18	https://www.fitchratings.com/site/re/921397	https://www.fitchratings.com/site/pr/10031212
Sector Specific	Credit Card ABS Rating Criteria	18-May-18	https://www.fitchratings.com/site/re/921341	https://www.fitchratings.com/site/pr/10031510
Sector Specific	U.S. and Canadian Multiborrower CMBS Rating Criteria	18-May-18	https://www.fitchratings.com/site/re/920542	https://www.fitchratings.com/site/pr/10031137
Sector Specific	United Kingdom Residential Mortgage Rating Criteria Addendum	18-May-18	https://www.fitchratings.com/site/re/922323	https://www.fitchratings.com/site/pr/10030739
Master	Supranationals Rating Criteria	24-May-18	https://www.fitchratings.com/site/re/923436	https://www.fitchratings.com/site/pr/10031808
Sector Specific	U.S. Timeshare Loan ABS Rating Criteria	25-May-18	https://www.fitchratings.com/site/re/923524	https://www.fitchratings.com/site/pr/10032384
Cross Sector	Exposure Draft: Structured Finance and Covered Bonds Counterparty Rating Criteria	31-May-18	https://www.fitchratings.com/site/re/921110	https://www.fitchratings.com/site/pr/10032614
Cross Sector	Structured Finance and Covered Bonds Counterparty Rating Criteria: Derivative Addendum	31-May-18	https://www.fitchratings.com/site/re/921111	https://www.fitchratings.com/site/pr/10032614
Sector Specific	Thermal Power Project Rating Criteria	1-Jun-18	https://www.fitchratings.com/site/re/923924	https://www.fitchratings.com/site/pr/10032893
Sector Specific	Future Flow Securitization Rating Criteria	8-Jun-18	https://www.fitchratings.com/site/re/925887	https://www.fitchratings.com/site/pr/10033742
Bespoke	Sprint Spectrum Securitization Bespoke Rating Criteria	13-Jun-18	https://www.fitchratings.com/site/re/928259	https://www.fitchratings.com/site/pr/10033655
Sector Specific	Exposure Draft: U.S. Public Power Rating Criteria	14-Jun-18	https://www.fitchratings.com/site/re/920511	https://www.fitchratings.com/site/pr/10034340
Cross Sector	Distressed Debt Exchange Rating Criteria	15-Jun-18	https://www.fitchratings.com/site/re/928338	https://www.fitchratings.com/site/pr/10033903
Sector Specific	U.S. RMBS Rating Criteria	15-Jun-18	https://www.fitchratings.com/site/re/923847	https://www.fitchratings.com/site/pr/10034756
Bespoke	Poland Residential Mortgage Bespoke Rating Criteria Addendum	18-Jun-18	https://www.fitchratings.com/site/re/929567	https://www.fitchratings.com/site/pr/10034696
Bespoke	Bank of Cyprus Residential Mortgage Bespoke Rating Criteria	19-Jun-18	https://www.fitchratings.com/site/re/928352	https://www.fitchratings.com/site/pr/10035105
Sector Specific	EMEA CMBS and CRE Loan Rating Criteria	19-Jun-18	https://www.fitchratings.com/site/re/925870	https://www.fitchratings.com/site/pr/10035095
Sector Specific	U.S. Federal Family Education Loan Program Student Loan ABS Rating Criteria	19-Jun-18	https://www.fitchratings.com/site/re/928459	https://www.fitchratings.com/site/pr/10034162
Sector Specific	U.S. Private Student Loan ABS Rating Criteria	21-Jun-18	https://www.fitchratings.com/site/re/931702	https://www.fitchratings.com/site/pr/10035281
Master	Bank Rating Criteria	22-Jun-18	https://www.fitchratings.com/site/re/929570	https://www.fitchratings.com/site/pr/10034714
Master	Non-Bank Financial Institutions Rating Criteria	22-Jun-18	https://www.fitchratings.com/site/re/929571	https://www.fitchratings.com/site/pr/10034714
Bespoke	French Residential Loans EDF Engie Bespoke Rating Criteria	27-Jun-18	https://www.fitchratings.com/site/re/931610	https://www.fitchratings.com/site/pr/10035346
Sector Specific	Structured Finance CDOs Surveillance Rating Criteria	27-Jun-18	https://www.fitchratings.com/site/re/931763	https://www.fitchratings.com/site/pr/10036291
Cross Sector	Third-Party Partial Credit Guarantees Rating Criteria	27-Jun-18	https://www.fitchratings.com/site/re/931778	https://www.fitchratings.com/site/pr/10035501
Sector Specific	U.S. State Housing Finance Agencies: Mortgage Insurance or Guarantee Fund Program Rating Criteria	28-Jun-18	https://www.fitchratings.com/site/re/925962	https://www.fitchratings.com/site/pr/10033613
