TREASURY CREDIT RATING AGENCY EXERCISE

OBJECTIVE OF EXERCISE

As part of a broader effort to help restore a well-functioning, responsible private label mortgage-backed securities (MBS) market[1], the U.S. Department of the Treasury (Treasury) invited six credit rating agencies to participate in an exercise intended to provide market participants greater transparency into their credit rating methodologies for residential mortgage loans. Since the financial crisis, the residential mortgage loans that have been securitized in private label MBS have generally been of very high credit quality, significant geographic concentration, and large loan balances relative to residential mortgage loans currently purchased or insured by the Federal National Mortgage Association (Fannie Mae) or the Federal Home Loan Mortgage Corporation (Freddie Mac), collectively the government-sponsored enterprises (GSEs). By increasing clarity around loss expectations and required subordination levels for more diverse pools of collateral, the credit rating agencies can stimulate a constructive market dialogue around post-crisis underwriting and securitization practices and foster greater confidence in the credit rating process for private label MBS. The information provided in this exercise may also give mortgage originators and aggregators greater insight into the potential economics of financing mortgage loans in the private label channel and the consequent implications for borrowing costs.

OVERVIEW OF EXERCISE

We invited six credit rating agencies (referred to herein as Rating Agencies A through F) to analyze six hypothetical pools of residential mortgage loans and produce a report with loss expectations for these pools at each rating category (AAA through B[2]). In defining these hypothetical pools, we used the collateral underlying the Structured Agency Credit Risk transaction (STACR) 2014-DN3[3], which consists of loans acquired by Freddie Mac in the fourth quarter of 2013. We based our exercise off this transaction because it referenced the most recently originated collateral at the time the exercise was initiated. Although these loans are by definition eligible for purchase and can serve as collateral in securities guaranteed by Freddie Mac, we asked the credit rating agencies to evaluate the collateral as if it were being securitized in private label MBS. **Because of the unique assumptions used in this exercise, the results reported in this document are not comparable to existing credit risk transfer transactions issued by the GSEs including but not limited to STACR 2014-DN3. The results of this exercise have no implications for the performance or credit ratings of credit risk transfer transactions including STACR 2014-DN3.**

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[1] The private label MBS market is often referred to as the non-agency MBS market because bonds issued in this channel are not guaranteed by a government agency such as Ginnie Mae or by a government-sponsored enterprise such as Fannie Mae or Freddie Mac.

[2] This report uses a general nomenclature to refer to rating categories. The reader should consult each credit rating agency's published materials for a precise description of its approach to rating, methodology, and rating classification. Links can be found on page 34.

[3] Loan-level data is publicly available at http://www.freddiemac.com/creditriskofferings/security_data.html.

REVIEW OF THE ANALYSIS

A Primer on Credit Ratings of Mortgage-Backed Securities

A mortgage-backed securitization involves the issuance of bonds backed by a pool of mortgage loans. Securitizations can be composed of more than one bond, or tranche, each of which may have a different level of priority with respect to repayment. The distribution of these bonds, with varying payment priorities and levels of risk, is often referred to as the capital structure. Bonds with higher repayment priority are typically considered safer (less risky) than bonds with lower repayment priority (more risky). Credit rating agencies typically assign ratings to bonds according to the associated level of credit risk. The lowest-risk bonds are typically assigned a rating of AAA, the highest possible rating. These bonds would be expected to withstand an extremely severe macroeconomic and home price decline scenario without sustaining any losses. AAA-rated bonds are typically held by investors such as mutual funds, insurance companies, and banks who seek relatively safe assets and are willing to accept a lower return. Bonds that could be expected to sustain losses in less severe macroeconomic and home price decline scenarios entail more risk and consequently, typically receive lower ratings.

When rating bonds, credit rating agencies begin by defining one or more macroeconomic and home price decline scenarios with different levels of stress. They then generally assess the credit risk of residential mortgage collateral under these scenarios at a loan and pool level. In order for a bond to receive a AAA rating, it would be expected to take no-to-negligible loss in the most severe macroeconomic and home price decline scenario as defined by the relevant credit rating agency (sometimes referred to as the "AAA scenario").

Analyzing the Results

For each bond rating category examined in this exercise (AAA through B), Rating Agencies A through E defined a macroeconomic and home price decline scenario commensurate with the amount of stress a bond of that rating would be expected to withstand. In each scenario, the credit rating agencies then derived a probability of default and loss severity for each loan in the pool.

- **Probability of default** (PD) is the likelihood that a borrower is unable or unwilling to repay their debt obligation.
- **Loss severity** (LS) is the magnitude of loss given default, expressed as a percentage of the debt obligation.
- **Loss expectation** [or expected loss E(L)] is the product of the probability of default and the loss severity.

The loss expectation for a given rating category is also sometimes referred to as the loss protection or coverage level because it measures the amount of collateral loss that a bond must be able to withstand in order to earn a given rating.

As an example (see Exhibit 1), in order for a bond to qualify for a AAA rating, it must withstand the most severe macroeconomic and home price decline scenario, or "AAA scenario". In this scenario, which entails assumptions about variables including unemployment, home prices, and interest rates, approximately 19.8 percent of the loans in Pool 1are projected to default, with a loss severity of 58.5 percent, and resulting in a cumulative expected loss of 11.6 percent. In order to qualify for a AAA rating, a bond would have to pay *timely* interest and ultimate principal in this scenario. Credit rating agencies would run progressively less severe economic scenarios – which produce lower default probabilities, loss severities, and expected losses – for lower-rated, riskier bonds. For more information on the macroeconomic and home price decline scenarios used by each credit rating agency, we recommend consulting their credit rating methodologies with links on page 34.

Exhibit 1: Sample Results for Pool 1

Rating	Probability of default	Loss severity	Expected loss
AAA	19.8%	58.5%	11.6%
AA	15.3%	52.0%	8.0%
A	11.2%	45.5%	5.1%
BBB	7.5%	39.0%	2.9%
BB	4.5%	32.6%	1.5%
B	2.7%	26.1%	0.7%

In contrast to the framework used by Rating Agencies A through E, Rating Agency F uses an expected loss (EL)-based approach to credit ratings that requires it to make assumptions about the transaction's structure. Its ratings depend not only on collateral loss but on the relative size, or thickness, of the tranche. As a result, for each rating category, Rating Agency F provided the subordination level required in order for a given bond to qualify for that rating. A bond's subordination level is a measure of the outstanding balance of lower-rated bonds (as a percentage of the total balance of bonds outstanding) that would have to be available to absorb losses ahead of the bond. Rating Agency F's EL-based approach is described in greater detail beginning on page 27.

Implications for the Private Label MBS Market

The loss expectations provided by Rating Agencies A through E are not subordination levels, but they can help to inform the structure of a transaction, including subordination levels. Subordination levels are important drivers of securitization costs, which in turn have implications for borrowing costs. Each bond in the capital structure has a unique level of credit risk for which investors would demand

a commensurate level of return, or yield. The cost of a securitization would be determined by the weighted average product of bond sizes and the respective yields that investors would demand. All else being equal, investors generally demand less compensation for bonds with lower credit risk and more compensation for bonds with greater credit risk. As a result, if lower expected losses (and consequently, lower required subordination) allow AAA-rated bonds with lower required yields to compose a greater proportion of the capital structure, the weighted average yield of a securitization would decrease. The loss expectations and subordination levels estimated in this exercise give market participants valuable insight into the potential capital structure of private label securitizations composed of diverse pools of collateral.

It is important to note that this exercise does not include projections of the yields that investors would demand for each bond rating category. Therefore, it is not possible to directly infer borrowing costs from the results of this exercise. However, market participants can observe yields for similarly rated bonds in the market and make inferences about the resulting costs of securitization. Private label securitization is one of a number of channels available to lenders for financing mortgage loans. Lenders may also sell loans to the GSEs, obtain insurance from the Federal Housing Administration (FHA) and securitize them in Ginnie Mae MBS, or retain or sell loans into portfolios. The channel that lenders choose and the mortgage rate they pass on to borrowers will be determined by the relative costs of these channels. The lower the cost of financing loans in a given channel, the lower the mortgage rate lenders will be able to offer borrowers.

DESCRIPTION OF RESIDENTIAL MORTGAGE LOAN POOLS

The credit rating agencies were asked to provide analysis for six hypothetical pools of residential mortgage loans:

1. **Pool 1:** All loans that collateralize STACR 2014-DN3;
2. **Pool 2:** Loans that collateralize STACR 2014-DN3 with an original principal balance[4] greater than $417,000;
3. **Pool 3:** Loans that collateralize STACR 2014-DN3 with a debt-to-income (DTI) ratio greater than 43 percent;
4. **Pool 4:** Loans that collateralize STACR 2014-DN3 with an original principal balance greater than $417,000 and DTI greater than 43 percent;
5. **Pool 5:** Loans that collateralize STACR 2014-DN3 with an original principal balance greater than $417,000 and DTI less than or equal to 43 percent; and
6. **Pool 6:** Loans that collateralize STACR 2014-DN3 with an original principal balance less than or equal to $417,000 and DTI greater than 43 percent.

