U.S. RMBS Loan Loss Model Criteria

Sector-Specific Criteria

Inside This Report

This report replaces "U.S. RMBS Loan Loss Model Criteria," dated November 2016.

Related Criteria

U.S. RMBS Master Rating Criteria (December 2016)

U.S. RMBS Cash Flow Analysis Criteria (April 2016)

Criteria for Rating U.S. and Canadian Residential and Small Balance Commercial Mortgage Servicers (February 2017)

Structured Finance and Covered Bonds Interest Rate Stresses Rating Criteria (February 2017)

Global Structured Finance Rating Criteria (June 2016)

Global Criteria for Lenders' Mortgage Insurance in RMBS (July 2016)

Structured Finance and Covered Bonds Counterparty Rating Criteria (March 2017)

U.S. RMBS Seasoned, Re-Performing and Non-Performing Loan Rating Criteria (March 2017)

U.S. RMBS Surveillance and Re-REMIC Criteria (November 2016)

Criteria for Rating Caps and Limitations in Global Structured Finance Transactions (June 2016)

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Scope

This criteria report details Fitch Ratings' model for estimating loan-level losses on U.S. mortgage pools collateralizing RMBS transactions and should be read in conjunction with the related criteria listed below left. The model is used for both new-issue and surveillance rating analysis. The core principle underpinning the model is the interaction between borrower equity and sustainable market value declines (sMVDs) in determining the expected loss for each loan. The methodology considers loan-level attributes and macroeconomic factors in deriving loss expectations.

Key Rating Drivers

Borrower Equity: The borrower's true equity in the property, as expressed by the sustainable loan-to-value (sLTV) ratio, is the most predictive default variable in the model and a key driver of loss severity (LS). The sLTV is calculated based on the lower of the current estimated market value and the value determined by Fitch's proprietary sustainable home price (SHP) model.

Home Price Projections: A key component of Fitch's approach is the application of its SHP model to adjust a property's current price to its sustainable value. The SHP component allows for a countercyclical view on the potential for negative equity when projecting defaults and losses. With the SHP component, collateral analysis and economic considerations, the loss model produces higher credit enhancement levels as risk enters the system and lower levels as risk neutralizes.

Economic Stress: Regional and macroeconomic stress, as expressed through the economic risk factor (ERF) variable, is a strong driver of default. The ERF incorporates such metrics as unemployment, income, inflation, mortgage rates and housing trends.

Borrower and Loan Attributes: In addition to sLTV and ERF, Fitch identifies 11 other borrower and loan attributes that it finds predictive of default. Notable examples include borrower credit score, loan documentation and loan purpose.

Liquidation Timelines and Costs: The amount of time a delinquent loan takes to liquidate, as well as the costs associated with liquidation, plays an important role in Fitch's accounting-based LS framework.

Transparent Rating Stresses: The model applies a dynamic two-step process in determining MVD stress assumptions, whereby home prices are first reduced to their sustainable value and then subjected to a further stressed MVD assumption that corresponds to each rating category. Additional stressing mechanisms include ERF floors, liquidation timeline stresses and LS floors. Fitch benchmarks its 'AAAsf' stress to a scenario comparable to the Great Depression.

Model Overview

Fitch's U.S. RMBS loan loss model assesses the credit risk of residential mortgage collateral backing securitizations and covered bonds under base and stressed home price and macroeconomic scenarios, at both the loan and pool levels.

At least once every year, updated loan performance, home price and economic data are reassessed and incorporated into the model's logic. The assumptions are reviewed and the model undergoes a validation process by a Fitch committee independent of U.S. RMBS.

Borrower home equity has been and will continue to be a primary driver of mortgage borrower behavior. Home price projections are determined using a countercyclical SHP model. The model calculates an sMVD at the MSA level for each loan, which represents the difference between the home value at origination and what Fitch believes to be the home's sustainable value. The sMVD is a significant driver in both the probability of default (PD) and LS calculations. The major components of the model are summarized below.

Probability of Default Overview

Fitch's PD regression model was developed using a dataset of loans originated from 1991–2009, with performance tracked through September 2016 for non-agency loans and September 2015 for agency loans.

Fitch uses a regression-based analysis to estimate the PD based on 13 independent variables found to strongly influence default risk. The variables include:

- A calculated sLTV assumption.
- An economic risk factor.
- 11 additional individual loan and borrower attributes.

PD assumptions reflect an updated regression of mortgage performance data through September 2016 for non-agency loans and September 2015 for agency loans. The PD adjustments applied in the model for most of the 13 regression-based variables (including sLTV, ERF and FICO) reflect the adjustments estimated by the regression analysis. For certain variables, the PD adjustments applied in the model reflect qualitative adjustments to the raw regression output, based on Fitch's analysis of the dataset and regression results. For purposes of the regression default dataset, Fitch relies on a roll-rate methodology using observed performance trends for estimating future defaults on loans still outstanding. As such, Fitch's regression not only considers cumulative defaults on older vintages, but also incorporates Fitch's cumulative default expectations for peak loss vintage loans originated during the 2005–2009 period.

Nonregression-based PD penalties are also applied to loans with variability in repayment terms, such as hybrid ARMs and interest-only (IO) mortgages, as well as non-performing loans and loans with imperfect payment histories.

In addition to the loan-level variables that determine default risk, Fitch applies additional PD penalty adjustments at the portfolio level to address concentration risks based on:

- The number of loans.
- The distribution of loan balances.
- The geographic composition of the pool.

Fitch may also apply additional PD adjustments for concentrations of borrower- or loan-related characteristics within a pool, such as multifamily properties, self-employed borrowers or first-time homebuyers.

Loss Severity Overview

LS is calculated using an accounting-based approach that utilizes MVD assumptions, distressed-sale discounts and liquidation cost assumptions as key inputs. Fitch believes this to be an intuitive and transparent approach, with all core underlying assumptions calibrated to empirical data. Each loan's LS percentage represents the loss amount calculated for each loan (i.e. loan balance less liquidation proceeds) expressed as a percentage of the loan balance. Loan-level loss severities are subject to floors at each rating category to assume a minimum amount of loss, given default.

Rating Stress Scenarios

Under the 'AAAsf' rating stress, Fitch assumes a property's value will decline an additional 35% below its sustainable value.

The product of each loan's PD and LS represents its base case loss expectation. Loss expectations derived for each rating category above the base case are determined by applying stresses to the calculated sMVD, LS floors, liquidation timelines and the ERF.

Rating stresses applied to the property's current value are based on a two-step process. Fitch first reduces each property from its current price to its sustainable value, which is produced by the SHP model. Next, the value is further reduced by a fixed percentage that Fitch has determined consistent with each rating category stress. For example, under the 'AAAsf' rating stress, Fitch assumes a property's value will decline an additional 35% below its sustainable value.

While sMVD is the primary driver of Fitch's stress scenarios, additional stresses are also applied to the ERF and liquidation timelines. The ERF is stressed via a system of floors, whereby the model uses the higher of the loan's actual ERF or the ERF floor associated with the rating category. Liquidation timelines are extended in stress scenarios and result in higher costs and higher LS assumptions.

Role of the Model in the Rating Process

Fitch's U.S. RMBS loss model is only one component in the rating process.

Fitch's mortgage loss model allows the rating agency to express its credit opinion in a consistent manner across pools with differing characteristics. While the model is an important component in the rating process, Fitch factors in qualitative considerations that help shape Fitch's opinion of the pool's overall risk profile and performance expectations. These considerations include a review of the collateral performance history, the quality of loan origination and servicing, results and findings of third-party due diligence reviews, an assessment of the transaction's representations and warranties, the legal structure and an analysis of the cash flow structure. It is the combination of the loan- and pool-level loss analysis and these other elements that inform the committee when assigning ratings to a particular transaction.

While Fitch believes its framework produces model output that is consistent with observed and projected defaults and losses on mortgage portfolios, we also acknowledge the model may not be applicable for select portfolios or transactions. Such examples may include loans with attributes uncommon in the historical dataset used to develop the model, or mortgage pools with unusual combinations or concentrations of attributes not anticipated by the existing criteria. In such cases, Fitch will overlay additional considerations to address portfolio risk factors, utilize other analytical approaches, apply rating caps in select cases as defined by criteria, or decline to rate the transaction. For detailed criteria methodology on the individual components listed above, see Fitch's Related Criteria on page 1.

Data Adequacy

The application of Fitch's U.S. RMBS Loan Loss Model relies on loan-level data to be provided by potential issuers of RMBS. Fitch requests that loan-level data for new securitizations conform to the format and breadth described by the American Securitization Forum's "ASF RMBS Disclosure and Reporting Packages," released on July 15, 2009 or comparable reporting templates released by the industry. In addition, Fitch requests that issuers provide data on the monthly payment used to qualify borrowers from a debt-to-income (DTI) perspective for adjustable-rate and IO loans, and servicer advancing data for loans that are delinquent at the time of securitization.

Loan-level data submitted are subject to review by an independent, third-party due diligence company to ensure data integrity, per Fitch's published criteria listed on page 1. Due diligence results may lead to adjustments to reported loan-level attributes and directly impact our credit view of the mortgage pool.

Fitch will update several model input data series on an ongoing basis as the data become available, typically quarterly. The most notable data series include MVDs from Fitch's SHP model, observed historical home price indices and the ERF. While Fitch does not anticipate large quarter-over-quarter movements in any one data series, the scheduled periodic data updates may have a modest impact on loss expectations, all other factors remaining constant.

Probability of Default Analysis: Model Development Dataset

The PD model development dataset comprises non-agency (prime-jumbo, Alt-A and subprime) loans as well as agency loans. The non-agency data source is CoreLogic LoanPerformance; the agency data source is Fannie Mae and Freddie Mac. Fitch determined that Fannie Mae, Freddie Mac and prime jumbo loans have comparable sensitivities to default drivers; as such, agency and prime jumbo loans were analyzed together and are referred to as a combined "agency/prime jumbo" sector throughout this report.

The PD portion of the model relies on a logistic regression analysis on a sample of fixed-rate, fully amortizing loans. The agency/prime jumbo dataset consists of loans originated between 1999 and 2009, while the Alt-A and subprime sets consist of 1991–2007 originations. A separate regression is run on each of the three sectors (agency/prime jumbo, Alt-A and subprime) to more accurately capture the nuanced interactions of default drivers within each asset class. For more information on the model development dataset and filters applied, see Appendix A on page 37.

The agency dataset used in the analysis consists of a much larger sample of loans than the prime jumbo dataset. Since the two sets are analyzed as a merged set, Fitch reweights the sample such that both datasets contribute equal weight to the analysis.

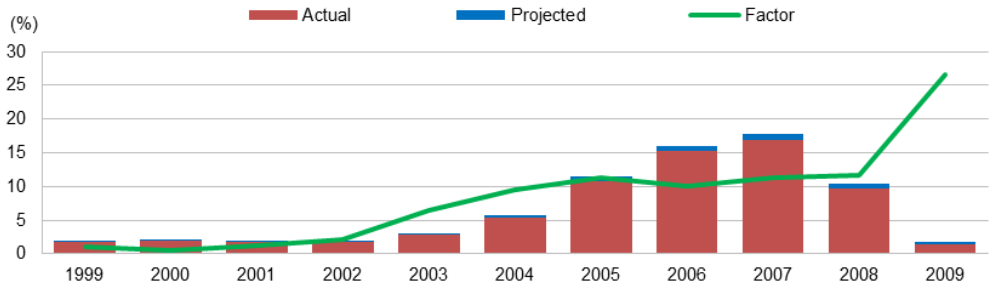
Through the regression analysis, Fitch identifies 13 significant drivers of default. The following sections describe how default is defined and measured for purposes of the analysis and then detail the 13 determinants of default.

Probability of Default Analysis: Measuring and Defining Default

Approximately 5%of Fitch's expected defaults for the agency/prime jumbo 2005–2007 peak vintages are projected to come from loans that are now current.

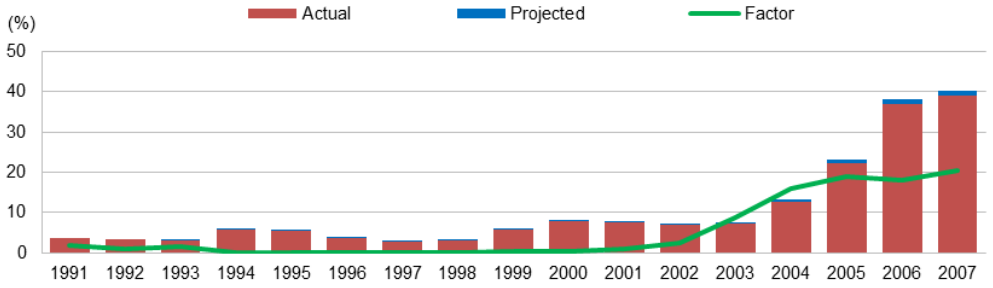
For the regression analysis, Fitch considered as a default any loan that had ever reached a delinquency status of 180 days, or had liquidated from a delinquency status between 90 and 150 days. Additionally, outstanding loans were considered to have defaulted if their delinquency status was 90 or more days delinquent as of the observation cutoff date.

Cumulative Default Projections - Prime Jumbo and Agency
(% of Original Balance; Fixed Rate, Fully Amortizing Loans)



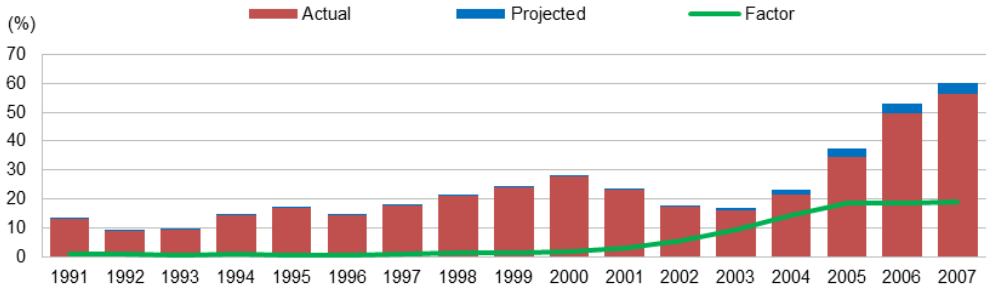
Projected - Projected defaults from outstanding performing loans; Actual - Observed defaults to date.
Factor - Remaining balance as a percentage of original balance.
Source: CoreLogic LoanPerformance.

Cumulative Default Projections - Alt A
(% of Original Balance; Fixed Rate, Fully Amortizing Loans)



Projected - Projected defaults from outstanding, performing loans; Actual - Observed defaults to date.
Factor - Remaining balance as a percentage of original balance.
Source: CoreLogic LoanPerformance.

