

RATING METHODOLOGY

US Housing Finance Agency Single-Family Housing Methodology

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This rating methodology replaces the *U.S. Housing Finance Agency Single Family Programs methodology* published in November 2016. While this methodology reflects many of the same core principles as the 2016 methodology, we changed the claims-payment assumptions for mortgage insurance used in our loan loss calculations (please see Appendix E). We also made editorial changes to enhance readability.

Introduction

In this rating methodology, we explain our general approach to assessing credit risk for bonds issued under US state and local housing finance agency (HFA) programs for the financing of single-family housing, including the qualitative and quantitative factors that are likely to affect rating outcomes for these bonds.¹

We discuss the scorecard used for this sector. The scorecard² is a relatively simple reference tool that can be used in most cases to approximate credit profiles in this sector and to explain, in summary form, many of the factors that are generally most important in assigning ratings to these transactions. The scorecard factors may be evaluated using historical or forward-looking data or both.

We also discuss other rating considerations, which are factors that are assessed outside the scorecard, usually because the factor's credit importance varies widely among transactions in the sector or because the factor may be important only under certain circumstances or for a subset of transactions. In addition, some of the methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector.³ Furthermore, since ratings are forward-looking, we often incorporate directional views of risks and mitigants in a qualitative way.

As a result, the scorecard-indicated outcome is not expected to match the actual rating for each transaction.

THIS METHODOLOGY WAS UPDATED ON JULY 10, 2020. WE REMOVED REFERENCE TO THE ASSIGNMENT OF SHORT-TERM RATINGS FOLLOWING THE PUBLICATION OF THE SHORT-TERM DEBT OF US STATES, MUNICIPALITIES AND NONPROFITS METHODOLOGY.

¹ In this methodology, the term "bond" refers to bonds issued under single-family housing bond programs. Bonds issued under parity programs are secured by the same collateral.

² In our methodologies and research, the terms "scorecard" and "grid" are used interchangeably.

³ A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Our presentation of this rating methodology proceeds with (i) the scope of this methodology; (ii) an overview of housing finance agencies; (iii) the scorecard framework; (iv) a discussion of the scorecard factors; (v) other rating considerations not reflected in the scorecard; (vi) the assignment of instrument-level ratings; (vii) methodology assumptions; and (viii) limitations.

In Appendix A, we describe how we use the scorecard to arrive at a scorecard-indicated outcome. Appendix B shows the full view of the scorecard factors, sub-factors, weights and thresholds. In Appendix C, we describe our analytical adjustments to the financial statements of HFAs and their bond programs. Appendix D describes the inputs and assumptions incorporated into our loan loss analysis, and Appendix E describes our claims-payment assumptions for US mortgage insurance, by insurer rating. In Appendix F, we provide information about the inputs and scenarios incorporated into the cash flow projections that inform our assessment of a bond program's financial position.

Scope of This Methodology

This methodology applies to bonds issued under bond programs established by US state and local housing finance agencies. Bonds issued under these programs are secured by pools of single-family housing loans⁴ or by single-family residential mortgage-backed securities (MBS). Typically, these MBS are guaranteed by the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac) or the Government National Mortgage Association (Ginnie Mae).

Bonds issued by HFAs for single-family housing bond programs that are secured by the general obligation pledge of the HFA or by the moral obligation pledge of the state or local government are rated under separate methodologies.

Overview of Housing Finance Agencies

HFAs are established by state or local law to help low- and moderate-income families attain affordable housing. Their primary activity has traditionally been to finance single-family mortgages for first-time homebuyers through tax-exempt bonds.⁵

Under a typical HFA single-family housing bond program, the bonds are issued under a trust indenture. Many of the programs are open, as opposed to closed, indentures, which means that multiple series of bonds are issued over time under the same indenture. These are also known as parity indentures, and HFAs manage their ongoing mortgage lending and bond issuances as part of a broad program, rather than as discrete, or closed, financings. Under both open and closed programs, bond proceeds are used primarily to finance mortgage loans, as well as to fund reserves. The mortgage loans and reserves are pledged to the bond indenture and are the primary source of repayment for the bonds.

This publication does not announce a credit rating action. For any credit ratings referenced in this publication, please see the ratings tab on the issuer/entity page on www.moodys.com for the most updated credit rating action information and rating history.

⁴ A single-family housing loan is a whole loan, which is a loan involving one borrower that is made by one lender.

⁵ HFAs also offer a range of affordable housing programs to families of low and moderate incomes, including both single-family and multifamily mortgage products. Bonds rated under this methodology primarily finance single-family mortgages.

Scorecard Framework

The scorecard in this rating methodology is composed of four factors. Some of the four factors comprise a number of sub-factors.

EXHIBIT 1

US Housing Finance Agency Single-Family Housing Scorecard Overview

Factor	Factor Weighting	Sub-factor	Sub-factor Weighting
Financial Position	45%	Balance Sheet Strength	20%
		Cash Flow Projections	15%
		Financial Performance	10%
Loan Portfolio	25%	Portfolio Performance	10%
		Portfolio Characteristics	5%
		Mortgage Type	5%
		State and Local Real Estate Conditions	5%
Bond Program Structure	15%	Variable-Rate Debt	10%
		Counterparties	5%
Management and Governance	15%	--*	15%
Total	100%		100%

*This factor has no sub-factors.

Source: Moody's Investors Service

Please see Appendix A for general information relating to how we use the scorecard and for a discussion of scorecard mechanics. The scorecard does not include every rating consideration.⁶

Discussion of the Scorecard Factors

In this section, we explain our general approach for scoring each scorecard sub-factor or factor, and we describe why they are meaningful as credit indicators.

Factor: Financial Position (45% Weight)

Why It Matters

The financial position of a single-family housing bond program provides important indications of the program's ability to pay debt service on the bonds in periods of financial stress, based on the program's balance sheet strength, projected cash flow and financial performance.

This factor comprises three sub-factors:

Balance Sheet Strength

The program-assets-to-debt ratio (PADR) is a useful indicator of the bond program's balance sheet strength. The ratio indicates the extent to which a bond program is overcollateralized and able to withstand financial stress. Causes of financial stress include (i) rapid mortgage prepayments, which may result in timing mismatches between the receipt of funds and bond redemptions, thereby

⁶ Please see the "Other Rating Considerations" and "Limitations" sections.

introducing negative arbitrage between interest income received and interest expense paid; and (ii) high loan delinquencies that result in uninsured losses.

Cash Flow Projections

Cash flow projections provide important indications of the bond program's ability to meet debt service obligations and maintain a PADR under various stress scenarios for interest rates, loan originations and mortgage prepayments that is consistent with the rating.

Financial Performance

The financial performance of the bond program provides indications of the program's likely available resources to pay debt service when needed.

How We Assess It for the Scorecard

BALANCE SHEET STRENGTH:

Scoring for this sub-factor is based on (i) the bond program assets-to-debt ratio (PADR), which is a measure or estimate of the extent to which a bond program is overcollateralized by loans and other assets, such as cash and investments; and (ii) the projected strength of the bond program, which is based on projected cash flow.

For the PADR, the numerator is adjusted⁷ program assets, and the denominator is total program debt outstanding plus accrued interest. For the Aaa and Aa scoring categories, we subtract projected stress case loan losses from the numerator,⁸ except for MBS programs where the obligor or guarantor is rated in the respective scoring category. MBS programs with PADRs lower than 1.0 are typically scored Ba or lower.

In addition to calculating the PADR as described above for the most recently reported financial period (the benchmark PADR), we also consider the projected strength of the PADR, including projected stress case loan losses in the numerator, through the life of the bonds, based on projected cash flow. In cases where the projected PADR is lower than the benchmark PADR, we consider the projected level of the PADR and the scenarios under which the lower PADRs occur, and we typically lower the sub-factor score relative to the benchmark PADR based on our view of the likelihood that such a scenario will occur.

CASH FLOW PROJECTIONS:

Scoring for this qualitative sub-factor is based on our assessment of the bond program's ability to pay debt service through the life of the bonds and absorb financial stress. Scoring is informed by the strength of the PADR under a variety of stress scenarios, including the impact of different interest and investment rates on projected cash flow.⁹

FINANCIAL PERFORMANCE:

Scoring for this qualitative sub-factor is based on overall assessment informed by three indicators: (i) the bond program's average net asset ratio; (ii) the bond program's average profitability; and (iii) the bond program's available resources to pay debt service.

⁷ Please see Appendix C for a description of our analytical adjustments to the financial statements of HFAs and HFA bond programs.

⁸ Please see Appendix D for a description of our loan loss analysis.

⁹ Please see Appendix F for information about our approach to the inputs and scenarios incorporated into the cash flow projections that inform our assessment.

For the net asset ratio, the numerator is adjusted program net assets (i.e., net of liabilities), and the denominator is total program debt outstanding. We use the average of the annual ratios for the past three years.

In assessing the consistency of profitability, we consider the level and trend of profitability over the medium to long term, informed by the historical performance of a ratio for which the numerator is program net operating revenue, and the denominator is total program operating revenue. Program net operating revenue is total program revenue minus total program expenses.

We also consider the HFA's financial resources beyond the revenue from the single-family housing bond program, such as funds available in the HFA's general fund, that historically have been available to pay debt service on the bonds when needed.¹⁰

¹⁰ Even if reported in the HFA's consolidated statement, the bond program is legally separated. The HFA's access to assets and cash flow of the bond program is limited to excess cash, and the bond program's creditors typically do not have recourse to the HFA.

FACTOR

Financial Position (45%)

Sub-factor	Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B and Below
Balance Sheet Strength	20%	Program Asset to Debt Ratio (PADR) above or equal to 1.10 with projected stress case loan losses netted from numerator, or at least 1.00 for Mortgage-Backed Security (MBS) programs (where the obligor or guarantor is Aaa). ^{*1} Cash flows demonstrate that benchmark PADR, incorporating stress case loan losses, is maintained through the life of the bonds.	PADR of 1.10 - 1.00 with projected stress case loan losses netted from numerator. Cash flows demonstrate that benchmark PADR, incorporating stress case loan losses, is maintained through the life of the bonds.	PADR at least 1.00 not incorporating projected stress case loan losses. Cash flows demonstrate that benchmark PADR, not incorporating stress case loan losses, is maintained through the life of the bonds.	PADR at least 1.00 not incorporating projected stress case loan losses. Cash flows demonstrate that benchmark PADR, not incorporating stress case loan losses, is maintained in the near term.	PADR of 0.98 - 1.00 not incorporating projected stress case loan losses, or MBS program with PADR of 0.98 - 1.00. Cash flows do not maintain benchmark PADR, not incorporating stress case loan losses, in some near-term periods.	PADR below 0.98 not incorporating projected stress case loan losses, or MBS program with PADR below 0.98.
Cash Flow Projections	15%	Meets cash flow stress tests under all scenarios. Robust ability to absorb future financial stress.	Meets cash flow stress tests under all scenarios. Solid ability to absorb future financial stress.	Meets cash flow stress tests under all scenarios except for the most stressful scenarios. Moderate ability to absorb future financial stress. Any projected shortfalls are small and occur in the later years of the program (i.e., more than 10 years).	Meets most cash flow stress tests. Limited ability to absorb future financial stress. The extent of the shortfall, speed of the recovery and under which stress scenario it occurs will be considered.	Cash flows demonstrate that the program is able to cover debt service only under cash flow runs with limited stress tests. Very limited ability to absorb future financial stress.	Cash flow scenarios demonstrate that revenues do not cover debt service. No ability to absorb financial stress.
Financial Performance	10%	Program demonstrates high and rising net asset ratios (e.g., above 15% combined fund balance as % of bonds outstanding on average over 3 years). Consistently high profitability (e.g., 15% on average). Strong levels of resources for maintaining the creditworthiness of the program under stressful circumstances.	Program contains stable net asset ratios (e.g., 8% - 15% combined fund balance as % of bonds outstanding on average over 3 years). Consistent profitability over the long term (e.g., 10% - 15% on average). Ample resources for maintaining the creditworthiness of the program under stressful circumstances.	Program contains stable net asset ratios (e.g., 3% - 8% combined fund balance as % of bonds outstanding on average over 3 years). Consistent profitability over the long term (e.g., 3% - 10% on average). Satisfactory levels of resources for maintaining the creditworthiness under standard circumstances.	Program may exhibit declining net asset ratios but ratio remains above 1% combined fund balance as % of bonds outstanding on average over 3 years. Profitability may average 1% - 3% or show periods of loss, but losses are offset by net assets and not expected to continue. Sufficient resources for maintaining the creditworthiness under standard circumstances.	Program has exhibited limited declines in net asset ratios, but net assets exceed liabilities over 3 years. Consistent losses but net assets are expected to cover such losses over the medium term. Limited resources for maintaining the creditworthiness under standard circumstances.	Program has exhibited declines in net asset ratios, and liabilities exceed net assets over 3 years. Consistent losses and net assets are not expected to cover losses. Insufficient resources for maintaining the creditworthiness under standard circumstances.

^{*1} If the obligor or guarantor of an MBS is rated below Aaa, the score associated with a PADR of at least 1.00 moves downward with the rating (e.g., if the obligor or guarantor were rated in the Aa range, the score would be Aa instead of Aaa). In cases where there is a mix of MBS and loans, we typically base the score on the loans but we may consider the strength of the MBS outside of the scorecard. In cases where there are multiple MBS obligors or guarantors that do not have the same rating, we typically consider their weighted average rating as well as how widely the obligors' or guarantors' ratings diverge.

Source: Moody's Investors Service

Factor: Loan Portfolio (25%)

Why It Matters

A single-family housing bond program's portfolio of mortgage loans provides important indications of the bond program's ability to pay debt service on the bonds, because the loans are typically the primary assets backing the bonds. Loan delinquencies and loan losses greatly impact the bond program's ability to pay debt service.