DESCRIPTION OF EXERCISE ASSUMPTIONS

To simplify the exercise, we asked the credit rating agencies to make several assumptions:

1. The scope of the analysis was limited to the pools of loans and did not include an evaluation of the securitization structure with the exception of Rating Agency F, whose methodology requires structural assumptions. Rating Agency F's methodology is described in detail beginning on page 27;
2. The analysis ignores any structural features that are unique to the GSEs' credit risk transfer transactions. Such features include defined credit events, a fixed severity schedule, and ten-year maturity; and
3. In the initial design of this exercise, the credit rating agencies were asked not to make adjustments for qualitative factors such as originator or servicer quality, third-party due diligence, and representations and warranties in order to avoid introducing subjectivity into the results. This assumption was later modified to accommodate the fact that some credit rating agency models use qualitative adjustments to capture post-crisis changes in underwriting and securitization practices. A more detailed explanation of these qualitative adjustments can be found on page 10.

[4] At origination, a loan's unpaid principal balance (UPB) is equal to its original principal balance.

To promote comparability and facilitate each credit rating agency's analysis of the hypothetical pools, Treasury requested that the following additional assumptions be made:

1. All loans are assumed to have been originated on July 1, 2014 to eliminate the effect of loan seasoning;
2. All loans with a DTI ratio greater than 43 percent do not meet the definition of a qualified mortgage (QM) and therefore are not eligible for the safe harbor from or rebuttable presumption of compliance with the ATR requirements under section 129C of the TILA;
3. All loans in connection with investor properties are not subject to ATR requirements and are therefore not eligible for the QM safe harbor or rebuttable presumption of compliance;
4. A FICO score[5] of 600 is to be used for all loans missing FICO scores;
5. A DTI ratio of 50 is to be used for all loans missing DTI ratios;
6. No loans have any points or fees;
7. All loans have full documentation;
8. For geographic concentration analysis, 3-digit zip codes are to be used;
9. All loans with second liens amortize at the same rate as the primary lien loan;
10. Each loan has an appraisal value equal to the loan's original principal balance divided by the original LTV ratio;
11. For all loans designated as "leaseholds," the property type "detached single family residence" is to be used; and
12. Servicers are assumed to advance interest and principal through liquidation for all loans.

[5] The FICO score is a metric commonly used in mortgage lending to evaluate borrower credit risk.

EXHIBIT 2: COLLATERAL COMPARISON

Below is a comparison of the credit characteristics of the pools analyzed by the credit rating agencies for this exercise, as well as average credit characteristics of private label prime jumbo loan securitizations since the financial crisis. Calculations are based on the original principal balance of the loans.

	Pool 1	**Pool 2**	**Pool 3**	**Pool 4**	**Pool 5**	**Pool 6**	**Post-crisis securitizations[6]**
Description	All loans	UPB > $417K	DTI > 43%	UPB > $417K DTI > 43%	UPB > $417K DTI ≤ 43%	UPB ≤ $417K DTI > 43%	
Current pool balance ($)	19,746,233,187	2,603,623,559	3,799,239,990	641,987,892	1,961,635,667	3,157,252,098	18,889,120,382
Average loan balance ($)	226,391	520,621	243,791	521,517	520,328	219,972	794,360
Number of loans	87,222	5,001	15,584	1,231	3,770	14,353	29,535
Average property value ($)	304,324	706,977	330,296	713,968	704,694	297,390	1,297,555
WA[7] mortgage rate	4.55%	4.59%	4.58%	4.64%	4.57%	4.57%	4.02%
WA DTI (%)	34.6	36.5	46.1	46.1	33.4	46.1	30.5
Full documentation (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Owner-occupied (%)	86.3	89.1	87.1	90.6	88.6	86.4	94.0
Purchase (%)	63.8	59.1	63.0	60.0	58.8	63.6	41.0
Non-QM (%)	17.8	23.0	92.3[8]	93.3	0.0	92.1	0.0
LTV/CLTV (%)							
WA LTV	75.9	74.9	75.3	74.4	75.1	75.4	66.8
WA CLTV	76.7	76.2	75.9	75.1	76.5	76.1	68.0
CLTV > 80%	5.5	8.1	3.7	3.8	9.5	3.7	0.7
FICO							
WA original FICO	755	756	751	754	757	750	770
FICO < 720 (%)	20.6	17.5	23.4	18.1	17.3	24.5	5.4

[6] Source: Fitch Ratings. Includes newly originated collateral securitized in 2010-2014.
[7] Weighted average abbreviated as WA.
[8] For Pools 3, 4, and 6, the percentage of non-QM loans does not equal 100 because investor loans are not subject to ATR requirements.

	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5	Pool 6	Post-crisis securitizations[9]
Description	All loans	UPB > $417K	DTI > 43%	UPB > $417K DTI > 43%	UPB > $417K DTI ≤ 43%	UPB ≤ $417K DTI > 43%	
Geographic concentration (%)							
Largest state	CA (23.0)	CA (58.9)	CA (31.6)	CA (63.3)	CA (57.4)	CA (25.2)	CA (48.6)
2nd largest state	TX (6.1)	NY (9.9)	NY (6.7)	NY (11.0)	NY (9.5)	FL (5.9)	TX (5.7)
Top three states	34.0	77.4	43.2	80.3	76.4	36.9	59.5
Top five states	43.4	85.9	51.6	88.6	85.4	46.8	69.2
Judicial foreclosure state[10]	34.3	17.6	32.6	17.9	17.5	35.6	27.0

[9] Source: Fitch Ratings. Includes newly originated collateral securitized in 2010-14.
[10] Judicial foreclosure state refers to the percentage of loans located in states with a judicial foreclosure process that must go through the court system.

OVERVIEW OF COLLATERAL CHARACTERISTICS

- **Prime quality borrowers:** The weighted average FICO scores across all of the pools range from 750 to 757, which would characterize the borrowers as prime quality.
- **Fixed-rate loans:** All of the pools contain fixed-rate fully amortizing mortgage loans. Fixed-rate mortgage loans have historically exhibited better performance relative to comparable adjustable-rate mortgage loans.
- **Fully-amortizing loans:** All of the pools contain fully-amortizing loans. The fully-amortizing nature of these loans and fixed-rate payment schedule do not present any risk of increased default due to payment shock.
- **Fully documented loans:** All of the pools contain 100 percent fully documented loans. Loans originated with full documentation underwriting standards have historically performed better than loans originated with reduced and/or alternative document standards.
- **Borrower leverage:** The weighted average CLTV ratios of the pools range from 75.1 percent to 76.7 percent, representing approximately 25 percent borrower equity at closing. LTV and CLTV across the pools analyzed for this exercise are 7-9 percent higher than post-crisis jumbo loan securitizations.
- **Owner-occupied properties:** Loans collateralized by owner-occupied properties comprise greater than 86 percent of collateral in all of the pools, and these have historically performed better than comparable loans collateralized by second homes and investor properties.
- **Relatively low mortgage rates:** Average mortgage rates in the pools are low by historical standards. The lower rates result in lower loss severity projections based on lower advanced interest costs through liquidation.
- **Geographic concentration:** Certain pools are concentrated geographically because of high cost area loan limits. All else equal, pools concentrated in a small number of geographic regions will likely be more sensitive to unforeseen localized stresses, potentially increasing loss expectations and subordination requirements in credit rating models. Post-crisis jumbo loan securitizations have also exhibited significant geographic concentration.
- **Non-QM loans:** As described in the assumptions, we have asked the credit rating agencies to treat loans on owner-occupied properties with a DTI ratio greater than 43 percent as loans that do not meet the definition of a QM. Certain pools have a high proportion of non-QM loans, particularly those defined by a DTI cut-off.

ADJUSTMENTS FOR QUALITATIVE CONSIDERATIONS

To facilitate comparison among credit rating agencies and reduce subjectivity, our initial proposal asked the participants to make no adjustments for qualitative considerations such as originator quality and due diligence results. However, after reviewing the results and feedback from the credit rating agencies that we received to the initial proposal, we concluded that the exercise should be modified to help accommodate differences in credit rating agency models.

The housing market, regulatory environment, and loan performance have evolved significantly from pre-crisis to present day. Credit rating agency models appear to account for these changes in varying ways. All credit rating agency models incorporate the performance of loans originated prior to, during, and after the crisis to the degree they believe best informs the nature of credit and prepayment risk reflected in the market. Credit rating agency model stress scenarios may be influenced by loans originated at the peak of the housing market, given the macroeconomic stress and home price declines they experienced. The credit rating agencies differ, however, in how their models adjust for the post-crisis regime of improved underwriting practices and operational controls. Some credit rating agencies capture these changes directly in their models, while other credit rating agencies rely on qualitative adjustments outside of their models.