Cumulative Default Projections - Subprime
(% of Original Balance; Fixed Rate, Fully Amortizing Loans)



Projected - Projected defaults from outstanding, performing loans; Actual - Observed defaults to date.
Factor - Remaining balance as a percentage of original balance.
Source: CoreLogic LoanPerformance.

A roll-rate model is applied to recent vintages to complete their lifetime default picture. This allows Fitch to use cumulative default expectations for all vintages as the dependent variable in the regression.

A considerable percentage of loans originated between 2002 and 2009 is still outstanding and would not otherwise be flagged by Fitch's default definition. Fitch utilizes a roll-rate methodology to project future defaults on these loans. Using historical default data alone would underestimate lifetime defaults for these recent vintages and bias the model's default probability lower.

Default projections for outstanding loans are derived by analyzing the delinquency roll rate (the rate at which loans move from one payment status to another, i.e. current to 30 days delinquent), as well as default and prepayment performance of loans with similar characteristics over a recent historical observation window. For agency and prime jumbo loans, the most recent five-year window is used,

while a two-year observation window is used for Alt-A and subprime loans. A shorter, and more recent, observation period for Alt-A and subprime loans is believed to be more representative of the outstanding borrowers due to the evolving composition of the remaining mortgage pools. Fitch then uses this analysis to extrapolate future defaults for outstanding loans by assuming that performance continued at these historical rates for the remainder of the life of the pool. Adjustments to future performance are made for projected changes in the borrowers' CLTVs based on assumptions of home price movements, amortization and inflation. For more details on Fitch's roll-rate methodology, see Appendix B on page 39.

After projecting defaults on the outstanding collateral balance, those projected defaults are added to actual defaults to reach a cumulative lifetime default expectation for each vintage. This allows Fitch to use a cumulative lifetime default expectation for all vintages as the dependent variable in its regression analysis. The charts on the previous page show cumulative default lifetime expectations by vintage used by Fitch as part of its regression analysis.

Probability of Default

The PD component of the model estimates the probability that a loan will default based on various loan and borrower characteristics, as well as Fitch's SHP forecasts and macroeconomic factors. Fitch identified 13 key drivers, or variables, of default probability. Credit attributes of the variables are used to determine their relative default risk.

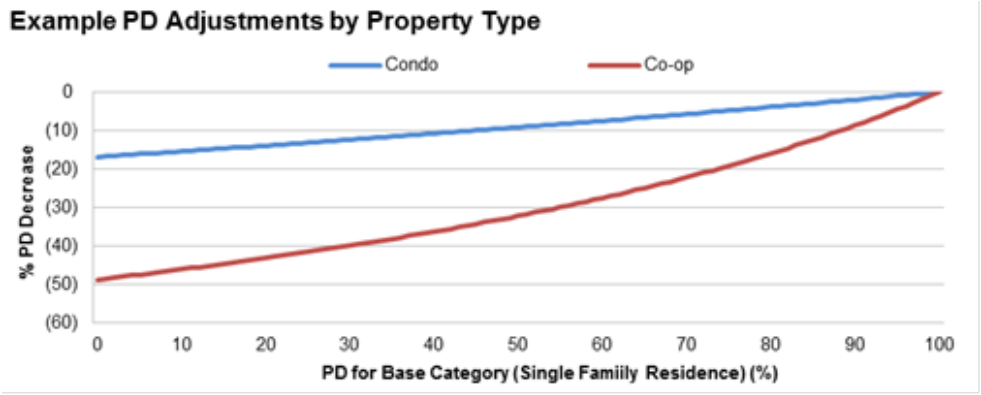
Variables can be either continuous or categorical. Continuous variables consist of a range of possible values, and the default risk rises or falls with changes in those values. For example, PDs derived for variables such as sLTV and credit scores reflect observed default rates for each sLTV or credit score value. The higher observed default rates for loans with higher sLTVs and lower credit scores are reflected by higher PDs for those loans.

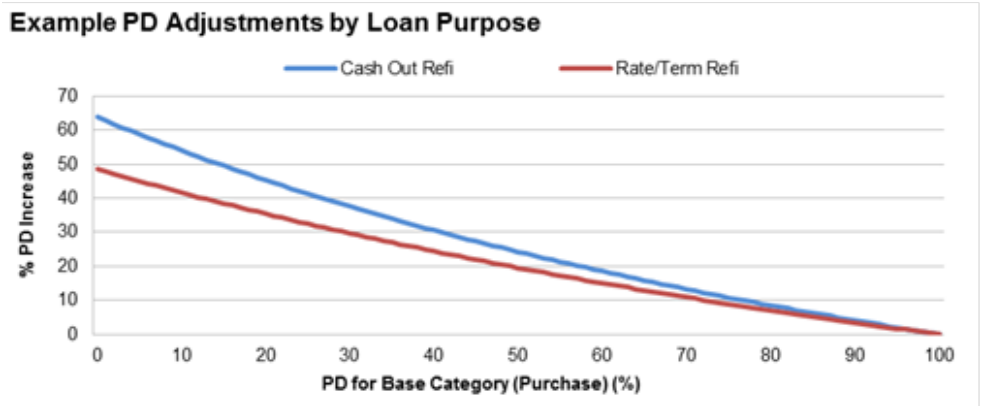
Fitch identifies 13 key variables that prove to be strong predictors of borrower default for agency/prime jumbo loans.

Categorical variables consist of a finite number of possible attributes — or categories — within each variable. One credit attribute within each variable represents the baseline from which the relative risk of other attributes is measured, holding all things constant. For example, the occupancy variable consists of owner-occupied, second home and investor property attributes. Owner occupied is the baseline attribute from which the other two are measured in terms of higher (or with other variables, sometimes lower) risk of default.

These examples illustrate how PD adjustments for specific credit attributes can vary by the loan's credit quality.

The magnitude of the PD adjustments for categorical variables is a function of the PD of the baseline attribute. As seen in the charts below, the relative magnitude of the PD adjustment is greatest when the baseline PD is near zero, and the adjustment converges to zero as the baseline PD approaches 100%. Throughout the following section, PD adjustments for categorical variables are listed for the unique case where the PD of the baseline attribute is 10%. A 10% PD is selected for illustrative purposes. When the baseline PD is less than 10%, the PD adjustment will be greater (farther from zero) than the listed value, and when the baseline PD is over 10%, the PD adjustment will be less (closer to zero) than the listed value.





Fitch conducts separate PD regression analyses on the agency/prime jumbo, Alt-A and subprime datasets. The agency/prime jumbo data is analyzed using 13 drivers of PD, while the Alt-A and subprime analyses utilize nine variables.

When conducting rating analysis on RMBS transactions, Fitch applies the PD regression model with the model development dataset that best represents the pool of loans under analysis. Fitch's "U.S. RMBS Surveillance and Re-REMIC Criteria" describes which PD regression models are used to maintain ratings on RMBS transactions issued prior to 2010 and re-REMICs. For transactions issued after 2009:

- GSE credit risk transfer and prime jumbo transactions are analyzed using the PD regression model developed on the agency/prime jumbo dataset.
- As stated in Fitch's "U.S. RMBS Seasoned, Re-Performing and Non-Performing Loan Criteria," NPL transactions will use the PD regression model developed on the subprime loan dataset, and the PD regression model used to analyze seasoned pools or RPLs will depend on the credit attributes of the collateral. Seasoned/RPL pools Fitch has rated since 2014 have most closely resembled legacy Alt-A collateral, and therefore the PD regression model developed on the Alt-A dataset has been used to date.
- The collateral in non-prime transactions originated after January 2014 is best represented by the dataset used to develop the agency/prime jumbo PD regression, across key risk variables like LTV, property value, documentation and occupancy. Additional PD risk variables provided in non-prime pools to date are only available in the agency/prime jumbo dataset, and not in the Alt-A or subprime datasets. Such variables include the number of borrowers, the origination channel, operational quality and liquid reserves.

  The agency/prime jumbo dataset has a wide distribution of credit scores that sufficiently represents the range of credit scores in non-prime RMBS analyzed to date. For example,

new non-prime pools analyzed to date have weighted average credit scores of roughly 700. In the agency/prime jumbo PD regression dataset, roughly one-third of the loans (reflecting millions of historical observations) have a credit score lower than 700.

For the reasons above, Fitch will use the PD regression model developed on the agency/prime jumbo dataset to analyze newly originated non-prime pools that have attributes generally consistent with those seen to date. If average collateral attributes in future non-prime transactions meaningfully diverge from those seen to date, such as weighted average credit score drifting into the mid-to-low 600 range, Fitch will re-evaluate which PD regression model will most accurately reflect the default risk.

To account for the limited performance record of the sector, a conservative PD adjustment will be made to the agency/prime jumbo regression in the form of increasing the ERF value by 0.5 in the base-case and stressed scenarios. With this adjustment, the model-derived PD for new non-prime pools will be modestly higher than historically observed in the agency/prime jumbo datasets, and closer to historically observed Alt-A default levels (controlling for attributes).

The treatment of each variable within the model may vary depending on the loan's sector. While the sLTV variable is the most influential variable across all sectors, the relative influence of other PD variables can vary for each sector. For instance, the ERF variable is less influential for subprime loans than it is for agency/prime jumbo and Alt-A loans. Subprime borrowers generally exhibit higher default rates than agency/prime jumbo or Alt-A borrowers in a benign macroeconomic environment. As such, periods of economic stress cause lower relative increases in subprime default rates than those of agency/prime jumbo or Alt-A.

Fitch explored the possibility of analyzing all three sectors with one combined dataset and found that the results did not sufficiently capture the varied default behavior of each sector. As the table below illustrates, loans from different sectors with similar attributes have historically shown different performance trends to date. Fitch concluded that a separate analysis on each sector was necessary to address the various underwriting standards and performance trends historically associated with each asset class.

In addition to different performance trends between the sectors, the default behavior in relation to each of the default drivers varies by asset class. For instance, Fitch finds that while refinance loans perform worse than purchase loans in the agency/prime jumbo and Alt-A sectors, refinances outperform purchases among subprime loans. As such, the PD adjustment for this variable varies between sectors. The varied and nuanced sensitivities to default drivers between sectors further support the decision to analyze the sectors separately.

Historical Performance Varies Across Sectors, Even Controlled for Attributes

	Average Attributes					Performance (%)				
Sector	**FICO**	**CLTV (%)**	**Full Doc (%)**	**CA (%)**	**Balance ($)**	**Factor**	**DQ**	**Mod**	**Default to Date**	**Loss to Date**
Agency/Prime Jumbo	700	79	100	100	352,392	3	9	1	3	1
Alt-A	700	79	100	100	349,875	11	13	7	14	8
Subprime	699	80	100	100	346,277	10	14	14	19	11

Sample: CA – California; full doc; FICO 690–710; CLTV 75%–85%; and loan size of $300,000–$400,000. CLTV – current combined loan-to-value ratio.
DQ – 60 or more days delinquent. Mod – Modified.
Source: CoreLogic/LoanPerformance and Freddie Mac.

The following section details each PD variable and its application for determining the base PD.

Probability of Default Risk Variables

Probability of Default Variable	Loan Attributes	Relative PD Adjustment
sLTV	Continuous	Higher sLTV = Higher PD
Economic Risk Factor (ERF)	Continuous	Higher ERF = Higher PD
Credit Score	Continuous	Higher Credit Score = Lower PD
Loan Documentation	Continuous	Less Documentation = Higher PD
Number of Borrowers[a]	1 Borrower	Baseline
	2 Borrowers	Lower than Baseline
Loan Purpose	Purchase	Baseline
	Rate/Term Refinance	Higher than Baseline[b]
	Cash-Out Refinance	Higher than Baseline[b]
Loan Term	30-Year Term	Baseline
	> 30-Year Term	Higher than Baseline
	<= 20-Year Term	Lower than Baseline
Origination Channel[a]	Retail	Baseline
	Non-Retail	Higher than Baseline
Property Value Ratio[a]	Continuous	Lower Value = Higher PD
Back-End DTI Ratio	Continuous	Higher DTI = Higher PD
Property Type	Single-Family/PUD	Baseline
	Co-Op	Lower than Baseline
	Condo	Lower than Baseline
	Multifamily	Higher than Baseline
Occupancy	Owner-Occupied Primary	Baseline
	Second Home	Higher than Baseline
	Investor	Higher than Baseline
Liquid Reserves[a]	Continuous	Greater Reserves = Lower PD

sLTV – Sustainable loan-to-value ratio, which is the original combined loan-to-value ratio adjusted by sustainable market value decline (sMVD). PUD – Planned unit development. DTI – Debt-to-income ratio. [a]Variable only applies to agency/prime PD regression model. [b]Refinances have a lower PD than baseline for subprime loans.

Fitch's SHP model associates movements in home prices with fundamental drivers like unemployment and supply and demand dynamics.

Probability of Default Variable 1: Sustainable Loan-to-Value Ratio

When determining a loan's default probability, the most predictive variable is borrower equity through the life of the loan. Fitch considers borrower equity through its sLTV metric, which measures the borrower's equity in the home, calculated using the lowest of the purchase price, appraisal value or the value determined by Fitch's SHP model. The SHP model calculates the declines necessary to return to sustainable home prices at the MSA level based on regional economic conditions and an analysis of fundamental price drivers. For homes in markets considered to be overvalued by the SHP model, the PD model views the borrower as having less equity than the loan underwriting and original CLTV would imply. There are no timing vectors associated with the SHP model's MVDs; rather, they are a point in time measurement of regional overvaluation.

The sLTV is the leading variable in Fitch's regression model. The sLTV considers both the original CLTV and MSA-level home price projections from Fitch's SHP model.

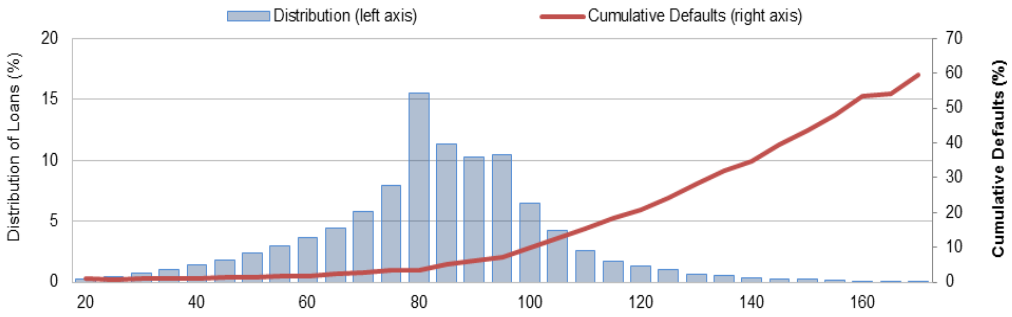
sLTV Example (2006 Vintage Loan)

Appraisal Value ($)	500,000
Loan Amount ($)	400,000
CLTV (%)	80
Sustainable Value ($)	250,000
Sustainable MVD (%)	50
sLTV Ratio (%)	160

sLTV – Sustainable loan-to-value ratio. CLTV – Combined loan-to-value ratio.