For MBS programs, the obligor or guarantor assumes the risks associated with the loan portfolio, and its rating is thus the key indicator of credit quality. In the case of Ginnie Mae MBS, the guarantor is the US government, whereas Fannie Mae and Freddie Mac are US government-sponsored enterprises.

This factor comprises four sub-factors:

Portfolio Performance

Trends in foreclosure and delinquency rates are important indicators of the likely incidence of defaults over the life of the bonds.

Portfolio Characteristics

Portfolio characteristics, including the quality of insurance coverage for the loans and the diversity of loan vintages, indicate the level of insurance protection against loan losses as well as the likelihood of loan delinquencies and home foreclosures.

Mortgage Type

The breakdown of the types of mortgages in a portfolio, including the number of standard, level-payment fixed-rate loans relative to variable-rate or other non-level-payment loans, indicates the likelihood of timely payments and loan delinquencies.

State and Local Real Estate Conditions

State and local real estate conditions indicate the stability of property values in the market and the likelihood of the program incurring loan losses.

How We Assess It for the Scorecard

PORTFOLIO PERFORMANCE:

For single-family housing bond programs, scoring for portfolio performance is primarily based on the percentage of loans in the portfolio that are 90 or more days delinquent or that are in foreclosure.

We also incorporate into our assessment recent trends (e.g., over three to five years) in loan delinquencies and foreclosures. Declining delinquency and foreclosure rates or other favorable trends may have a positive impact on the sub-factor score. Increasing delinquency and foreclosure rates or other unfavorable trends typically have a negative impact on the sub-factor score.

For MBS bond programs, our assessment is based on the rating of the MBS obligor or guarantor.¹¹

¹¹ We use the rating of the entity that corresponds to its obligation to the bond program, e.g., the senior unsecured rating if the guarantee is a senior unsecured obligation of the entity.

PORTFOLIO CHARACTERISTICS:

We assess the strength of the bond program portfolio based on the quality and depth of mortgage insurance. We also consider loan-to-value (LTV) ratios and the diversity of loan vintages across origination years.

Our assessment of the quality of the mortgage insurance is based on the type of insurance, which can be insurance from US government programs, private sector mortgage insurance (PMI) or, in some cases, insurance from a state insurance fund. We also assess the depth of insurance coverage. Mortgage insurance generally covers a percentage of the outstanding principal balance of the loan, lost interest for a certain period, and allowable expenses incurred in obtaining the title to the property and in selling the property (e.g., legal fees, maintenance and sales costs).

The quality and depth of coverage varies with the different forms of mortgage insurance available. Federal insurance programs include insurance or guarantees from the Federal Housing Administration (FHA), the Department of Veterans Affairs (VA), and the US Department of Agriculture's Rural Development Program (RD). Mortgage insurers backed by the federal government have historically paid their claims fully and on time for the life of the bonds, and therefore, we have typically considered the insurance provided by these programs to be of the highest quality.¹² PMI typically provides coverage for a specific percentage of lost principal as well as specified levels of lost interest and expenses. HFAs generally have minimum requirements for the depth of PMI coverage for their bond programs, often expressed as an amount that brings the bond program's exposure down to a set percentage of defaulted principal. For PMI, the quality of the insurance is primarily based on the insurer's Insurance Financial Strength Rating.

In assessing loan-to-value ratios, we consider ratios below 80% to be low. It is at this percentage that lenders typically have not required mortgage insurance.

We also consider the diversity of loan vintages, i.e., the diversity of years the loans were originated. Portfolios that include loans with long-dated originations typically receive higher scores for this sub-factor, because there is generally a higher likelihood of a rise in home values since the loans were originated. Higher home equity values indicate a higher likelihood that proceeds from a sale of the property would be sufficient to pay the loan and a lower likelihood of loan delinquency.

For MBS bond programs, our assessment is based on the rating of the MBS obligor or guarantor.¹³

MORTGAGE TYPE:

In assessing mortgage type, we consider the different amortization periods for loans within the portfolio. The loans that secure HFA bond programs are primarily fixed-rate, level-payment loans that amortize fully over 30 years. However, some HFAs originate loans with weaker amortization terms, including fixed-rate, level-payment loans that amortize over 40 years; step-rate loans, which are loans with interest rates that step up in stated amounts and at predetermined intervals (typically over the first three to five years of the loan term); and fixed-rate interest-only loans, which are fixed-coupon loans that pay only interest for a fixed period (generally three to five years) and then amortize fully with level payments over their remaining terms.

¹² In all cases, the scoring is based on our assessment of the efficacy of the insurance in mitigating risks and the credit quality of the provider. Our assessment of a provider could change over time in accordance with that provider's track record or changes in its rating or the rating of its supporter.

¹³ We use the rating of the entity that corresponds to its obligation to the bond program, e.g., the senior unsecured rating if the guarantee is a senior unsecured obligation of the entity.

Single-family bond programs with portfolios with higher percentages of fixed-rate, 30-year loans typically receive higher scores for this sub-factor. Bond programs with portfolios with higher percentages of 40-year loans, step-rate loans and interest-only loans, which are considered weak loan types, typically receive lower scores for this sub-factor.

For MBS bond programs, our assessment is based on the rating of the MBS obligor or guarantor.¹⁴

STATE AND LOCAL REAL ESTATE CONDITIONS:

We assess the history of home price growth or decline in a state or region, typically placing greater weight on trends over the past three to five years, primarily based on data for house price appreciation or depreciation, including data from the Federal Housing Finance Agency. We also consider the projected time frame for stabilization in home prices, typically based on economic data for local housing markets across a state.

We may request further breakdowns of the geographic location of the loans within the state, or loan-by-loan data for the portfolio, to assess housing price changes and other real estate metrics on a more detailed level. We also consider employment growth and other economic indicators to assess the likelihood of home price stability in the future.

For MBS bond programs, our assessment is based on the rating of the MBS obligor or guarantor.¹⁵

¹⁴ We use the rating of the entity that corresponds to its obligation to the bond program, e.g., the senior unsecured rating if the guarantee is a senior unsecured obligation of the entity.

¹⁵ We use the rating of the entity that corresponds to its obligation to the bond program, e.g., the senior unsecured rating if the guarantee is a senior unsecured obligation of the entity.

FACTOR

Loan Portfolio (25%)

Sub-factor	Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B and Below
Portfolio Performance	10%	90+ days delinquent and in-foreclosure rates are very low (i.e., less than 2%). Trends have been favorable. Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}	90+ days delinquent and in-foreclosure rates are low (i.e., 2% - 5%). Trends have been favorable.	90+ days delinquent and in-foreclosure rates are moderate to high (i.e., 5% - 8%). Trends display modest weakness.	90+ days delinquent and in-foreclosure rates are high (i.e., 8% - 12%). Trends reveal increasing weaknesses in the portfolio.	90+ days delinquent and in-foreclosure rates are very high (i.e., 12%-20%).	90+ days delinquent and in-foreclosure rates are extreme (i.e., above 20%).
Portfolio Characteristics	5%	More than 75% of loans carry highest quality mortgage insurance or low Loan-to-Values (LTVs). Loan vintages are favorable and well distributed within portfolio. Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}	More than 65% of loans carry highest quality mortgage insurance or low LTVs. Loan vintages are favorable and well distributed within portfolio.	More than 50% of loans carry highest quality mortgage insurance or low LTVs. Loan vintages are distributed within portfolio.	Less than 50% of loans carry highest quality mortgage insurance or low LTVs. Loans are concentrated in weaker vintages.	High LTVs and low quality mortgage insurance. Loans are concentrated in weaker vintages.	High LTVs and a substantial portion of the portfolio does not have mortgage insurance. Loans are concentrated in weaker vintages.
Mortgage Type	5%	More than 90% of loan types are fixed-rate, level-payment. Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}	75%-90% of loan types are fixed-rate, level-payment.	60%-75% of loan types are fixed-rate, level-payment.	50%-60% of loan types are fixed-rate, level-payment.	40%-50% of loan types are fixed rate, level payment.	Less than 40% of loan types are fixed rate, level payment.
State and Local Real Estate Conditions	5%	Home prices have appreciated or have declined modestly from peak (i.e., less than 5%) and are projected to stabilize or appreciate within the next 12 months. Employment and other economic indicators support stability in local housing market. Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}	Home prices have declined from peak (i.e., 5% - 10%) and are projected to stabilize within the next 12 months. Employment and other economic indicators support stability in local housing market.	Home prices have declined significantly from peak (i.e., 10% - 15%) and are projected to stabilize within the next 18 months. Employment and other economic indicators show some weakness in the local housing market.	Home prices have declined substantially from peak (i.e., 15% - 20%) and are not projected to stabilize in the near term. Employment and other economic indicators lead to concern about local housing market.	Home prices have declined substantially from peak (i.e., 20% - 40%). Employment and other economic indicators are substantially inferior to national average.	Home prices have declined substantially from peak (i.e., above 40%). Employment and other economic indicators are far inferior to national average.

^{*2} If the obligor or guarantor of an MBS is rated below Aaa, the score associated with a PADR of at least 1.00 moves downward with the rating (e.g., if the obligor or guarantor were rated in the Aa range, the score would be Aa instead of Aaa). In cases where there is a mix of MBS and loans, we typically base the score on the loans but we may consider the strength of the MBS outside of the scorecard. In cases where there are multiple MBS obligors or guarantors that do not have the same rating, we typically consider their weighted average rating as well as how widely the obligors' or guarantors' ratings diverge.

Source: Moody's Investors Service

Factor: Bond Program Structure (15%)

Why It Matters

The debt structure of a single-family housing bond program, including the program's percentage of variable-rate debt as well as counterparty credit quality, is important because the program's structure may increase risk to bondholders regardless of the credit quality of the underlying loan portfolio.

This factor comprises two sub-factors:

Variable-Rate Debt

The percentage of variable-rate debt in the bond program is an important indicator of credit quality because mortgages are typically fixed-rate. Variable-rate debt introduces potential vulnerability to a mismatch between mortgage revenue and debt service payments (e.g., mortgage revenues remain stable while interest due on liabilities rises). While the bond program can enter into interest rate swaps to manage this risk, swaps can add complexity and other types of risks.

In addition, liquidity risk may arise when a variable-rate demand bond (VRDB) has a demand feature that allows borrowers to tender their bonds back to the bond program at various times. The bond program generally obtains external liquidity facilities from banks or other financial institutions to mitigate this risk; however, in the event of a failed remarketing of the bonds, these liquidity facilities may require higher interest rates and the repayment of principal on an accelerated basis.

The percentage of unhedged variable-rate bonds funding the program is an important metric because it indicates the extent to which the bond program is exposed to interest rate risk. Although variable-rate bonds are typically hedged via interest rate swaps, a swap does not fully insulate the program from interest rate risk because there is often a difference between the cost of the bonds and the variable-rate payments received from the counterparty. In addition, swaps are generally subject to early termination due to certain events, which may result in a termination payment, and they may be subject to collateral posting requirements.

Counterparties

Bond programs typically enter into agreements with various counterparties, including investment providers, liquidity providers and swap counterparties. Bond programs that issue variable-rate debt may also have agreements with liquidity providers and interest-rate swap counterparties.

The credit quality and diversity of these counterparties are critical considerations because exposure to one or more weak counterparties increases the risk to the bond program of investment losses or the termination of any liquidity or swap agreements, which could result in accelerated repayment and a structural mismatch between revenue and debt service. The bond program's financial resources are also relevant because they can mitigate these risks.

How We Assess It for the Scorecard

VARIABLE-RATE DEBT:

For this qualitative sub-factor, we primarily consider the percentage of variable-rate debt issued by the bond program. The numerator is the amount of variable-rate debt issued by the program, and the denominator is the total amount of debt issued by the program.

We also consider the percentage of unhedged variable-rate debt issued by the bond program or the percentage of debt primarily hedged with variable-rate investments in the bond program. The numerator is the amount of unhedged variable-rate debt issued by the bond program or the amount of debt issued by the bond program primarily hedged with variable-rate investments, and the denominator is the total amount of bonds issued by the bond program outstanding. This part of the assessment may result in a lower sub-factor score.

We also assess the extent to which bond program resources cover certain contingent liabilities, such as swap termination payments or collateral posting requirements. This part of the assessment can also lower the sub-factor score.

COUNTERPARTIES:

The credit quality of the majority of counterparties is based on their credit profiles, as indicated by their credit ratings. We also consider whether the bond program's liquidity and reserves can mitigate counterparty credit risk.

We also assess the level of concentration of counterparties, with a distribution among several separate counterparties corresponding to a stronger assessment.

FACTOR

Bond Program Structure (15%)

Sub-factor	Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B and Below
Variable Rate Debt	10%	Variable rate debt as a percent of program bonds outstanding is ≤10%. Unhedged variable rate debt is no more than 5% of bonds outstanding or primarily hedged with variable rate investments. Program resources are extremely ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 10% - 25%. Unhedged variable rate debt is no more than 10% of bonds outstanding or primarily hedged with variable rate investments. Program resources are very ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 25% - 45%. Unhedged variable rate debt is no more than 15% of bonds outstanding or substantially hedged with variable rate investments. Program resources are ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 45% - 70%. Unhedged variable rate debt is no more than 20% of bonds outstanding with a portion hedged with variable rate investments. Program resources are sufficient to cover contingent liabilities (e.g., swaps).	More than 70% of program debt is variable rate debt. More than 25% of bonds outstanding is unhedged. Program resources are not sufficient to cover contingent liabilities (e.g., swaps).	More than 70% of program debt is variable rate debt. More than 50% of bonds outstanding is unhedged. Program resources are not sufficient to cover contingent liabilities (e.g., swaps).
Counterparties	5%	Majority of counterparties rated at or above A1/P-1 (Aa3 if no short-term rating). Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is well distributed or not material to the credit.	Majority of counterparties rated at or above A2/P-1. Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is moderately distributed and is expected to have minimal impact.	Majority of counterparties rated at or above A3. Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is significant and may be material to the credit.	Majority of counterparties rated at or above Baa3. Program financial resources may be able to mitigate funds invested with lower rated providers under most circumstances. Substantial counterparty concentration.	Majority of counterparties are rated in the Ba category. Program financial resources are unable to mitigate funds invested at lower levels.	Majority of counterparties rated in the B category or below.

