Structured Finance CDOs Surveillance Rating Criteria

Sector-Specific Criteria

This report replaces the criteria report entitled "Structured Finance CDOs Surveillance Rating Criteria," dated May 14, 2021.

Scope

This criteria report outlines the global framework that Fitch Ratings uses to monitor and analyze ratings on existing issues of structured finance collateralized debt obligations (SF CDOs) backed by portfolios of ABS, RMBS, CMBS and CDO bonds. These criteria are used in conjunction with the related criteria listed on page 2. The analysis of CDOs issued between 2004 and 2007, where collateral is predominantly U.S. commercial real estate loans (CREL), is addressed in Fitch's "North America and Asia-Pacific Multiborrower CMBS 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. While all key rating drivers are equally important, not all will be relevant or have equal weighting in any one rating action, and as transactions season and/or concentrations increase over time, alternative loss considerations may have a greater weighting.

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 of assets from a single country, with the few exceptions listed on page 4.

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.

Currently, Fitch employs a full-scope cash flow modeling analysis for only a small number of SF CDOs. Some of the analytical elements described in this report are no longer relevant for distressed transactions or for transactions backed by very small and/or highly concentrated portfolios. For those transactions with a majority of the portfolio rated at distressed rating levels, an alternative review process may be followed, as described in the Review of Distressed Transactions section. For transactions backed by small and/or highly concentrated portfolios, a look-through analysis of the individual assets may be used in place of or as a complement to SF PCM. For the remaining transactions, rating reviews will include portfolio analysis generally using SF PCM and structural analysis, which may employ Fitch's Multi-Asset Cash Flow Model (CFM), details of which can be found at https://www.fitchratings.com/structured-finance/multi-asset-cash-flow-model.

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 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 to 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.

Related Criteria

Global Structured Finance Rating Criteria (March 2021)

CLOs and Corporate CDOs Rating Criteria (September 2021)

Structured Finance and Covered Bonds Counterparty Rating Criteria (January 2020)

Structured Finance and Covered Bonds Counterparty Rating Criteria: Derivative Addendum (January 2020)

Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria (November 2020)

Related Model

Fitch Portfolio Credit Model

Default Probabilities

Base Assumptions

Fitch uses an asset's individual rating and term to maturity as the primary determinants of that asset's expected default probability.

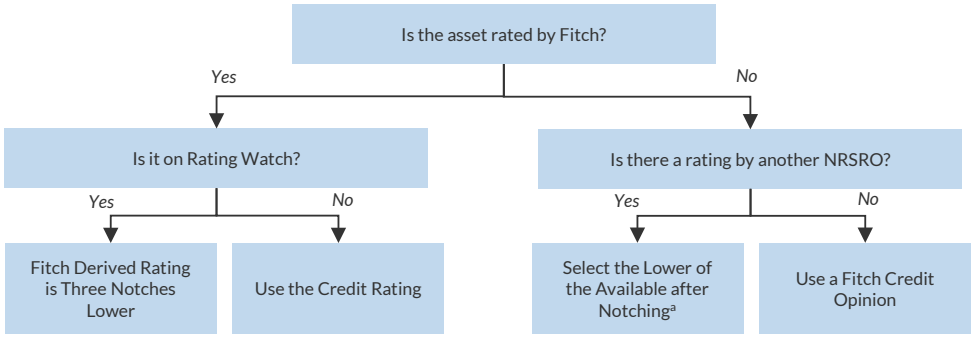
For the default probabilities of structured finance assets, we use the same figures as those used for corporate assets described in the CLOs and Corporate CDOs Rating Criteria. Corporate asset default probabilities are developed from the default data of a wide spectrum of corporate entities spanning several decades and covering several economic cycles, an observation period that is longer than what is available for SF assets. As the confidence levels are based on the probability of defaults, we also use the same confidence levels as those used in the CLOs and Corporate CDOs Rating Criteria.