As shown in the table above, for a 2006 vintage loan with an original CLTV of 80%, the SHP model implies a sustainable value of one-half the original value, which results in a 160% Fitch-adjusted original CLTV, or sLTV. It is important to highlight that the sLTV considers both the original CLTV and the MSA-level home price projection from Fitch's SHP model.

Cumulative Defaults[a] by sLTV for the Agency/Prime Jumbo Regression Dataset

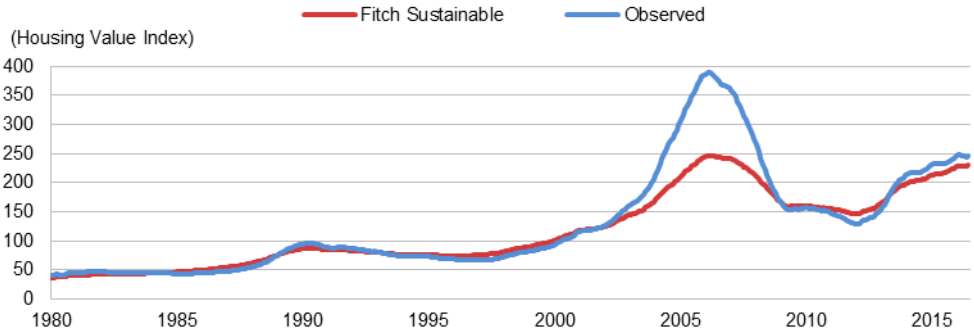


[a]Includes observed defaults to date and Fitch's roll-rate projected defaults.
Source: CoreLogic/LoanPerformance and Freddie Mac.

Unlike appraised values that are pro-cyclical and may be influenced by short-term trends, Fitch's sustainable home price represents a long-term value that is anchored to regional macro and housing fundamentals. It also reflects the long-term nature of residential property investments.

Examining default performance across the development dataset, Fitch identifies a strong correlation between sLTV and mortgage defaults. More influential than credit score, product type, documentation, or other borrower attributes, the combination of original CLTV and sMVDs explains a majority of a loan's behavior and is the strongest factor in determining a loan's risk of default. Fitch's analysis also shows this relationship holds true across geographic regions, including states with and without lender recourse against defaulting borrowers.

California Home Prices: Observed (Case-Shiller) vs. Fitch Sustainable Value



Source: Case-Shiller, Fitch.

A Closer Look at Fitch's Sustainable Home Price Model

The SHP model is a regression-based model that aims to associate movements in home prices with drivers fundamental to the housing market. An analysis of these drivers is the basis for identifying deviations of prices from historical trends. Thus, the SHP model is used by Fitch to identify potential regional property value bubbles that can impact default and loss performance on mortgage loans. The key drivers used in the SHP model are unemployment, income, rental prices, the rate of growth of households, and mortgage rates.

These fundamental drivers are used as inputs to the SHP model and are each associated with a coefficient for determining the expected movement in home prices for any given change in a driver. To reflect long-term trends, sustainable values are calculated as a three-year average, including two years of historical data and one year of projection. This helps ensure that a change in sustainable prices predicted by the model reflects a change in long-term economics rather than a short-term or seasonal movement. The regression is run at the MSA level to capture regional variations and differences that may arise in localized drivers. Limits are placed on the overall impact of individual factors to avoid historical overfit to any one metric, and to ensure a distribution of influence across the variables most important to the housing price equation. State-level values are calculated as a weighted average of the MSAs within each state.

Because of concerns about fitting to periods where prices were at exceptional levels, driven primarily by speculative influences rather than fundamental growth, Fitch utilizes a dynamic weighting methodology in its regression approach. Using an iterative regression approach, the model identifies periods where price levels were unsustainable, decreasing the regression weight placed on these unsustainable periods. With this mechanism, the model can identify periods as "unsustainable", meaning that the model sees higher risk for loans originated in these environments.

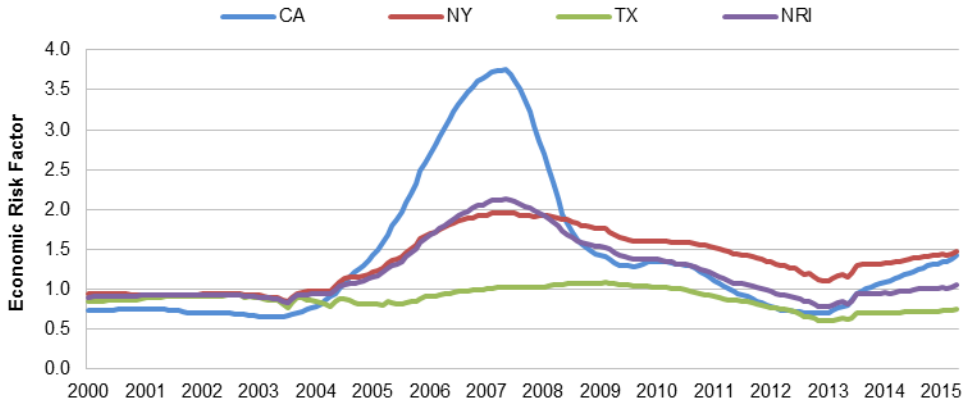
By and large, home price movements in the 1980s and 1990s were highly correlated with this measure of sustainable prices, with some exceptions. On average, prices remained at sustainable levels until the 2000s, when market enthusiasm drove prices significantly higher, resulting in aggressive overbuilding, which, in turn, caused a decline in the demand value of housing stock. 412 MSAs (approximately 95% of all mortgage production) are covered by Fitch's SHP analysis, with the remainder analyzed at the state level.

Probability of Default Variable 2: Economic Risk Factor

The economic risk factor aligns Fitch's default expectations with national macroeconomic trends, as well as regional economic conditions.

The ERF variable accounts for regional economic and demographic factors, as well as national macroeconomic trends. The regression analysis shows a strong correlation between the ERF variable and default risk. In general, as the ERF increases, indicating increased macroeconomic stress, default rates also increase.

Historical ERF and National Risk Index



Source: University Financial Associates LLC.

The volatility in macroeconomic indicators is most evidenced by the increase in the historical National Risk Index (NRI) and ERF values beginning in mid-2004, as shown in the chart above. States that had experienced very high default rates, such as California, exhibited very high ERF values prior to and during the housing crisis. In contrast, Texas has exhibited relatively low ERF values and mortgage default rates that have remained relatively stable through the downturn.

University Financial Associates, LLC (UFA), a mortgage portfolio analysis software provider, provides Fitch with the quarterly ERF. The ERF reflects the impact of economic factors and home price forecasts on future defaults and losses, which are incorporated in UFA's NRI and regional risk (state and zip code) multipliers. Assuming the same average loan credit quality, the NRI provides a default probability for loans originated today relative to those of the 1990s.

State- and zip code-level risk multipliers represent the level of expected risk over the life of a loan relative to the national average on a constant quality basis. For example, if the UFA default multiplier for a state is 0.90, expected defaults in that state are 90% of those for the average loan in the U.S. For more information on the ERF methodology and performance in the regression, see Appendix B, on page 39.

Probability of Default Variable 3: Credit Score

Credit or FICO score remains a key driver of default in Fitch's model, as data continue to show a strong relationship to default risk. Default risk is inversely related to FICO score. With all other variables remaining unchanged, a high borrower FICO score, which indicates a sound repayment history of debt obligations, results in a lower PD assumption. Credit or FICO score is incorporated into Fitch's regression model as a continuous variable.

For loans without credit scores in transactions issued prior to 2009, Fitch will assume an initial value of 720 for prime, 680 for Alt-A and 620 for subprime. Fitch will expect transactions issued after 2009 to contain credit scores and will likely decline to rate a newly issued transaction with

a material percentage of missing credit scores. For the immaterial percentage of loans that may be present in a post-2009 transaction without a FICO score, Fitch will assume 700 for prime, 680 for GSE, 650 for Alt-A, 620 for subprime and 600 for re-performing loans. Fitch assumes lower credit scores for missing values in post-2009 pools than those that are typical for the sector to account for the potential for adverse selection in borrowers with missing scores. Fitch reviews the version of FICO used for the mortgage pool to confirm it is consistent with the version used in our model development. If the version is inconsistent, Fitch may make adjustments to calibrate the versions.

Probability of Default Variable 4: Loan Documentation

Fitch's analysis demonstrated that loans originated under reduced documentation programs have a higher PD than loans underwritten to full documentation programs. Loans with no verification of income or assets showed a very high propensity to default, particularly when combined with other risk attributes, such as lower FICO scores and higher original CLTVs. Because loan underwriting and origination practices can vary from one lender to another, Fitch utilizes a scoring system based on four categories of documentation and verification standards for assessing the risks associated with a lender's underwriting program and documentation practices.

The four categories are differentiated by the type of verification and documentation of borrower income, assets and employment. Each category is assigned a weight — income having the highest weight (60%), followed by assets (25%) and employment (15%) — to calculate a documentation score. Scores range from 1–5, with 1 representing a fully documented loan and 5 representing a loan with very limited or no documentation. PD adjustments are applied based on each loan's documentation score. Loans with scores of 1.5 or lower are considered to be fully documented and receive no PD adjustment. PD adjustments increase incrementally as documentation scores exceed 1.5, with a maximum PD adjustment of 175% for scores of 5.

For loan programs that do not rely on fully documented income, Fitch will solicit additional information from lenders to adequately assess compliance with the Ability-to-Repay rule, eligibility guidelines, risk controls and performance. This will allow Fitch to more accurately code loans originated under such programs under its documentation scoring matrix. The originator review assessment and third-party due diligence results will also impact our opinion of such programs and loan quality.

Probability of Default Variable 5: Number of Borrowers

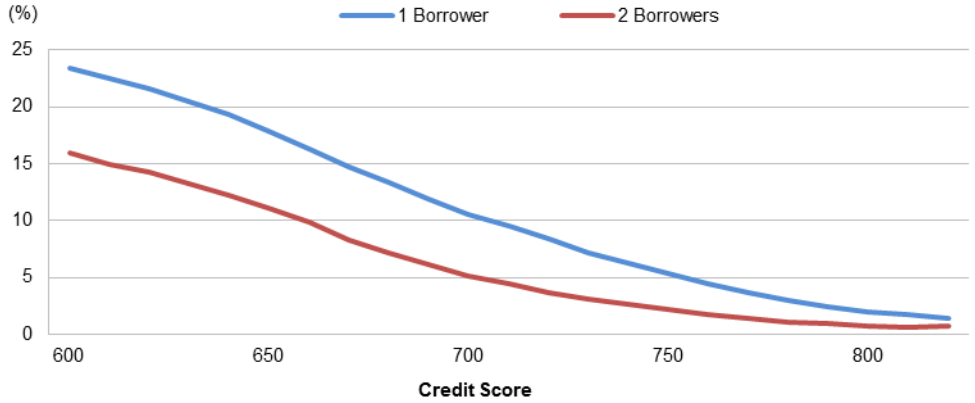
Through its analysis of the agency dataset, Fitch is able to identify a strong relationship between the number of borrowers on a loan and default behavior. Mortgage loans made to two borrowers outperform those made to a single borrower. To account for this performance difference, Fitch assigns a lower default probability to two-borrower loans than to those made to single borrowers. This variable is applied only to agency and prime jumbo loans. Fitch requests that loan-level data provided for new securitizations to identify the number of borrowers on each loan.

Number of Borrowers
(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
One Borrower		Baseline	
Two Borrowers	↓ 50	N.A.	N.A.

[a]Rounded PD adjustment for loans with a baseline PD of 10%. N.A. – Not applicable. See page 6 for a full description.

Historical Defaults by Number of Borrowers



Source: Freddie Mac.

As seen in the chart above, two-borrower loans outperform single borrower loans across a range of credit scores. Fitch attributes this performance differential mainly to a FICO bias in the data. For two-borrower loans, the lower of the borrowers' two FICO scores is typically used to underwrite the loan to determine qualification, and is also reported in the dataset that was used in the regression analysis. Because of this, the reported FICO of two-borrower loans generally overestimates the default risk of the loan since the higher of the borrowers' two FICOs is not taken into account. Conversely, a portion of single borrowers may have intentionally decided to leave another household member off the loan due to a poor credit score that could adversely affect the loan terms or qualification. In this case, the reported FICO of the single-borrower loans generally underestimate the default risk of the loan since a potential second household member with a lower credit score is not considered.

In addition to a FICO bias, the performance gap between single- and two-borrower loans is attributed to household income. Loans backed by two borrowers are more likely to have a second source of income than single-borrower loans and, therefore, have a reduced risk of default should one of the borrowers experience a life event that interrupts their income. While Fitch views the FICO bias as having relevance for all loans, it has determined that the number of incomes is not as equally relevant for all income brackets. To account for this, the PD of higher net worth single borrowers will generally be decreased. In applying this PD adjustment, Fitch may also consider a lender's underwriting criteria, collateral performance and loan-level due diligence findings.

Probability of Default Variable 6: Loan Purpose

Fitch observes that default risk varies among refinances (refis) and purchase loans depending on sector. For agency/prime jumbo and Alt-A loans, refis exhibit a higher default rate than the purchase loan baseline. For subprime loans, however, refis outperform purchase loans. As such, Fitch applies a higher PD expectation to refinanced loans than to purchase loans for agency/prime jumbo and Alt-A loans, and a lower PD projection to refis than to purchases.

For agency/prime jumbo and Alt-A loans, cash-out refinances are applied a higher default rate than purchase loans. Borrowers extracting equity from their home are often involved in debt consolidation or may be experiencing other financial or personal hardships. If the borrower reloads debt after consolidation, the debt burden may increase to a prohibitively high level and cause the borrower to default. Additionally, borrowers using equity to finance large, non-

Loan Purpose
(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
Purchase		Baseline	
Rate/Term Refinance	↑ 40	↑ 25	↓25
Cashout Refinance	↑ 55	↑ 25	↓25

[a]Rounded PD adjustment for loans with a baseline PD of 10%. See page 6 for a full description.

essential expenses are more prone to default if cash is otherwise needed due to a life event or change in financial circumstances.

Rate and term refinance mortgages are also applied a higher default rate than purchase loans among agency/prime jumbo and Alt-A loans. Fitch believes that appraisals associated with refinance loans may be less reliable than the purchase price, as there is no market clearing bid to support the value.

