

Request for Input

Stress Testing Framework and Recommendations

Responses Due August 31, 2019

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Overview

Ginnie Mae has developed a first iteration (“Version 1” or “V1”) of an analytical framework (“framework”) and a set of models for assessing issuer financial performance during a base-case and an adverse economic environment. Ginnie Mae recognizes that the mortgage banking industry is a highly complex set of interconnected activities and inputs performed by divergent organizations with diverse business models, and an attempt to accurately forecast financial performance may be challenging. Therefore, Ginnie Mae is seeking feedback on its V1 framework from

stakeholders and industry participants as the agency continues to refine its approach to implementation. This RFI also provides insight into how the agency is assessing issuer performance under a stressed economic scenario. Ginnie Mae is also seeking feedback from stakeholders on recommendations as to how Ginnie Mae might use this framework in the administration of the program, as well as what policy options could be utilized as a counterparty risk management tool for the agency.

Background

Ginnie Mae’s development of a stress testing framework is part of a larger effort to expand the use of analytic techniques for uncovering, evaluating and addressing counterparty risk it faces as guarantor of a portfolio with over \$2 trillion in mortgage-backed securities (“MBS”). It also reflects an intention to be well-positioned ahead of potentially challenging economic circumstances and to foster development of this capability within Ginnie Mae’s issuer base.

Due to the Dodd-Frank Act of 2010, depository institutions that are subject to regulatory oversight by the Federal Reserve, Federal Deposit Insurance Corporation (FDIC), Office of the Comptroller of the Currency (OCC) and National Credit Union Administration (NCUA) have become well-versed in developing and reporting results from a rigorous stress testing framework. As such, Ginnie Mae is not seeking to replicate these efforts. This stress testing framework is focused exclusively on Ginnie Mae’s non-bank issuer base.

Ginnie Mae has experienced a significant transformation of its issuer base in the years following the 2008 financial crisis. This transformation has resulted in the migration of the bulk of issuance volume toward non-bank institutions. For example, in FY 2010, non-banks accounted for only 12% of MBS issuances. In FY 2018, non-banks accounted for 77% of MBS issuances. Additionally, ownership and management of Ginnie Mae mortgage servicing rights (“MSRs”) have experienced a similar migration, with non-banks comprising 62% of total outstanding portfolio balances at year-end FY 2018. For comparison purposes, this is up from 10% at the end of FY 2010. This transformation has altered the diversity of participants in the program and helped ensure that American borrowers continue to have broad access to credit. However, it is unclear whether or not non-banks have the same access to durable capital and liquidity as depository institutions. As such, Ginnie Mae believes it is prudent to assess how these institutions might perform in an adverse economic environment.

Ginnie Mae evaluated two approaches to developing a stress testing framework. The first approach approximates the process leveraged by the Federal Reserve, in which they provide the scenarios and the regulated institutions perform the modeling of impacts to the bank's financial condition. The second alternative contemplates that Ginnie Mae determines the scenarios and models the impacts to an issuer's financial condition. The first option was considered and then discarded as Ginnie Mae believes this approach would create a heavy burden on issuers as well as Ginnie Mae staff. Therefore, Ginnie Mae elected to adopt the second option.

The Version 1 stress testing framework forecasts an issuer's financial performance over the next

eight quarters under a base and an adverse scenario and provides the following outputs:

- **Balance sheet, income statement and cashflow statement** over the evaluation period;
- **Projected Issuer Risk Grade** (Ginnie Mae's proprietary risk rating method) over the evaluation period;
- **Projected issuer compliance** with Ginnie Mae and Government Sponsored Enterprise ("GSEs") net worth, liquidity and capitalization requirements over the evaluation period;
- **Projected compliance** with a series of common warehouse covenants; and
- **Projected risk of insolvency.**

Input Sought

Responders may provide input on any of the following topics and expand on the topics, as appropriate, to address related questions or implications that are not directly articulated below. Additionally, where applicable, responders may provide any relevant data analysis that would support input submissions.