As part of their rating process, credit rating agencies generally conduct reviews of the quality of loan origination and servicing, results and findings of third-party due diligence reviews, quality of representations and warranties framework, and the cash flow structure, among others. These qualitative considerations may be combined with raw model output to inform the ultimate assignment of ratings.

To accommodate this practice, we asked the credit rating agencies to submit updated results based on the following qualitative assumptions:

1. Originator quality: above average
2. Servicer quality: above average
3. Due diligence review: 100 percent with no adverse findings
4. Representations and warranties: full representations and warranties framework with investment-grade counterparty

In response to these modified assumptions, some credit rating agencies provided updated results with qualitative adjustments, while other credit rating agencies indicated that their existing model and results sufficiently captured these modified assumptions.

Qualitative adjustment necessary: Rating Agencies A, C, and D submitted adjusted results that are shown on pages 31 to 33. In Appendix 2, we show a comparison of adjusted and unadjusted results for Rating Agencies A, C, and D.

Rating Agency E declined to submit adjusted results although they agreed that qualitative adjustments could impact expected losses for an actual transaction. They felt that such adjustments in the context of a hypothetical exercise would be overly speculative in the absence of specifically identified provisions and counterparties. While we acknowledge their point, we believe the adjusted results provide value to the exercise and have provided them as an additional view in comparing the participants' projected collateral performance.

No qualitative adjustment necessary: Rating Agencies B and F indicated that the revised assumptions resulted in no changes to their results. Both of these credit rating agencies noted that their models are sufficiently effective at capturing the performance of good quality loans to the stress of the crisis period. Additionally, Rating Agency B indicated its view that the performance record of post-crisis loans is too short and lacking in stress to justify any additional reduction in default and loss expectations. Rating Agency F noted that its model already accounts for current industry practices and stronger post-crisis underwriting regime and that any additional adjustments would depend on specific details not already accounted for in its model that deviate from industry practices and directly increase or decrease credit risk of the loans.

EXHIBIT 3: BASE CASE EXPECTED POOL LOSSES

The credit rating agencies calculated their loss expectations for the six hypothetical pools under their base case scenario, or model projections of expected macroeconomic conditions. Results shown for Rating Agencies A, C, and D include qualitative adjustments. The resulting base case loss expectations are shown below:

		Rating Agency					
Pool	**Pool Description**	A	B	C	D	E	F
1	All loans that collateralize STACR 2014-DN3	0.3%	0.7%	0.4%	1.1%	0.8%	0.8%
2	Loans with UPB > $417,000	0.4%	0.3%	0.2%	0.5%	0.8%	0.6%
3	Loans with DTI > 43	0.4%	0.7%	0.6%	1.3%	1.1%	0.9%
4	Loans with UPB > $417,000 and DTI > 43	0.5%	0.3%	0.2%	0.5%	1.0%	0.7%
5	Loans with UPB > $417,000 and DTI ≤ 43	0.3%	0.3%	0.2%	0.5%	0.8%	0.6%
6	Loans with UPB ≤ $417,000 and DTI > 43	0.5%	0.8%	0.7%	1.5%	1.1%	1.0%

EXHIBIT 4: COMPARISON OF EXPECTED LOSS ACROSS RATING CATEGORIES BY POOL

	Pool 1 (All loans)					
Rating	A	B	C	D	E	F[11]
AAA	11.6%	11.1%	9.8%	10.0%	10.8%	7.7%
AA	8.0%	7.6%	6.9%	8.3%	7.4%	6.5%
A	5.1%	5.3%	4.0%	6.4%	4.8%	4.0%
BBB	2.9%	2.6%	2.8%	4.3%	2.9%	2.9%
BB	1.5%	1.3%	1.6%	2.4%	1.8%	1.3%
B	0.7%	0.7%	0.4%	1.1%	0.8%	N/A

	Pool 2 (Loans with UPB > $417,000)					
Rating	A	B	C	D	E	F
AAA	12.7%	8.6%	8.5%	6.6%	11.5%	8.3%
AA	8.7%	5.2%	6.0%	5.2%	7.9%	5.7%
A	5.5%	3.4%	3.5%	3.8%	5.1%	3.8%
BBB	3.1%	1.7%	2.4%	2.2%	3.1%	2.3%
BB	1.5%	0.7%	1.3%	1.1%	1.9%	1.1%
B	0.8%	0.3%	0.2%	0.5%	0.8%	N/A

	Pool 3 (Loans with DTI > 43)					
Rating	A	B	C	D	E	F
AAA	14.4%	12.0%	14.5%	11.1%	14.3%	9.7%
AA	10.0%	8.3%	10.2%	9.3%	10.0%	7.0%
A	6.5%	5.6%	5.9%	7.3%	6.8%	4.9%
BBB	3.8%	2.7%	4.1%	4.9%	4.3%	3.0%
BB	2.0%	1.3%	2.4%	2.7%	2.6%	1.6%
B	1.0%	0.7%	0.6%	1.3%	1.1%	N/A

	Pool 4 (Loans with UPB > $417,000 and DTI > 43)					
Rating	A	B	C	D	E	F
AAA	14.9%	9.2%	10.2%	7.3%	14.0%	9.9%
AA	10.3%	5.6%	7.2%	5.8%	9.8%	6.0%
A	6.6%	3.7%	4.1%	4.3%	6.5%	4.5%
BBB	3.8%	1.9%	2.8%	2.5%	4.1%	2.3%
BB	1.9%	0.8%	1.5%	1.2%	2.4%	1.2%
B	1.1%	0.3%	0.2%	0.5%	1.0%	N/A

	Pool 5 (Loans with UPB > $417,000 and DTI ≤ 43)					
Rating	A	B	C	D	E	F
AAA	12.1%	8.4%	7.7%	6.4%	10.8%	8.1%
AA	8.2%	5.0%	5.4%	5.1%	7.3%	5.7%
A	5.1%	3.3%	3.1%	3.7%	4.7%	3.8%
BBB	2.9%	1.6%	2.1%	2.2%	2.8%	2.3%
BB	1.4%	0.7%	1.2%	1.0%	1.7%	1.0%
B	0.8%	0.3%	0.2%	0.5%	0.8%	N/A

	Pool 6 (Loans with UPB ≤ $417,000 and DTI > 43)					
Rating	A	B	C	D	E	F
AAA	14.9%	12.8%	15.2%	11.8%	14.5%	10.0%
AA	10.4%	8.9%	10.7%	10.0%	10.1%	7.2%
A	6.8%	6.1%	6.2%	7.9%	6.9%	5.1%
BBB	4.0%	2.9%	4.3%	5.4%	4.4%	3.2%
BB	2.1%	1.5%	2.5%	3.1%	2.6%	1.7%
B	1.0%	0.8%	0.7%	1.5%	1.1%	N/A

[11] For Rating Agency F, tables show subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

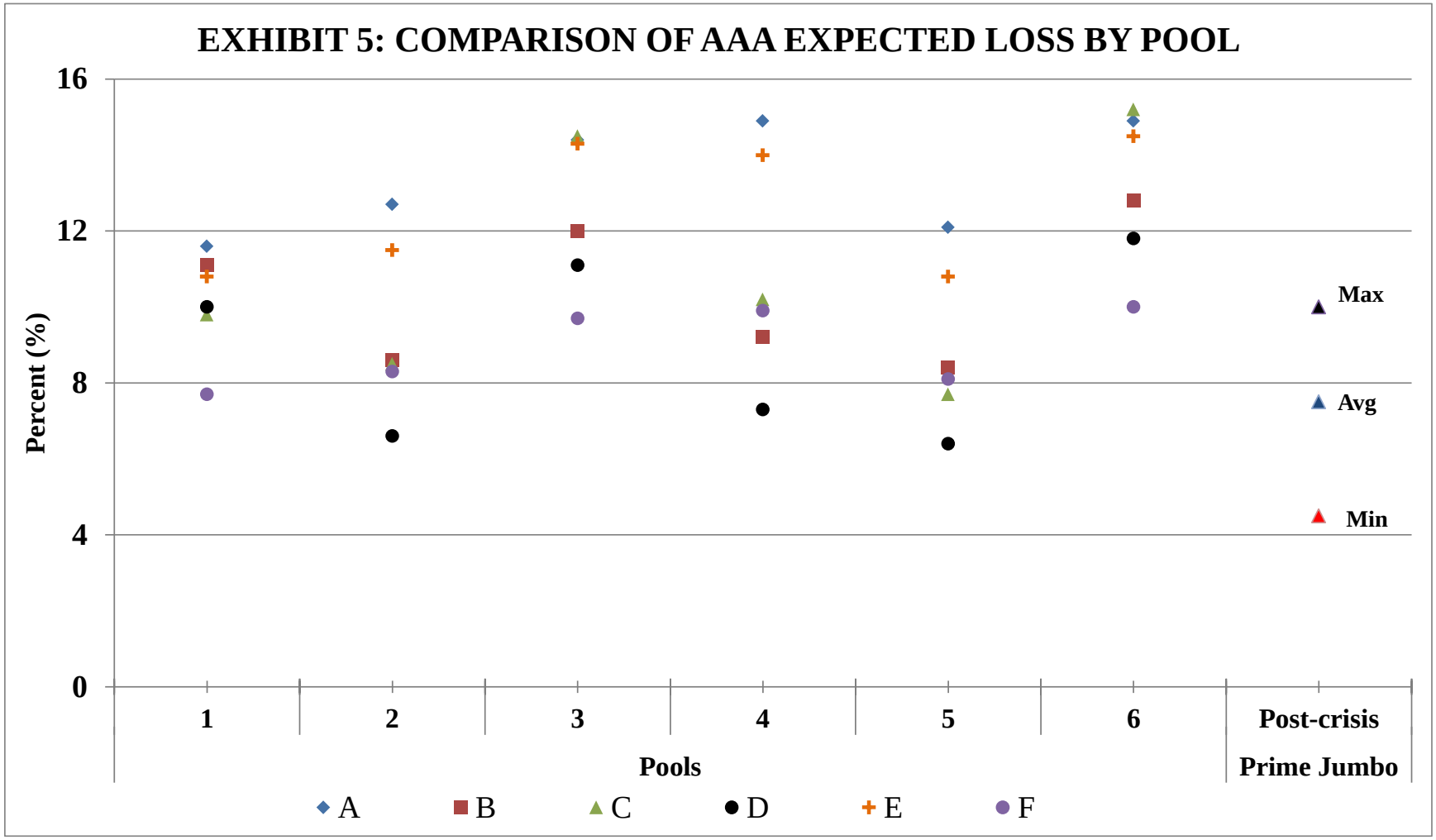
EXHIBIT 5: COMPARISON OF AAA EXPECTED LOSS BY POOL
16
12
8
4
0
Percent (%)
1
2
3
4
5
6
Post-crisis Prime Jumbo
Pools
Max
Avg
Min
A
B
C
D
E
F