In the subprime sector, the historical data suggests that refis have a lower default risk than purchase loans, all other attributes equal. Of the 2.7 million loans in the subprime PD model development dataset, roughly 81% are either cashout or rate/term refinances. Purchase loans make up only 19% of the dataset and contain a meaningful percentage of first-time homebuyers. Fitch believes this adverse selection contributes to the underperformance of subprime purchase loans compared to refis.

Probability of Default Variable 7: Loan Term

Loan Term
(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
30-Year Term		Baseline	
> 30-Year Term	↑ 115	↑ 70	↑ 65
<= 20-Year Term	↓35	↓ 45	↓ 30

[a]Rounded PD adjustment for loans with a baseline PD of 10%. See page 6 for a full description.

Loans with 20-year or shorter terms exhibited significantly lower default rates than the 30-year term baseline. As such, Fitch assigns lower PDs to loans with maturities of 20 years or shorter than to those with 30-year terms. The shorter maturity results in faster amortization and equity build-up, which increases a borrower's incentive to repay the loan. In particular, borrowers of a 15-year mortgage voluntarily assume the higher payment, despite having a smaller payment option with the 30-year mortgage, reflecting a positive selection bias. In contrast, Fitch applies a PD penalty relative to the 30-year baseline to loans with a maturity in excess of 30 years to account for weaker performance, slower amortization and heightened adverse selection risk.

When analyzing seasoned and RPL RMBS transactions issued in 2014 and thereafter, Fitch does not apply the ">30-Year Term" PD adjustment listed to the left for loans with terms extended beyond 30 years as the result of a modification.

Probability of Default Variable 8: Origination Channel

Origination Channel
(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
Retail		Baseline	
Nonretail	↑25	N.A.	N.A.

[a]Rounded PD adjustment for loans with a baseline PD of 10%. N.A. – Not applicable. See page 6 for a full description

Fitch has determined that loans originated through a direct retail channel have a lower default risk than those originated through a broker, correspondent or wholesale channel. To account for this risk, Fitch assigns a higher default probability to loans originated through nonretail channels than those originated through retail. This variable is applied only to agency and prime jumbo loans. Fitch requests that loan-level data provided for new securitizations identify the channel through which the loan was sourced/originated. If Fitch has not conducted a review of the loan's originator, Fitch will expect the due diligence sample to include a review of the originator's channel designation to qualify for the retail benefit.

Probability of Default Variable 9: Property Value Ratio

Fitch compares the value of each mortgage property with the state-level median property value at the time of origination and finds this variable to be predictive of borrower default among agency/prime jumbo loans. Loans associated with property values significantly below the median exhibited higher default rates relative to those at or above the median value. This makes intuitive sense, as larger properties are generally associated with higher income borrowers who may be less sensitive to income shocks than lower income borrowers. Less desirable, low-value properties may also increase the default risk if the borrower has more difficulty selling the home. The property value to median variable is incorporated into Fitch's agency/prime jumbo regression model as a continuous variable.

Fitch's analysis of the Alt-A and subprime sectors indicates a correlation between property value ratio and default, similar to that of the agency/prime jumbo sector. However, the default variation among property values could largely be accounted for by other predictive variables. Among nonprime loans, lower-valued properties generally had higher sLTVs, lower credit scores and higher investor concentrations. When controlling for these attributes and others, the property value ratio alone had little to no influence on default risk. As such, this variable is not included in the Alt-A or subprime PD models.

Probability of Default Variable 10: Back-End Debt-to-Income Ratio

Fitch's default expectations are also influenced by a borrower's back-end debt-to-income ratio (DTI), which measures a borrower's mortgage payment, taxes, insurance and other debt obligations (i.e. auto loans and credit cards), as a percentage of monthly gross income. In Fitch's regression analysis, the DTI variable has a positive influence on default, with risk increasing with the DTI ratio. While predictive, the variable remains one of the less sensitive continuous default drivers in the model.

Property Type

(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
Single-Family/ PUD	Baseline		
Co-Op	↓ 30	↓ 30	↓ 35
Condo	↓ 10	↓ 10	↓ 30
Multifamily	↑ 30	↑ 10	↑ 10

[a]Rounded PD adjustment for loans with a baseline PD of 10%. See page 6 for a full description.

Probability of Default Variable 11: Property Type

The property type variable consists of single-family detached (SFD) homes, condominiums, cooperatives, multifamily homes and planned unit developments (PUDs). The SFD and PUD property types are the baseline, since both have historically exhibited similarly low default rates.

Condominiums and co-ops exhibit lower default levels relative to the SFD/PUD baseline and are therefore are applied a lower PD in the model. Fitch believes these loans experience fewer defaults because they are predominantly concentrated in heavily populated metropolitan areas where demand is high.

In contrast, multifamily properties exhibited higher default rates, compared with the baseline. These homes are more prone to default risk since the borrower may be relying on income from rental or other sources to help pay the mortgage. Likewise, the limited liquidity of these properties also increases default risk. The PD adjustment for this property type may be increased to as high as four times the SFD baseline PD, depending on the lender's origination processes and underwriting guidelines, operating history and portfolio performance.

Occupancy

(PD Adjustment %)[a]

Category	Prime	Alt-A	Subprime
Owner-Occupied Primary	Baseline		
Second Home	↑ 10	↑ 10	↑ 15
Investor	↑ 60	↑ 30	↑ 60

[a]Rounded PD adjustment for loans with a baseline PD of 10%. See page 6 for a full description.

Probability of Default Variable 12: Occupancy

Second homes are assigned a higher default rate than the owner-occupied primary home baseline. The higher PD reflects the increased likelihood of default on the second home if a borrower is having financial difficulties and cannot sell it.

Investment properties exhibit a higher likelihood of default than owner-occupied primary home properties. Fitch attributes the high default rates to the effect of speculative investments and the higher risk of rental properties. Speculative investing can increase default rates if the property does not sell as fast as or at the price needed for an investor to break even. For rental properties, the borrower relies on income from external sources to repay the mortgage. The investment property penalty may be increased above the minimum thresholds presented based on the quality of the lender's underwriting guidelines and historical portfolio performance.

Probability of Default Variable 13: Liquid Reserves

Fitch's data analysis determines that borrowers with significant levels of liquid reserves experience a lower historical default rate than those with little to no reserves. Liquid reserves are financial assets available to a borrower post close, including checking and savings accounts, investments in stocks, bonds, mutual funds, certificates of deposits, money market funds and vested amounts in a retirement savings account. Originators may apply discounts to certain assets due to illiquidity and/or exposure to market volatility. Fitch measures reserves as a percentage of the mortgage balance. Fitch will apply a 25% haircut to the reserves amount based on the volatility of values associated with some asset types and may decline to provide any PD benefit from reserves depending on its review of the originators' practices and underwriting guidelines, as well as any overlays applied by an aggregator.

Calculated reserves ratios are decreased by 30% to simulate an adequate amount of reserves to withstand economic or personal shocks, with the remainder classified as the available reserves ratio present to provide default support to the mortgage. The magnitude of the PD adjustment rises as the available reserves ratio increases between 0% and 100%. There is no further incremental benefit beyond an available reserves percentage of 100% of the loan balance.

Additional Probability of Default Adjustments

In addition to the 13 variables in the regression model listed above, there are other important factors that are significant determinants of default in Fitch's model framework. These are:

- Cure rates — loans that resolve without a loss following a default.
- Products — hybrid adjustable-rate and IO mortgages.
- Origination/aggregator quality.
- Third-party due diligence.
- Pool concentration — loan count and geographic concentration.
- Prior credit events
- Other qualitative considerations.

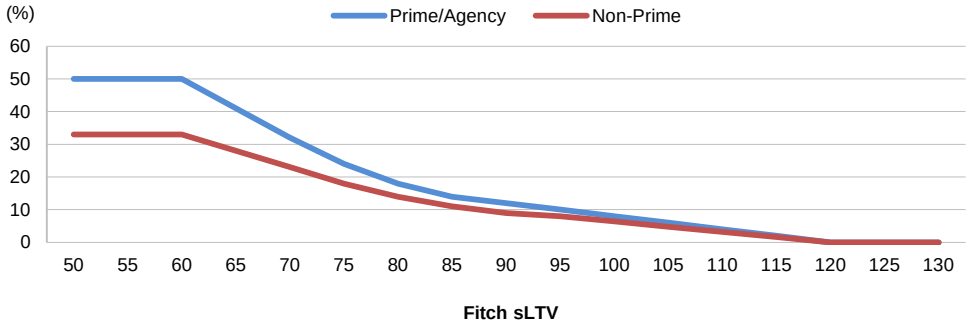
Fitch adjusts the PD model output to take these factors into account, as described below.

Cure Rate Adjustment

Fitch's regression-derived PD assumption reflects the probability of a loan becoming 180 days delinquent. Historically, a meaningful percentage of loans that have 'defaulted' per this definition have resolved without a loss. To reflect this, Fitch adjusts each loan's regression-derived PD by a cure rate adjustment (CRA) prior to applying a loss severity.

Fitch's analysis of historical cure rates following a 180-day default indicates a borrower's sLTV is the key driver of cure rates, with lower sLTV resulting in higher cure rates. Fitch's CRA assumption is derived at the loan level as a function of the loan's sLTV. As shown in the charts below, prime loans with low sLTVs can receive up to a 50% CRA while the maximum CRA for non-prime loans is 33%. The CRA is reduced to zero for loans with an sLTV of 120% or higher.

Cure Rate Adjustment (CRA)



The CRA assumption varies by rating category, with more conservative assumptions in higher rating categories. This is a result of the CRA being a function of sLTV, which is stressed at every rating category, and not due to an explicit CRA stress. The table below demonstrates how, for a loan with a base-case sLTV of 70%, the CRA decreases at higher rating categories as a result of higher sLTV assumptions. See Generating Rating Stressed Losses below for a discussion of how sLTV is stressed.

Example CRA Credit on a Hypothetical Prime Jumbo Loan

(%)

Rating Stress	MVD Stress	sLTV	CRA
AAAsf	35	108	5
AAsf	30	100	8
Asf	25	93	11
BBBsf	20	88	13
BBsf	15	82	16
Bsf	10	78	20
Base Case	0	70	32

In its CRA analysis, Fitch focused solely on historical observations of defaulted loans that subsequently prepaid in full without a loss. Defaulted loans that had been modified or are re-performing and still outstanding were excluded from the analysis due to the interest or principal losses typically incurred and the possibility of a future re-default.

Hybrid Adjustable-Rate Mortgages and Interest-Only Mortgages

Hybrid ARMs provide for a fixed rate of interest for a specified time, after which the interest rate adjusts based on an index, such as the six-month LIBOR or the Constant Maturity Treasury (CMT). Principal is paid and amortizes beginning on the first payment date.

IO mortgages can be either fixed or adjustable and provide for only interest to be paid for a specified time, which typically ranges from five to 10 years. No principal is due to be paid or amortized during the IO period. Once

PD Adjustments for ARMs and IOs[a]

Payment Increase (%)	Time to Payment Increase (Years)	Average PD Adjustment (%)
<25	1	↑ 45
<25	3	↑ 30
<25	5	↑ 25
<25	7	↑ 20
<25	10	↑ 10
25–50	1	↑ 85
25–50	3	↑ 60
25–50	5	↑ 45
25–50	7	↑ 35
25–50	10	↑ 20
>50	1	↑ 170
>50	3	↑ 120
>50	5	↑ 90
>50	7	↑ 65
>50	10	↑ 40

[a]Adjustments reflect observed performance.
Source: CoreLogic/LoanPerformance.

the IO period terminates, the payment converts to a fully amortizing monthly amount. If the loan is both an ARM and an IO, the interest rate may adjust prior to or concurrent with the end of the IO period. For fixed-rate IOs, the rate of interest does not change when the IO period terminates; it is fixed at origination for the life of the loan.

The payment shock resulting from an increase in the monthly payment raises a borrower's propensity to default. To address this risk, Fitch applies penalty adjustments to a loan's base case PD based on the size of the payment increase relative to the initial unadjusted payment and the length of time before the first scheduled increase occurs. When analyzing seasoned and RPL RMBS transactions issued in 2014 and later, the current payment amount will be used as the baseline for modified loans, and the lower of the current payment and original payment amount will be used for non-modified loans. The current interest-only payment is used for loans that have yet to amortize.

To derive PD adjustments, Fitch analyzed the relative historical payment behavior of adjustable-rate and IO mortgage products that experienced an upward payment adjustment. This analysis was used in lieu of a regression analysis due to the limited sample size of post-reset loans in a rising rate environment. Hybrid ARMs and IOs originated in 2004 and later that have experienced a payment adjustment have done so during an extremely low rate environment, and many have seen a decline in their monthly payments, producing a distortedly low default profile for modeling purposes. Furthermore, the higher level of defaults that has occurred before the adjustment date indicates the presence of other risk factors as cause for default rather than payment shock alone.

Fitch accounts for payment reset risk in ARM and IO products by applying PD penalties that consider both the magnitude of the payment shock and its timing.

For purposes of the analysis, Fitch established three bands of observed payment increases in relation to the initial payment: less than 25%; 25%–50%; and greater than 50%. Fitch then analyzed the post-adjustment delinquency history of the ARM and IO dataset to determine the PD penalty adjustment based on the relative behavior of loans that had comparable credit characteristics but faced different timing and amounts of payment adjustments.

The relative observed behavior of loans analyzed was used to determine PD penalty adjustments for hybrid ARMs and IO mortgages. Fitch estimates each loan's future payment increase based on mortgage loan terms and the 'Bsf' interest rate stress detailed in "Criteria for Interest Rate Stresses in Structured Finance Transactions and Covered Bonds," available on Fitch's website at www.fitchratings.com. The base case PD increases by the penalty that corresponds to the payment increase derived from this approach.

The PD penalty determined by the projected payment shock is adjusted based on the length of time until the payment increase is expected to occur. For loans with a longer period until the payment adjustment occurs, the PD penalty is reduced to reflect the greater likelihood that the borrower will voluntarily prepay prior to experiencing an increase. Fitch runs multiple prepayment scenarios to test the sensitivity of pool credit enhancement to the prepayment assumption. Fitch may make adjustments to penalties to reflect individual lender underwriting practices, such as how the initial qualifying monthly payment is calculated. If the initial qualifying payment used in the loan's underwriting varies from the borrower's actual monthly payment, Fitch will use the qualifying payment when assessing future payment shock risk.

Origination Quality

As part of its agency/prime jumbo regression analysis, Fitch was able to identify loans that consistently outperformed or underperformed the mean, after controlling for all traditional default drivers. Fitch attributes these performance variations to differences in origination quality.

Through both qualitative and quantitative consideration, Fitch may increase or decrease the default expectation of certain newly originated loans in a pool to account for the quality of origination or, for conduit deals, aggregation.