Topic 1

Input is sought on the data sources, economic scenarios (and assumptions) and any simplifying assumptions leveraged by the framework. Detailed feedback regarding the strengths and weaknesses of the respective data sets is desired.

Topic 2

Input is sought on the modeling methods for the calculation of results and the associated validity of the calculation methodologies. Suggested alternatives to calculation methodologies are desired.

Topic 3

Input is sought on the effectiveness of the stress testing framework as a method for evaluating counterparty risk in the administration of the Ginnie Mae MBS program. Feedback is desired on whether or not the usage of the framework will materially enhance Ginnie Mae's understanding of how issuer risk would change in an adverse environment.

Topic 4

Input is sought on whether the framework should form the basis for policy making, including the formulation of issuer requirements as expressed in the MBS Guide. Specific recommendations and explanations are desired on how stress testing should or shouldn't shape policy.

Instruction For Submitting Input

Participants who wish to respond to this request should **send responses via email no later than 3:00 PM Eastern Time on August 31, 2019 to gnma.rfi.submission@hud.gov**.

Ginnie Mae acknowledges that any responses are provided completely on a voluntary basis and responses are not required for participation in any federal program. Please clearly mark all responses with “Voluntary response provided to HUD in response to an RFI. This is not a required submission for participation in a federal program.” Any responses provided to Ginnie Mae may be subject to release subject to the Freedom of Information Act (FOIA).

Should responses be responsive to a FOIA request, HUD will process in accordance with the law and apply any FOIA exemptions that may apply. If you wish HUD and Ginnie Mae to consider any portion of your response exempt from disclosure under the FOIA, you should clearly mark that portion as “confidential commercial information.”

Please include in your response the following information:

- **Name(s) or organization(s) and addresses.**
- **Contact information.**

Important Notes (Disclaimer)

This RFI is not a request for proposal, request for quotation, offer or an invitation for bid, nor does its issuance restrict the Government on its eventual activities. This is an RFI only, and all information received will be used for planning and market research purposes only. Information received will not be published. Respondents will not be notified of any results derived from a review of the information

provided. This RFI should not be construed as a commitment by Ginnie Mae. All information contained in the RFI is preliminary and is subject to modification and is in no way binding on the Government. The Government will not pay for information received in response to this RFI. Responders to this RFI are solely responsible for all expenses associated with responding to this RFI.



Request for Input

Stress Testing Framework

July 22, 2019

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ISSUER STRESS TESTING FRAMEWORK OVERVIEW

Below are the structural components that form the basis for the Issuer stress testing (“IST”) Framework. The components are based on guidelines outlined in the former Dodd-Frank Act stress testing guidance as well as other risk management practices at Ginnie Mae.



Data

Identified potential data sources and assessed quality and completeness of data for modeling purposes



Performance Criteria

Identified relevant metrics and thresholds to assess Issuer performance



Model Selection

Identified appropriate model methodologies based on data availability



Financial Statement Segmentation

Identified significant balance sheet, income statement, and supplemental line items to be projected discretely



Economic Scenario Generation

Developed expected and stressed scenarios designed to shock specific areas of Issuer financial performance



Projection Methodology and Assumptions

Projected financial performance for the discretely modeled line items using quantitative models, ratios to other modeled financial items, or other non-statistical methodologies

DATA



The following guiding principles were assessed in identifying the data to use in the IST Framework.

1. Financial data fields should be structured, consistent, and available for Issuers on a quarterly basis over a sufficient historical time period
2. The granularity of available data fields should be appropriate for the various model types used in the Framework
3. Data should be accurate and complete

The following table provides a description of the primary data sources used in the Framework.