KEY DRIVERS OF CREDIT RATING AGENCY RESULTS

The credit rating agencies cited the following loan attributes as key drivers of default, loss severity, and expected loss projections. For each pool, certain attributes play a more dominant role than others.

- **LTV and CLTV:** Loan-to-value (LTV) is the ratio of first lien mortgage debt divided by the value of the property, while combined LTV (CLTV) is the ratio of aggregate mortgage debt divided by the value of the property. These ratios are measures of borrower leverage. All else equal, a higher CLTV ratio results in a higher probability of borrower default. If the LTV ratio is also high, the projected loss severity will increase. Credit rating agency models give a significant amount of consideration to borrower equity in projecting default probability, loss severity, and expected loss. However, the credit rating agencies have varying approaches to calculating borrower equity. For example, Rating Agency A adjusts property values using its proprietary home price model. Rating Agency D's model considers the absolute dollar value of borrower equity, not just the ratio; in Rating Agency D's model, borrowers who put down a large amount of equity have a greater incentive to continue their mortgage payments, and consequently, a lower probability of default.

- **Credit score:** Credit score is a key driver of default in credit rating agency models. All else equal, a higher credit score will result in lower default projections.

- **Geography:** All else equal, pools concentrated in a small number of geographic regions could be more sensitive to unforeseen localized stresses. As a result, some credit rating agencies assess a geographic concentration penalty due to the higher default risk. In contrast, Rating Agency D's model identifies California as tending to have more favorable long-run home price appreciation trends than the rest of the country; consequently, Rating Agency D's model does not similarly penalize pools with a high concentration of loans in California.

- **Loan balance:** All else equal, a higher loan balance results in lower projected loss severity due to the fact that the fixed expenses associated with a defaulted loan represent a lower percentage of the loan balance.

- **Property value:** All else equal, a relatively low property value distribution results in higher probability of default and loss severity projections. Rating Agency A considers the loan property value relative to regional property values in its analysis.

- **DTI:** A borrower's DTI ratio is a key driver of default in some credit rating agency models; all else equal, a higher DTI ratio will result in greater default risk. Other credit rating agencies may make an explicit adjustment outside of their model.

- **Non-QM:** Each credit rating agency has developed its own approach to non-QM risk, resulting in divergent results in pools with high levels of non-QM loans. Given the absence of historical data, there is a notable difference of opinion among credit rating agencies with respect to projecting performance of non-QM loans. Some credit rating agency models only adjust the projected loss severity, reflecting the potentially heightened liability resulting from a borrower's successful claim against a lender for violations of the TILA ATR requirements, while other credit rating agency models also increase defaults on non-QM loans to capture potential heightened liability risk under TILA due to strategic defaults. The exact non-QM penalty depends on borrower credit and property location (judicial vs. non-judicial jurisdiction). Additional factors explicitly considered by some credit rating agencies in their analysis of non-QM loans include the strength of representations and warranties providers and originators' policies and procedures to comply with the ATR requirements.

- **Credit spread:** The interest rate that a lender charges a borrower is a strong indicator of risk; lenders generally charge a risk premium consistent with a borrower's credit risk. Rating Agency F found that historically, the spread between a borrower's mortgage rate and the prevailing interest rate charged to borrowers is statistically as predictive of a borrower's relative probability of default as is the FICO score. Its model is therefore also sensitive to credit spread.

POOL 1: ALL LOANS THAT COLLATERALIZE STACR 2014-DN3

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B[12]	C	D	E	F[13]
AAA	19.8%	18.6%	15.9%	21.2%	19.8%	58.5%	58.6%	61.6%	47.0%	54.4%	11.6%	11.1%	9.8%	10.0%	10.8%	7.7%
AA	15.3%	13.8%	12.4%	19.1%	14.3%	52.0%	54.3%	55.5%	43.5%	51.6%	8.0%	7.6%	6.9%	8.3%	7.4%	6.5%
A	11.2%	10.4%	8.9%	16.3%	9.9%	45.5%	50.1%	44.8%	39.5%	48.5%	5.1%	5.3%	4.0%	6.4%	4.8%	4.0%
BBB	7.5%	6.2%	6.9%	12.3%	6.6%	39.0%	42.2%	40.3%	34.4%	44.2%	2.9%	2.6%	2.8%	4.3%	2.9%	2.9%
BB	4.5%	3.9%	4.9%	8.0%	4.5%	32.6%	34.6%	32.1%	29.3%	39.0%	1.5%	1.3%	1.6%	2.4%	1.8%	1.3%
B	2.7%	2.5%	2.9%	4.6%	2.4%	26.1%	27.4%	12.5%	24.2%	33.5%	0.7%	0.7%	0.4%	1.1%	0.8%	N/A

Items of note:

- AAA expected loss and subordination levels for a well-diversified pool of conforming collateral such as Pool 1 are within the range of levels observed in prime jumbo loan securitizations.
- While the conforming collateral analyzed for this exercise is of lower credit quality relative to prime jumbo loans securitized post-crisis, the AAA expected losses and subordination levels for Pool 1 reflect the benefits of diversification and strengthened underwriting and securitization practices post-crisis.

The primary drivers of expected losses for Pool 1 reported by the credit rating agencies participating in this exercise include:

- **LTV and CLTV:** Pool 1 has a relatively high LTV and CLTV as compared to post-crisis private label jumbo loan securitizations, resulting in higher probability of default, loss severity, and loss expectations. Rating Agency A found that 44 percent of Pool 1 has an adjusted LTV above 80 percent.
- **Credit score:** While the weighted average credit score of Pool 1 is relatively high, there is a high concentration (21 percent) of loans with FICO less than 720, increasing the probability of default.
- **Geography:** Pool 1 is geographically well-diversified, requiring no additional adjustment for geographic concentration.
- **Loan balance:** Pool 1 has a lower average loan balance as compared to post-crisis private label jumbo loan securitizations, which results in a higher loss severity.
- **Property value:** Pool 1 has a relatively low property value distribution, resulting in higher probability of default and loss severity projections in Rating Agency A's model.