Source: Moody's Investors Service

Factor: Management and Governance (15%)**Why It Matters**

Management's understanding of the complexity of the single-family housing bond program, including the portfolio characteristics and debt structure, as well as its ability to handle the related risks, provide important indications of whether it will be able to maintain the financial position of the bond program. Oversight from a capable and experienced governing board is also critical for maintaining the bond program's risk-management policies and financial position.

A record of consistency, including whether management has demonstrated a willingness to act swiftly and address challenges, can provide insight into management's likely future performance in stressed situations and can be an indicator of management's tendency to depart significantly from its stated plans and guidelines.

How We Assess It for the Scorecard

In assessing this factor, we consider management's understanding of and ability to adapt to the bond programs' financial strengths and challenges, typically based on the depth of the management team's expertise and on its tenure. Management's knowledge of and compliance with federal and state regulations and the implications of non-compliance are also important. While we recognize that HFAs often use third parties to assist them in these tasks, we typically assess the level of management's involvement, its oversight of the third parties and its understanding of products provided to them from outside sources.

In addition, we consider the financial resources and personnel available to the HFA to support the financial position of the bond program. We typically assess management's ability and willingness to use resources to support its bond programs, based on its track record. For example, we may consider whether the HFA management has provided additional funds to a bond program facing difficulties, has provided grants to mortgagors, or has maintained sufficient staff levels to monitor programs even if revenue or activity from these programs has declined. We may also consider the HFA's loan underwriting process, asset management procedures and portfolio monitoring practices.

In assessing governance, we consider the board's makeup and level of involvement in the policies and activities of the HFA. Considerations may include the process of board selection and the frequency of meetings, the procedures for reporting and approving key decisions at the board level, the experience level of board members, the use of an internal audit function, and board-approved policies on investments, debt management and liquidity.

FACTOR

Management and Governance (15%)

Factor	Factor Weight	Aaa	Aa	A	Baa	Ba	B and Below
Management and Governance	15%	Superior management with substantial financial and personnel resources available to maintain and grow the financial position of the program.	Strong management with significant financial and personnel resources available to maintain the program.	Solid management with significant financial and personnel resources to maintain the program.	Adequate management with sufficient financial and personnel resources to maintain the program.	Limited management or oversight of the program by the issuer, program is generally governed by the trustee following the terms of the legal documents.	Poor management or oversight of the program.
		Very deep understanding of program's strengths, challenges and future direction.	Strong understanding of program's strengths, challenges and future direction.	Solid understanding of program's strengths, challenges and future direction.	Understands financial strengths and challenges, but may be dependent on financial advisors/professionals.	Limited understanding of the financial strengths and challenges and absence of financial advisors/professionals.	Very limited understanding of the financial strengths and challenges and absence of financial advisors/professionals.
		Ability and willingness to act swiftly and appropriately to address challenges.	Ability and willingness to act promptly and appropriately to address challenges.	Ability and willingness to act appropriately and in a timely manner to address challenges.	Ability and willingness to act appropriately to address challenges.	Limited ability or willingness to act appropriately to address challenges.	Very limited ability or willingness to act appropriately to address challenges.
		Superior governance with highly experienced and involved board members providing oversight.	Strong governance with very experienced and involved board members providing oversight.	Capable governance with experienced and involved board members providing oversight.	Capable governance with experienced involved board members providing oversight.	Minimal board involvement.	Essentially no board involvement.

Source: Moody's Investors Service

Legal Framework and Covenants

The structural framework of an HFA single-family housing bond program is important because transaction documents define, among other aspects, the assets and revenue available to pay debt service, how the servicer will administer the mortgages, how the funds will flow into the trustee account and how the trustee will use the available funds to pay the bonds and meet other obligations. Some aspects of the structural framework affect our view of whether bondholders have a sufficient claim on the underlying mortgages or MBS and whether the transaction can be rated under this methodology, and other aspects relate to whether we have sufficient information to rate the transaction. Structural weaknesses can add risks that may not be addressed by the other rating factors in this methodology, and these weaknesses may introduce risk scenarios that are difficult to predict. For example, insufficient clarity in the priority of payments may introduce uncertainties that could have a significant impact on default risk.

Type of Pledge

A clearly defined security pledge for the bonds is important because it establishes the assets and revenues pledged for repayment of the bonds, the terms of the pledge, and whether the bonds are special limited obligations or general obligations of the HFA.

For a bond to be rated under this methodology, the mortgages or MBS must be pledged to the bonds. We generally consider whether the transaction documents provide sufficient clarity that the mortgage loans or the MBS financed under the bond program are subject to the lien of the indenture.

Flow of Funds

Provisions related to the flow of funds are important because they prioritize where bond principal and interest fall in relation to other uses of pledged revenue.

In forming a forward view of financial position, we also typically consider whether the HFA has the ability to remove excess funds above and beyond pre-determined expenses from a program. A closed-loop flow of funds retains excess revenue or uses excess revenue to redeem bonds, which tends to increase bond program fund balances over time. An open-loop flow of funds allows revenue to be transferred out of the bond program, often, but not always, after an asset or cash flow sufficiency test (as defined in the indenture) has been met. The ability to remove funds is usually assessed in the context of management's stated goals and plans for the bond program as well as their demonstrated actions in this regard. Depending on the result of this analysis, an open flow of funds may lead to a lower rating on the transaction.

For a bond to be rated under this methodology, the transaction structure must include the following provisions, or provisions that provide similar protections:

- » The priority of payment of bond interest and principal in the cash flow waterfall and upon default is clearly defined in the transaction documents.
- » The investment criteria under which all cash revenue received is invested in permitted or specific investments provides that it be invested promptly or within a defined period following receipt of applicable funds.

Redemption Provisions

Redemption provisions are important because a deviation from the projected mortgage loan repayment or debt service schedule may result in current or future cash flow insufficiency, for example due to a negative spread between interest earned on assets and interest paid on liabilities.

Unless the HFA's management of the bond program is sufficiently active to mitigate weakness in the transaction structure related to redemption, for a bond to be rated under this methodology, the transaction structure must include the following provisions:

- » The requirements and circumstances for redeeming bonds from mortgage prepayments are defined.
- » Bond redemptions are subject only to providing prior notice to bondholders with a defined maximum notice period.

Reserve Funds

Where present, reserve funds provide additional protection for bondholders if cash flow is delayed or disrupted, for example while mortgage insurance claims are being processed.

Where relevant, we assess the sufficiency of reserves relative to the likely needs for using the reserves, based on our assessment of potential timing delays or other cash flow shortfalls arising from the transaction structure.

Reserve funds provide protection to bondholders if cash flow is temporarily disrupted. They are held for the benefit of bondholders in the event of a short-term disruption in the receipt of mortgage loan payments. Reserve fund requirements often range from 2% of program loans outstanding to maximum annual debt service for programs with whole loans. The sufficiency of the reserve requirements is typically assessed based on the characteristics and the strength of the bond program and could cause the actual rating to be lower than indicated by the outcome of the other scorecard factors.

Permitted Investments

The types of investments an HFA is permitted to hold in bond program funds directly affect the risk of loss to the bond program due to potential investment losses.

We typically consider the quality and liquidity of a bond program's investments in assessing the risk of loss to bond program liquidity. HFA single-family housing bond program investments have commonly been US Treasury and agency securities or a diversified portfolio of guaranteed investment contracts (GICs).

We review the investment parameters, including the types, credit quality and tenor of permitted investments, and we typically consider whether the transaction documents clearly define permitted investments, including credit rating levels for the securities other than securities issued by or closely related to the US government. The absence of clear guidelines may lead to material risks, the effect of which we cannot predict, and the transaction may not qualify to be rated under the approach described in this methodology. Where permitted investments are well-defined but include riskier categories, we consider the implications of these investments on the probability of default and loss given default of the HFA single-family housing bond program, and this additional risk is reflected in the rating, which may be lower than indicated by the other scorecard factors.

Commonly Permitted Short-Term Securities

US Government Obligations – Obligations or securities whose timely payment of principal and interest are guaranteed by the US government.

Direct US Treasury Obligations – Securities issued by the US Treasury Department and guaranteed by the US government, such as Treasury bills.

US Federal Agency Securities – Debt instruments issued by federal departments and federally related agencies that are fully backed by the full faith and credit of the US government. This group of issuers includes:

- » Ginnie Mae
- » FHA
- » US Maritime Administration, which operates within the US Transportation Department
- » Small Business Administration
- » General Services Administration

Government-sponsored Enterprises (GSEs) – While the debt of GSEs is not backed by the full faith and credit of the US government, each agency has a loan entitlement or line of credit with the US Treasury. This group includes:

- » Fannie Mae and Freddie Mac
- » Federal Home Loan Bank (FHLB)
- » Resolution Funding Corporation (REFCORP)
- » Federal Farm Bank Credits
- » Tennessee Valley Authority

Money Market Funds – Money market funds with the highest eligible rating.

US Treasury STRIPS (Separate Trading of Registered Interest and Principal of Securities) – STRIPS are non-callable, non-prepayable zero-coupon instruments derived from selected Treasury bonds and notes with maturities of 10 years or more. STRIPS are created on request. The underlying bonds and notes are separated on the books of the US Federal Reserve by the US Treasury into their component parts of principal and interest payments.

Bank Deposits – Funds are deposited with banks (not holding companies or other related entities) with a short-term rating of P-1 or a long-term deposit or debt rating that corresponds to a P-1 short-term rating.¹⁶

¹⁶ FDIC insurance alone does not guarantee timeliness of payment, and therefore we consider the short-term bank rating.

Other Rating Considerations

Ratings may include additional factors that are not in the scorecard, usually because the factor's credit importance varies widely among the issuers in the sector or because the factor may be important only under certain circumstances or for a subset of issuers. Such factors include financial controls and the quality of financial reporting; assessments of environmental and social considerations; and possible government interference from other levels of government. Regulatory, litigation, liquidity and technology risk as well as changes in demographic and macroeconomic trends also affect ratings.

Following are some examples of additional considerations that may be reflected in our ratings.

Demonstrated Financial Support from a Strong HFA

In the Management and Governance scorecard factor, we consider an HFA's ability and willingness to provide financial support to a single-family housing bond program. When an HFA has a demonstrated history of financial support as well as strong management and financial resources, the importance of this strength may be greater than the standard scorecard weight, and the actual rating may be higher than the scorecard-indicated outcome.

Very High or Low PADR Levels

The relatively narrow scorecard thresholds for the PADR in the Balance Sheet Strength sub-factor reflect our experience of typical structures. In assessing a bond program's loan portfolio, we may consider whether it has very high or very low PADR levels. When a bond program's portfolio demonstrates a PADR level that is very high relative to the typical program, the importance of this credit strength may be higher than the standard weight, and the actual rating may be higher than the scorecard-indicated outcome. Conversely, when a single-family bond program's portfolio demonstrates a PADR level that is very low relative to the typical program, the actual rating may be lower than the scorecard-indicated outcome.

Very Seasoned Loan Portfolio

While loan vintage is considered under the Loan Portfolio factor, we may consider whether the portfolio has an unusually significant portion of seasoned loans (i.e., loans that have a strong record of regular monthly repayments). When a loan portfolio is very seasoned, the actual rating may be higher than the scorecard-indicated outcome.

Small Loan Pool

Loan portfolio diversity is an important strength for most single-family bond programs. A small portfolio of mortgage loans may introduce additional risks to a bond program, including concentration risk. Where a loan portfolio is very small relative to the typical bond program, the actual rating may be lower than the scorecard-indicated outcome.

Introduction of Substantially Weaker Loan Types into a Program

The introduction of loan types into a bond program that are significantly weaker than the existing portfolio may signal that portfolio quality will decline. Where an HFA introduces substantially weaker loan types into its single-family housing bond program, the actual rating may be lower than the scorecard-indicated outcome.

Regulatory and Policy Considerations

HFAs and their counterparties are subject to varying degrees of regulatory oversight. Effects of these regulations may entail limitations on operations and higher costs. Regional differences in regulation, implementation or enforcement may advantage or disadvantage particular issuers. Our view of future regulations plays an important role in our expectations of future financial metrics as well as our confidence level in the ability of an issuer to generate sufficient cash flows relative to its debt burden over the medium and longer term. In some circumstances, regulatory considerations may be a rating factor outside the scorecard, for instance when regulatory change is swift. Changing political considerations may also affect ratings. For instance, if federal policy changes affect funding of housing programs, ratings in this sector could be affected.

Environmental, Social and Governance (ESG) Issues

Environmental, social and governance considerations may affect the ratings of transactions in this sector, including underlying asset values. While governance is considered in the Management and Governance factor, a material weakness in governance can be more important than the standard scorecard weight, and the actual rating may be lower than the scorecard-indicated outcome. For information about our approach to assessing ESG issues, please see our methodology that describes our general principles for assessing these risks.¹⁷

Financial Controls

We rely on the accuracy of audited financial statements to assign and monitor ratings in this sector. The quality of financial statements may be influenced by internal controls, including the proper tone at the top, centralized operations, and consistency in accounting policies and procedures. Auditors' reports on the effectiveness of internal controls, auditors' comments in financial reports and unusual restatements of financial statements or delays in regulatory filings may indicate weaknesses in internal controls.