Influential factors include the findings of our originator/aggregator review process, the amount, scope and findings of third party due diligence performed on the reference pool, and the historical performance history of the originator/aggregator. Such adjustments will be made only to credit risk transfer, prime jumbo and non-prime transactions issued after 2009.

The amount of the adjustment will range from a 10% credit to a 15% penalty for originators that have undergone an originator assessment by Fitch. (All lenders that contribute more than 15% of a prime jumbo RMBS pool will be subject to a Fitch originator assessment.) For lenders that contribute smaller portions of a mortgage pool, an adjustment will be based on an assessment of the transaction's aggregator. The amount of the adjustment for aggregators of private label RMBS will range from 0% (no adjustment) to a 15% penalty. If an originator or aggregator is determined to be below average, Fitch may cap the ratings or not assign ratings.

Fitch makes a distinction between aggregators of private label RMBS transactions and the acquisition of loans by Fannie Mae and Freddie Mac. Given their long track record, unique market position and operational enhancements, Fitch applies a 5% credit to the model output for loans acquired by the GSEs since the financial crisis.

Loans that have been reviewed by a third-party due diligence firm prior to securitization receive a 5% credit to account for the additional robustness of the loan/borrower attribute data being input into the model, relative to a loan that has not been reviewed.

In addition to the adjustments described above, Fitch applies a 5% credit to the model output for all loans originated after 2009, except for those originated from lenders with operational assessments 'Below Average.' Fitch's analysis indicates that, when controlled for known credit characteristics and differences in economic environment, the performance of mortgage loans originated after 2009 appears to reflect a broad improvement in operational quality in the U.S. mortgage market relative to practices prior to 2009. Since the loan loss model is developed using loans originated in 2009 and earlier, Fitch makes an adjustment to the model output for post-2009 loans to reflect the broad changes apparent in the performance.

Transaction Maturities

The mortgage loss model predicts a loan's lifetime PD. For transactions where noteholders are not exposed to lifetime defaults, (i.e. as with GSE risk-sharing transactions), Fitch will reduce the PD expectation for performing loans. The amount of the reduction will vary based on the transaction's maturity and the rating stress. In a 'BBBsf' rating stress scenario, the adjustment will reduce the lifetime default probability by 10% for transactions with a default risk exposure of 10 years backed by loans with maturities of 30 years. The adjustment will be greater for shorter maturities and lower rating stress scenarios, and less for longer maturities and higher rating stress scenarios. The table on the next page shows the default adjustments by stress and years until maturity for GSE risk-sharing transactions that use a 180-day delinquency definition for a credit event. For transactions that use an actual loss structure, the time until maturity is reduced by 2.5 years prior to referencing the table on the next page to account for an average expected time of 30 months between 180-day delinquency and the loan's liquidation.

Reduction to Lifetime Loan Default Assumption for Transactions with Maturities Prior to Loan Maturities

(%)

Rating Stress	Years Until Transaction Maturity						
	7	8	9	10	11	12	13
AAAsf	16	12	8	4	0	0	0
AAsf	18	14	10	6	2	0	0
Asf	20	16	12	8	4	0	0
BBBsf	22	18	14	10	6	2	0
BBsf	24	20	16	12	8	4	0
Bsf	26	22	18	14	10	6	2
CCCsf	26	22	18	14	10	6	2

Note: Years until maturity shown above are for fixed-tiered loss severity GSE transactions. For actual-loss transactions, 2.5 years is subtracted from actual years until maturity before referencing table above. PD adjustment only applied to performing loans.

Fitch's model measures both loan and geographic concentrations at the portfolio level and applies penalties as these risks increase.

Pool Concentration Risk: Loan Count and Geographic

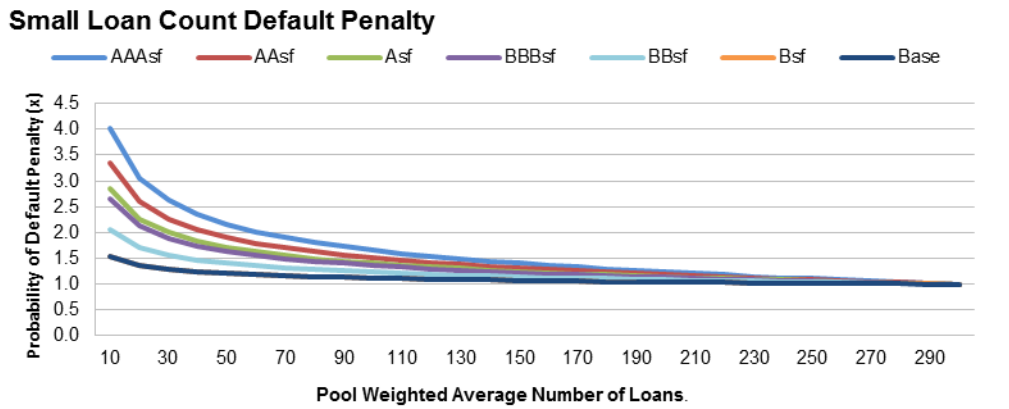
For the model output to reflect portfolio credit risk, there must be some consistency between the RMBS transaction under analysis and the diversified portfolio of assets on which the model was regressed. As an RMBS transaction becomes more concentrated, there is a greater risk the pool will exhibit default characteristics that deviate from the default behavior of the model development dataset.

The U.S. RMBS rating framework seeks to identify and make adjustments for portfolio concentrations that may impact performance in the future. It does so through a combination of base assumptions and an overlay of additional stresses, which act to increase credit enhancement if a portfolio exhibits significant loan and/or geographic concentrations.

Concentration Risk 1: Loan Count

RMBS transactions with a small number of loans or those dominated by loans with very large balances carry the risk that portfolio performance may be adversely impacted by a few assets that may underperform relative to the statistically derived assumptions underlying their ratings. This is simply because the variability of defaults inherently increases when a portfolio depends on a smaller number of assets. In contrast, large diversified pools with more evenly distributed balances benefit from the increased conformity to default estimates.

Fitch uses the Herfindahl-Hirschman Index (HHI) to measure loan concentration in U.S. RMBS transactions. The ratio is calculated as the sum of the squared pool shares (measured in fractions) of each loan in the pool and expressed in a scale of zero to one, with values approaching zero reflecting greater granularity. Fitch then uses the HHI to calculate the weighted average number (WAN) of loans (WAN=1/HHI) in the portfolio. The WAN accounts for both the number of loans in the pool and the distribution of loan balances.



Note: For typical prime jumbo pool with a base case pool default assumption of 50 bps and a 'AAAsf' default assumption of 10%.

Mortgage pools with weighted average loan counts below 300 are subject to PD penalties.

Pool granularity is established when each loan's potential loss exposure represents a very small share of the overall portfolio risk. Fitch's updated framework treats a pool with 300 evenly distributed loans as being sufficiently granular and, therefore, does not apply an additional PD adjustment. However, RMBS pools with an initial loan count or WAN below 300 loans are subject to PD penalties that are applied to the pool's model-generated PD. The adjustment amount is inversely related to the pool's concentration metric and is stressed to a higher degree at higher rating categories. The range of potential PD outcomes intended to be covered by the concentration adjustment at each rating stress increases from 55% in the base-case ('CCCsf') to 99.95% of projected outcomes at the 'AAAsf' rating category. As an example of the implications for PD, a high-quality RMBS pool with a 200 loan count as measured by its WAN would be subject to a PD penalty of approximately 5% at the 'Bsf' rating category and 20% at the 'AAAsf' rating category, compared with an identical pool that meets Fitch's minimum threshold.

RMBS pools where individual mortgage balances are disproportionately larger than the pool's average loan size are also subject to additional PD and LS sensitivity analysis. The results of this additional analysis are applied outside the model and presented to the rating committee for consideration before final ratings are assigned.

Fitch measures geographic concentration risk and will apply PD penalties to pools that are more geographically concentrated than the aggregate development set.

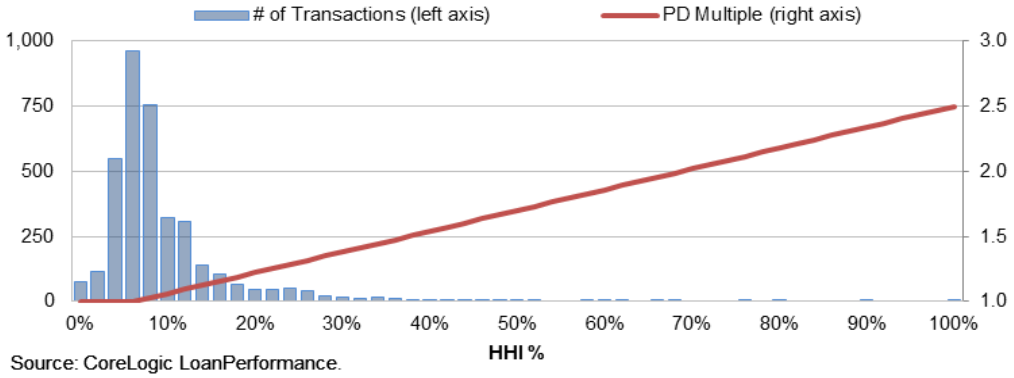
Concentration Risk 2: Geographic Distribution

Pools concentrated in a small number of geographic regions may be highly sensitive to unforeseen localized stresses, including industrial shifts, deteriorating economic conditions, or natural disaster events. While Fitch believes its SHP and ERF risk factors are adequate to protect for a geographically diverse pool, some regions will naturally overperform or underperform expectations. In a highly concentrated pool, performance is highly dependent on a small subset of regions; therefore, loss protection derived by a diverse development dataset may prove insufficient to cover the concentrated pool's defaults and losses. To account for the additional risk posed by highly concentrated pools, Fitch applies PD adjustments to model results.

Fitch uses the HHI to measure the extent to which a pool has adequate spread of its geographic risk. In this application, loans are identified as within one of the largest 50 MSA/CBSA regions in the U.S. or otherwise grouped by state, representing 100 total measured regions. The HHI is calculated as the sum of the squared pool percentages within each region, reflecting a weighted average pool concentration that ranges from 1% for a perfectly distributed pool up to 100% for a pool concentrated in a single region.

Fitch applies a PD penalty adjustment to pools that are more geographically concentrated than the aggregate development set. The magnitude of the penalty is determined by comparing the subject pool's HHI with the development set's HHI of 6.2%. The adjustment is applied as a sliding scale up to a maximum PD multiple of 2.5x for a pool with 100% concentration within a single region. As shown in the chart below, the majority of prime jumbo RMBS transactions issued to date had a geographic HHI under 10%, resulting in little to no PD adjustment since the loan pools are sufficiently geographically diverse.

Geographic Concentration PD Adjustments
Prime Jumbo RMBS Transactions Issued Between 1990–2015



Source: CoreLogic LoanPerformance.

In addition to applying the framework described above, concentrations in select MSAs or states may result in additional scrutiny on regional economies and housing markets and sensitivities for committee consideration. Transactions with significant concentrations in a single region or a small number of regions may also be subject to rating caps, as discussed in "Criteria for Rating Caps and Limitations in Global Structured Finance Transactions," listed on page 1 and available on Fitch's website. Fitch applies a geographic concentration adjustment to both newly issued transactions and existing transactions as part of its surveillance process.

Prior Credit Events

Historical data show that borrowers that experienced a credit event with their previous loan — such as a foreclosure, short sale or bankruptcy — default on their new loan at a higher rate than borrowers with comparable credit scores without a prior credit event. To account for this, Fitch applies a 20% PD penalty at all rating category stresses to loans with prior credit events.

Other Qualitative Considerations

Fitch conducted an analysis on a number of loan- and borrower-related variables that were not included in the final PD regression. Factors such as risk premium, self-employed borrowers and first-time homebuyers were considered for inclusion in the regression but were ultimately excluded due to their statistical insignificance when controlled for other attributes. However, to the extent that any of these attributes or characteristics are heavily represented in a mortgage

pool, Fitch will request additional underwriting and performance information on these loans, which may result in adjustments to PD model output. Any such qualitative PD adjustments will be disclosed in Fitch's rating action commentary (RAC) and/or presale report.

Loss Severity

Fitch employs an accounting-based LS modeling framework that takes into account the key underlying drivers of mortgage loss. Fitch calculates LS using regional projections of sMVD derived from its SHP model, combined with estimated carrying costs and liquidation expenses. An inflation adjustment is made to the property value to account for nominal price increases projected to occur in the period between the date of the analysis and the future liquidation date of the loan. Fitch assumes 2% annual inflation and applies a maximum adjustment of 6% to loans currently performing to reflect an assumption that, on average, borrowers that default will pay as agreed for three years prior to default. A DSA discount is applied to the sMVD- and inflation-adjusted market value of the property to determine the recovery value based on the observation that properties typically sell at a discount in distressed sales.

Loss Severity Calculation Example

	AAAsf Stress	Bsf Stress
Appraisal/Sale Value ($)	600,000	600,000
Plus: Inflation (6%)	36,000	36,000
Less: MVD (35%)/(10%)	210,000	60,000
Less: DSA (15%)	63,900	86,400
Resale Value ($)	362,100	489,600
Resale Value Less Expenses		
Liquidation Costs ($)	64,781	57,101
Carrying Costs ($)	72,000	36,000
Net Recovery ($)	225,319	396,499
Mortgage Amount ($) (LTV = 80%)	480,000	480,000
Less: Amortization Prior to Liquidation (5%)	24,000	24,000
Less: Net Recovery ($)	225,319	396,499
Loss Amount ($)	230,681	59,501
Loss Severity % (Loss Amount/ Mortgage Amount)	48	12[a]

[a]This loan would be subject to a 15% LS floor, as described on page 29. Liquidation costs – Legal costs ($5,000) plus taxes and insurance (1.7% of the appraised value per year) plus repair costs (1% of distressed property value) plus periodic maintenance (0.25% of distressed property value per year) plus sales commission (6% of the resale value). Carry costs – Unpaid principal and interest ($2,000 per month). Liquidation timeline – 'AAAsf' = 36 months; 'Bsf' = 18 months. MVD – Market value decline. DSA – Distressed-sale adjustment. LTV – Loan-to-value ratio.

Foreclosure and liquidation costs, which include unpaid taxes, insurance, legal fees and other associated fees, are netted from recovery proceeds. Finally, carrying costs associated with unpaid principal and interest due on the loan also reduce total recoveries. After these adjustments, net recoveries are subtracted from the projected loan balance at liquidation to determine a loan's LS, which is expressed as a percentage of the current loan balance. Fitch assumes 100% LS for all second lien loans.