[12] Unlike the other credit rating agencies, Rating Agency B applies geographic concentration and non-QM adjustments directly to pool-level expected losses. As a result, Expected Loss for Rating Agency B will not equal the product of Probability of Default and Loss Severity as it does for the other credit rating agencies.
[13] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

POOL 2: LOANS WITH AN ORIGINAL PRINCIPAL BALANCE > $417,000

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F[14]
AAA	24.1%	17.8%	16.4%	15.6%	21.8%	52.8%	40.2%	52.3%	41.9%	52.7%	12.7%	8.6%	8.5%	6.6%	11.5%	8.3%
AA	18.8%	13.2%	12.8%	13.6%	15.8%	46.3%	35.7%	47.0%	38.6%	49.9%	8.7%	5.2%	6.0%	5.2%	7.9%	5.7%
A	13.8%	9.9%	9.3%	10.9%	10.9%	39.7%	31.4%	37.7%	34.7%	46.8%	5.5%	3.4%	3.5%	3.8%	5.1%	3.8%
BBB	9.2%	5.8%	7.0%	7.5%	7.3%	33.3%	23.4%	34.3%	29.7%	42.5%	3.1%	1.7%	2.4%	2.2%	3.1%	2.3%
BB	5.7%	3.6%	4.7%	4.4%	5.0%	27.0%	16.2%	27.5%	24.3%	37.3%	1.5%	0.7%	1.3%	1.1%	1.9%	1.1%
B	3.9%	2.4%	2.4%	2.6%	2.5%	21.4%	10.0%	8.1%	18.9%	31.8%	0.8%	0.3%	0.2%	0.5%	0.8%	N/A

Items of note:

- While expected losses for Pool 2 relative to Pool 1 increased for Rating Agencies A, E, and F, they decreased for Rating Agencies B, C, and D.
    - For Rating Agencies A, E, and F, the effect of geographic concentration seems to have dominated, resulting in higher probabilities of default.
    - For Rating Agencies B, C, and D, the effect of larger loan sizes seems to have dominated, resulting in lower loss severities.
- Rating Agency D also indicated that the higher level of borrower equity in absolute dollar terms coupled with favorable home price appreciation trends in California contributed to lower default projections than Pool 1.

Relative to Pool 1, the primary distinguishing drivers of expected losses for Pool 2 include:

- **LTV and CLTV:** Although the weighted average LTV of Pool 2 is roughly similar to Pool 1, Rating Agency D noted that on an absolute dollar basis, Pool 2 has a higher level of home equity. On the other hand, Rating Agency A found that roughly 62 percent of Pool 2 has an adjusted LTV over 80 percent in its model, primarily due to concentration in MSAs that they found to be overvalued.
- **Credit score:** Although the weighted average FICO of Pool 2 is similar to that of Pool 1, the former has a slightly lower concentration of borrowers with FICO less than 720.
- **Geography:** Pool 2 has significant geographic concentration with over 50 percent of the pool located in three MSAs, reflecting the fact that larger loans are concentrated in certain high-cost metropolitan areas. Geographic concentration was a key driver of

[14] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

expected loss for Rating Agency A and F; absent the penalty for geographic concentration, expected loss for Pool 2 would be lower than for Pool 1 in Rating Agency A and F's models.

Rating Agency A: Impact of Pool 2 Geographic Concentration

	Probability of Default			Expected Loss	
	Geo unadj	**Geo adj**		**Geo unadj**	**Geo adj**
AAA	19.6%	24.1%		10.3%	12.7%
AA	15.0%	18.8%		6.9%	8.7%
A	10.8%	13.8%		4.3%	5.5%
BBB	7.2%	9.2%		2.4%	3.1%
BB	4.4%	5.7%		1.2%	1.5%
B	3.0%	3.9%		0.6%	0.8%

- **Loan balance:** Pool 2 has a significantly higher average loan balance, resulting in lower projected loss severity. Rating Agencies B and D project lower expected losses for Pool 2 because their models assess a significantly lower loss severity for higher balance loans.
- **DTI:** Pool 2 has slightly higher weighted average DTI ratios, which results in higher default risk.
- **Non-QM:** Pool 2 has a higher percentage of non-QM loans.

POOL 3: LOANS WITH DTI RATIO > 43 PERCENT

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F[15]
AAA	23.6%	19.5%	21.4%	21.2%	25.0%	61.0%	56.6%	67.9%	52.2%	57.1%	14.4%	12.0%	14.5%	11.1%	14.3%	9.7%
AA	18.4%	14.6%	16.6%	19.0%	18.4%	54.4%	52.2%	61.6%	48.7%	54.3%	10.0%	8.3%	10.2%	9.3%	10.0%	7.0%
A	13.6%	11.1%	11.8%	16.2%	13.2%	47.9%	47.9%	50.2%	44.8%	51.2%	6.5%	5.6%	5.9%	7.3%	6.8%	4.9%
BBB	9.2%	6.6%	9.1%	12.3%	9.2%	41.4%	39.9%	45.5%	39.7%	46.9%	3.8%	2.7%	4.1%	4.9%	4.3%	3.0%
BB	5.6%	4.1%	6.4%	7.9%	6.1%	34.8%	32.2%	36.8%	34.5%	41.6%	2.0%	1.3%	2.4%	2.7%	2.6%	1.6%
B	3.5%	2.7%	3.7%	4.5%	2.9%	28.1%	25.0%	15.7%	28.9%	36.1%	1.0%	0.7%	0.6%	1.3%	1.1%	N/A

Items of note:

- The large proportion of non-QM loans in Pool 3 is the key driver of model projections across all of the credit rating agencies. Given the absence of historical data, there is a notable difference of opinion among credit rating agencies with respect to projecting performance of non-QM loans. Each credit rating agency has developed its own approach to non-QM risk, generating the divergent results shown.
    - Rating Agency C seems to be an outlier from a projected loss severity perspective.

Relative to Pool 1, the primary distinguishing drivers of expected losses for Pool 3 include:

- **Credit score:** Pool 3 has the second-highest share of borrowers with FICO less than 720 after Pool 6, resulting in higher probability of default.
- **Property value:** Rating Agency A identifies the average property value of Pool 3 loans to be only about half of the state median home value, resulting in higher default and loss severity projections.
- **DTI:** Pool 3 has a significantly higher weighted average DTI ratio, which increases default risk. Rating Agency B indicated that if they were presented with a pool with this level of concentration of high DTI loans, substantial review of underwriting and due diligence would be required, and additional qualitative loss adjustments could be warranted.
- **Non-QM:** Pool 3 has a significantly higher percentage of non-QM loans. Because any potential challenge to foreclosure associated with ATR requirements must begin with borrower default, Pool 3's high probability of default heightens the impact of the non-QM loss adjustment. Rating Agency F indicated that for a non-QM pool such as Pool 3, it would also focus on the factors that the originator considered to determine that the borrower has the ability to repay and that mitigate the risk from the higher DTI. Furthermore, Rating Agency F would also consider the strength of representations and warranties framework and

[15] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

provider, results of third-party due diligence results as they relate to meeting ATR requirements, and originators' policies and procedures to comply with the ATR requirements.

- **Risk layering:** In addition to high DTI ratios, Rating Agency A points out that Pool 3 has additional risks including low borrower equity and low credit scores.

POOL 4: LOANS WITH AN ORIGINAL PRINCIPAL BALANCE > $417,000 AND DTI RATIO > 43 PERCENT

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F[16]
AAA	27.2%	18.1%	19.8%	16.1%	25.8%	54.8%	40.2%	51.7%	45.2%	54.4%	14.9%	9.2%	10.2%	7.3%	14.0%	9.9%
AA	21.4%	13.4%	15.4%	13.9%	19.0%	48.2%	35.7%	46.7%	41.8%	51.6%	10.3%	5.6%	7.2%	5.8%	9.8%	6.0%
A	15.8%	10.1%	11.0%	11.2%	13.4%	41.7%	31.5%	37.7%	38.0%	48.5%	6.6%	3.7%	4.1%	4.3%	6.5%	4.5%
BBB	10.7%	5.9%	8.1%	7.8%	9.3%	35.1%	23.5%	35.0%	32.7%	44.2%	3.8%	1.9%	2.8%	2.5%	4.1%	2.3%
BB	6.6%	3.7%	5.2%	4.5%	6.2%	28.7%	16.2%	29.1%	27.1%	38.9%	1.9%	0.8%	1.5%	1.2%	2.4%	1.2%
B	4.7%	2.4%	2.3%	2.6%	3.0%	22.8%	10.0%	8.5%	20.6%	33.4%	1.1%	0.3%	0.2%	0.5%	1.0%	N/A

Items of note:

- Similar to Pool 2, there was a noteworthy divergence in loss expectations for Pool 4 relative to Pool 1. While loss expectations increased for Rating Agencies A, E, and F, they decreased for Rating Agencies B, C, and D.
    - For Rating Agencies A, E and F, the effect of geographic concentration seems to have dominated, resulting in higher probabilities of default.
    - For Rating Agencies B, C, and D, the effect of higher loan sizes seems to have dominated, resulting in lower loss severities.
- Rating Agency D also indicated that the higher level of borrower equity in absolute dollar terms contributed to lower default projections.
- Similar to Pool 3, the high proportion of non-QM loans is once again a key driver of differences among credit rating agency projections.

Relative to Pool 1, the primary distinguishing drivers of expected losses for Pool 4 include:

- **LTV and CLTV:** Although Pool 4 has both a slightly lower LTV and CLTV than Pool 1, Rating Agency A found that Pool 4's adjusted LTV, an important driver of default in its model, was actually significantly higher. Rating Agency A found that over 55 percent of Pool 4 had an adjusted LTV of over 80 percent, producing the highest probability of default across all of the pools.
- **Geography:** Pool 4 has significant geographic concentration, reflecting the fact that larger loans are concentrated in certain high-cost metropolitan areas. Rating Agency F noted that the effective number of metropolitan statistical areas (MSA) in this pool was very low and consequently, made the highest adjustment for geographic concentration to this pool.