Liquidity

Liquidity is an important rating consideration for all transactions in this sector, although it may not have a substantial impact in discriminating between two issues with a similar credit profile. In the Legal Framework and Covenants section, we discuss some structural features, including reserves, that can affect liquidity. More generally, liquidity issues can arise when there are meaningful mismatches in the timing of cash receipts and cash outlays. We form an opinion on likely near-term liquidity requirements and the propensity of the transaction to introduce liquidity shortfalls from the perspective of both sources and uses of cash. Ratings can be heavily affected by extremely weak liquidity. For additional insight into general principles for assessing liquidity, please see the liquidity cross-sector rating methodology.¹⁸

Event Risk

We also recognize the possibility that an unexpected event could cause a sudden and sharp decline in the fundamental creditworthiness of a transaction, which may cause actual ratings to be lower than the scorecard-indicated outcome. Event risks — which are varied and can include natural disasters, legal judgments, pandemics, cyber-crime events and abrupt changes in state or federal policy — can overwhelm even a stable HFA single-family bond program. In assessing event risk for this sector, we typically consider the nature of the disruption and the amount of lost revenue.

¹⁷ A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

¹⁸ A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

Assigning Instrument-Level Ratings

After considering the scorecard-indicated outcome, other rating considerations and relevant cross-sector methodologies, we assign one or more instrument-level ratings.

Occasionally, a single-family bond program may issue a debt series with a lower lien on bond program assets. Senior debt has a first lien on bond program assets and subordinate debt has a junior lien; sometimes, a bond program will issue an additional series of debt with a third lien or lower. We may assign lower ratings to subordinate debt than to senior debt if our analysis shows material increased risk of default and loss to the subordinate debt.

Assumptions

Key rating assumptions that apply in this sector include our view that sovereign credit risk is strongly correlated with that of other domestic issuers, that legal priority of claim affects average recovery on different classes of debt sufficiently to generally warrant differences in ratings for different debt classes of the same issuer, and the assumption that access to liquidity is a strong driver of credit risk.

Our forward-looking opinions are based on assumptions that may prove, in hindsight, to have been incorrect. Reasons for this could include unanticipated changes in any of the following: the macroeconomic environment, general financial market conditions, competition, disruptive technology, or regulatory and legal actions.

Limitations

In the preceding sections, we have discussed the scorecard factors, many of the other rating considerations that may be important in assigning ratings, and certain key assumptions. In this section, we discuss limitations that pertain to the scorecard and to the overall rating methodology.

Limitations of the Scorecard

There are various reasons why scorecard-indicated outcomes may not map closely to actual ratings.

The scorecard in this rating methodology is a relatively simple tool focused on indicators for relative credit strength. Credit loss and recovery considerations, which are typically more important as an issuer gets closer to default, may not be fully captured in the scorecard. The scorecard is also limited by its upper and lower bounds, causing scorecard-indicated outcomes to be less likely to align with ratings for issuers at the upper and lower ends of the rating scale.

The weights for each sub-factor and factor in the scorecard represent an approximation of their importance for rating decisions across the sector, but the actual importance of a particular factor may vary substantially based on an individual issuer's circumstances.

Factors that are outside the scorecard, including those discussed above in the Other Rating Considerations section, may be important for ratings, and their relative importance may also vary from program to program. In addition, certain broad methodological considerations described in one or more cross-sector rating methodologies may be relevant to ratings in this sector.¹⁹ Examples of such

¹⁹ A link to an index of our sector and cross-sector methodologies can be found in the "Moody's Related Publications" section.

considerations include the following: how sovereign credit quality affects non-sovereign issuers, the assessment of credit support from other entities, and the assignment of short-term ratings.

We may use the scorecard over various historical or forward-looking time periods. Furthermore, in our ratings we often incorporate directional views of risks and mitigants in a qualitative way.

General Limitations of the Methodology

This methodology document does not include an exhaustive description of all factors that we may consider in assigning ratings in this sector. Transactions in the sector may face new risks or new combinations of risks, and new strategies or structural features may be developed to mitigate risk. We seek to incorporate all material credit considerations in ratings and to take the most forward-looking perspective that visibility into these risks and mitigants permits.

Ratings reflect our expectations for the future performance of an issuer or transaction; however, as the forward horizon lengthens, uncertainty increases and the utility of precise estimates, as factor inputs or in other rating considerations, typically diminishes. In any case, predicting the future is subject to substantial uncertainty.

Appendix A: Using the Scorecard to Arrive at a Scorecard-Indicated Outcome

1. Measurement or Estimation of Factors in the Scorecard

In the "Discussion of the Scorecard Factors" section, we explain our analytical approach for scoring each scorecard sub-factor or factor,²⁰ and we describe why they are meaningful as credit indicators.

The information used in assessing the sub-factors is generally found in or calculated from information in the issuer's financial statements or regulatory filings, derived from other observations or estimated by Moody's analysts. We may also incorporate non-public information.

Our ratings are forward-looking and reflect our expectations for future financial and operating performance. However, historical results are helpful in understanding patterns and trends of a bond program's performance as well as for peer comparisons. Historical financial ratios, unless otherwise indicated, are typically calculated based on the most recent annual statement for the bond program. However, the factors in the scorecard can be assessed using various time periods. For example, rating committees may find it analytically useful to examine both historical and expected future performance for periods of several years or more. In addition, qualitative sub-factors informed by financial ratios typically consider a track record over the medium to long term as well as our expectations for future performance.

The quantitative credit metrics used in this methodology may incorporate analytical adjustments that are specific to a particular issuer.

2. Mapping Scorecard Factors to a Numeric Score

After estimating or calculating each sub-factor, the outcomes for each of the sub-factors are mapped to a broad Moody's rating category (Aaa, Aa, A, Baa, Ba, and B and below, also called alpha categories) and to a numeric score.

All sub-factors are qualitative, although some are informed by quantitative metrics. Sub-factor thresholds are described in broad alpha categories in the scorecard, but within that broad description for the Aa, A and Baa categories, they may be scored as strong (receiving the higher alphanumeric score in the alpha category), medium (receiving the middle alphanumeric score in the alpha category) or weak (receiving the lower alphanumeric score in the alpha category). For the Aaa, Ba, and B and below alpha categories, there is one numeric value for each alpha score. The numeric value of each alphanumeric or alpha score is shown in the table below.

Aaa	Aa1	Aa2	Aa3	A1	A2	A3	Baa1	Baa2	Baa3	Ba	B and Below
1	1.65	2	2.3	2.65	3	3.3	3.65	4	4.3	4.95	5.75

Source: Moody's Investors Service

The sub-factor score is typically assigned to the alpha category for which the issuer has the greatest number of characteristics. In most cases, to the extent that the characteristics falling outside the preponderant category are in lower alpha categories, the more likely the score will be weak within the alpha category. Conversely, to the extent that the characteristics falling outside the preponderant category are in higher alpha categories, the more likely the score will be strong within the alpha

²⁰ When a factor comprises sub-factors, we score at the sub-factor level. Some factors do not have sub-factors, in which case we score at the factor level.

category. However, there may be cases in which one characteristic is sufficiently important to a particular issuer that it is determinative of the factor score (including the positioning within the alpha category).

3. Determining the Overall Scorecard-Indicated Outcome

The numeric score for each sub-factor (or each factor, when the factor has no sub-factors) is multiplied by the weight for that sub-factor (or factor), with the results then summed to produce an aggregate numeric score. The aggregate numeric score is then mapped back to a scorecard-indicated outcome based on the ranges in the table below.

EXHIBIT 2

Scorecard-indicated Outcome

Scorecard-indicated Outcome	Aggregate Numeric Score
Aaa	$1 \leq x < 1.5$
Aa1	$1.5 \leq x < 1.9$
Aa2	$1.9 \leq x < 2.2$
Aa3	$2.2 \leq x < 2.5$
A1	$2.5 \leq x < 2.9$
A2	$2.9 \leq x < 3.2$
A3	$3.2 \leq x < 3.5$
Baa1	$3.5 \leq x < 3.9$
Baa2	$3.9 \leq x < 4.2$
Baa3	$4.2 \leq x < 4.5$
Ba	$4.5 \leq x < 5.5$
B and Below	≥ 5.5

Source: Moody's Investors Service

For example, an issuer with an overall numeric score of 3.6 would have a Baa1 scorecard-indicated outcome.

Appendix B: US Housing Finance Agency Single-Family Housing Scorecard

	Factor or Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B or Below
Factor: Financial Position (45%)							
Balance Sheet Strength	20%	<p>Program Asset to Debt Ratio (PADR) above or equal to 1.10 with projected stress case loan losses netted from numerator, or at least 1.00 for Mortgage-Backed Security (MBS) programs (where the obligor or guarantor is Aaa).^{*1}</p> <p>Cash flows demonstrate that benchmark PADR, incorporating stress case loan losses, is maintained through the life of the bonds.</p>	<p>PADR of 1.10 - 1.00 with projected stress case loan losses netted from numerator.</p> <p>Cash flows demonstrate that benchmark PADR, incorporating stress case loan losses, is maintained through the life of the bonds.</p>	<p>PADR at least 1.00 not incorporating projected stress case loan losses.</p> <p>Cash flows demonstrate that benchmark PADR, not incorporating stress case loan losses, is maintained through the life of the bonds.</p>	<p>PADR at least 1.00 not incorporating projected stress case loan losses.</p> <p>Cash flows demonstrate that benchmark PADR, not incorporating stress case loan losses, is maintained in the near term.</p>	<p>PADR of 0.98 - 1.00 not incorporating projected stress case loan losses, or MBS program with PADR of 0.98 - 1.00.</p> <p>Cash flows do not maintain benchmark PADR, not incorporating stress case loan losses, in some near-term periods.</p>	<p>PADR below 0.98 not incorporating projected stress case loan losses, or MBS program with PADR below 0.98.</p>
Cash Flow Projections	15%	<p>Meets cash flow stress tests under all scenarios.</p> <p>Robust ability to absorb future financial stress.</p>	<p>Meets cash flow stress tests under all scenarios.</p> <p>Solid ability to absorb future financial stress.</p>	<p>Meets cash flow stress tests under all scenarios except for the most stressful scenarios.</p> <p>Moderate ability to absorb future financial stress. Any projected shortfalls are small and occur in the later years of the program (i.e., more than 10 years).</p>	<p>Meets most cash flow stress tests.</p> <p>Limited ability to absorb future financial stress. The extent of the shortfall, speed of the recovery and under which stress scenario it occurs will be considered.</p>	<p>Cash flows demonstrate that the program is able to cover debt service only under cash flow runs with limited stress tests.</p> <p>Very limited ability to absorb future financial stress.</p>	<p>Cash flow scenarios demonstrate that revenues do not cover debt service.</p> <p>No ability to absorb financial stress.</p>

	Factor or Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B or Below
Financial Performance	10%	<p>Program demonstrates high and rising net asset ratios (e.g., above 15% combined fund balance as % of bonds outstanding on average over 3 years).</p> <p>Consistently high profitability (e.g., 15% on average).</p> <p>Strong levels of resources for maintaining the creditworthiness of the program under stressful circumstances.</p>	<p>Program contains stable net asset ratios (e.g., 8% - 15% combined fund balance as % of bonds outstanding on average over 3 years).</p> <p>Consistent profitability over the long term (e.g., 10% - 15% on average).</p> <p>Ample resources for maintaining the creditworthiness of the program under stressful circumstances.</p>	<p>Program contains stable net asset ratios (e.g., 3% - 8% combined fund balance as % of bonds outstanding on average over 3 years).</p> <p>Consistent profitability over the long term (e.g., 3% - 10% on average).</p> <p>Satisfactory levels of resources for maintaining the creditworthiness under standard circumstances.</p>	<p>Program may exhibit declining net asset ratios but ratio remains above 1% combined fund balance as % of bonds outstanding on average over 3 years.</p> <p>Profitability may average 1% - 3% or show periods of loss, but losses are offset by net assets and not expected to continue.</p> <p>Sufficient resources for maintaining the creditworthiness under standard circumstances.</p>	<p>Program has exhibited limited declines in net asset ratios, but net assets exceed liabilities over 3 years.</p> <p>Consistent losses but net assets are expected to cover such losses over the medium term.</p> <p>Limited resources for maintaining the creditworthiness under standard circumstances.</p>	<p>Program has exhibited declines in net asset ratios, and liabilities exceed net assets over 3 years.</p> <p>Consistent losses and net assets are not expected to cover losses.</p> <p>Insufficient resources for maintaining the creditworthiness under standard circumstances.</p>
Factor: Loan Portfolio (25%)							
Portfolio Performance	10%	<p>90+ days delinquent and in-foreclosure rates are very low (i.e., less than 2%).</p> <p>Trends have been favorable.</p> <p>Federal MBS programs (where the obligor or guarantor is Aaa).²</p>	<p>90+ days delinquent and in-foreclosure rates are low (i.e., 2% - 5%).</p> <p>Trends have been favorable.</p>	<p>90+ days delinquent and in-foreclosure rates are moderate to high (i.e., 5% - 8%).</p> <p>Trends display modest weakness.</p>	<p>90+ days delinquent and in-foreclosure rates are high (i.e., 8% - 12%).</p> <p>Trends reveal increasing weaknesses in the portfolio.</p>	<p>90+ days delinquent and in-foreclosure rates are very high (i.e., 12%-20%).</p>	<p>90+ days delinquent and in-foreclosure rates are extreme (i.e., above 20%).</p>
Portfolio Characteristics	5%	<p>More than 75% of loans carry highest quality mortgage insurance or low Loan-to-Values (LTVs).</p>	<p>More than 65% of loans carry highest quality mortgage insurance or low LTVs.</p>	<p>More than 50% of loans carry highest quality mortgage insurance or low LTVs.</p>	<p>Less than 50% of loans carry highest quality mortgage insurance or low LTVs.</p>	<p>High LTVs and low quality mortgage insurance.</p>	<p>High LTVs and a substantial portion of the portfolio does not have mortgage insurance.</p>