Data	Description
MBFRF	<p>Issuers are primarily composed of lesser regulated, mostly private financial institutions. This leads to limited availability of relevant primary data sources. Ginnie Mae, Fannie Mae, and Freddie Mac (the latter two will be referred to as “GSEs” henceforth) require Issuers not regulated by a governing body (e.g., Federal Deposit Insurance Corporation (“FDIC”), National Credit Union Administration (“NCUA”)) to provide quarterly, unaudited financial statements. This data is provided via the Mortgage Banking Financial Reporting Form (“MBFRF”). MBFRF includes over 1,500 fields across 22 schedules in a structured format which is conducive to modeling with minimal data restructuring. The current layout of the MBFRF web-formatted data hosted on the MBFRF site dates back to Q3 2008. MBFRF serves as the primary source of financial statements for the Issuers as it represents the most comprehensive financial dataset available for non-depository mortgage Issuers.</p> <p>There are limitations to the data within MBFRF. These include elements of data incompleteness, inconsistencies, unintuitive results, and lack of data reported in certain supplementary schedules that are critical for modeling. For example, B010 (Outstanding Balance on Debt Facilities) should equal K040T (Total Outstanding Borrowings). Significant inconsistencies were observed for multiple Issuers within these fields, which leads to incorrect estimated value for WHL balances. In addition, early buyout (“EBO”) lines were not consistently reported in Schedule K, though its use in the industry is common.</p> <p>Ultimately, MBFRF was selected as the primary database for Issuer financial data as it is consistently available for Issuers on a quarterly basis and has a sufficient amount of granularity for modeling purposes. No other data sources met these requirements.</p>

DATA (CONTINUED)

Data	Description
Macroeconomic Variables	<p>Certain models used within the Framework require projections of macroeconomic variables to project significant line items within the Issuer financial statements. An industry-leading publisher of historical and projected economic data was used to provide macroeconomic variables for the two scenarios in the Framework – expected and stressed. The specific scenarios selected generally align with the Federal Reserve Bank’s Comprehensive Capital Analysis and Review (“CCAR”) baseline and severely adverse scenarios. Sample macroeconomic variables used in the Framework include Home Price Index, Total Origination Volume (Purchase and Refinance), Consumer Price Index, the 30-Year Residential Mortgage Rate, and Percent of Loans in Foreclosure.</p>
Ginnie Mae Internally Available Data	<p>As part of participating in the Ginnie Mae mortgage-backed security (“MBS”) program, Issuers must report loan-level data for their Ginnie Mae servicing portfolios to Ginnie Mae. One of the uses of this data is to perform a periodic independent mortgage servicing rights (“MSR”) valuation to compare against Issuer-reported MSR values. In addition, the loan-level data is used to assess the potential future exposure (“PFE”) to Ginnie Mae in the event of an Issuer default. These existing data sources and models were leveraged for stress testing purposes.</p> <p>In addition, Ginnie Mae actively tracks Issuer financial performance for internal monitoring and reporting. Each Issuer is assigned an internal risk rating (Issuer risk grade, or “IRG”) based on individual Issuer performance relative to other participants in the Ginnie Mae MBS program. This process is also leveraged for stress testing purposes.</p>
Other External Data Sources	<p>Other data sources include market research published by capital markets and MSR valuation firms regarding historical and recent MBS securitization pricing, MSR valuation multiples, and other MSR inputs.</p>

MODEL SELECTION



The following guiding principles were assessed in selecting the model methodologies to use in the IST Framework.

1. Methodologies selected should be appropriate for their intended use as stress testing models and represent a balance between complexity and transparency
2. Where possible, selected modeling methodologies should include quantitative links between changes in macroeconomic variables and Issuer performance
3. Segmentation of modeled results should be detailed enough to appropriately capture the significant operations and risks of the Issuers while being consistent with the segmentation used in other models in the Framework
4. Outputs should include sufficient transparency for end users to effectively understand and evaluate Issuer performance results and the associated drivers

The following tables provide a description of the modeling methodologies used in the Framework.