Master	Closed-End Funds and Market Value Structures Rating Criteria	5-Jul-18	https://www.fitchratings.com/site/re/932687	https://www.fitchratings.com/site/pr/10036958
Sector Specific	Insurance-Linked Securities Rating Criteria	6-Jul-18	https://www.fitchratings.com/site/re/929663	https://www.fitchratings.com/site/pr/10034997
Cross Sector	Parent and Subsidiary Rating Linkage	16-Jul-18	https://www.fitchratings.com/site/re/932592	https://www.fitchratings.com/site/pr/10037493
Sector Specific	CLOs and Corporate CDOs Rating Criteria	19-Jul-18	https://www.fitchratings.com/site/re/933376	https://www.fitchratings.com/site/pr/10038307
Cross Sector	Country Ceilings Criteria	19-Jul-18	https://www.fitchratings.com/site/re/933194	https://www.fitchratings.com/site/pr/10038000
Sector Specific	Single- and Multi-Name Credit-Linked Notes Rating Criteria	19-Jul-18	https://www.fitchratings.com/site/re/933491	https://www.fitchratings.com/site/pr/10038660
Master	Sovereign Rating Criteria	19-Jul-18	https://www.fitchratings.com/site/re/932929	https://www.fitchratings.com/site/pr/10037684
Sector Specific	UK Whole Business Securitisation Rating Criteria	19-Jul-18	https://www.fitchratings.com/site/re/933304	https://www.fitchratings.com/site/pr/10038728
Sector Specific	U.S. RMBS Rating Criteria	23-Jul-18	https://www.fitchratings.com/site/re/933629	https://www.fitchratings.com/site/pr/10038914
Cross Sector	Sukuk Rating Criteria	25-Jul-18	https://www.fitchratings.com/site/re/933707	https://www.fitchratings.com/site/pr/10039110
Sector Specific	U.S. Military Housing Rating Criteria	25-Jul-18	https://www.fitchratings.com/site/re/933479	https://www.fitchratings.com/site/pr/10038531

Criteria Type	Criteria Title	Publication Date	Criteria Report Link		Changes
Sector Specific	CMBS Large Loan Rating Criteria	27-Jul-18	https://www.fitchratings.com/site/re/933507	https://www.fitchratings.com/site/pr/10039548	
Master	Rating Criteria for Infrastructure and Project Finance	27-Jul-18	https://www.fitchratings.com/site/re/933480	https://www.fitchratings.com/site/pr/10039042	
Bespoke	Australian Emerald Reverse Mortgage Bespoke Rating Criteria	30-Jul-18	https://www.fitchratings.com/site/re/933876	https://www.fitchratings.com/site/pr/10039771	
Sector Specific	Toll Roads, Bridges and Tunnels Rating Criteria	30-Jul-18	https://www.fitchratings.com/site/re/933625	https://www.fitchratings.com/site/pr/10039853	
Cross Sector	Structured Finance and Covered Bonds Counterparty Rating Criteria	1-Aug-18	https://www.fitchratings.com/site/re/933840	https://www.fitchratings.com/site/pr/10039506	
Cross Sector	Structured Finance and Covered Bonds Counterparty Rating Criteria: Derivative Addendum	1-Aug-18	https://www.fitchratings.com/site/re/933861	https://www.fitchratings.com/site/pr/10039506	
Sector Specific	EMEA RMBS Rating Criteria	3-Aug-18	https://www.fitchratings.com/site/re/933666	https://www.fitchratings.com/site/pr/10040409	
Sector Specific	Global Rating Criteria for Rental Fleet ABS	8-Aug-18	https://www.fitchratings.com/site/re/934040	https://www.fitchratings.com/site/pr/10041022	
Sector Specific	U.S. Federal Family Education Loan Program Student Loan ABS Rating Criteria	10-Aug-18	https://www.fitchratings.com/site/re/934054	https://www.fitchratings.com/site/pr/10040577	
Master	Covered Bonds Rating Criteria	13-Aug-18	https://www.fitchratings.com/site/re/934236	https://www.fitchratings.com/site/pr/10041405	
Sector Specific	UK Income-Contingent Student Loans Rating Criteria	14-Aug-18	https://www.fitchratings.com/site/re/934201	https://www.fitchratings.com/site/pr/10041421	
Bespoke	White Mountains Insurance Group Bespoke Rating Criteria	15-Aug-18	https://www.fitchratings.com/site/re/934632	https://www.fitchratings.com/site/pr/10041607	
Sector Specific	U.S. Public Finance Solid Waste Revenue Bond Rating Criteria	20-Aug-18	https://www.fitchratings.com/site/re/934776	https://www.fitchratings.com/site/pr/10041961	
Sector Specific	Availability-Based Projects Rating Criteria	23-Aug-18	https://www.fitchratings.com/site/re/934454	The new report is largely consistent with the previous one in terms of substance.	