Factor or Sub-factor Weight		Aaa	Aa	A	Baa	Ba	B or Below
		Loan vintages are favorable and well distributed within portfolio.	Loan vintages are favorable and well distributed within portfolio.	Loan vintages are distributed within portfolio.	Loans are concentrated in weaker vintages.	Loans are concentrated in weaker vintages.	Loans are concentrated in weaker vintages.
		Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}					
Mortgage Type	5%	More than 90% of loan types are fixed-rate, level-payment.	75%-90% of loan types are fixed-rate, level-payment.	60%-75% of loan types are fixed-rate, level-payment.	50%-60% of loan types are fixed-rate, level-payment.	40%-50% of loan types are fixed rate, level payment.	Less than 40% of loan types are fixed rate, level payment.
		Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}					
State and Local Real Estate Conditions	5%	Home prices have appreciated or have declined modestly from peak (i.e., less than 5%) and are projected to stabilize or appreciate within the next 12 months.	Home prices have declined from peak (i.e., 5% - 10%) and are projected to stabilize within the next 12 months.	Home prices have declined significantly from peak (i.e., 10% - 15%) and are projected to stabilize within the next 18 months.	Home prices have declined substantially from peak (i.e., 15% - 20%) and are not projected to stabilize in the near term.	Home prices have declined substantially from peak (i.e., 20% - 40%).	Home prices have declined substantially from peak (i.e., above 40%).
		Employment and other economic indicators support stability in local housing market.	Employment and other economic indicators support stability in local housing market.	Employment and other economic indicators show some weakness in the local housing market.	Employment and other economic indicators lead to concern about local housing market.	Employment and other economic indicators are substantially inferior to national average.	Employment and other economic indicators are far inferior to national average.
		Federal MBS programs (where the obligor or guarantor is Aaa). ^{*2}					

	Factor or Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B or Below
Factor: Bond Program Structure (15%)							
Variable Rate Debt	10%	Variable rate debt as a percent of program bonds outstanding is ≤10%. Unhedged variable rate debt is no more than 5% of bonds outstanding or primarily hedged with variable rate investments. Program resources are extremely ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 10% - 25%. Unhedged variable rate debt is no more than 10% of bonds outstanding or primarily hedged with variable rate investments. Program resources are very ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 25% - 45%. Unhedged variable rate debt is no more than 15% of bonds outstanding or substantially hedged with variable rate investments. Program resources are ample to cover contingent liabilities (e.g., swaps).	Variable rate debt as a percent of program bonds outstanding is 45% - 70%. Unhedged variable rate debt is no more than 20% of bonds outstanding with a portion hedged with variable rate investments. Program resources are sufficient to cover contingent liabilities (e.g., swaps).	More than 70% of program debt is variable rate debt. More than 25% of bonds outstanding is unhedged. Program resources are not sufficient to cover contingent liabilities (e.g., swaps).	More than 70% of program debt is variable rate debt. More than 50% of bonds outstanding is unhedged. Program resources are not sufficient to cover contingent liabilities (e.g., swaps).
Counterparties	5%	Majority of counterparties rated at or above A1/P-1 (Aa3 if no short-term rating). Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is well distributed or not material to the credit.	Majority of counterparties rated at or above A2/P-1. Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is moderately distributed and is expected to have minimal impact.	Majority of counterparties rated at or above A3. Program financial resources can mitigate funds invested with providers at lower rating levels. Counterparty exposure is significant and may be material to the credit.	Majority of counterparties rated at or above Baa3. Program financial resources may be able to mitigate funds invested with lower rated providers under most circumstances. Substantial counterparty concentration.	Majority of counterparties are rated in the Ba category. Program financial resources are unable to mitigate funds invested at lower levels.	Majority of counterparties rated in the B category or below.

	Factor or Sub-factor Weight	Aaa	Aa	A	Baa	Ba	B or Below
Factor: Management and Governance (15%)							
Management and Governance	15%	Superior management with substantial financial and personnel resources available to maintain and grow the financial position of the program. Very deep understanding of program's strengths, challenges and future direction.	Strong management with significant financial and personnel resources available to maintain the program. Strong understanding of program's strengths, challenges and future direction.	Solid management with significant financial and personnel resources to maintain the program. Solid understanding of program's strengths, challenges and future direction.	Adequate management with sufficient financial and personnel resources to maintain the program. Understands financial strengths and challenges, but may be dependent on financial advisors/professionals.	Limited management or oversight of the program by the issuer, program is generally governed by the trustee following the terms of the legal documents. Limited understanding of the financial strengths and challenges and absence of financial advisors/professionals.	Poor management or oversight of the program. Very limited understanding of the financial strengths and challenges and absence of financial advisors/professionals.
		Ability and willingness to act swiftly and appropriately to address challenges.	Ability and willingness to act promptly and appropriately to address challenges.	Ability and willingness to act appropriately and in a timely manner to address challenges.	Ability and willingness to act appropriately to address challenges.	Limited ability or willingness to act appropriately to address challenges.	Very limited ability or willingness to act appropriately to address challenges.
		Superior governance with highly experienced and involved board members providing oversight.	Strong governance with very experienced and involved board members providing oversight.	Capable governance with experienced and involved board members providing oversight.	Capable governance with experienced involved board members providing oversight.	Minimal board involvement.	Essentially no board involvement.

*1 If the obligor or guarantor of an MBS is rated below Aaa, the score associated with a PADR of at least 1.00 moves downward with the rating (e.g., if the obligor or guarantor were rated in the Aa range, the score would be Aa instead of Aaa). In cases where there is a mix of MBS and loans, we typically base the score on the loans but we may consider the strength of the MBS outside of the scorecard. In cases where there are multiple MBS obligors or guarantors that do not have the same rating, we typically consider their weighted average rating as well as how widely the obligors' or guarantors' ratings diverge.

*2 If the obligor or guarantor of an MBS is rated below Aaa, the score associated with a PADR of at least 1.00 moves downward with the rating (e.g., if the obligor or guarantor were rated in the Aa range, the score would be Aa instead of Aaa). In cases where there is a mix of MBS and loans, we typically base the score on the loans but we may consider the strength of the MBS outside of the scorecard. In cases where there are multiple MBS obligors or guarantors that do not have the same rating, we typically consider their weighted average rating as well as how widely the obligors' or guarantors' ratings diverge.

Source: Moody's Investors Service

Appendix C: Analytical Adjustments to HFA and Their Bond Programs' Financial Statements

This appendix describes our analytical adjustments to the financial statements of HFAs and their bond programs. We adjust reported financial statements to better reflect the underlying financial positions of HFAs and to improve the comparability of financial data.

Our adjustments do not imply that an HFA's financial statements fail to comply with applicable accounting rules. Our goal is to enhance the analytical value of financial data for credit analysis.

In general, we adjust intangible items on the statement of net assets and on the statement of revenues, expenses and changes in net assets. Intangible items may include deferred issuance costs, amortization of the bond discount, custodial funds, certain assets relating to state-sponsored mortgage insurers, and public housing operations. The following sections describe our typical adjustments.²¹

Adjustments to the Statement of Net Assets

We may make adjustments to a specific HFA's statement of net assets to reflect situations that are specific to a particular HFA.

Bonds Payable

For the amount of bonds payable, we use the par amount of bonds outstanding, eliminating the effect of unamortized discounts or premiums.

Custodial Funds

Many state HFAs have custodial funds, which are funds the HFA administers on behalf of others, including funds held on behalf of project owners to pay property taxes and property and casualty insurance premiums. The HFA holds these custodial funds until they are due to the taxing authority or the insurer. We adjust the HFA's balance sheet by subtracting the amount of custodial funds from the HFA's assets and the corresponding accrued liabilities from the HFA's liabilities.

Depreciation

For HFAs that include depreciation on their statement of net assets and on their statement of revenues, expenses and changes in net assets, we add back accumulated depreciation to calculate total assets and the surplus.

Investments

We adjust an HFA's investments by subtracting unamortized discounts or premiums. In our calculations, we reverse the effect of gains or losses related to Governmental Accounting Standards Board (GASB) Statement 31, which establishes fair value standards for investment reporting for public sector entities. Most investments held by an HFA for its bond programs are typically held until maturity. The annual or cumulative gain or loss in market or fair value, therefore, is not generally realized.

²¹ In this appendix, references to an HFA signify both the HFA and its bond programs. We may not make adjustments when items are immaterial.

In our calculations, we may adjust investments (or other items) based on non-public information or our own estimates, for example if the HFA's financial statements or other disclosures do not include information related to the par value of investments.

Loans Receivable

We adjust loans receivable to eliminate the effect of premiums and discounts by using the par amount of the loans. When an HFA purchases mortgage loans at a discount, the amount reported in the statement of net assets is lower than the actual amount of loan principal outstanding, because GASB rules generally require certain assets to be carried at the lower of cost or current value. We use the par amount of loans receivable, which often results in a higher amount of assets than reported by the HFA and which facilitates greater comparability across bond programs.

We also adjust loans receivable to eliminate the effects of any material loan loss set-aside. While some HFAs set aside certain monies they believe are uncollectible, we add back loan loss reserves and, as described in Appendix D, use our loan loss calculator to project the losses to the program. These projections incorporate our default and recovery assumptions. By using the par amount of loans rather than the net amount after the loan loss reserve, which reflects the HFA's loss assumptions, we avoid double counting of loan loss assumptions.

Segregation of Certain Funds

In cases where an HFA houses a state-sponsored mortgage insurance program, we exclude the insurance assets and liabilities from the statement of net assets. These assets typically can be used only for insurance claims and are not available to purchase mortgage loans or pay debt service.

We exclude HFA funds and other assets associated with public housing authority (PHA) functions or other governmental activities. If a state HFA is also a PHA, we exclude PHA funds and other assets from the statement of net assets, because federal government subsidies represent the primary source of PHA revenue and are intended for specific public housing purposes rather than for HFA bond-related activities. We also exclude funds and other assets associated with certain state-sponsored activities that the HFA manages on behalf of its parent government, such as grants and pass-through programs, or related funds for which the HFA serves as a custodian.

Derivative Instruments

We exclude from the statement of net assets fair value adjustments for derivative instruments, such as swaps and interest rate caps, classified as effective derivative hedging instruments, pursuant to GASB Statement No. 53.

Adjustments to the Statement of Revenues, Expenses and Changes in Net Assets

We may make adjustments to a specific HFA's statement of revenues, expenses and changes in net assets to reflect situations that are specific to a particular HFA.

General Adjustments

We subtract the effect of annual changes to the following items:

- » Depreciation.
- » Gains or losses on the reported value of the investments.
- » Loan losses.

- » Changes in the fair value of derivative instruments.

Operating versus Non-Operating Revenue and Expenses

In some cases, a statement of revenues, expenses and changes in net assets includes certain entries that are not regularly part of the HFA's annual revenue or expenses.

Generally, we consider the following items to be operating revenue:

- » Mortgage loan interest.
- » Investment interest.
- » Loan and program fees.
- » Trade premiums on to-be-announced (TBA) mortgage-backed securities.

Generally, we consider the following items to be operating expenses:

- » Interest expense.
- » Administrative expenses.
- » Pool policy fees.
- » Cost of terminating TBA hedges.

Essentially all other revenue and expenses are typically classified as non-recurring or non-operating entries and are not considered part of ongoing operations. We include these items in total revenue or total expenses, but as non-operating revenue or a non-operating expense. An example of non-operating revenue is a realized gain on an investment.

Appendix D: Loan Loss Analysis

In this appendix, we discuss the stress case loan loss projections used in our ratio analysis. In assessing the balance sheet strength of a single-family housing bond program, we consider the bond program's ability to withstand loan losses under a stress scenario to meet debt service obligations and maintain levels of PADR as described in the Financial Position factor.

Our loan loss projections incorporate stress case assumptions about the probability of default and the loss given default of the loans in a loan portfolio. The projected loan loss is the product of the default probability and the loss given default.

Loan Loss Calculation Inputs

For most bond programs, we conduct our loan loss analysis on a portfolio-wide basis; however, for higher-risk bond programs, we may conduct the analysis on a loan-by-loan basis.

Portfolio-Wide Analysis

In developing stress case loan loss projections on a portfolio-wide basis, we generally use the following information:

- » The principal balance of the mortgage loans outstanding.
- » The number of mortgage loans outstanding.
- » The weighted-average interest rate.
- » The percentage of the portfolio covered by each insurance provider.
- » The percentage of the portfolio that is uninsured.
- » A comparison of the original loan-to-value ratio and the current loan-to-value ratio (i.e., the current loan outstanding/the purchase price of the home), broken down by each mortgage insurer.

For certain portfolios we may consider additional portfolio data for each mortgage loan type (e.g., 30-years of level monthly payments or monthly interest-only payments), or for each vintage (i.e., the year of mortgage origination).

Loan-by-Loan Analysis

In developing stress case loan loss projections for each loan in the loan portfolio, we generally use the following information:

- » The mortgage loan type.
- » The original mortgage loan amount and the original appraised value to arrive at the loan-to-value ratio.
- » The lien position (e.g., first lien or second lien).
- » The current mortgage loan balance.
- » The interest rate.
- » The original underwriting data (e.g., FICO score and the level of documentation).
- » The loan status (whether it is current, or the number of days delinquent).
- » The location of the property.

Assumptions

Probability of Default

For the purpose of our loan loss calculations, probability of default represents the percentage of loans projected to default over the life of the bond program (i.e., the cumulative default rate). We establish an annual base case default rate assumption for each bond program after considering the program's historical levels of default and trends in delinquency and foreclosure within the portfolio, as well as delinquency and foreclosure rates for loans within the HFA's state that are insured by the Federal Housing Administration (FHA).²² The base case cumulative default rate is equal to the roll-forward amount assuming that the annual base case default rate is the same for the subsequent three years. The cumulative base case default rate is capped at 75%.

To arrive at the stress case default probabilities used in the calculator, we then apply multiples to the base case probabilities. The multiples are based on the bond program's expected rating,²³ using the values shown in the table below.

²² FHA loans are considered in this analysis because HFA borrowers have many of the same characteristics as FHA borrowers.

²³ The initial expected rating is typically the bond program's existing rating or is based on our estimate of the ability of the bond program to sustain a certain percentage of loan losses. Where the resulting scorecard-indicated outcome incorporating stress case loan losses is not consistent with the expected rating used in this lookup, we may employ an iterative approach.