[16] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

- **Loan balance:** Pool 4 has a significantly higher average loan balance, which reduces loss severity. Rating Agencies B and D project lower expected losses for Pool 2 because their models assess a significantly lower loss severity for higher balance loans.
- **DTI:** Pool 4 has a significantly higher weighted average DTI ratio, which increases default risk. Rating Agency A pointed out, however, that the higher credit scores of Pool 4 reduced the impact of risk layering on default.
- **Non-QM:** Pool 4 has a significantly higher share of non-QM loans.

POOL 5: LOANS WITH AN ORIGINAL PRINCIPAL BALANCE > $417,000 AND DTI RATIO ≤ 43 PERCENT

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F[17]
AAA	23.2%	17.7%	15.1%	15.6%	20.6%	52.1%	40.1%	51.1%	40.9%	52.1%	12.1%	8.4%	7.7%	6.4%	10.8%	8.1%
AA	18.0%	13.1%	11.9%	13.6%	14.7%	45.5%	35.6%	45.7%	37.5%	49.4%	8.2%	5.0%	5.4%	5.1%	7.3%	5.7%
A	13.2%	9.8%	8.6%	10.9%	10.2%	39.0%	31.3%	36.1%	33.7%	46.3%	5.1%	3.3%	3.1%	3.7%	4.7%	3.8%
BBB	8.8%	5.8%	6.5%	7.5%	6.6%	32.5%	23.3%	32.7%	28.7%	42.0%	2.9%	1.6%	2.1%	2.2%	2.8%	2.3%
BB	5.4%	3.6%	4.5%	4.4%	4.5%	26.4%	16.1%	26.0%	23.5%	36.8%	1.4%	0.7%	1.2%	1.0%	1.7%	1.0%
B	3.7%	2.4%	2.4%	2.6%	2.4%	20.9%	9.9%	7.7%	18.4%	31.2%	0.8%	0.3%	0.2%	0.5%	0.8%	N/A

Items of note:

- Similar to Pool 2, there was a noteworthy divergence in loss expectations for Pool 5 relative to Pool 1. While loss expectations increased for Rating Agencies A, E, and F, they decreased for Rating Agencies B, C, and D.
    - For Rating Agencies A, E, and F, the effect of geographic concentration seems to have dominated, resulting in higher probabilities of default.
    - For Rating Agencies B, C, and D, the effect of higher loan sizes seems to have dominated, resulting in lower loss severities.

Relative to Pool 1, the primary distinguishing drivers of expected losses for Pool 5 include:

- **LTV and CLTV:** Rating Agency A cited its adjusted LTV metric as a key driver of default, finding almost two-thirds of Pool 5 to have an adjusted LTV ratio over 80 percent and 17 percent of Pool 5 with an adjusted LTV ratio of over 90 percent.
- **Credit score:** Rating Agency A noted that some of the impact of high adjusted LTV ratios is offset by Pool 5's high weighted average credit score.
- **Geography:** Pool 5 has significant geographic concentration, reflecting the fact that larger loans are concentrated in certain high-cost metropolitan areas. Geographic concentration was a key driver of expected loss for Rating Agency A; absent the penalty for geographic concentration, expected loss for Pool 5 would be lower than for Pool 1 in Rating Agency A's model.
- **Loan balance:** Pool 5 has a significantly higher average loan balance, which reduces loss severity. Rating Agencies B and D project lower expected losses for Pool 5 because their models assess a significantly lower loss severity for higher balance loans.

[17] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

- **DTI:** Pool 5 has the lowest weighted average DTI among all of the pools, which generally reduces default risk. Rating Agency F's consideration of this attribute resulted in a marginal benefit to Pool 5 as compared to other pools. However, given that this attribute was not well-reported historically, both Rating Agency F and D limit the amount of credit given in their model to lower DTI ratios.

POOL 6: LOANS WITH AN ORIGINAL PRINCIPAL BALANCE ≤ $417,000 AND DTI RATIO > 43 PERCENT

Rating	Probability of default					Loss severity					Expected loss					
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F[18]
AAA	24.0%	19.7%	21.7%	22.2%	25.2%	62.1%	60.9%	70.0%	53.2%	57.6%	14.9%	12.8%	15.2%	11.8%	14.5%	10.0%
AA	18.8%	14.8%	16.9%	20.0%	18.4%	55.6%	56.5%	63.4%	49.7%	54.8%	10.4%	8.9%	10.7%	10.0%	10.1%	7.2%
A	13.9%	11.2%	12.0%	17.2%	13.3%	49.0%	52.3%	51.5%	45.7%	51.7%	6.8%	6.1%	6.2%	7.9%	6.9%	5.1%
BBB	9.4%	6.7%	9.3%	13.2%	9.3%	42.5%	44.3%	46.5%	40.6%	47.4%	4.0%	2.9%	4.3%	5.4%	4.4%	3.2%
BB	5.8%	4.2%	6.7%	8.6%	6.2%	35.9%	36.6%	37.4%	35.3%	42.2%	2.1%	1.5%	2.5%	3.1%	2.6%	1.7%
B	3.5%	2.8%	4.0%	4.9%	2.9%	29.2%	29.1%	16.3%	29.8%	36.6%	1.0%	0.8%	0.7%	1.5%	1.1%	N/A

Items of note:

- Pool 6 is the weakest pool from a collateral credit quality perspective and consequently, yields the highest expected loss projections across all credit rating agencies.

Relative to Pool 1, the primary distinguishing drivers of expected losses for Pool 6 include:

- **LTV and CLTV:** Rating Agency D found that Pool 6 produces the highest default probability in its model due to the low absolute amount of home equity. Rating Agency F also found that both default probability and loss severity was the highest for this pool.
- **Credit score:** Pool 6 has the highest share of borrowers with FICO less than 720.
- **Loan balance:** Pool 6 has the lowest average loan balance, which increases loss severity.
- **DTI:** Pool 6 has a significantly higher weighted average DTI ratio, which increases default risk.
- **Non-QM:** Pool 6 has a significantly higher share of non-QM loans. Once again, Rating Agency C is a noteworthy outlier from a projected loss severity perspective.
- **Risk layering:** Rating Agency A identified the concentration of very high DTI ratios combined with low loan balances, low property values, and low credit scores as creating significant layered risk. This is offset to some extent by the pool's low adjusted LTV ratio in Rating Agency A's model.

[18] For Rating Agency F, table shows subordination levels assuming a simple structure with sequential principal and reverse sequential loss allocations.

EXPECTED LOSS-BASED CREDIT RATING APPROACH

A bond, or tranche, in a securitization may receive the same rating (e.g., AAA) from more than one agency, but these ratings may be based upon meaningfully different modeling approaches and standards, depending on each credit rating agency's proprietary definition. Credit rating agencies evaluate the credit risk of a tranche in a structured transaction using one of two common approaches: a probability of default- (PD) based approach or an expected loss- (EL) based approach[19]. In the PD-based approach, a tranche is eligible for a given rating if the probability that loss on the pool exceeds the attachment point of the tranche is less than a predefined value – meaning that the probability that the tranche will experience some loss is sufficiently low. The PD-based approach does not take into consideration the thickness of the tranche because it is irrelevant to measuring the first dollar of loss on that tranche. Conversely, the EL-based approach not only takes into consideration the tranche's default probability, but also considers its loss severity in the event of default. The thickness of the tranche matters because the same dollar amount of loss would translate into a higher rate of loss for a thin tranche relative to a thick tranche. Unlike the PD-based approach, the EL-based approach will make a credit distinction between tranches of different thickness.

Because the EL-based approach depends not only on collateral loss but on the thickness of the tranche, a rating agency that employs this approach must make an assumption about the transaction's structure. Rating Agency F is the only credit rating agency in our universe that uses the EL-based approach, and their model results are shown below. This credit rating agency assumed a purely sequential structure in which principal is paid sequentially and losses are allocated in reverse sequential order. No assumptions were made around loss or delinquency triggers or rules that would change payment or loss allocation rules. The coupon on the tranches was set equal to the net weighted average coupon of the pool. These assumptions would make the EL-based tranching approach as comparable as possible to expected loss levels from credit rating agencies that use the PD-based approach.

Exhibit 6: Rating Agency F Tranche Subordination Levels[20]

Rating	Pool 1	Pool 2	Pool 3	Pool 4	Pool 5	Pool 6
AAA	7.7%	8.3%	9.7%	9.9%	8.1%	10.0%
AA	6.5%	5.7%	7.0%	6.0%	5.7%	7.2%
A	4.0%	3.8%	4.9%	4.5%	3.8%	5.1%
BBB	2.9%	2.3%	3.0%	2.3%	2.3%	3.2%
BB	1.3%	1.1%	1.6%	1.2%	1.0%	1.7%
Expected Loss	0.8%	0.6%	0.9%	0.7%	0.6%	1.0%

[19] For more information on these tranching methods, we encourage you to consult *"Differences in Tranching Methods: Some Results and Implications"* by Ashish Das and Roger M. Stein.