Model	Description
<p>Origination Volume Model</p>	<p>In addition to existing servicing balances, the Framework projects new originations and securitizations and their subsequent MSR valuations/cash flows in each projection quarter. Future originations provide a source of cash from fees and premiums above par from loan securitizations, while future MSRs provide a servicing cash flow stream and have other non-cash balance sheet and income statement impacts.</p> <p>To project Issuer-specific origination volumes in varying economic scenarios, a regression analysis was performed that correlated historical Issuer-level origination volumes (split by purchase and refinance) to historical aggregated, industry-level origination volumes published by a third party firm. The output of the correlation analysis is a beta (or ratio of Issuer volume to aggregate industry volume), which is applied to projected industry origination volumes to arrive at Issuer-specific origination volumes by type and for each projection period. The projected Issuer-specific origination volume is used to generate fees, securitization gains, and future MSR balances and cash flows.</p> <p>The current period Ginnie Mae loan-level data is used to derive starting point for the loan-level characteristics for future tranches (e.g., loan-to-value (“LTV”) ratios and FICO scores), with adjustments to certain characteristics for the GSE origination volume. The future interest rate for new originations is based on the projected 30-year residential mortgage rate.</p>

MODEL SELECTION (CONTINUED)

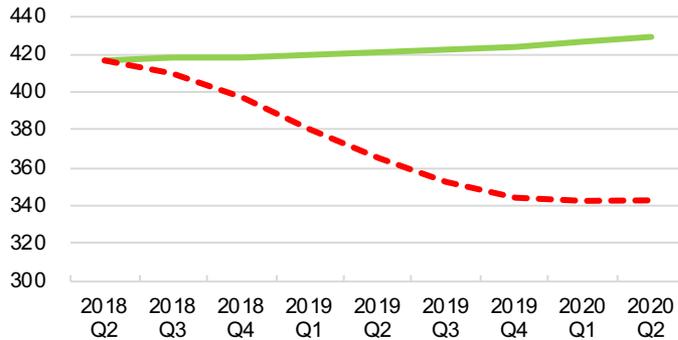
Model	Description
Econometric Models (PD, LGD, and CPR)	<p>Econometric models were developed to project probability of default (“PD”), loss given default (“LGD”), and full voluntary prepayment rate (“VPR”) for the Ginnie Mae servicing portfolios. The PD and VPR models are logistic regression models that estimate historical correlation of PDs and VPRs at the loan level to certain underwriting characteristics and macroeconomic data. The resulting model equations are applied to the Ginnie Mae loan level attributes and projected macroeconomic variables to develop estimates of PDs and VPRs over the projection period for the Ginnie Mae Single Family (“SF”), Multifamily (“MF”), and GSE loan portfolios. The LGD model utilizes assumptions regarding collateral recovery rates and property preservation costs in order to develop estimates for each of the loan types.</p>
MSR Projection Model	<p>Ginnie Mae utilizes a proprietary MSR projection model to estimate MSR balances and cash flows for risk management purposes. This model is leveraged for stress testing purposes. Loan-level data is prepared and integrated with pool, insuring agency, and macroeconomic data for input into the MSR projection model.</p> <p>Ginnie Mae loans are aggregated into cohorts based on product attributes (e.g., agency, vintage, state, ARM) and amortized over their remaining lives using contractual terms and the econometric model outputs described above. Future loan origination tranches are created based on outputs from the origination volume model, the most recent quarter’s loans characteristics, and projected interest rates in each quarter. The current book and new origination tranches are re-amortized over their remaining lives based on new interest rate forecasts in each projected quarter. For each quarter, amortized balances are run through a cash flow engine to estimate servicing inflows and outflows (e.g. advances, foreclosures, claim recoveries). Cash flows are then aggregated by Issuer and an after-tax cost of equity is applied to arrive at the Issuer-specific MSR fair value in each projection period.</p> <p>For GSE loans, a synthetic GSE loan-level file is compiled based on the geographical concentration of an Issuer’s Ginnie Mae portfolio, adjusted for conventional loan credit characteristics (e.g., lower LTVs, higher FICOs) based on publicly available data. The synthetic loan-level file is then subject to the same process described above with the exception of differing assumptions for servicing fee, servicing cost, and liquidity dynamics, which are adjusted to account for GSE servicing guidelines (e.g., advance economics and GSE repurchase).</p> <p>In order to minimize differences in reported vs projected MSR values, the outputs of the MSR projection model are converted into common size ratios and applied to the starting period MSR values from MBFRF.</p>
IST Model	<p>The IST Model aggregates outputs from the other models used in the Framework as well as MBFRF and other data to project Issuer-level financial performance over an 8-quarter projection period for each economic scenario. The line items projected include a full set of dynamic financial statements (balance sheet and income statement) as well as supplemental items not included within financial statements that are used to develop projected financial performance. The IST Model also calculates performance metrics for each Issuer based on their projected performance and assigns the projected IRG and IST ratings.</p>