EXHIBIT 3

Multiples to Base Case Probabilities Based on Bond Program's Expected Rating

Roll Forward %	C	Ca	Caa3	Caa2	Caa1	B3	B2	B1	Ba3	Ba2	Ba1	Baa3	Baa2	Baa1	A3	A2	A1	Aa3	Aa2	Aa1	Aaa
0.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.23	1.37	1.50	1.67	1.83	2.0	2.2	2.7	3.00	3.30	4.50	5.00	5.50	7.00
0.25%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.22	1.36	1.49	1.66	1.82	1.98	2.19	2.66	2.97	3.29	4.41	4.91	5.47	6.88
0.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.21	1.34	1.48	1.64	1.81	1.96	2.18	2.61	2.94	3.29	4.31	4.81	5.44	6.75
0.75%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.20	1.33	1.46	1.63	1.80	1.94	2.16	2.57	2.91	3.28	4.22	4.72	5.41	6.63
1.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.19	1.31	1.45	1.61	1.79	1.93	2.15	2.53	2.88	3.28	4.13	4.63	5.38	6.50
1.25%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.18	1.30	1.44	1.60	1.78	1.91	2.14	2.48	2.84	3.27	4.03	4.53	5.34	6.38
1.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.17	1.28	1.43	1.58	1.77	1.89	2.13	2.44	2.81	3.26	3.94	4.44	5.31	6.25
1.75%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.16	1.27	1.41	1.57	1.76	1.87	2.11	2.39	2.78	3.26	3.84	4.34	5.28	6.13
2.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.40	1.55	1.75	1.85	2.10	2.35	2.75	3.25	3.75	4.25	5.25	6.00
2.25%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.39	1.54	1.74	1.84	2.09	2.34	2.72	3.19	3.69	4.19	5.13	5.88
2.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.39	1.53	1.73	1.83	2.08	2.33	2.69	3.13	3.63	4.13	5.00	5.75
2.75%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.38	1.51	1.71	1.81	2.06	2.31	2.66	3.06	3.56	4.06	4.88	5.63
3.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.38	1.50	1.70	1.80	2.05	2.30	2.63	3.00	3.50	4.00	4.75	5.50
3.25%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.37	1.49	1.69	1.79	2.04	2.29	2.59	2.94	3.44	3.94	4.63	5.38
3.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.36	1.48	1.68	1.78	2.03	2.28	2.56	2.88	3.38	3.88	4.50	5.25
3.75%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.36	1.46	1.66	1.76	2.01	2.26	2.53	2.81	3.31	3.81	4.38	5.13
4.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.25	1.35	1.45	1.65	1.75	2.00	2.25	2.50	2.75	3.25	3.75	4.25	5.00
4.25%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.24	1.35	1.44	1.63	1.73	1.98	2.23	2.47	2.72	3.22	3.72	4.22	4.94
4.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.24	1.34	1.43	1.61	1.71	1.96	2.20	2.44	2.69	3.19	3.69	4.19	4.88
4.75%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.23	1.33	1.41	1.59	1.69	1.94	2.18	2.41	2.66	3.16	3.66	4.16	4.81
5.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.23	1.33	1.40	1.58	1.68	1.93	2.15	2.38	2.63	3.13	3.63	4.13	4.75
5.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.21	1.31	1.38	1.54	1.64	1.89	2.10	2.31	2.56	3.06	3.56	4.06	4.63
6.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.20	1.30	1.35	1.50	1.60	1.85	2.05	2.25	2.50	3.00	3.50	4.00	4.50
6.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.15	1.20	1.30	1.35	1.49	1.59	1.84	2.03	2.23	2.47	2.94	3.42	3.90	4.38
7.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.14	1.20	1.30	1.35	1.48	1.58	1.83	2.02	2.21	2.44	2.88	3.33	3.79	4.25
7.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.14	1.20	1.30	1.35	1.48	1.58	1.81	2.00	2.19	2.41	2.81	3.25	3.69	4.13
8.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.13	1.20	1.30	1.35	1.47	1.57	1.80	1.98	2.17	2.38	2.75	3.17	3.58	4.00

EXHIBIT 3

Multiples to Base Case Probabilities Based on Bond Program's Expected Rating

Roll Forward %	C	Ca	Caa3	Caa2	Caa1	B3	B2	B1	Ba3	Ba2	Ba1	Baa3	Baa2	Baa1	A3	A2	A1	Aa3	Aa2	Aa1	Aaa
8.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.13	1.20	1.30	1.35	1.46	1.56	1.79	1.97	2.15	2.35	2.69	3.08	3.48	3.88
9.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.13	1.20	1.30	1.35	1.45	1.55	1.78	1.95	2.13	2.32	2.63	3.00	3.38	3.75
9.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.12	1.20	1.30	1.35	1.44	1.54	1.76	1.93	2.10	2.28	2.56	2.92	3.27	3.63
10.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.12	1.20	1.30	1.35	1.43	1.53	1.75	1.92	2.08	2.25	2.50	2.83	3.17	3.50
11.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.11	1.20	1.30	1.35	1.42	1.52	1.73	1.88	2.04	2.19	2.38	2.67	2.96	3.25
12.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.20	1.30	1.35	1.40	1.50	1.70	1.85	2.00	2.13	2.25	2.50	2.75	3.00
13.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.19	1.28	1.33	1.39	1.49	1.68	1.83	1.95	2.10	2.21	2.43	2.65	2.88
14.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.18	1.25	1.30	1.39	1.48	1.65	1.80	1.90	2.07	2.18	2.35	2.55	2.75
15.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.16	1.23	1.28	1.38	1.46	1.63	1.78	1.85	2.03	2.14	2.28	2.45	2.63
16.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.37	1.45	1.60	1.75	1.80	2.00	2.10	2.20	2.35	2.50
17.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.37	1.44	1.58	1.73	1.78	1.95	2.08	2.16	2.29	2.44
18.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.36	1.43	1.55	1.70	1.75	1.90	2.05	2.13	2.23	2.38
19.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.36	1.41	1.53	1.68	1.73	1.85	2.03	2.09	2.20	2.31
20.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.35	1.40	1.50	1.65	1.70	1.80	2.00	2.05	2.15	2.25
21.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.34	1.39	1.49	1.63	1.67	1.77	1.97	2.02	2.12	2.21
22.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.34	1.39	1.47	1.60	1.65	1.74	1.94	1.98	2.08	2.18
22.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.33	1.38	1.47	1.59	1.64	1.73	1.92	1.97	2.06	2.16
23.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.25	1.33	1.38	1.46	1.58	1.63	1.72	1.91	1.95	2.05	2.14
24.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.33	1.37	1.45	1.57	1.61	1.69	1.88	1.92	2.02	2.11
25.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.32	1.37	1.44	1.55	1.59	1.67	1.85	1.90	1.99	2.08
26.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.32	1.36	1.43	1.53	1.58	1.65	1.83	1.87	1.96	2.06
27.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.31	1.35	1.42	1.52	1.56	1.63	1.81	1.85	1.94	2.03
27.50%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.31	1.35	1.42	1.51	1.55	1.62	1.80	1.84	1.93	2.02
28.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.31	1.35	1.41	1.51	1.55	1.61	1.78	1.83	1.92	2.01
29.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.30	1.34	1.41	1.49	1.53	1.60	1.76	1.81	1.90	1.98
30.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.30	1.34	1.40	1.48	1.52	1.58	1.74	1.79	1.87	1.96
31.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.30	1.34	1.39	1.47	1.51	1.57	1.72	1.77	1.85	1.94

EXHIBIT 3

Multiples to Base Case Probabilities Based on Bond Program's Expected Rating

Roll Forward %	C	Ca	Caa3	Caa2	Caa1	B3	B2	B1	Ba3	Ba2	Ba1	Baa3	Baa2	Baa1	A3	A2	A1	Aa3	Aa2	Aa1	Aaa
32.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.29	1.33	1.39	1.46	1.50	1.56	1.70	1.75	1.83	1.92
33.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.29	1.33	1.38	1.45	1.49	1.54	1.68	1.73	1.81	1.89
34.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.29	1.33	1.38	1.44	1.48	1.53	1.66	1.71	1.79	1.87
35.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.29	1.32	1.37	1.44	1.47	1.52	1.64	1.69	1.77	1.85
36.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.24	1.28	1.32	1.37	1.43	1.46	1.51	1.63	1.67	1.75	1.83
37.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.28	1.32	1.36	1.42	1.45	1.50	1.61	1.65	1.73	1.81
38.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.28	1.31	1.36	1.41	1.45	1.49	1.59	1.63	1.71	1.79
39.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.28	1.31	1.35	1.41	1.44	1.48	1.57	1.61	1.69	1.77
40.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.28	1.31	1.35	1.40	1.43	1.48	1.56	1.59	1.67	1.75
41.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.31	1.35	1.39	1.43	1.47	1.54	1.58	1.66	1.73
42.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.30	1.34	1.39	1.42	1.46	1.52	1.56	1.64	1.71
43.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.30	1.34	1.38	1.41	1.45	1.51	1.55	1.62	1.70
44.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.30	1.34	1.38	1.41	1.45	1.49	1.53	1.60	1.68
45.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.30	1.33	1.37	1.40	1.44	1.48	1.51	1.59	1.66
46.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.27	1.30	1.33	1.37	1.40	1.43	1.47	1.50	1.57	1.65
47.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.26	1.29	1.33	1.36	1.39	1.43	1.46	1.50	1.56	1.63
48.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.26	1.29	1.33	1.36	1.39	1.42	1.45	1.49	1.55	1.62
49.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.42	1.45	1.48	1.53	1.60
50.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.47	1.52	1.59
51.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.15	1.20	1.22	1.25	1.28	1.31	1.34	1.37	1.40	1.43	1.46	1.51	1.58
52.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.10	1.14	1.19	1.22	1.25	1.28	1.31	1.34	1.37	1.40	1.43	1.46	1.50	1.57
53.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.09	1.14	1.19	1.22	1.24	1.27	1.30	1.33	1.36	1.39	1.42	1.45	1.49	1.55
54.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.09	1.14	1.18	1.21	1.24	1.27	1.30	1.33	1.36	1.39	1.41	1.44	1.48	1.54
55.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.09	1.13	1.18	1.21	1.23	1.26	1.29	1.32	1.35	1.38	1.41	1.44	1.48	1.53
56.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.09	1.13	1.17	1.20	1.23	1.26	1.29	1.32	1.35	1.38	1.40	1.43	1.47	1.52
57.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.09	1.13	1.17	1.20	1.22	1.25	1.28	1.31	1.34	1.37	1.40	1.42	1.46	1.51
58.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.13	1.17	1.19	1.22	1.25	1.28	1.31	1.34	1.37	1.39	1.42	1.45	1.50

EXHIBIT 3

Multiples to Base Case Probabilities Based on Bond Program's Expected Rating

Roll Forward %	C	Ca	Caa3	Caa2	Caa1	B3	B2	B1	Ba3	Ba2	Ba1	Baa3	Baa2	Baa1	A3	A2	A1	Aa3	Aa2	Aa1	Aaa
59.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.12	1.16	1.19	1.22	1.24	1.27	1.30	1.33	1.36	1.39	1.41	1.45	1.49
60.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.12	1.16	1.19	1.21	1.24	1.27	1.30	1.33	1.36	1.38	1.41	1.44	1.48
61.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.12	1.16	1.18	1.21	1.23	1.26	1.30	1.33	1.35	1.38	1.40	1.43	1.47
62.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.35	1.37	1.40	1.43	1.47
63.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.08	1.11	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34	1.37	1.39	1.42	1.46
64.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.11	1.15	1.17	1.20	1.22	1.25	1.28	1.31	1.34	1.36	1.39	1.42	1.45
65.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.11	1.14	1.17	1.19	1.22	1.25	1.28	1.31	1.34	1.36	1.38	1.41	1.44
66.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.11	1.14	1.17	1.19	1.21	1.25	1.28	1.31	1.33	1.36	1.38	1.40	1.43
67.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.10	1.14	1.16	1.19	1.21	1.24	1.27	1.30	1.33	1.35	1.38	1.40	1.43
68.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.10	1.14	1.16	1.18	1.21	1.24	1.27	1.30	1.32	1.35	1.37	1.39	1.42
69.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.10	1.13	1.16	1.18	1.20	1.24	1.27	1.30	1.32	1.34	1.37	1.39	1.41
70.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.07	1.10	1.13	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34	1.36	1.38	1.41
71.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.06	1.10	1.13	1.15	1.18	1.20	1.23	1.26	1.29	1.31	1.34	1.36	1.38	1.40
72.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.06	1.10	1.13	1.15	1.17	1.20	1.23	1.26	1.29	1.31	1.33	1.36	1.37	1.39
73.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.06	1.09	1.12	1.15	1.17	1.19	1.22	1.25	1.29	1.31	1.33	1.35	1.37	1.37
74.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.06	1.09	1.12	1.14	1.17	1.19	1.22	1.25	1.28	1.31	1.33	1.35	1.35	1.35
75.00%	-0.99	0.35	0.65	0.80	0.90	0.95	1.00	1.06	1.09	1.12	1.14	1.16	1.19	1.22	1.25	1.28	1.30	1.32	1.33	1.33	1.33

Source: Moody's Investors Service

The stress case default probability used in the loan loss calculation is also subject to a minimum probability of default based on the expected rating of the bond program (please see Exhibit 4). The higher the expected rating of the bond program, the higher the minimum stress case probability of default we apply to the bond program.

EXHIBIT 4

Minimum Probabilities of Default Based on Expected Rating of the Bond Program

Program Rating	PD Minimum
Aaa	25%
Aa1	20%
Aa2	20%
Aa3	20%
A1	15%
A2	15%
A3	15%
Baa1	10%
Baa2	10%
Baa3	10%
Ba1	5%

Source: Moody's Investors Service

Loss Given Default

For the purpose of our loan loss calculations, loss given default is the magnitude of the loss on defaulted loans. We estimate this loss as the principal balance at default plus interest and costs between default and final recovery, less recovered funds from the foreclosure sale and any mortgage insurance. For the percentage of loans that are assumed to default in the stress scenario, we estimate loss on foreclosure based on the level of home price change of single-family homes within the state from peak to trough within the housing real estate cycle. For the level of home price change, we use the most recent state-specific house price index from the Federal Housing Finance Agency.