Bespoke	EMEA Equity Release Mortgage Bespoke Rating Criteria	17-Sep-18	https://www.fitchratings.com/site/re/935679	https://www.fitchratings.com/site/pr/10045060	
Sector Specific	U.S. Wireless Tower Transaction Rating Criteria	26-Sep-18	https://www.fitchratings.com/site/re/935840	https://www.fitchratings.com/site/pr/10046031	
Sector Specific	U.S. Public Finance State Revolving Fund and Municipal Finance Pool Program Rating Criteria	27-Sep-18	https://www.fitchratings.com/site/re/935963	https://www.fitchratings.com/site/pr/10046395	
Sector Specific	CMBS Large Loan Rating Criteria	28-Sep-18	https://www.fitchratings.com/site/re/936260	https://www.fitchratings.com/site/pr/10046117	
Sector Specific	Exposure Draft: U.S. RMBS Surveillance and Re-REMIC Rating Criteria	2-Oct-18	https://www.fitchratings.com/site/re/936399	https://www.fitchratings.com/site/pr/10046362	
Master	Exposure Draft: Insurance Rating Criteria	4-Oct-18	https://www.fitchratings.com/site/re/935892	https://www.fitchratings.com/site/pr/10047354	
Sector Specific	European RMBS Rating Criteria	5-Oct-18	https://www.fitchratings.com/site/re/936632	https://www.fitchratings.com/site/pr/10047550	
Sector Specific	Exposure Draft: Aircraft Enhanced Equipment Trust Certificates Rating Criteria	5-Oct-18	https://www.fitchratings.com/site/re/936511	https://www.fitchratings.com/site/pr/10047431	
Master	Covered Bonds Rating Criteria	8-Oct-18	https://www.fitchratings.com/site/re/936720	https://www.fitchratings.com/site/pr/10047243	
Sector Specific	U.S. RMBS Rating Criteria	8-Oct-18	https://www.fitchratings.com/site/re/936596	https://www.fitchratings.com/site/pr/10047708	
Master	Bank Rating Criteria	12-Oct-18	https://www.fitchratings.com/site/re/935709	https://www.fitchratings.com/site/pr/10046992	
Master	Non-Bank Financial Institutions Rating Criteria	12-Oct-18	https://www.fitchratings.com/site/re/935708	https://www.fitchratings.com/site/pr/10046992	
Sector Specific	U.S. CREL CDO Surveillance Criteria	15-Oct-18	https://www.fitchratings.com/site/re/938301	https://www.fitchratings.com/site/pr/10047784	
Sector Specific	Sports Facilities, Leagues and Teams Rating Criteria	16-Oct-18	https://www.fitchratings.com/site/re/936599	The new report is largely consistent with the previous one in terms of substance.	