ECONOMIC SCENARIOS

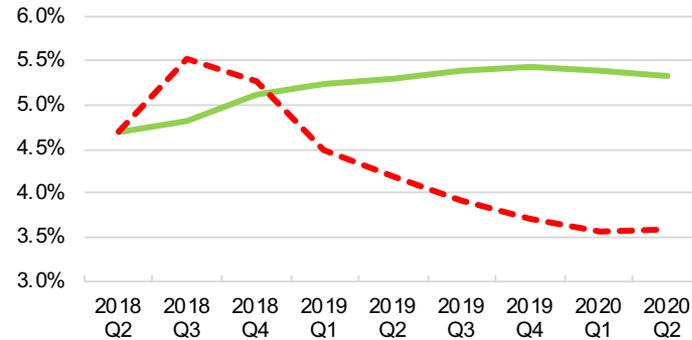


The IST Framework uses two economic scenarios to project Issuer performance – expected and stressed. The expected scenario is intended to be a projection of economic conditions in line with the Federal Reserve’s baseline CCAR scenario. The stressed scenario is intended to reflect a heavy short term economic downturn commensurate with the Federal Reserve’s severely adverse CCAR scenario. All forecasted economic variables are sourced from an independent third party. See below for illustrative examples of variable projections between the two scenarios.

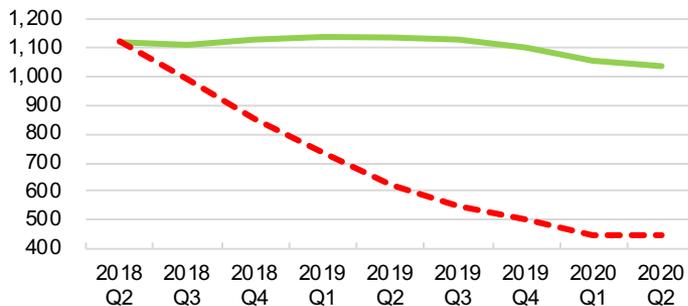
Home Price Index



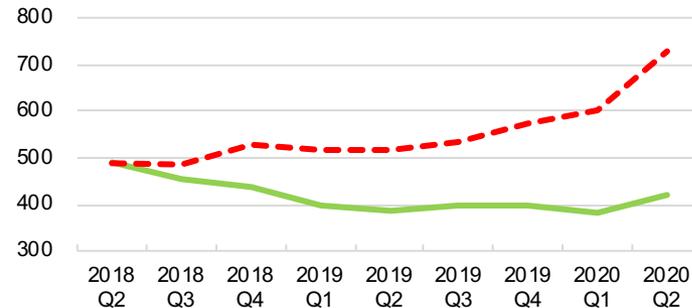
30-Year Residential Mortgage Rate



Total Origination Volume - Purchase, \$ Billions



Total Origination Volume - Refinance, \$ Billions



— Expected - - - Stressed

PERFORMANCE CRITERIA



The performance metrics utilized to assess Issuer performance in the IST Framework are grouped into the following categories. The components of the performance metric calculations are discussed in the Projection Methodology section.

Issuer Risk Grade Metrics

IRG scores, Ginnie Mae's proprietary risk rating method, are calculated for each Issuer and projection period using the results of the Issuer's financial performance and related risk metrics reviewed by Ginnie Mae. The IRG metrics are used to assess the performance of each Issuer relative to other participants in the Ginnie Mae MBS program.