We add lost interest as well as legal fees and other costs of maintaining the property prior to sale. These additional costs are based on the time line from default to foreclosure to disposition of the real estate owned (REO) experienced by the program, as well as the published data for the state where the HFA is located. We reduce the loss by assumed recovery from mortgage insurance (including both primary insurance and pool insurance) based on the level of coverage provided by the insurance. We give credit to the mortgage insurance, based on the terms of the contract regarding depth of coverage for the HFA's loan losses as well as the insurer's rating. The percentage of credit given is based on the Insurance Financial Strength Rating of the insurance provider.²⁴ We may also incorporate rates of rejection, rescission, curtailments and denial of claims based on the performance of individual programs or issuers.

Some programs also benefit from pool insurance, which is additional insurance coverage on one or more pools of loans in the bond program. Pool insurance, which is typically written by PMI providers,

²⁴ Please see Appendix E. In the case of a US government insurance program, e.g., FHA insurance, the percentage of credit given is based on the rating of the US government. For a description of the Insurance Financial Strength Rating, please see *Rating Symbols and Definitions*. A link can be found in the "Moody's Related Publications" section.

generally pays losses after recovery on the PMI and foreclosure of the loan, as specified in the pool contract. We subject pool coverage to the same haircuts we apply to PMI.

Appendix E: Claims-Payment Assumptions for US Mortgage Insurance, by Insurer Rating

The table below lists the claims-payment assumptions for US mortgage insurance that we use in our loan loss calculations (please see Appendix D).

EXHIBIT 5

Claims-Payment Assumptions for US Mortgage Insurance

US Mortgage Insurer Rating	Claims-Payment Assumption
Aaa	100%
Aa1	70%
Aa2	60%
Aa3	50%
A1	40%
A2	35%
A3	30%
Baa1	25%
Baa2	20%
Baa3	17.5%
Ba1	15%
Ba2	12.5%
Ba3	10%
B1	9%
B2	8%
B3	7%
< B3	0%

Source: Moody's Investors Service

Appendix F: Cash Flow Inputs and Projection Scenarios

This appendix provides information about our approach to the inputs and scenarios incorporated into the cash flow projections that inform our assessment of a single-family housing bond program's financial position.

Because the bonds are repaid primarily with mortgage and investment revenues, cash flow projections incorporate stress scenarios for mortgage originations, prepayments and investment earnings. Cash flow projections also incorporate stress scenarios for expenses, such as changes in interest rates and remarketing spreads, as well as for the repayment terms for bank bonds. Based on the terms and conditions of an individual bond program, we may modify the inputs or consider additional cash flow scenarios in our assessments.

Cash Flow Inputs

We use inputs as described in the bond documents, including the mortgage rates and terms, reinvestment rates and program expenses in cash flow projections. In this section, we discuss the inputs to the cash flow projections for a single-family housing bond program. Not all inputs are relevant to an individual transaction.

Mortgage Loan Rates and Terms

Cash flow projections typically reflect the revenue generated by the outstanding mortgage loans pledged to the bond program. For new loans, which will typically be made from proceeds of new bond sales, cash flow projections include the expected lending rates, typically informed by prevailing interest rates and the program's costs, based on bond rates and any expected subsidies the program will receive. Loans with second liens are excluded from the cash flow projections because we have a low expectation that they will be repaid on a timely basis..

Many HFAs modify their mortgage rates on a periodic basis in response to market conditions. While these modifications do not generally result in a substantial change in the characteristics of the future mortgage origination assumed in the cash flow projections, where there is a material change in the mortgage characteristics, we analyze updated cash flow projections that incorporate these changes.

Loan losses upon foreclosure are generally covered by primary mortgage insurance (including insurance provided by the US government through the Federal Housing Administration, the Department of Veterans Affairs and the Department of Agriculture's Office of Rural Development), by secondary insurance or by overcollateralization. Where we consider these enhancements adequate, our cash flow projections generally assume no loan losses, but we may consider scenarios incorporating loan losses in certain cases, such as lower-rated bond programs or programs with delinquency rates that are higher than average.

Mortgage Payment Lag

The duration between when a borrower makes a monthly payment and when the trustee receives the funds is known as the lag. For loans converted into mortgage-backed securities (MBS) that are backed by an enhancement provider, e.g., Ginnie Mae, Fannie Mae or Freddie Mac, the lag in our base-case cash-flow projections reflects the credit enhancement payment provisions, as established by the enhancement provider, plus an additional five calendar days for the receipt of payment to reflect potential administrative delays (e.g., a minor delay in the receipt of payment from the credit enhancer or servicer, including the effect of weekends or holidays). For example, if the typical payment due date for a provider were the 25th of the month, the input would be the 30th of the month.

Since Ginnie Mae, Fannie Mae and Freddie Mac payments are made in the month following MBS issuance, MBS base case cash flow projections use an additional payment lag input of one month.

As an example, a Ginnie Mae I security is issued on September 1. If the security's first payment would be due on October 15, the five-day lag referred to above for guaranteed payment in the event of a missed mortgage payment would be reflected in the cash flows as an MBS payment date of October 20.

Bond Redemption

Cash flows include bond redemption inputs that reflect the provisions established in the bond documents for each bond series, including the priority of maturities and the frequency and limits of the redemption. If these provisions are not specified in the bond documents, the cash flow projections reflect actual practices and strategies of the HFA. We may also consider how the strategy could evolve, for example in response to the effect of changing market conditions on variable-rate debt. Our bond redemption inputs also reflect federal tax law requirements.

Program Expenses

Program expense inputs reflect all program expenses defined in the transaction documents or based on HFA practices, including any minimum or maximum fees. Expenses include the following fees and payments, if applicable:

- » Mortgage servicing fees.
- » Trustee fees.
- » Mortgage insurance fees.
- » Credit enhancement or bond insurance fees.
- » Remarketing or auction agent fees.
- » Liquidity facility fees.
- » Broker-dealer fees.
- » Rebate analyst fees.
- » Issuer fees.
- » Arbitrage rebates, yield reduction payments and other payments related to federal tax law.

Bond Interest Rates

For fixed-rate transactions, cash flow inputs incorporate the actual interest rates on the bonds or the anticipated interest rates when the cash flows are generated before bond pricing. For variable-rate transactions, cash flow inputs reflect both a low interest-rate scenario and a high interest-rate scenario.

Low Interest-Rate Scenario

In this scenario, the prevailing taxable short-term rate in the US starts at 0.25% and gradually increases to 2.0% over 10 years (Exhibit 6).

Interest rates for many single-family housing variable-rate bonds are based on the Securities Industry and Financial Markets Association's (SIFMA) municipal swap index, which comprises tax-exempt variable-rate demand obligations (VRDOs). Since the SIFMA rate does not have a forward curve, we derive the SIFMA rate input for the cash flow projections based on a percentage of the prevailing taxable short-term index in the US. VRDOs are assumed to pay interest at the SIFMA rate (with additional trading spreads outlined in Exhibit 7). Correspondingly, we incorporate a higher ratio of the SIFMA rate/prevaling short-term index to reflect compression between tax-exempt and taxable rates when interest rates are low. For bond programs that use swaps based on 1-month taxable short-term rates, the SIFMA rate/1-month taxable short-term index rate ratio stays at 105% for the initial five years and decreases to 95% thereafter.

For bond programs that use swaps based on 3-month taxable short-term index rates, we assume a SIFMA rate/3-month taxable short-term index rate ratio of 80% for the life of the VRDOs.

High Interest-Rate Scenario

In the standard high interest-rate scenario, the prevailing taxable short-term index rate starts at the current level, increases to 10.5% over five years, remains at 10.5% for an additional five years and decreases to a holding rate of 8.25% thereafter.²⁵

EXHIBIT 6

Interest Rate Assumptions for Programs with Variable-Rate Debt

		Low Interest-Rate Environment		High Interest-Rate Environment	
Prevailing Taxable Short-term Index Rates		Year 1-3	0.25%	Year 1-5	Ramp up from current to 10.5%
		Year 4-6	0.75	Year 6-10	Hold at 10.5%
		Year 7-10	1.50%	Year 11-17	Wind down to 8.25%
		Thereafter	2.00%	Thereafter	Hold at 8.25%
Ratio of the SIFMA Rate/Taxable Short-term Index Rate	1-month taxable short-term index rate	Year 1-6	105% of 1-month taxable short-term index rate	75% of 1-month taxable short-term index rate	
		Thereafter	95% of 1-month taxable short-term index rate		
	3-month taxable short-term index rate	80% of 3-month taxable short-term index rate		75% of 3-month taxable short-term index rate	

Source: Moody's Investors Service

VRDO Spread Levels

The VRDO interest rate assumptions for variable-rate debt are based on historical taxable short-term index rate data. We assume that the tax-exempt bonds pay a rate equal to the SIFMA rate plus a spread, where the SIFMA rate is equal to certain percentages of the taxable short-term index rate, as shown in exhibit 6. The trading spreads described below.

Our spread assumptions for VRDOs not subject to alternative minimum tax (AMT) is five basis points. For AMT and taxable VRDOs, our spread assumptions are 15 basis points and 40 basis points,

²⁵ We would vary these assumptions in a high interest rate environment, and the assumed taxable rate would in all cases be at least as high as the 10-year US treasury yield plus 3%.

respectively. We consider using different assumptions if an HFA provides historical evidence of narrower spreads by tax status on its VRDOs.

In addition, for the initial year, an additional 30-basis-point spread is assumed for VRDOs supported by the largest private-sector liquidity provider (Exhibit 7) to reflect a stress scenario due to a weak credit market.

EXHIBIT 7

VRDO Spreads for Programs with Variable-Rate Debt

Tax Status	Time Period	Remaining Providers	Largest Private Sector Standby Bond Purchase Agreement Provider
Non-AMT	First Year	5 bps	35 bps
	Thereafter	5 bps	5 bps
AMT	First Year	15 bps	45 bps
	Thereafter	15 bps	15 bps
Taxable	First Year	40 bps	70 bps
	Thereafter	40 bps	40 bps

Source: Moody's Investors Service

Liquidity Facilities Renewal Expense

For bond program cash flows, we assume that the cost of maintaining a liquidity facility for an HFA that has issued VRDOs increases at the first stated expiration date of the facility to the greater of (i) our estimate of current market rates for such facilities; (ii) an all-in cost of 100 basis points per year; or (iii) 20% above the current annual cost of the existing facility.

Net Effect of Swaps

Bond program cash flows reflect the effect of interest rate swaps. HFAs typically use interest rate swaps to hedge their variable-rate debt. There are three relevant payment streams:

- » The HFA's variable-rate debt service payments.
- » The HFA's fixed payments to the swap counterparty based on the rate in the swap documents (or the expected rate, in the case of pre-pricing cash flows).
- » The counterparty's variable-rate payments to the HFA based on the terms of the swap and the high and low interest-rate scenarios.

Cash flows may reflect the three separate payment streams or one net payment stream, but the net effect remains the same in either scenario. Depending on the interest rate environment, the net effect of an interest rate swap could be an outflow or an inflow to the HFA issuer.

Under the minimum prepayment scenario described below in the "Cash Flow Projection Scenarios" section, a swap's notional amount may amortize faster than the bonds, resulting in an amount of unpaid bond principal that exceeds the notional amount of swaps outstanding. In this case, if the HFA has a track record of redeeming unhedged bonds, program cash flow projections assume that this practice continues. If the HFA has not demonstrated this redemption practice, the cash flow projections assume that the amount by which the bond principal exceeds the swap notional amount remains unhedged.

Under a rapid prepayments scenario, a swap's notional amount may exceed the unpaid principal of the bonds if prepayments are used to redeem bonds. When this occurs, the cash flow projections would reflect the strategy that is consistent with legal requirements and actual practice. Typical strategies are:

- » The HFA uses prepayments to redeem the variable-rate bonds so that the outstanding bond principal equals the swap notional amount.
 - Any excess prepayments may be used to redeem other bonds in the same series or another series (as long as it is consistent with the HFA's cross-calling practice and tax law). If excess prepayments are not used for redemptions, cash flows assume excess prepayments are invested without a guaranteed rate of return, and the reinvestment rates in Exhibit 8 are applied.
- » The HFA uses prepayments to redeem the variable-rate bonds but continues to make full payments on the swap.
 - Cash flows assume that the HFA makes fixed-rate payments to the counterparty in exchange for variable-rate receipts (based on the interest rate assumptions in Exhibit 8) from the counterparty.
- » The HFA uses prepayments to redeem the variable-rate bonds and terminates the swap at market value.
 - Where the swap contract includes an option to terminate the swap at par value, the cash flows may assume the exercise of this option if, based on the HFA's policy and practices, it is clear the HFA will exercise that option in the case of a termination. Otherwise, cash flows reflect the termination payment to or from the HFA, based on applicable interest rate inputs and scenarios.
- » The HFA uses prepayments to make new loans and does not redeem the bonds.
 - Program cash flow projections reflect only the recycling of prepayments into new loans if the HFA has demonstrated this practice. Assumptions related to the timing and the rates of the new mortgage loans are determined, based on the HFA's recycling practice and history of originations, as well as our forward view of market conditions, but the swap expense inputs do not change under this scenario.

Investment Rates

Cash flows typically reflect actual investments in the program. We assume assets are valued at par, because HFAs often hold investments to maturity.

A commonly used long-term investment agreement in this sector is a guaranteed investment contract (GIC). GICs are fixed-rate investment agreements with financial institutions, such as banks or insurance companies, that provide a predetermined rate of return on funds invested that is over the life of the contract. GICs may be used for the transaction acquisition, float and debt service reserve funds. Where the terms of the GICs are available, cash flow projections reflect the contracted interest rates, maturity, restrictions on deposits and withdrawals, and minimum or maximum balances.