Corporate asset default probabilities are seen as a good proxy for structured finance default probabilities as the two are comparable other than during the global financial crisis. The lesson from the financial crisis was that structured finance assets are more volatile and highly correlated than corporate assets. To capture this volatility, we apply the correlation stresses described in the next section that increase the portfolio default rates under higher stress rating categories.

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.
Source: Fitch 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." 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 non-publicly 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 of assets from a single country. In such transactions, Fitch will limit the rating of the notes to a maximum of 'BBBsf'. In addition, consideration will be given to portfolios with excessive obligor concentration risk. For example, Fitch will not upgrade the notes above 'BBBsf' when the portfolio comprises 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 SF 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
	Different Country +0%	N.A.	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

[a]Vintage 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.
Source: Fitch Ratings.

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 Ratings.

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 risk 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 an '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 country	Single sector (RMBS, CMBS, corporate CDOs, CREL or ABS)	80	70	100
2		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

[a]Fitch is unlikely to assign ratings in any category where the model rating default rate (RDR) output exceeds 90%.
Source: Fitch Ratings.

The tables below show model RDR and rating loss rate (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

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

Source: Fitch Ratings.

Rating Loss Rate — Single-Sector Portfolio

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

Source: Fitch Ratings.

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

	AAAsf			AAsf	Asf	BBBsf	BBsf	Bsf
(%)	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
Rating Stress	**—**	**>6**	**0–6**	**>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 Ratings.

Rating Loss Rate — Highly Diverse Portfolio

	AAAsf			AAsf	Asf	BBBsf	BBsf	Bsf
(%)	Senior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior	Nonsenior
Rating Stress	**—**	**>6**	**0–6**	**>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	7.9	28.1	48.8
Bsf	0.0	0.0	0.0	0.0	1.0	4.8	20.2	38.4

Source: Fitch Ratings.

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.

If a portfolio contains a very small number of assets and/or a very small number of assets represent 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 'BBBsf' 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 'BBsf' 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 'Asf'

and lower rating categories equal to input default probabilities for the same-level rating categories. For the rating categories 'AAAsf' and 'AAsf', target default probabilities are set at levels lower than the input default probabilities because the sample size of data cohorts for the 'AAAsf' and 'AAsf' 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 'AAAsf' and 'AAsf' 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 'BBBsf" stress and 30% at the 'AAAsf' rating stress, as seen in the below table.

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.

Recovery Assumptions

		Rating Stress (%)					
Seniority	**Tranche Size (%)**	**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

[a]Senior is defined as the most senior tranche in a structure or a pro rata to the most senior tranche.
Source: Fitch Ratings.

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 Recovery Assumptions table are applied.
- The tranche defaults, and a senior-ranking security also defaults, in which case a 0% recovery rate is applied.

Effective Recovery Rate

Owing to 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 recovery 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

(%)		Rating Stress					
Seniority	**Tranche Size (%)**	**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 Ratings.

10-Year AAsf Portfolio Effective Recovery

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

Source: Fitch Ratings.

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. 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.

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

Source: Fitch Ratings.

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.

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, the Multi-Asset Cash Flow Model, which is described in detail at https://www.fitchratings.com/structured-finance/multi-asset-cash-flow-model. The CFM is 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.