Fitch considered empirical data on observed loss severities of liquidated loans through different economic scenarios in calibrating underlying assumptions. The framework recognizes the pro-cyclical nature of defaults and recoveries, with higher loss severities occurring during periods of higher defaults.

Loss Severity Variable 1: Sustainable Market Value Declines

In estimating the sale value of a property, appraised values are first adjusted by the sMVD, which is estimated at the MSA level. The sMVD estimates are derived from Fitch's SHP model and represent projected declines needed to achieve price sustainability as described in the SHP model discussion on page 9. The sMVD assumptions applied in the LS calculations are consistent with those used in Fitch's PD calculation. Fitch assumes that the MVDs occur instantaneously, with no timing vectors employed.

Loss Severity Variable 2: Distressed-Sale Adjustment

Fitch applies a DSA to all loans to reflect the discount on open-market values that sellers of foreclosed properties may have to accept to find interested buyers and to account for distressed property conditions. The DSA discounts are applied as an incremental reduction to the property price after it has been reduced by the sMVD and no timing vector is applied; Fitch applies the DSA as an immediate reduction to the price.

DSA haircuts were tallied by comparing expected and observed losses for liquidated loans and calculating the price discount necessary to reconcile these numbers. Components of the expected losses in this formula include carry costs, price declines estimated by the SHP model and all other foreclosure and transaction costs, using observed information where available, and reflecting information from Fitch's operational risk group and discussions with lenders and other market participants.

In reviewing its DSA assumptions, Fitch found that observed DSAs for liquidated loans have a strong correlation to the property value and occupancy status. Lower-valued properties and investor properties tend to liquidate at a larger discount than higher valued properties and owner-occupied properties. Accordingly, the rating agency used a regression analysis to develop a dynamic DSA assumption relying on those two variables. A DSA floor of 10% is implemented to assume a reasonable discount to market values for each loan, and the DSA assumption is capped at 95%. Based on historical data, property values over $600,000 are assumed to have a DSA consistent with a property value of $600,000.

In Fitch's DSA regression analysis, the dependent variable (DSA) is calculated using the SHP model predicted home price at liquidation. This is meant to synchronize the development of the DSA regression model with its application in the LS framework, since the DSA discount is applied as an incremental reduction after the SHP reduction. In practice, the revised DSA reflects not only a discount to market value, but also accounts for the fact that not all properties within an MSA will observe the full decline predicted by the SHP model before liquidation.

Loss Severity Variable 3: Liquidation Timelines and Costs

Fitch subtracts liquidation costs from the recovery amount expected to be realized at property sale or disposition. Fitch estimates both fixed and variable liquidation costs based on available industry data, and information obtained from Fitch's operational risk group and discussions with Fitch-rated servicers. The fixed-cost assumptions reflect legal fees, while variable costs are inclusive of real estate agent fees of 6% of the property sale price and maintenance costs, which are assumed to be an initial 1% of the property value plus 0.25% per year. Fitch also assumes taxes and insurance (T&I) based on the property's location and value accrue monthly throughout the liquidation period. Fitch's T&I assumptions vary by state, with a range between 0.5% and 3.5% annually, and an average of approximately 2% annually.

LS variables:

- Stressed sMVD.
- DSA.
- Liquidation timelines and costs.
- Loan amortization.

Liquidation timeline assumptions vary by state and delinquency status to reflect differences in local foreclosure statutes and housing market dynamics. The timeline assumption for 'clean current' loans (performing loans with no missed payments in the last 24 months) is based off a long-term average of observed liquidations prior to 2008. Timeline assumptions for 'dirty current' (performing, but with at least one missed payment in the last 24 months) and delinquent loans, as well as those in foreclosure (FC) and real-estate owned (REO), are based off average observed liquidations from 2008 through 2015. The table below displays the average base-case remaining liquidation timeline assumption by loan status for a geographically diverse sample of outstanding loans, as well as the range of state-level assumptions. For delinquent loans and those in FC and REO, Fitch's total timeline assumption consists of the remaining timeline assumption shown below and the observed timeline to date. As discussed in the Generating Rating Stressed Losses section later in the report, timeline assumptions are further lengthened at each rating category stress beyond the base-case assumptions in the table below.

Base Case Assumption for Remaining Liquidation Timeline

		Range (State Level)	
Loan Status	**Average No. of Months[a]**	**Shortest**	**Longest**
Clean Current	16	13	23
Dirty Current and Delinquent	22	15	34
Foreclosure	19	10	25
REO	8	6	12

[a]Average for sample of outstanding non-agency loans. Assumptions will vary by transaction based on geographic (state) distribution. For delinquent loans, remaining timeline assumption is added to observed timeline to date.

Fitch's assumption for principal and interest (P&I) carry costs varies by transaction. For transactions rated after 2009, Fitch refers to the transaction's documents to determine whether unpaid interest is included in the definition of realized loss. For transactions where unpaid interest is considered realized loss, Fitch's carry cost assumption is determined by the liquidation timeline assumption. For transactions rated after 2009 where unpaid interest is not considered realized loss, Fitch assumes only those unpaid P&I payments that are advanced by the servicer will result in a cost to the trust, as the servicer will be reimbursed the advanced amount from liquidation proceeds. For legacy transactions issued prior to 2010, Fitch will assume unpaid interest is considered realized loss regardless of the transaction-specific definition unless the assumption would result in a downgrade of a class rated 'Bsf' or higher, in which case the transaction-specific realized loss definition will be applied. To calculate advanced P&I carrying costs, Fitch estimates the number of missed payments advanced by the servicer as described below.

Loss Severity Variable 4: Loan Amortization

Fitch's accounting based LS framework reflects loan balance amortization that occurs prior to liquidation. Using the loan's amortization schedule, each loan is assigned a projected balance at liquidation. The assumed average number of payments made by the borrower is consistent with the mid-loaded default timing curve and benchmark prepayment speed used in Fitch's cash flow analysis and ranges from 35 payments made in the base case to 17 payments made in the 'AAAsf' stress scenario, with three-month increments between each rating category stress.

Servicer Advancing Considerations

Most U.S. RMBS transactions include a servicer advancing structure, whereby the servicer will advance borrower delinquent principal and interest to the trust to the extent that those amounts are deemed recoverable. When analyzing newly originated and performing seasoned mortgage loans, Fitch assumes full servicer advancing on loans with a projected LS less than 90%. For loans with projected severities greater than 90%, Fitch assumes that the servicer will deem advances unrecoverable and, therefore, will not advance delinquent principal and interest. In instances where the servicer does not advance and unpaid interest is not included in the transaction's definition of realized loss, Fitch assumes lower liquidation costs and, in turn, lower loss severities. However, we use the same servicer advancing assumption in its LS calculation as it does in its cash flow analysis. As such, the advancing assumption does not affect the total collateral loss assumption. Rather, it affects the timing assumption of when the collateral losses are sustained by the trust.

Non-Qualified Mortgages

Fitch increases its LS for loans identified as high-priced qualified mortgages (HPQM) and non-qualified mortgages (non-QM) as part of its analysis under the Ability-to-Repay (ATR) and Qualified Mortgage (QM) Rule (the Rule) that the Bureau of Consumer Financial Protection (CFPB) adopted as part of its amendments to Regulation Z under the Truth in Lending Act (TILA) for mortgage applications received by Jan. 10, 2014.

Fitch will make upward adjustments to its LS calculations if the originator designates the loan as HPQM or non-QM. The Rule affords differing levels of protections to these different categories, which in turn determine the likelihood of challenges to foreclosure and the potential legal costs and damages that could be incurred by the trust as assignee of the mortgage loans. Fitch will not make credit enhancement adjustments for loans identified as safe harbor qualified mortgage loans and confirmed by a due diligence review.

Fitch will consider the strength of R&Ws, enforcement mechanisms and indemnification provisions as potential mitigants that can offset some of the risk to the trust. Where Fitch's originator/aggregator reviews demonstrate weaknesses in lender processes with the Rule and/or third-party due diligence findings evidence material compliance issues with respect to the Rule, Fitch may revise its analysis, apply a rating cap, or decline to rate the transaction.

For HPQMs and non-QM loans, Fitch assumes only borrowers that default within five years of origination (60% of projected lifetime defaults) will potentially contest the Rule as a defense to foreclosure. Fitch's loss model assumes the percentage of borrowers that default within the first five years that will pursue ATR claims is 50% in judicial foreclosure states and 25% in non-judicial foreclosure states. Fitch assumes a higher probability of a defaulted borrower pursuing ATR claims (100% for judicial; 50% for non-judicial states) in the following circumstances:

- HPQM and non-QM loans with credit scores less than 680 and annual income less than $75,000.
- Loan programs with less than full income documentation or substantial Appendix Q deviations.

For borrowers assumed to pursue a claim, Fitch projects longer foreclosure timelines than those typically assumed. In judicial foreclosure states, Fitch assumes timelines increase six months for summary judgment resolutions and 18 months for trials. For claims in non-judicial states, Fitch extends timelines six months for dismissals and modifications, 12 months for summary judgements and 24 months for trials. Additionally, Fitch assumes additional legal expenses for summary judgements of $20,000 for borrowers and $40,000 for the trust for a

total of $60,000 and $90,000 for trials, assuming $30,000 for borrower legal costs and $60,000 for the trust. Fitch's assumptions for the resolutions of potential claims are shown in the table below.

Probability of Resolution as % of Challenges

	HPQM and Lower Income & Credit Non-QM		Higher Credit Quality Non-QM	
	Judicial State	Non-Judicial State	Judicial State	Non-Judicial State
Resolution				
Dismissal	10	0	10	0
Modification	40	40	10	10
Summary Judgment				
Lender Prevails	20	25	30	35
Borrower Prevails	20	25	40	45
Trial				
Lender Prevails	5	5	5	5
Borrower Prevails	5	5	5	5

HPQM – Higher-priced qualified mortgage. QM – Qualified mortgage.

Mortgage Insurance

To the extent that a loan has MI from a qualified MI provider, Fitch will adjust the LS assumption in accordance with its published criteria, "Global Criteria for Lenders' Mortgage Insurance in RMBS," listed on page 1.

Risk-sharing transactions issued by the GSEs may also benefit from an MI backstop by the GSEs guaranteeing the full payment of all MI claims. Fitch will assume all eligible claims are paid for loans benefiting from MI with a GSE backstop.

While lender-paid MI cannot be canceled, Fitch will consider the potential for MI cancellations when adjusting the LS assumption for loans with borrower-paid MI. Typically, in the U.S., borrower-paid MI is automatically canceled after the month in which the loan-to-value ratio is scheduled to reach 78% based on the original amortization schedule and using the original home value. Fitch will apply a projected default timing curve to estimate the likelihood of default after the projected cancellation date and will haircut the MI benefit accordingly. For example, loans that are expected to reach their cancellation date halfway through the lifetime default timing curve will only receive a benefit for half of the total MI coverage amount. Fitch assumes no MI benefit for loans scheduled to reach 78% LTV within 15 months of the analysis date. As the number of months to 78% LTV increases beyond 15, the amount of MI credit increases, with 100% credit given at month 121.

The default timing used in the borrower-paid MI cancellation analysis will assume a mid-loaded default scenario with benchmark prepayments, which is consistent with the amortization timing assumption in the model. For loans insured by the Federal Housing Administration (FHA), Fitch assumes insurance claims are paid in an amount equal to 100% of the outstanding principal balance of the mortgage loan plus a portion of interest and certain additional costs and expenses. The credit given to loans guaranteed by the Veterans Administration (VA) can be as high as 50% of the loan amount, but varies by loan amount level as established by the federal program. For loans guaranteed by the Rural Housing Service, Fitch assumes 90% of the loan principal is covered by the guarantee.

Generating Rating Stressed Losses

A core objective of the model framework is to clearly associate rating stress levels with economic conditions and home price correction scenarios to aid investors in understanding the type of stress and the associated loss expectations each rating category represents.

When deriving a loan's PD and LS at each rating category, the primary variable used to determine the stressed scenarios is the sMVD. Additional stresses are also applied to the ERF, liquidation timelines and LS floors, as described below.

Rating Stress 1: Stressed sMVD

Stressed variables:
- SMVD.
- ERF.
- Liquidation timelines.
- LS floors.

Fitch's sMVD rating stresses are designed to be countercyclical and consider positioning in the housing market cycle. sMVD stresses increase in unsustainable price environments and decline as the housing market corrects and approaches sustainable levels. In application, Fitch applies a two-step process, whereby properties are first adjusted to their sustainable values and then applied an additional sMVD stress that corresponds to different rating scenarios.

Stressed sMVD by Rating Category

Rating Category	Stresses Below Sustainable Level (%)
AAAsf	35
AAsf	30
Asf	25
BBBsf	20
BBsf	15
Bsf	10

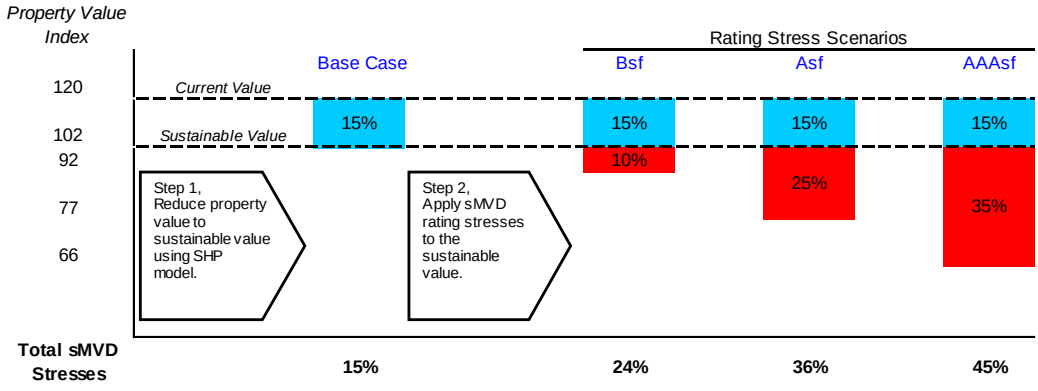
SMVD stresses influence both PD and LS model calculations. When calculating a loan's PD, each loan is subjected to the sMVD rating category stress, which increases its sLTV and, therefore, its default probability. In estimating LS, the stressed sMVDs are applied as haircuts to the property value, thereby increasing the loan-level loss expected at each rating category.

Step 1

Fitch associates its 'AAAsf' rating category stress with the most severe declines observed in the early 1900s and during the Great Depression.

The first step in Fitch's analysis is unwinding any perceived overvaluation in the regional housing market by applying the SHP model adjustment described on page 9. By comparing actual property prices to those indicated by the SHP model, Fitch derives an sMVD opinion in the base case for each property at the MSA level.