Compliance Metrics

Ginnie Mae SF, Ginnie Mae MF, and GSE compliance metrics and ratios are calculated for each Issuer and projection period. The applicable ratios and requirements vary based on the underlying asset type for each portfolio serviced by the Issuers.

Debt Covenants

Certain debt covenants were identified based on a review of Issuer financial data, discussions with warehouse lenders as well as participants in the mortgage banking industry, and research of publicly disclosed information. These covenants were tracked over the projection period for each Issuer, with violations of debt covenants impacting warehouse line commitment capacity.

Overall Issuer Stress Test Rating

The final output of the modeling process is an Issuer-specific rating based on the aggregate performance of the Issuer using metrics from the above categories.

PERFORMANCE CRITERIA (CONTINUED)

Below are details on the individual compliance ratios considered in the IST model when assessing Issuer performance for each projection period and economic scenario.

Metric	Description
<i>Compliance Metrics</i>	
Adjusted Net Worth Requirement	<p>The adjusted net worth compliance ratio is one of three core compliance ratios for both Ginnie Mae Issuers and GSE seller/servicers. Depending on the type of servicing portfolio each Issuer holds, they may be subject to one or more of the below ratios in the IST model.</p> <ul style="list-style-type: none"> • Ginnie Mae SF - the sum of \$2.5 million and 0.35% of the outstanding Ginnie Mae SF unpaid principal balance (“UPB”) • Ginnie Mae MF - the sum of \$1.0 million and a) 1.00% of Ginnie Mae MF UPB and commitment authority (“CA”) between \$25 million and \$175 million; and b) 0.20% of incremental Ginnie Mae MF UPB and CA above \$175 million • GSE - the sum of \$2.5 million and 0.25% of all SF UPB
Liquid Asset Requirement	<p>The liquid asset compliance ratio is one of three core compliance ratios for Ginnie Mae Issuers only. Depending on the type of securitized portfolio the Issuer holds, they may be subject to one or both of the below ratios in the IST model.</p> <ul style="list-style-type: none"> • Ginnie Mae SF - the greater of \$1 million or 0.10% of Ginnie Mae SF UPB • Ginnie Mae MF - 20.00% of the Ginnie Mae MF adjusted net worth requirement
Agency Serious Delinquent Rate	<p>The agency serious delinquency rate is used by the GSEs to require liquidity levels for seller/servicers in their program, as Ginnie Mae enforces a separate liquid asset requirement on its Issuer base. The agency serious delinquent rate is one of three core compliance ratios for GSE seller/servicers only and the requirement is liquid assets equal to 0.035% of all SF UPB plus 2.00% of delinquent loan balances that exceed 6.00% of the total outstanding UPB.</p>
Capital Requirement	<p>The capital compliance ratio is one of three core compliance ratios for both Ginnie Mae Issuers and GSE seller/servicers in order to measure capital adequacy and leverage of the Issuer. The capital requirement is consistent across both entities and is calculated as the ratio of adjusted net worth to total assets, with the minimum threshold set at 6.00%.</p>

PERFORMANCE CRITERIA (CONTINUED)

Below are details on the individual debt covenants considered in the IST model when assessing Issuer performance for each projection period and economic scenario.