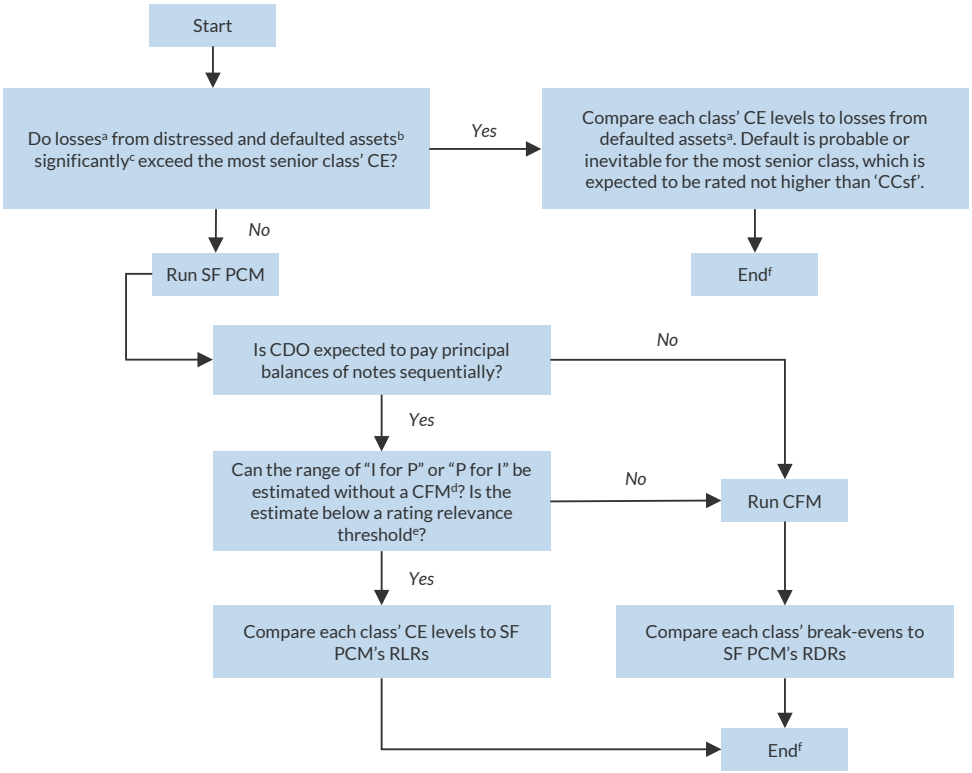
Fitch will neither use the SF PCM to project losses from the portfolio nor conduct cash flow model analysis to analyze the impact of CDO structural features and cash flow timing when the most senior class of notes is expected to suffer a first-dollar loss stemming from the distressed assets alone.

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 on the following page.

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.

Decision Process for a Rating Review Scope



[a]Using asset-specific or standard recovery rate assumptions for assets with a Fitch-derived rating for 'CCsf' and lower. [b]Assets with a Fitch-derived rating of 'CCsf' and lower. [c]Significance 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. [d]Based 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. [e]For 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. [f]This chart does not include potential further qualitative adjustments recommended by a credit analyst and credit committee.
Source: Fitch Ratings.

When the expected losses from the distressed assets (those rated 'CCsf' and lower) already significantly exceed the credit enhancement (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 Assumption Sensitivity

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% nonsenior thin tranche.
- 10-year maturity.
- Sector: RMBS (33%), CMBS (33%), Commercial ABS (34%).

		Indicative Rating					
Initial Rating	Base RLR (%)	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 Correlation	150% x PD; 112.5% Base Correlation
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

PD – Probability of default. RR – Recovery rate.
Source: Fitch Ratings.

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 (%)	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 Correlation	150% x PD; 112.5% Base Correlation
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 Ratings.

Binary Risk

Rating volatility could increase as the pool size contracts over time and/or as the transaction nears the end of its expected term. Multiple category upgrades are harder to predict and may arise when an underperforming bond has a higher than expected recovery and/or when a manager buys it out of the pool.

For example, if an underlying CMBS pool has defeased collateral with a long-dated maturity and the pool size becomes smaller as a result of greater than expected recoveries on dispositions, multiple category upgrades to the underlying bond are possible because the defeased collateral would then represent a greater proportion of the pool.

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 the correlation impact are informed by historical performance of cohort structured finance products. Recovery assumptions are informed by observed recoveries. The decision to use corporate asset default probabilities for structured finance assets is based on comparisons of historical defaults of both. Fitch used data from Trepp, LLC and Intex Solutions, Inc. along with its own data when calculating historical performance.

The above data in conjunction with analytical judgement 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.

The ratings above were solicited and assigned or maintained at the request of the rated entity/issuer or a related third party. Any exceptions follow below.