Sector Specific	Trade Receivables Securitisation Rating Criteria	16-Oct-18	https://www.fitchratings.com/site/re/938379	https://www.fitchratings.com/site/pr/10047972	
Sector Specific	North America and Asia-Pacific Multiborrower CMBS Surveillance Criteria	19-Oct-18	https://www.fitchratings.com/site/re/938436	https://www.fitchratings.com/site/pr/10048113	
Sector Specific	APAC Residential Mortgage Rating Criteria	22-Oct-18	https://www.fitchratings.com/site/re/936441	https://www.fitchratings.com/site/pr/10047468	
Cross Sector	Structured Finance and Covered Bonds Country Risk Rating Criteria	23-Oct-18	https://www.fitchratings.com/site/re/936644	https://www.fitchratings.com/site/pr/10049361	
Sector Specific	Exposure Draft: U.S. Public Finance Charter School Rating Criteria	24-Oct-18	https://www.fitchratings.com/site/re/938381	https://www.fitchratings.com/site/pr/10049779	
Cross Sector	Government-Related Entities Rating Criteria	25-Oct-18	https://www.fitchratings.com/site/re/936695	https://www.fitchratings.com/site/pr/10048780	
Sector Specific	GARVEE Bonds Rating Criteria	6-Nov-18	https://www.fitchratings.com/site/re/939575	https://www.fitchratings.com/site/pr/10051146	
Cross Sector	Corporate Hybrids Treatment and Notching Criteria	9-Nov-18	https://www.fitchratings.com/site/re/939714	https://www.fitchratings.com/site/pr/10051211	
Sector Specific	Covered Bonds and CDOs Public Entities' Asset Analysis Criteria	9-Nov-18	https://www.fitchratings.com/site/re/939099	https://www.fitchratings.com/site/pr/10050429	
Master	Exposure Draft: Rating Criteria for International Local and Regional Governments	14-Nov-18	https://www.fitchratings.com/site/re/934773	https://www.fitchratings.com/site/pr/10051520	
Sector Specific	U.S. RMBS Surveillance and Re-REMIC Rating Criteria	14-Nov-18	https://www.fitchratings.com/site/re/939794	https://www.fitchratings.com/site/pr/10051263	
Sector Specific	Exposure Draft: U.S. Public Finance College and University Rating Criteria	15-Nov-18	https://www.fitchratings.com/site/re/939427	https://www.fitchratings.com/site/pr/10050267	
Sector Specific	DIP (Debtor-in-Possession) Rating Criteria	19-Nov-18	https://www.fitchratings.com/site/re/940093	https://www.fitchratings.com/site/pr/10052692	
Sector Specific	Dealer Floorplan ABS Rating Criteria	19-Nov-18	https://www.fitchratings.com/site/re/940309	https://www.fitchratings.com/site/pr/10052522	
Sector Specific	U.S. Public Finance Prerefunded Bonds Rating Criteria	20-Nov-18	https://www.fitchratings.com/site/re/939743	https://www.fitchratings.com/site/pr/10051118	
Sector Specific	Consumer ABS Rating Criteria	22-Nov-18	https://www.fitchratings.com/site/re/940088	https://www.fitchratings.com/site/pr/10052459	
Sector Specific	Consumer ABS Rating Criteria - Auto Residual Value Addendum	22-Nov-18	https://www.fitchratings.com/site/re/940091	https://www.fitchratings.com/site/pr/10052459	
Sector Specific	Aircraft Enhanced Equipment Trust Certificates Rating Criteria	27-Nov-18	https://www.fitchratings.com/site/re/940449	https://www.fitchratings.com/site/pr/10053421	
Sector Specific	U.S. Water and Sewer Rating Criteria	29-Nov-18	https://www.fitchratings.com/site/re/939292	https://www.fitchratings.com/site/pr/10053905	
Sector Specific	Oil Vessel-Backed Financing Rating Criteria	5-Dec-18	https://www.fitchratings.com/site/re/940321	https://www.fitchratings.com/site/pr/10054392	
Master	Exposure Draft: Covered Bonds Rating Criteria	7-Dec-18	https://www.fitchratings.com/site/re/938490	https://www.fitchratings.com/site/pr/10053601	
Sector Specific	Exposure Draft: Originator-Specific Residential Mortgage Analysis Rating Criteria	7-Dec-18	https://www.fitchratings.com/site/re/939687	https://www.fitchratings.com/site/pr/10053614	
Sector Specific	U.S. Utility Tariff/Stranded Cost Bonds Rating Criteria	7-Dec-18	https://www.fitchratings.com/site/re/940755	https://www.fitchratings.com/site/pr/10054170	
Sector Specific	U.S. RMBS Seasoned and Re-Performing Loan Rating Criteria	13-Dec-18	https://www.fitchratings.com/site/re/941364	https://www.fitchratings.com/site/pr/10054851	
Sector Specific	U.S. State Housing Finance Agencies: Pooled Multifamily Housing Bonds Rating Criteria	14-Dec-18	https://www.fitchratings.com/site/re/939744	https://www.fitchratings.com/site/pr/10051121	
Sector Specific	Multi-Issuer Cedulas Hipotecarias Rating Criteria	20-Dec-18	https://www.fitchratings.com/site/re/942082	https://www.fitchratings.com/site/pr/10056332	
Sector Specific	EMEA RMBS Rating Criteria	21-Dec-18	https://www.fitchratings.com/site/re/941862	https://www.fitchratings.com/site/pr/10055896	
Sector Specific	European RMBS Rating Criteria	21-Dec-18	https://www.fitchratings.com/site/re/941860	https://www.fitchratings.com/site/pr/10055896	
Sector Specific	U.S. and Canadian Multiborrower CMBS Rating Criteria	21-Dec-18	https://www.fitchratings.com/site/re/941598	https://www.fitchratings.com/site/pr/10055386	