[20] Rating Agency F analyzed this pool using its proposed credit rating methodology.

Exhibit 7: Rating Agency F Model Attribution

Exhibit 7 shows an attribution analysis for each of the six pools in Rating Agency F's model. It shows the respective increase (or decrease for multipliers less than one) in credit risk owing to specific loan characteristics that differ from that of a benchmark loan's characteristics.[21] For example, Pool 1 has some loans whose purpose was for the purchase of a property and others whose purpose was to refinance an existing loan. The loan purpose multiplier of 1.15 for Pool 1 indicates that the pool probability of default is approximately 15 percent higher than what it would have been if all the loans in the pool had been used to purchase the property.

	Probability of Default Attribution					
	Pool 1	**Pool 2**	**Pool 3**	**Pool 4**	**Pool 5**	**Pool 6**
Benchmark PD*	***13.9%***	***13.3%***	***14.1%***	***12.9%***	***13.4%***	***14.3%***
Original Term to Maturity	1.00	1.00	1.00	1.00	1.00	1.00
Balloon Loan	1.00	1.00	1.00	1.00	1.00	1.00
Original Interest Only Term	1.00	1.00	1.00	1.00	1.00	1.00
ARM Loan	1.00	1.00	1.00	1.00	1.00	1.00
Occupancy	1.02	1.03	1.02	1.02	1.03	1.02
Documentation	1.00	1.00	1.00	1.00	1.00	1.00
Property Type	0.99	0.99	0.99	0.99	0.99	0.99
Loan Purpose	1.15	1.17	1.16	1.17	1.17	1.16
Prepayment Penalty	1.00	1.00	1.00	1.00	1.00	1.00
Original Interest Rate	0.97	0.97	0.97	0.97	0.97	0.97
Original Property Value	0.93	0.81	0.93	0.80	0.81	0.95
Credit Spread At Lock-In	1.10	1.14	1.11	1.16	1.13	1.10
Credit Spread At First Payment Date	0.97	0.96	0.96	0.94	0.97	0.96
Gross Margin	1.00	1.00	1.00	1.00	1.00	1.00
Seasoning	1.08	1.07	1.08	1.08	1.07	1.08
Adjusted PD*	***16.9%***	***14.4%***	***17.1%***	***14.1%***	***14.5%***	***17.7%***

[21] A benchmark loan is a newly originated, fully amortizing, 30-year, fixed-rate $300,000 loan to a borrower who furnished full income and asset documentation to purchase a single family property to be used as his/her primary residence. The loan is part of a geographically diversified portfolio of similar loans.

	Severity Attribution					
	Pool 1	**Pool 2**	**Pool 3**	**Pool 4**	**Pool 5**	**Pool 6**
Benchmark Severity*	***45.0%***	***40.1%***	***44.5%***	***40.1%***	***40.1%***	***45.4%***
Occupancy	1.02	1.02	1.02	1.02	1.02	1.02
Property Type	0.96	0.97	0.97	0.97	0.97	0.96
Adjusted Severity*	***44.4%***	***39.6%***	***43.8%***	***39.6%***	***39.6%***	***44.7%***

Exhibit 8: Rating Agency F Adjusted AAA Pool Loss Expectations

Exhibit 8 shows the loss attribution due to geographic and borrower concentration, as well as other adjustments which include DTI, channel, and non-QM.

	Pool 1	**Pool 2**	**Pool 3**	**Pool 4**	**Pool 5**	**Pool 6**
Pre-concentration model subordination	***7.7%***	***5.8%***	***7.7%***	***5.7%***	***5.8%***	***8.1%***
Concentration adjustments	0.0%	2.3%	0.6%	3.0%	2.4%	0.4%
Model-implied AAA pool loss	7.7%	8.1%	8.4%	8.7%	8.3%	8.5%
Other adjustments	0.0%	0.2%	1.3%	1.2%	-0.2%	1.5%
AAA pool loss	***7.7%***	***8.3%***	***9.7%***	***9.9%***	***8.1%***	***10.0%***

APPENDIX 1: COMPARISON OF EXPECTED LOSS ACROSS RATING CATEGORIES BY RATING AGENCY[22]

	Rating Agency A					
Rating	1	2	3	4	5	6
AAA	11.6%	12.7%	14.4%	14.9%	12.1%	14.9%
AA	8.0%	8.7%	10.0%	10.3%	8.2%	10.4%
A	5.1%	5.5%	6.5%	6.6%	5.1%	6.8%
BBB	2.9%	3.1%	3.8%	3.8%	2.9%	4.0%
BB	1.5%	1.5%	2.0%	1.9%	1.4%	2.1%
B	0.7%	0.8%	1.0%	1.1%	0.8%	1.0%

	Rating Agency B					
Rating	1	2	3	4	5	6
AAA	11.1%	8.6%	12.0%	9.2%	8.4%	12.8%
AA	7.6%	5.2%	8.3%	5.6%	5.0%	8.9%
A	5.3%	3.4%	5.6%	3.7%	3.3%	6.1%
BBB	2.6%	1.7%	2.7%	1.9%	1.6%	2.9%
BB	1.3%	0.7%	1.3%	0.8%	0.7%	1.5%
B	0.7%	0.3%	0.7%	0.3%	0.3%	0.8%

	Rating Agency C					
Rating	1	2	3	4	5	6
AAA	9.8%	8.5%	14.5%	10.2%	7.7%	15.2%
AA	6.9%	6.0%	10.2%	7.2%	5.4%	10.7%
A	4.0%	3.5%	5.9%	4.1%	3.1%	6.2%
BBB	2.8%	2.4%	4.1%	2.8%	2.1%	4.3%
BB	1.6%	1.3%	2.4%	1.5%	1.2%	2.5%
B	0.4%	0.2%	0.6%	0.2%	0.2%	0.7%

	Rating Agency D					
Rating	1	2	3	4	5	6
AAA	10.0%	6.6%	11.1%	7.3%	6.4%	11.8%
AA	8.3%	5.2%	9.3%	5.8%	5.1%	10.0%
A	6.4%	3.8%	7.3%	4.3%	3.7%	7.9%
BBB	4.3%	2.2%	4.9%	2.5%	2.2%	5.4%
BB	2.4%	1.1%	2.7%	1.2%	1.0%	3.1%
B	1.1%	0.5%	1.3%	0.5%	0.5%	1.5%

	Rating Agency E					
Rating	1	2	3	4	5	6
AAA	10.8%	11.5%	14.3%	14.0%	10.8%	14.5%
AA	7.4%	7.9%	10.0%	9.8%	7.3%	10.1%
A	4.8%	5.1%	6.8%	6.5%	4.7%	6.9%
BBB	2.9%	3.1%	4.3%	4.1%	2.8%	4.4%
BB	1.8%	1.9%	2.6%	2.4%	1.7%	2.6%
B	0.8%	0.8%	1.1%	1.0%	0.8%	1.1%

	Rating Agency F					
Rating	1	2	3	4	5	6
AAA	7.7%	8.3%	9.7%	9.9%	8.1%	10.0%
AA	6.5%	5.7%	7.0%	6.0%	5.7%	7.2%
A	4.0%	3.8%	4.9%	4.5%	3.8%	5.1%
BBB	2.9%	2.3%	3.0%	2.3%	2.3%	3.2%
BB	1.3%	1.1%	1.6%	1.2%	1.0%	1.7%
Expected loss	0.8%	0.6%	0.9%	0.7%	0.6%	1.0%

[22] Expected loss projections are shown for Rating Agencies A through E. Subordination levels are shown for Rating Agency F.