For balances in excess of amounts permitted by the GIC and all invested funds that do not have any guaranteed rate of return, the reinvestment rate assumption is based on whether they are fixed-rate programs or variable-rate programs.

For fixed-rate programs with active management, we use a reinvestment rate assumption starts at 0% and increases in three steps to 1.5% over 11 years, as shown in Exhibit 8. Reinvestment rate assumptions for fixed-rate programs without active management that use closed indentures remain at 0% for the life of the bonds.

For variable-rate bond programs, our assumed reinvestment rate is 70% of the prevailing taxable short-term index rate through the life of the transaction.

EXHIBIT 8

Reinvestment Rate Assumptions for Investments without any Guaranteed Rate of Return

(Years Reflect Time Elapsed in Cash Flow Projections, not Investment Terms)

With Active Management		Without Active Management	
Years	Fixed-Rate Programs Rate	Variable-Rate Programs Rate	Fixed-Rate Programs Rate
1 – 3	0%		0%
4 – 6	0.5%		0%
7 – 10	1%	70% of 1-month taxable short-term index rate	0%
11 – maturity	1.5%		0%

Source: Moody's Investors Service

Counterparties

HFA single-family housing bond programs rely on performance by outside counterparties, including GIC and other investment providers, liquidity providers and swap counterparties.

We incorporate risks related to counterparty performance in our cash flow inputs by haircutting the amounts held in a GIC or other investment vehicles and by haircutting the net interest rate swap payments. The haircuts are based on the rating of the counterparty and the rating of the associated HFA single-family housing bond program (see Exhibit 9). When the GIC provider is an insurance company, we use the Insurance Financial Strength Rating as the counterparty rating. When the GIC provider is a bank, we use the bank's long-term deposit rating as the counterparty rating. For interest rate swaps, we use the provider's Counterparty Risk (CR) Assessment as the counterparty rating.

EXHIBIT 9

GIC and Swap Haircuts, by Rating Level

Provider Rating	Aaa Program	Aa Program	A Program	Baa Program
A1 or higher	0%	0%	0%	0%
A2	35%	0%	0%	0%
A3	45%	35%	0%	0%
Baa1	55%	45%	35%	0%
Baa2	65%	55%	45%	35%
Baa3	85%	65%	55%	45%
Below Baa3	100%	100%	100%	100%

Source: Moody's Investors Service

We use an additional stress case for pool programs that may otherwise be eligible for a rating of Aaa, when these programs have limited diversification and rely on investment earnings or swap payments

to meet debt service. In these cases, if a provider is rated below A1, we run a projections scenario assuming that the provider will no longer meet its payment obligations to the program. For programs that may otherwise be eligible for a rating of Aa1-Aa3, we run a similar scenario assuming that any provider rated below A2 will no longer meet its payment obligations to the pool.

Cash flows reflect the GIC haircuts in the following ways:

- » Amounts in the debt service reserve funds and acquisition funds are reduced by the appropriate discount. For debt service reserve or float funds, the one-time principal reduction is equal to the highest projected six-month fund balance, which typically varies with the prepayment assumptions.
- » The investment return for the debt service reserve and acquisition funds and the reinvestment rate for the float fund is calculated by applying the applicable investment rate to the discounted principal.

When a GIC is terminated after a rating downgrade of the provider and the investment balance is returned to the pool, we do not haircut the principal amounts in the GIC, but cash flows projections reflect the reinvestment rate assumptions for investments without any guaranteed rate of return (see Exhibit 10).

Cash flows reflect the swap haircuts in the following ways:

- » Under the high interest-rate scenarios (where net swap payments are typically in the issuer's favor), cash flows reflect full fixed-rate swap payments by the HFA in exchange for full variable-rate receipts from the swap counterparty in the initial three years, followed by discounted fixed-rate swap payments in exchange for discounted variable-rate receipts through the life of the bond.
- » Under the low interest-rate scenario, HFAs continue to make full fixed-rate swap payments in exchange for full variable-rate receipts.

In cases where a program's rating has been downgraded to a level at which the provider can terminate the swap, we analyze cash flows using an assumption that the HFA pays any swap termination amounts and that the variable-rate debt related to the swap is unhedged. However, when swaps are novated following a downgrade, cash flow projections reflect terms of the novated swaps and incorporate expenses payable by the indenture or HFA, if any.

Many investment agreements provide for the posting of collateral by an investment provider if its rating falls below a specified level. We typically do not consider that such provisions enhance the likelihood of payment of the earnings or repayment of the principal investment, because the collateral posting may be subject to the automatic stay or disgorgement provisions in the event the investment provider files for bankruptcy.

Cash Flow Projection Scenarios

In this section, we describe the cash flow projections that inform our assessments of a single-family housing bond program's financial position.

Depending on the specifics of the bond program, we generally assess cash flow projections based on various mortgage origination and prepayment scenarios. For variable-rate demand bonds, we also include a high and low interest-rate environment overlay for each scenario.

Exhibit 10 lists the cash flow scenarios we typically assess, each of which is discussed below:

EXHIBIT 10

Cash Flow Projection Scenarios

Program Structure/Interest Rate Environment	Scenario
Variable-Rate/High Interest-Rate Environment	Full non-origination
	Full origination – minimum prepayment
	Full origination – three-year weighted average life
	Partial origination – No prepayment and three-year weighted average life
	Super sinker or Planned Amortization Class (PAC) bonds*
	Call-protected, premium, taxable or Capital Appreciation Bonds (CABs)*
	Mortgage Loans with Different Interest Rates or Different Terms
	Bank Bonds
Variable-Rate/Low Interest-Rate Environment	Full non-origination
	Full origination – minimum prepayment
	Full origination – three-year weighted average life
	Partial origination – No prepayment and three-year weighted average life
	Super sinker or Planned Amortization Class (PAC) bonds*
	Call-protected, premium, taxable or Capital Appreciation Bonds (CABs)*
	Mortgage Loans with Different Interest Rates or Different Terms
	Bank Bonds
Fixed Rate	Full non-origination
	Full origination – minimum prepayment
	Full origination – three-year weighted average life
	Partial origination – No prepayment and three-year weighted average life
	Super sinker or Planned Amortization Class (PAC) bonds*

EXHIBIT 10

Cash Flow Projection Scenarios

Program Structure/Interest Rate Environment	Scenario
	Call-protected, premium, taxable or Capital Appreciation Bonds (CABs)*
	Mortgage Loans with Different Interest Rates or Different Terms

**If applicable.*

Source: Moody's Investors Service

Full Non-Origination

We review a non-origination scenario for transactions where no mortgages have been funded prior to or upon bond closing. In this scenario, no mortgages are originated, and bonds are not redeemed until the last allowable day in accordance with the transaction agreements. In this scenario, investment earnings on unexpended bond proceeds, in combination with other funds in the transaction such as capitalized interest reserves, generally provide the only funds available to meet bond debt service payments and transaction expenses until the bonds are called for full redemption.

Full Origination – Minimum Prepayment

A full origination scenario assumes bond proceeds are fully used to acquire mortgage loans or MBS. For most single-family housing bond programs, bond proceeds are placed in an acquisition fund, which is used to purchase the mortgage loans or MBS that secure the transaction within a specified period. If the rate on the mortgage loans (net of any expenses) is higher than the investment rate on the acquisition fund, cash flow projections assume that all loans are originated on the last day of the expected origination period. Any extension to this period would require new cash flows. However, if the rate of the loans is lower than the acquisition fund rate, cash flow projections assume that all loans are originated on the first day of the origination period if the net mortgage rate is lower than the investment rate of the acquisition fund.

In addition, under this scenario, we generally assume no loan prepayments over the life of the bonds. However, recognizing that most loan portfolios experience some level of prepayments as a result of refinancings, home sales or loan defaults, where an HFA is able to provide 10 years of historical prepayment data (i.e., 20 semi-annual periods) by loan vintage for a single-family housing bond program, we may consider prepayments derived from the historical data.

Full Origination – Three-Year Weighted Average Life

The same full origination as in the prior scenario is used in this scenario.

We also review cash flow scenarios incorporating prepayment risk. Prepayments can reduce a transaction's expected net revenue stream or cause a reduction in the weighted average pass-through mortgage rate. Since the amount of any future prepayments is uncertain, we generally review a three-year weighted average loan life scenario. In this scenario, mortgage prepayments occur such that the average life of the pool of mortgage loans is three years.

Partial Origination — No Prepayment and Three-Year Weighted Average Life

We review a partial-origination scenario for bond programs where some mortgages have been funded prior to or upon bond closing. In this scenario, no other mortgages are funded.

In addition, for bond programs with a single series of bonds and varying interest rates or terms, we typically review a scenario where only the lowest-rate mortgages are originated. This version of the partial-origination scenario isolates certain mortgages to assess whether they can support bond debt service independent of other mortgages with more advantageous features. We consider the no prepayment and the three-year weighted average life scenarios as described above.

Super Sinker or Planned Amortization Class Bonds

A super sinker is a mechanism for concentrating mortgage prepayments toward a specifically identified bond maturity that is redeemed first from all mortgage prepayments. This allows the super sinker bond to be paid faster than other bonds in the offering.

In the planned amortization class (PAC) bond structure, a specifically identified bond maturity is redeemed according to a schedule based on a designated range of prepayment speeds. As long as the actual prepayment rate is within the range, the PAC bond receives these prepayments and other maturities do not. This structure may increase the certainty of the actual life of the PAC bond.

For both of these types of bonds, we review a scenario under which loan prepayments occur at a speed such that the super sinker or PAC bonds are called in full pursuant to the redemption provisions, after which the prepayment rate is reduced to 0%. We use this scenario to assess whether the transaction can support debt service on the remaining bonds, which typically have a higher weighted average coupon.

Call-protected, Premium, Taxable or Capital Appreciation Bonds (CABs)

In some instances, the structural framework does not permit a trustee to redeem higher coupon debt until all or a portion of the lower coupon bonds are paid off. When this structural feature is present, we review a scenario under which mortgages prepay rapidly, generally at a three-year weighted average life, and the associated funds redeem lower coupon bonds. The prepayment rate is reduced to 0% after the lower coupon bonds have been paid in full. We use this scenario to assess whether the transaction can support debt service on the remaining bonds, which typically have a higher weighted average coupon.

Mortgage Loans with Different Interest Rates or Different Terms

In what is often referred to as a split-rate scenario, higher-rate mortgages experience rapid prepayments, typically at a three-year weighted average life, while lower-rate mortgages do not experience any prepayments. The bond program quickly loses the higher source of income and is left with the lower source for an extended period. We typically review a split-rate scenario for transactions where there is at least a 100-basis-point difference between underlying mortgage rates or where at least one mortgage rate is lower than the weighted average bond rate.

If a bond program includes a material amount of mortgages with step-rate loans or interest-only loans, where the borrower pays a lower monthly mortgage payment initially and a higher payment later, our cash flow projections typically include a stress test assuming minimum prepayment speed on those loans during the initial lower payment period and rapid prepayment thereafter.

Bank Bonds

For bond programs with VRDOs using external liquidity facilities, cash flow projections include additional scenarios to test the ability of the bond program to meet its debt service obligations if a failed remarketing were to result in bank bonds, which typically have accelerated repayment schedules and high interest rates. The cash flow projections include additional scenarios that test the ability of

the bond program to withstand (i) a period of high interest-rate spreads on variable-rate debt (other than indexed bonds) and (ii) repayment of bank bonds for one year (before the bonds can be re-marketed as VRDOs).

We review scenarios under the high and low interest rate environment assumptions described above, modified by the bank bond repayment assumptions below. We also assume minimum prepayment for both scenarios.

For the bank bond projection scenarios, we assume the amount of bank bonds will be equal to the highest of: (i) 25% of the VRDOs; (ii) the amount of bonds supported by the liquidity provider with the highest percentage of exposure in the program; or (iii) the current amount of bank bonds. Bank bond cash flow projections assume a higher amount of bank bonds where particular circumstances warrant, such as where the ratings for relevant liquidity banks are downgraded or the relevant liquidity banks are not supporting remarketings effectively. In these cases, VRDOs supported by these banks would be considered bank bonds in the cash flow projections.

Where a bond program has bank bonds that require accelerated repayment, the cash flow projections assume the schedule of bank bond interest and principal repayment based on the terms of the liquidity agreement. Where a bond program does not have any bank bonds, the cash flow projections we assume that the bank bond amount determined in accordance with the previous paragraph becomes bank bonds on the first day of the cash flow projections, with repayment based on the terms of the liquidity agreement. The cash flow projections assume that the HFA makes these payments for one full year (i.e., the bank bond period). At the end of the bank bond period, cash flow projections assume that the remaining balance of the bonds are remarketed and remain VRDOs supported by the same liquidity facility (subject to increased cost upon the facility's expiration).

Bank bond cash flow projections assume the following:

- » The bond program pays the full amount of the bank bond amortization in accordance with the terms of applicable conditional liquidity support for the amount of bonds assumed to become bank bonds.
- » If the largest conditional liquidity provider's exposure covers less than 25% of the VRDOs (and we therefore assume the amount of bank bonds is equal to 25% of the total VRDOs issued by the bond program), we use the bank bond repayment schedule associated with the liquidity provider with repayment terms that would result in the largest amount of bank bond payments during the one-year term.
- » The bank bonds bear interest at the bank rate, calculated as prescribed in the HFA's liquidity support contract, including any step-ups during the first 12 months.
- » Where the bank rate is based on the prime rate, our prime rate assumption is 95% of the prevailing taxable short-term index rate plus 300 basis points, as follows:

Cash flow projections incorporate either (i) full ongoing payments on the swaps associated with the bank bonds even after the bank bonds have been redeemed (unless par termination options are available to the HFA); or (ii) swaps terminate at market value plus associated fees.

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