Metric	Description
<u>Debt Covenants</u>	
Minimum Adjusted Net Worth	The minimum adjusted net worth debt covenant is similar in nature to the compliance ratio. However, the calculation of this threshold utilizes all outstanding UPB instead of only specific types of portfolios in order to account for the full range of origination activities for each Issuer. The threshold for all Issuers is set based on net worth covenant requirements reported by Issuers and available market data for industry-standard covenant requirements.
Liquid Assets / Total Assets	The liquid asset to total asset debt covenant is similar in nature to the compliance ratio, however the calculation of the threshold utilizes total assets as the basis instead of outstanding UPB. The threshold for all Issuers is set based on net worth covenant requirements reported by Issuers and available market data for industry-standard covenant requirements.
Leverage Ratio	Based on debt covenants disclosed by industry participants, a leverage ratio covenant was also included in the IST model in order to assess an Issuer's potential riskiness and capital position. The leverage ratio is calculated as the ratio of total liabilities to adjusted net worth, and the threshold is set based on consideration of publicly available covenant information as well as consideration of the capital compliance requirement for Ginnie Mae and the GSEs.
Minimum Net Income	While many Issuers have minimum net income covenants within their warehouse lending and debt agreements, the enforcement of minimum profitability requirements has not been observed based on an assessment of recent violations for certain Issuers compared to their subsequent warehouse line availability in MBFRF. Therefore, this covenant was considered but not used within the IST model when determining possible capacity reductions.

PERFORMANCE CRITERIA (CONTINUED)

Below are details on the IST rating used to assess the overall Issuer performance for each economic scenario in the IST Model.

Metric	Description
<i>Issuer Stress Test Rating</i>	
Pass	An IST rating of Pass indicates that the Issuer does not meet any of the criteria for the below categories, and maintains adequate levels of capital and liquidity in each projection period for each scenario.
Watch	An IST rating of Watch indicates that the Issuer has one or more compliance ratios in the Watch category or has their warehouse line capacity was reduced in the stressed scenario. The Watch category threshold is determined as being within a 50% buffer of the Ginnie Mae and GSE compliance ratios.
Potentially Non-Compliant	An IST rating of Potentially Non-Compliant indicates that the Issuer has one or more compliance ratios below Ginnie Mae's or the GSE's minimum compliance thresholds, but the Issuer maintains positive overall capital and equity levels in the projection period.
Potentially Deficient	An IST rating of Potentially Deficient indicates that the Issuer has negative capital or liquidity in at least one projection period and may be at risk of insolvency. Issuers rated Potentially Deficient are flagged for further examination as to the causes of the deficiency and if any mitigating actions may be available to mitigate the outcome of the stress test.

FINANCIAL STATEMENT SEGMENTATION

Approach



The financial statement segmentation process began with data available from the MBFRF database. The MBFRF dataset contains over 1,500 fields across 22 schedules. Segmentation for IST purposes was determined based on consideration of the following criteria:

- The materiality of the line item in the historical MBFRF data using a minimum threshold relative to the appropriate corresponding basis of the line item
- Level of detail required for the calculation of performance criteria
- Significance to certain Issuers' financial statements and operations
- Possible significance or impact to financial performance in stressed periods, including their overall sensitivity to changes in economic conditions

Line items that did not fall into one of the above criteria (e.g., Other Assets) were grouped with other similar line items and projected on an aggregate basis.

FINANCIAL STATEMENT SEGMENTATION (CONTINUED)



Below are the balance sheet line items and additional off-balance sheet items that are projected within the IST model.

Assets

Cash & Cash Equivalents - Unrestricted
Cash & Cash Equivalents - Restricted
Available for Sale ("AFS") & Other Securities
Other Liquid Investments
Loans Held For Sale
Loans Held For Investment
Allowance for Loan Losses
MSRs
Derivatives
Owned Real Estate Owned ("OREO")
Deferred Tax Assets
Goodwill & Intangibles
Other Assets - Disallowed
Servicing Advances
Other Assets

Off-Balance Sheet Items

Loan Origination Volume
Loan Securitization Sales Volume
Ginnie Mae Commitment Authority
UPB of Servicing Portfolios
Net Charge-Offs
MSR Sales Volume

Liabilities

Warehouse Lending Lines
Financing for Servicing Advances
Short-Term Debt
Long-Term Debt
Mortgage Putback Liabilities
Servicing Liabilities
Derivative Liabilities
Deferred Tax Liabilities
Other Liabilities

Equity

Common Stock
Treasury Stock
Preferred Stock
Retained Earnings
Accumulated Other Comprehensive Income ("AOCI")
Other Equity

Unrealized Gain (Loss) on AFS Securities
Adjusted Net Worth
Liquid Assets
Agency Serious Delinquency Rate ("SDQ")

FINANCIAL STATEMENT SEGMENTATION (CONTINUED)

Below are the income statement line items that are projected within the IST model.