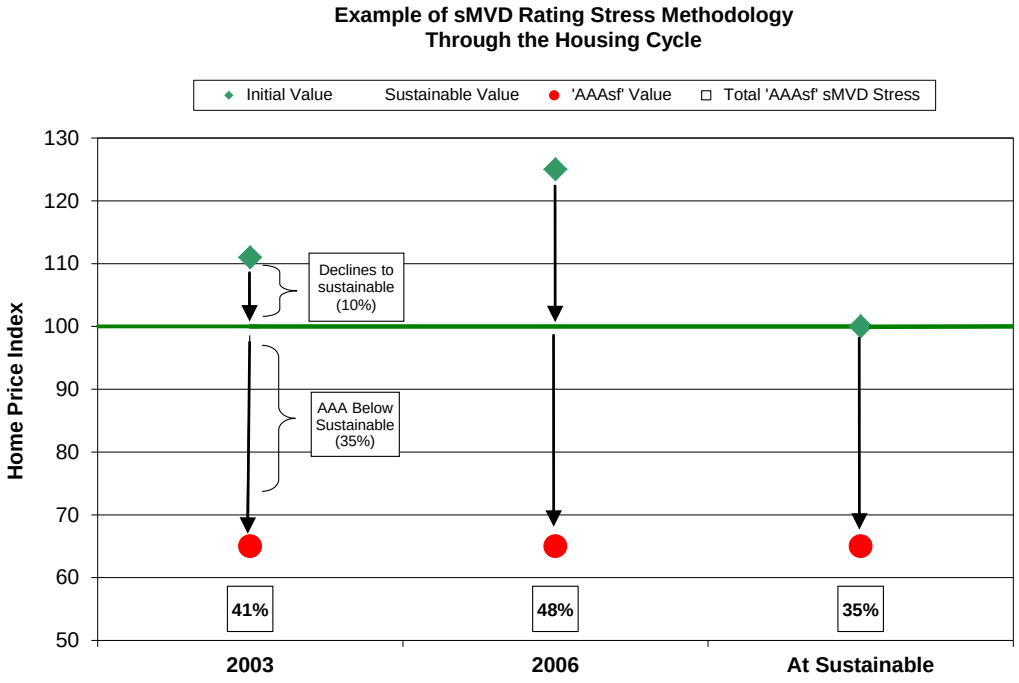
Example of Sustainable Market Value Decline Stresses
(Assumes 15% Overvalued Property)



Step 2

After adjusting property values to sustainable levels, Fitch applies incremental stresses to property prices that correspond to the different rating categories. The magnitude of each rating category's decline below sustainable levels is shown in the Stressed sMVD by Rating Category table on the previous page, which was established by associating the 'AAAsf' rating category stress with the most severe declines observed in the early 1900s and during the Great Depression.

For example, in the chart below, the SHP model would calculate a property in 2003 to be 10% overvalued (base case sMVD = 10%). To determine that property's 'AAAsf' stressed sMVD, its current price is first reduced by 10% (step 1) to achieve its sustainable price level. Then, the 'AAAsf' rating stress, an additional 35% decline to the sustainable price, is applied (step 2). This results in an "all-in" 41% 'AAAsf' stressed sMVD from the 2003 current value. In contrast, if a property is currently at its sustainable value, step 1 is not necessary and the 'AAAsf'-stressed sMVD reflects only the step 2 adjustment below sustainable (35%). This framework allows Fitch to make clear differentiations in its sMVD stresses across regional housing markets and at different points in the economic and housing cycle.



Rating Stress: How is Unemployment Stressed?

While unemployment is not stressed as an independent metric for determining loan performance, it is a core component in both the sMVD and ERF variables, which are both subject to stresses when generating loss expectations for each rating category.

The correlation between unemployment and the sMVD assumptions can be illustrated with historical economic downturns similar to Fitch's investment-grade stress scenarios (which assume home prices drop 20%–35% below sustainable values). During the Great Depression, when home prices declined 30%, the national unemployment rate rose to approximately 24% from 3%.

More recently, local regions that experienced MVDs below a sustainable level similar to Fitch's high-investment-grade stresses also experienced significant increases in unemployment levels. As shown in the table below, the local unemployment rates increased to between 14% and 19%. Generally, Fitch estimates that the unemployment rate would have to reach approximately 20% to result in a price decline of 35% below a sustainable level.

Recently Observed Economic Experiences Similar to Fitch's Investment-Grade Stress Scenarios

(%)

MSA	Declines from Peak	Home Price Decline Below Fitch Sustainable Level	Unemployment Rate Pre-Crisis	Unemployment Rate Crisis Peak
Bakersfield-Delano, CA	(63)	(33)	6	16
Merced, CA	(73)	(35)	7	19
Warren-Troy-Farmington Hills, MI	(49)	(35)	3	15
Ocala, FL	(55)	(36)	3	14

Sources: Case-Shiller and Bureau of Labor Statistics.

Rating Stress 2: Economic Risk Factor

For macroeconomic and unemployment stress scenarios, Fitch benchmarked the economic scenario experienced by the 2007 origination vintage to an 'Asf'. The ERF for the 2007 vintage was 2.4.

The ERF stresses are applied only to the PD calculations and do not apply to LS. Fitch has established ERF floors for each rating category to provide more stability in credit enhancement levels and ratings during periods of macroeconomic and unemployment stress. The 'Asf' ERF floor of 2.5 is benchmarked against an economic environment that includes high levels of unemployment and roughly 25% overvaluation in home prices to provide a combined rating stress that reflects a sufficiently remote probability of occurrence.

Economic Risk Factor Floors

Rating Category	Minimum ERF Applied
AAAsf	3.5
AAsf	3.0
Asf	2.5
BBBsf	2.0
BBsf	1.5
Bsf	1.0

Each loan's base case ERF is compared with the ERF floor, and the higher level is used. The stressed level is evaluated with each quarterly update from UFA.

Rating Stress 3: Liquidation Timelines

Base case liquidation timelines vary by state and sector, and range from 13–23 months for performing loans.

Fitch's base-case liquidation timelines assumptions vary by state and loan status, as discussed in the Loss Severity section above.

Stressed timelines are applied as incremental increases to Fitch's base case timeline assumption, as displayed in the table above. For example, if a prime loan in California has a base case liquidation timeline of 16 months, its 'Bsf' timeline assumption would be 19 months (three-month stress), and its

Liquidation Timeline Stresses

Rating Category	Additional Timeline Above the Base Assumption[a] (Mos.)
AAAsf	18
AAsf	15
Asf	12
BBBsf	9
BBsf	6
Bsf	3

[a]Includes pre-foreclosure, foreclosure and real-estate owned timelines.

'AAAsf' timeline assumption would be 34 months (18-month stress). All loans receive the same liquidation timeline stresses, as shown in the table above.

Rating Stress 4: Loss Severity Floors

Fitch also incorporates LS floor assumptions into its model that are scaled by rating category. The floors range from 35% in the 'AAAsf' stress to 10% in the 'CCCsf' scenario, which is consistent with minimum severities observed during periods of relatively low macroeconomic stress. This mechanism results in minimum thresholds of credit enhancement, particularly for transactions with concentrations of low CLTV loans. Fitch believes that, in investment-grade stress scenarios, property values could become considerably more volatile; therefore, loss protection should be sufficient to protect against higher than expected MVDs.

Loss Severity Floors

Rating Category	Minimum Loss Severity Assumed (%)
AAAsf	35
AAsf	30
Asf	25
BBBsf	20
BBsf	17
Bsf	15
CCCsf (Base)	10

With respect to its application, the LS component of the model produces two stressed levels at each rating category. The first is generated by stressing the components of the LS calculation (sMVD, foreclosure timelines and the DSA), and the second is simply Fitch's defined floor for that rating category. The model compares the two stressed LS values and uses the higher of the two. LS floors may be reduced for loans with MI provided by a qualified MI provider.

Treatment of Seasoned Loans

Fitch uses a consistent model framework for seasoned loans, with adjustments for borrower equity movements and loan performance.

When estimating losses on seasoned mortgage loans, Fitch uses the same PD, LS and rating stress framework as used for analyzing newly originated loans. However, two key adjustments based on the borrower's updated sLTV and payment history are made to account for the additional observed performance data available for seasoned loans. Depending on Fitch's view of the borrower's equity position — as measured by sLTV — and the loan's performance over time, these adjustments can either increase or decrease the loan's loss expectation, compared with the loss level the model would have assigned at loan origination.

In developing its approach to analyzing seasoned loans, Fitch considered several loan and borrower attributes it deemed predictive of default at origination that may potentially lose predictive ability as a loan seasons. Attributes such as loan documentation, purpose, occupancy and term were all explored for potential revision. The analysis showed that all attributes retained their relevance to default behavior over time. For instance, the performance of an average low-documentation loan, compared with a full-documentation loan, was roughly the same at month 24 as it was at month 60. As such, Fitch uses all original loan/borrower attributes when estimating losses for seasoned loans, except for sLTV.

Updated sLTV

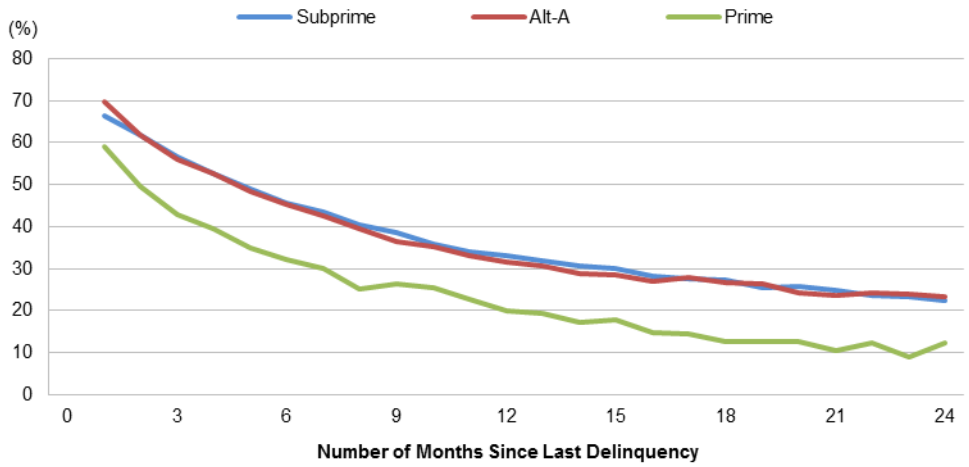
Updating the sLTV of a seasoned loan results in an implicit seasoning benefit.

Fitch adjusts the sLTV of each seasoned loan to reflect the current equity position of the borrower. The property value is adjusted to account for nominal home price movements, and the current loan balance is used to reflect any amortization since origination. The values are updated using the Case-Shiller home price index, new appraisals, or other valuation methods Fitch deems acceptable. Additionally, to the extent that Fitch's view on the property's sustainable value has fluctuated over time, the sLTV also will be adjusted accordingly.

Assuming the sustainable property value remains relatively stable in real terms, a borrower's sLTV will generally decrease over time as inflation increases the actual nominal property value and the loan balance decreases with amortization. A lower sLTV translates into lower expected losses, since sLTV is a prominent variable in PD. Loan seasoning combined with increased borrower equity (through price inflation and loan amortization) will generally result in lower expected losses.

Fitch observed this improvement in default rates over time when analyzing actual loan-level performance data and considered several factors that may be driving the behavior. However, after controlling for credit, economic environment and, most importantly, borrower CLTV, performance no longer improved as a loan seasoned; it remained relatively constant and, in some cases, deteriorated over time.

Historical Default Rates of Re-Performing Loans



Source: CoreLogic/LoanPerformance.

Fitch adjusts the PD for loans with poor performance history, including loans that are currently performing.

As a result of this analysis, Fitch concluded that improvement in default rates over time was the direct result of increased borrower equity. By simply updating the sLTV of a seasoned loan, the model appropriately replicates this behavior and implicitly provides a so-called seasoning benefit without having to dedicate a separate variable to do so.

Loan Delinquency and Payment History Adjustments

For loans that are past due or have recent delinquency, Fitch makes several adjustments to the expected loss inputs to account for the increased risk that such loans present. The default probability for delinquent (DQ) loans is determined by a regression-based model.

The DQ PD model includes four variables: the loan's recent payment history; its most recent delinquency status; the base case PD; and the monthly payment change for modified loans. Fitch's analysis indicates a meaningful correlation between redefault risk and the amount of monthly payment reduction among modified loans. Loans with larger payment reductions tend to outperform those with little to no payment reduction. As such, Fitch will apply a smaller upward PD adjustment for recently modified loans with large payment reductions.

The DQ model not only increases the PD for loans that are currently DQ, it also penalizes loans that are performing but have some amount of recent delinquency. As with performing loans, PD percentages for DQ loans progressively increase for higher rating category scenarios to reflect the

greater propensity of past-due loans to be foreclosed under stressed conditions. The multiples of stressed DQ PD levels to the base-case PD levels are generally consistent with those of loans with a clean payment history.

Fitch's servicer-advancing assumption also differs between performing and DQ loans. For most DQ loans, Fitch has access to loan-level data tracking servicer advancing practices. The recent historical data are used to inform Fitch's projected advancing assumption at the loan level.

The final adjustment made to DQ loans is to the MVD assumption. This change arises from the fact that DQ loans have a shorter average time to liquidation than newly originated or seasoned performing loans. Because of the shorter liquidation window, Fitch believes DQ loans have a more limited range of property declines that are likely to occur before liquidation. Fitch assumes a maximum rate of MVDs of 2% per month, and in application of the model, caps the MVD for DQ loans at the remaining liquidation timeline multiplied by 2%. This adjustment mainly influences the loan's expected LS, since many DQ loans already have an adjusted default probability at or near 100% in stressed scenarios.

Seasoned, Re-Performing and Non-Performing Loan Transactions

For seasoned and re-performing loan (RPL) RMBS transactions issued starting in 2014, Fitch makes several adjustments to liquidation timeline, loss severity and PD based on historical trends and findings of the due diligence review of the loan files. A full description of these adjustments can be found in the Collateral Analysis section of Fitch's "U.S. RMBS Seasoned, Re-Performing and Non-Performing Loan Criteria," available on Fitch's website or by clicking the link on page 1.

Sensitivity Analysis

Fitch's sensitivity analysis provides three levels of rating sensitivities to demonstrate how the ratings would react to steeper MVDs than that assumed at issuance. The various rating sensitivities include defined stresses and defined sensitivities. The implied rating sensitivities are only indicative of some of the potential outcomes and do not consider other risk factors to which the transaction is exposed or are considered during the surveillance process. Furthermore, the sensitivity analyses are calculated based on pool-level weighted-average attributes and may differ from a loan-level re-analysis of the pool at the additional stress levels.