APPENDIX 2: COMPARISON OF UNADJUSTED AND ADJUSTED RESULTS FOR RATING AGENCIES A, C, AND D

Pool 1

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	23.5%	19.8%	58.5%	58.5%	13.8%	11.6%
AA	18.7%	15.3%	52.1%	52.0%	9.8%	8.0%
A	13.8%	11.2%	45.5%	45.5%	6.3%	5.1%
BBB	9.4%	7.5%	39.0%	39.0%	3.8%	2.9%
BB	5.7%	4.5%	32.5%	32.6%	1.8%	1.5%
B	3.4%	2.7%	26.1%	26.1%	0.9%	0.7%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	19.1%	15.9%	64.5%	61.6%	12.3%	9.8%
AA	14.9%	12.4%	57.7%	55.5%	8.6%	6.9%
A	10.7%	8.9%	45.7%	44.8%	4.9%	4.0%
BBB	8.3%	6.9%	41.1%	40.3%	3.4%	2.8%
BB	5.9%	4.9%	32.8%	32.1%	1.9%	1.6%
B	3.5%	2.9%	12.9%	12.5%	0.4%	0.4%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	22.6%	21.2%	47.1%	47.0%	10.6%	10.0%
AA	20.4%	19.1%	43.6%	43.5%	8.9%	8.3%
A	17.6%	16.3%	39.6%	39.5%	7.0%	6.4%
BBB	13.6%	12.3%	34.4%	34.4%	4.7%	4.3%
BB	9.0%	8.0%	29.3%	29.3%	2.6%	2.4%
B	5.1%	4.6%	24.3%	24.2%	1.3%	1.1%

Pool 2

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	28.6%	24.1%	52.8%	52.8%	15.0%	12.7%
AA	22.6%	18.8%	46.3%	46.3%	10.5%	8.7%
A	16.8%	13.8%	39.7%	39.7%	6.8%	5.5%
BBB	11.4%	9.2%	33.2%	33.3%	3.8%	3.1%
BB	7.1%	5.7%	27.1%	27.0%	2.0%	1.5%
B	5.0%	3.9%	21.5%	21.4%	1.1%	0.8%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	19.5%	16.4%	54.1%	52.3%	10.6%	8.5%
AA	15.1%	12.8%	48.7%	47.0%	7.4%	6.0%
A	10.7%	9.3%	38.7%	37.7%	4.1%	3.5%
BBB	8.2%	7.0%	34.8%	34.3%	2.9%	2.4%
BB	5.7%	4.7%	27.3%	27.5%	1.6%	1.3%
B	3.2%	2.4%	7.9%	8.1%	0.3%	0.2%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	17.1%	15.6%	42.0%	41.9%	7.2%	6.6%
AA	15.0%	13.6%	38.7%	38.6%	5.8%	5.2%
A	12.1%	10.9%	34.9%	34.7%	4.2%	3.8%
BBB	8.5%	7.5%	29.8%	29.7%	2.5%	2.2%
BB	5.0%	4.4%	24.6%	24.3%	1.2%	1.1%
B	2.8%	2.6%	19.3%	18.9%	0.5%	0.5%

Pool 3

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	27.9%	23.6%	60.9%	61.0%	17.0%	14.4%
AA	22.1%	18.4%	54.4%	54.4%	12.0%	10.0%
A	16.7%	13.6%	47.9%	47.9%	8.0%	6.5%
BBB	11.5%	9.2%	41.4%	41.4%	4.8%	3.8%
BB	7.1%	5.6%	34.8%	34.8%	2.5%	2.0%
B	4.5%	3.5%	28.1%	28.1%	1.3%	1.0%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	24.7%	21.4%	81.5%	67.9%	20.2%	14.5%
AA	19.4%	16.6%	71.9%	61.6%	14.0%	10.2%
A	14.1%	11.8%	55.0%	50.2%	7.7%	5.9%
BBB	10.9%	9.1%	49.6%	45.5%	5.4%	4.1%
BB	7.8%	6.4%	39.7%	36.8%	3.1%	2.4%
B	4.6%	3.7%	16.4%	15.7%	0.8%	0.6%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	22.5%	21.2%	52.2%	52.2%	11.8%	11.1%
AA	20.4%	19.0%	48.8%	48.7%	9.9%	9.3%
A	17.6%	16.2%	44.8%	44.8%	7.9%	7.3%
BBB	13.5%	12.3%	39.7%	39.7%	5.4%	4.9%
BB	8.9%	7.9%	34.4%	34.5%	3.1%	2.7%
B	5.0%	4.5%	29.0%	28.9%	1.5%	1.3%

Pool 4

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	32.1%	27.2%	54.8%	54.8%	17.5%	14.9%
AA	25.6%	21.4%	48.2%	48.2%	12.3%	10.3%
A	19.2%	15.8%	41.6%	41.7%	8.0%	6.6%
BBB	13.2%	10.7%	35.1%	35.1%	4.8%	3.8%
BB	8.3%	6.6%	28.7%	28.7%	2.5%	1.9%
B	5.9%	4.7%	22.8%	22.8%	1.3%	1.1%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	22.9%	19.8%	58.6%	51.7%	13.4%	10.2%
AA	17.5%	15.4%	52.7%	46.7%	9.2%	7.2%
A	12.2%	11.0%	41.5%	37.7%	5.1%	4.1%
BBB	9.1%	8.1%	38.0%	35.0%	3.5%	2.8%
BB	6.1%	5.2%	31.0%	29.1%	1.9%	1.5%
B	3.1%	2.3%	10.0%	8.5%	0.3%	0.2%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	17.4%	16.1%	45.3%	45.2%	7.9%	7.3%
AA	15.3%	13.9%	41.9%	41.8%	6.4%	5.8%
A	12.5%	11.2%	38.1%	38.0%	4.7%	4.3%
BBB	8.8%	7.8%	32.8%	32.7%	2.9%	2.5%
BB	5.1%	4.5%	27.2%	27.1%	1.4%	1.2%
B	2.8%	2.6%	21.0%	20.6%	0.6%	0.5%

Pool 5

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	27.4%	23.2%	52.0%	52.1%	14.3%	12.1%
AA	21.8%	18.0%	45.5%	45.5%	10.0%	8.2%
A	16.1%	13.2%	39.0%	39.0%	6.3%	5.1%
BBB	10.9%	8.8%	32.5%	32.5%	3.5%	2.9%
BB	6.8%	5.4%	26.4%	26.4%	1.8%	1.4%
B	4.7%	3.7%	20.9%	20.9%	1.0%	0.8%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	18.2%	15.1%	51.4%	51.1%	9.4%	7.7%
AA	14.2%	11.9%	46.2%	45.7%	6.5%	5.4%
A	10.1%	8.6%	36.8%	36.1%	3.7%	3.1%
BBB	7.8%	6.5%	32.8%	32.7%	2.5%	2.1%
BB	5.5%	4.5%	25.3%	26.0%	1.4%	1.2%
B	3.1%	2.4%	7.0%	7.7%	0.2%	0.2%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	17.1%	15.6%	41.1%	40.9%	7.0%	6.4%
AA	15.0%	13.6%	37.7%	37.5%	5.6%	5.1%
A	12.2%	10.9%	33.8%	33.7%	4.1%	3.7%
BBB	8.5%	7.5%	28.8%	28.7%	2.5%	2.2%
BB	5.0%	4.4%	23.7%	23.5%	1.2%	1.0%
B	2.8%	2.6%	18.7%	18.4%	0.5%	0.5%

Pool 6

Rating Agency A

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	28.6%	24.0%	62.0%	62.1%	17.8%	14.9%
AA	22.7%	18.8%	55.5%	55.6%	12.5%	10.4%
A	17.1%	13.9%	49.0%	49.0%	8.3%	6.8%
BBB	11.8%	9.4%	42.5%	42.5%	5.0%	4.0%
BB	7.3%	5.8%	35.9%	35.9%	2.5%	2.1%
B	4.5%	3.5%	29.2%	29.2%	1.3%	1.0%

Rating Agency C

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	25.2%	21.7%	84.7%	70.0%	21.3%	15.2%
AA	19.8%	16.9%	74.4%	63.4%	14.7%	10.7%
A	14.5%	12.0%	56.5%	51.5%	8.2%	6.2%
BBB	11.3%	9.3%	50.7%	46.5%	5.7%	4.3%
BB	8.1%	6.7%	40.3%	37.4%	3.3%	2.5%
B	4.9%	4.0%	16.7%	16.3%	0.8%	0.7%

Rating Agency D

Rating Category	Probability of Default		Loss Severity		Expected Loss	
	Unadj	Adj	Unadj	Adj	Unadj	Adj
AAA	23.6%	22.2%	53.3%	53.2%	12.6%	11.8%
AA	21.4%	20.0%	49.8%	49.7%	10.6%	10.0%
A	18.5%	17.2%	45.7%	45.7%	8.5%	7.9%
BBB	14.5%	13.2%	40.5%	40.6%	5.9%	5.4%
BB	9.6%	8.6%	35.3%	35.3%	3.4%	3.1%
B	5.5%	4.9%	29.9%	29.8%	1.6%	1.5%

RATING AGENCY MODELS AND METHODOLOGY

For more information on credit rating agency methodology and models, please consult the following links (in alphabetical order by rating agency):

DBRS
U.S. Residential Mortgage-Backed Securities Model and Rating Methodology
Assessing U.S. RMBS Pools under the Ability-to-Repay Rules

Fitch
U.S. RMBS Master Rating Criteria
U.S. RMBS Loan Loss Model Criteria
U.S. RMBS Qualified and Non-Qualified Mortgage Criteria

Kroll Bond Rating Agency
Residential Mortgage Default and Loss Model
U.S. RMBS Rating Methodology
U.S. RMBS Rating Methodology for Assessing Non-QM Risk

Moody's
Moody's Proposed Updated Approach to Rating US Prime RMBS
Moody's Proposed Approach to Assessing Incremental Risk Posed by the Ability to Repay Rules in US RMBS
US MILAN Model

Morningstar
RMBS Ratings Methodology

Standard & Poor's Ratings Services
Relevant criteria are publicly available at www.sandp.com.

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