Defined Stresses

Defined stresses show the impact of three defined stress assumptions where the base SHP level is 10, 20 and 30 percentage points lower than that derived at deal issuance. These assumptions result in higher sLTVs and steeper sMVDs — the most significant drivers of PD and LS in Fitch's loss model. The table at right shows the impact on ratings for each additional defined stress to sustainable price declines for a hypothetical deal.

Defined Stresses

	Additional Decline in Sustainable Price Level		
Original Rating	**10%**	**20%**	**30%**
AAAsf	AAAsf	AAsf	BBBsf
AAsf	AAsf	Asf	BBsf
Asf	Asf	BBBsf	BBsf
BBBsf	BBBsf	BBsf	Bsf
BBsf	BBsf	Bsf	< Bsf
Bsf	Bsf	< Bsf	< Bsf

Defined Sensitivities

Defined sensitivities describe the stresses to the assumptions required to reduce a rating by one full category, to non-investment grade, and to 'CCCsf'.

The variable being stressed in this analysis is Fitch's SHP assumption. The percentage points shown in the table to the right reflect the additional MVDs that would have to occur to impact ratings for each defined sensitivity for a hypothetical deal.

Defined Sensitivities

(%)

Original Rating	Reduced Rating: One Full Category	Reduced Rating: Non-Investment Grade	Reduced Rating: To CCCsf
AAAsf	11	37	66
AAsf	11	30	49
Asf	11	21	41
BBBsf	11	12	34
BBsf	12	—	25
Bsf	13	—	13

Fitch performs sensitivity analyses on the ratings assigned to RMBS transactions. Fitch will provide details of these sensitivities for each transaction, which may include the following considerations.

- Rating sensitivity to increased loan-level sMVD assumptions.
- Ratings sensitivity to extended foreclosure and liquidation timeline assumptions.
- Ratings sensitivity to defaults of the largest loans in the pool with increased sMVD assumptions.
- Rating sensitivity to increased MVDs for loans concentrated in a geographic region.

Sample Model Output

Sample Model Output

(%)

	Prime Jumbo 2016 Origination[a]			Prime Jumbo 2006 Origination[b]			Subprime 2006 Origination[c]		
	PD	LS	Loss	PD	LS	Loss	PD	LS	Loss
AAA	14.4	45.6	6.6	47.9	68.9	33.0	81.6	72.4	59.1
AA	10.4	39.2	4.1	41.8	64.2	26.9	77.1	67.5	52.0
A	7.1	32.8	2.3	35.7	60.1	21.4	71.9	62.8	45.2
BBB	4.4	26.5	1.2	29.6	56.7	16.8	66.3	58.4	38.7
BB	2.5	21.0	0.5	24.3	54.1	13.1	60.9	54.4	33.1
B	1.6	16.5	0.3	20.3	51.6	10.5	55.9	50.8	28.4
Base Case	1.1	10.2	0.1	17.2	45.0	7.7	51.2	43.7	22.4

[a]69% Orig. CLTV, 71% sLTV, 772 FICO, 100% full doc, 0% DQ. [b]Pool of outstanding 2006 prime jumbo loans, analyzed as of 2016; 81% orig. CLTV, 81% sLTV, 727 FICO, 42% full doc, 15% DQ. [c]Pool of outstanding 2006 subprime loans, analyzed as of 2016; 84% orig. CLTV, 83% sLTV, 616 FICO, 59% full doc, 35% DQ.

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

Rating levels discussed in this report relate to Fitch's international credit rating scale and reflect stand-alone creditworthiness without considering external credit enhancement or government support. Ratings, including Rating Watches and Outlooks, assigned by Fitch are subject to the limitations specified in Fitch's ratings definitions, available at www.fitchratings.com/site/definitions.

Specific asset-level and operational risks may prevent Fitch from rating a transaction, or may limit the highest achievable ratings in our analysis. The core areas where such restrictions may apply are generally those detailed in the report, "Criteria for Rating Caps and Limitations in Global Structured Finance Transactions," dated June 2016. Specific examples for U.S. RMBS transactions include:

- limited historical performance data;
- a due diligence result or an operational assessment that raises concerns about the reliability of the data used in the model analysis;
- excessive regional concentrations or loan concentrations due to small pools;
- excessive counterparty exposure; and
- insufficient structural features to mitigate asset credit risk.

Additionally, Fitch may make modifications to the loss model results in some instances where the credit attributes of a mortgage pool are not well represented or identified in the historical dataset used to develop the model. Specific examples for U.S. RMBS transactions include:

- an increase in the probability of default for borrowers that have experienced recent credit events, such as foreclosure, bankruptcy or short-sales; and
- an increase in the projected loss severity for pools with concentrations of relatively small property values, such as those below $100,000.

In instances where Fitch determines it appropriate to modify or supplement criteria or its criteria assumptions, such departures will be disclosed in presale and new issue reports, and other rating action commentaries.

Data Sources

Fitch conducted its PD regression analysis with CoreLogic/LoanPerformance (CoreLogic/LP) and Freddie Mac data on mortgages that satisfied the following conditions:

- Classified as agency, prime jumbo, Alt-A or subprime loan.
- Fixed-rate loan.
- First lien loan.
- Originated between 1999 and 2009 (agency and prime jumbo).
- Originated between 1991 and 2007 (Alt-A and subprime).
- Excluded loans with IO features.
- Excluded loans with negative amortization features.
- Excluded loans with original LTV ratio > 110%.
- Excluded loans with original CLTV ratio < 10%.
- Excluded loans where state = Puerto Rico, Virgin Islands, Guam or missing.

Fitch also merged the following data elements into the Freddie Mac and CoreLogic/LP loan-level data:

- Fitch's sMVD was assigned to each loan based on its origination date and the MSA/state where the property is located.
- The economic risk variable provided by a third party (UFA) was assigned to each loan based on its origination date and the zip code within which the property is located or at the state level.
- For documentation type and back-end debt-to-income ratio, Fitch used its own loan-level database as a supplement for loans where LP data were sparsely populated.

All loan attributes were taken as of the origination date of the loan. In determining whether to consider loans as defaults or nondefaults, the performance of each loan was tracked through April 2014.

Appendix A: Roll-Rate Analysis Description

For loans in the PD regression dataset that are still outstanding and are not otherwise captured by Fitch's definition of default, we assign a projected default or nondefault expectation based on a cohort roll-rate analysis.

The metrics used to quantify the observed performance are roll rates to a worse DQ bucket, cure rates to a better DQ bucket, default rates and prepayment rates. For each metric, the monthly average is calculated over the observation period of July 2010 to July 2015 for agency/prime jumbo loans and July 2013 to July 2015 for nonprime loans.

Fitch applies a granular approach to distinguish between loans with different attributes. Fitch's methodology establishes several hundred cohorts, each defined by a unique combination of loan attributes. The cohorts consist of different combinations of documentation, mark-to-market (MTM) CLTV, credit score and payment history. Each loan falls into exactly one cohort, based on its attributes.

After defining the cohorts and populating each with loans from its sample, Fitch then calculates a unique set of recent performance histories (average roll, cure, default and prepayment rates) for loans within each cohort. These average performance metrics are then used to project future performance of the outstanding loans on a month by month basis.

Characteristics of Regression Datasets

	Agency/Prime Jumbo[a]					Alt-A					Subprime				
Vintage	Loan Count (000)	Avg. Loan Amount ($000)	Avg. FICO Score	Avg. OCLTV (%)	Full Doc (%)	Loan Count (000)	Avg. Loan Amount ($000)	Avg. FICO Score	Avg. OCLTV (%)	Full Doc (%)	Loan Count (000)	Avg. Loan Amount ($000)	Avg. FICO Score	Avg. OCLTV (%)	Full Doc (%)
1991	—	—	—	—	—	0	102	705	73	58	2	72	651	77	53
1992	—	—	—	—	—	1	126	729	74	71	5	91	668	69	61
1993	—	—	—	—	—	2	278	730	72	66	12	85	661	70	76
1994	—	—	—	—	—	14	145	720	72	38	17	61	638	71	66
1995	—	—	—	—	—	26	131	699	73	39	24	60	615	71	68
1996	—	—	—	—	—	39	133	708	74	41	51	67	614	73	71
1997	—	—	—	—	—	86	126	713	75	44	89	71	609	74	73
1998	—	—	—	—	—	153	155	711	75	41	179	80	606	75	77
1999	293	229	717	75	84	86	148	697	78	42	235	82	605	76	67
2000	186	242	719	77	85	60	197	695	80	36	164	83	596	76	76
2001	442	285	723	73	89	96	255	698	78	33	183	106	611	77	76
2002	423	305	727	70	87	147	236	707	76	37	216	130	625	77	71
2003	429	321	732	69	79	283	202	714	72	34	392	154	632	77	71
2004	207	319	728	72	82	322	191	711	77	39	427	161	630	77	73
2005	187	352	731	73	77	394	214	713	77	36	414	166	626	78	75
2006	166	374	731	75	75	343	231	704	79	25	401	171	620	80	75
2007	146	388	732	76	74	116	283	709	77	25	119	180	612	78	75
2008	256	213	739	73	100	—	—	—	—	—	—	—	—	—	—
2009	250	228	762	68	100	—	—	—	—	—	—	—	—	—	—

[a]Statistics reflect reweighted agency/prime jumbo dataset in which each set contributes equal influence. OCLTV – Original combined loan-to-value ratio.

Source: CoreLogic/LoanPerformance, Freddie Mac.

While cohort-specific performance rates are assumed to remain constant over the course of the projection, each outstanding cohort's MTM CLTV designation is dynamic based on several projections. The outstanding loans are projected to amortize based on their schedules, and an annual inflation rate of 1.75% is assumed, both of which worked to improve the cohort's MTM CLTV designation over time. Additionally, Fitch incorporates state-level housing price forecasts and arrives at an aggregate forecast number for each cohort based on its state distribution. Insofar as these three forecasts shift the cohort's average CLTV beyond the definition of the cohort, the performance rates of a different cohort — one whose definition includes the new

CLTV — would take over. These sometimes-shifting performance rates are projected monthly until all outstanding loans either prepay or default. The result is a PD for each cohort of outstanding loans.

To translate the cohort-level PD into loan-level data for input into the regression, outstanding loans within each cohort are randomly flagged as defaulters or nondefaulters, according to the cohort-level projected default rate. For example, if a cohort consists of 100 outstanding loans and the roll rate analysis projected a 25% default rate, 25 of the 100 loans would be randomly assigned as defaulters and 75 as nondefaulters.

Appendix B: Regression Data and Methodology

The PD regression dataset, as described in Appendix A, was extracted from the CoreLogic/LP and Freddie Mac loan-level databases. For the purposes of the regression analysis, each loan in the agency/prime jumbo dataset was applied a weight to ensure that each of the agency and prime jumbo datasets contributed 50% of the total loan observations.

Logistic Regression

The logistic regression model was specified to estimate the drivers of fixed-rate loan PD. The default risk for mortgage loans is characterized as a dichotomous event that can take one of two possible outcomes, i.e. default or nondefault. The logit model is based on the cumulative logistic probability function where it can be specified as a generalized linear function:

$$g(p) = \ln(p/(1-p)) = X\beta$$

where g is the function through which PD is related to X, which is the matrix of explanatory variables, p is the PD, and β is the matrix of regression coefficients. The expected PD can be analytically solved for p through logit transformation where:

$$p = 1/ (1+e^{-X\beta})$$

The logistic regression specified above assumes a natural logarithmic relationship between the explanatory variables and the ratio of event (default) to non-event (nondefault), otherwise known as the odds ratio. Thus, the natural log of the odds is linearly related to the explanatory variables.

This form is desirable in that the logit function *g(p)* is linear in its parameters, and the logistic transformation always generates an outcome *p* probability between 0 and 1. Estimates of the parameters are obtained by maximizing the sample log likelihood function:

$$\log L(\beta; x_i) = \sum_{i=1}^{N} [y_i \log p(x_i; \beta) + (1 - y_i) \log((1 - p(x_i; \beta))]$$

where L(.) is the likelihood function, yi = 1 for a defaulted loan and 0 for a nondefaulted loan, and *p* is the probability measure.

SAS and other statistical software contain statistical procedures to perform logistic regression. The SAS procedure LOGISTIC is used to estimate the parameters of the regression model with options to generate goodness of fit and other diagnostics designed to assess model robustness.

Univariate analysis was initially performed for each variable individually to understand distributions, strengths and forms of relationships to default before performing the analysis in a multivariate context. Each variable was assessed for the need of additional transformations based on the nature of relationship to default. Nonlinear transformations were applied when necessary to improve the fit of the regression. Performance of the regression was measured by nonparametric statistics for rank ordering/separation ability (i.e. Somer's D, Kolmogorov-Smirnov, or K-S). All tests showed the model had high power in rank ordering and separation ability.

The main focus in measuring the model's performance was the comparison of model-predicted PD versus actual and/or roll-rate projected defaults at the vintage level. For the prime dataset, the cumulative default expectation, consisting of actual defaults and projected defaults on outstanding loans, was used as a benchmark. For the nonprime datasets, only the roll-rate

projected defaults on outstanding loans were used for comparison, since the model's most immediate application for these sectors will be for seasoned collateral.

Appendix C: Economic Risk Factors

The impact of economic factors on future defaults and losses is captured by a national risk index and regional risk multiplier. The index and multipliers are provided by UFA and are updated quarterly. The risk factors reflect econometric measures, including home price forecasts, and are incorporated into Fitch's PD model to raise or lower the expected default probability on the mortgage loans.

The economic risk factor (ERF) used in the model is a composite of the national risk index and the regional risk multipliers provided by UFA. The national risk index reflects changes in economic measures, such as real GDP growth, real consumer spending, business spending, national unemployment rates, CPI inflation rates, mortgage rates, national house price appreciation and housing permits. The regional risk multipliers take into account state and local economic metrics, such as personal income and distribution, employment growth, housing construction and other indicators. A demographic component is also considered, which includes unemployment rates and population growth, as well as a political component that considers local taxes and zoning regulations.

The ERF provides a default forecast for loans originated today relative to loans underwritten during the 1990s. Thus, the 1990–2000 economic climate serves as a benchmark from which today's metrics are measured and is the comparative basis for future defaults. UFA assumes the quality of the borrower, loan characteristics and legal environment remain constant; thus, changes in the index reflect only changes in current macroeconomic conditions.

Because the ERF is updated quarterly, credit enhancement levels for pools with similar characteristics could vary from quarter to quarter. To reflect the risk of further economic deterioration and provide for more stable credit enhancement and ratings through the economic cycle, stressed ERF floors are applied to all investment-grade rating categories. The stressed levels will be evaluated with each quarterly update from UFA. Should the ERF rise more than expected, the stressed multiplier may be increased accordingly.