Interest Income

Interest Income - Loans Held For Sale (“HFS”)
Interest Income - Loans Held For Investment (“HFI”)
Interest Income - AFS & Other Securities
Interest Income - Other

Interest Expense

Interest Expense - Warehouse Lending Lines
Interest Expense - Financing for Servicing Advances
Interest Expense - Other Debt

Net Interest Income

Non-Interest Expense

Salaries and Benefits - Loan Production Officers
Salaries and Benefits - Originations
Salaries and Benefits - Servicing
Salaries and Benefits - Other
Subservicing Expense
OREO Write-Down Expense
Provision Expense
Other Non-Interest Expense

Non-Interest Income

Loan Origination Fees
Ginnie Mae Commitment Authority Expense
Gain on Securitization Sales
Gain (Loss) on Loan Repurchases
Gain (Loss) on Resolution of Delinquent Loans
Gain (Loss) on & Servicing Advances
Putback Reserve Expense
Capitalized MSR Value
Servicing Income
Subservicing Income
MSR Amortization
Fair Value Adjustments
Fees Paid To Brokers
Other Servicing Related Income
Other Non-Interest Income

Pre-Tax Income

Taxes

Net Income

Net Cash Flow¹

¹ Net Income less non-cash items

PROJECTION METHODOLOGY AND ASSUMPTIONS



Approach

Once financial statement segmentation for the IST Framework was determined, each segment was examined individually in order to determine the most appropriate projection methodology for that line item based on the same criteria used to determine the segmentation. The projection methodologies used within the IST Framework fall into the following categories:

- Statistical Model Forecast – Outputs estimated using statistical methods that establish a quantitative relationship between line item performance and macroeconomic variables
- Modeled Output – Outputs estimated in a non-statistical model based on a set of inputs and assumptions (e.g., MSR projection model outputs)
- Value Driver – Outputs calculated based on historical ratios to related line items as a starting point, which are then projected based on changes in economic variables (e.g., expense ratios or interest yields)
- Assumption – A direct input into the IST model using external research as the basis (e.g., tax rate, debt covenant thresholds and capacity reduction amounts)
- Calculation – Based on a static formula and the outputs for other modeled line items (e.g., unrestricted cash, retained earnings)

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<i>Balance Sheet - Assets</i>	
Cash & Equivalents - Unrestricted	<p>Unrestricted cash serves as the main indication of liquidity for Issuers. This line item is projected based on each Issuer's beginning unrestricted cash balance and their financial performance in each projection period. This results in a single line item that can be used to assess liquidity levels for each Issuer in each projection period.</p> <p>The unrestricted cash balances are used in determining Issuers' liquid assets ratios for compliance and debt covenant requirement purposes as well as being an indication of potential stress to an Issuer's liquidity should it become negative.</p>
Cash & Equivalents - Restricted	<p>Restricted cash is bifurcated from unrestricted cash due to its importance in Issuers' debt agreements. Generally, restricted cash is unable to be used for liquidity purposes and thus is not included in calculations of liquid assets. Restricted cash is projected based on the current period ratio between Issuers' reported restricted cash levels and outstanding warehouse lending balances in MBFRF.</p>
AFS & Other Securities	<p>AFS securities are a liquid investment for Issuers that are interest-earning and can be a source for short-term liquidity needs. AFS securities are segmented from other assets due to their importance in calculating liquid asset ratios for compliance and debt covenant purposes. No changes to current period AFS securities balances are projected aside from the mark-to market impact of projected changes in benchmark interest rates.</p>
Loans Held For Sale	<p>Loans HFS are the main balance sheet line item related to Issuers' origination activities. Within the modeling process, loans HFS are separated into subsegments based on security type (Ginnie Mae vs GSE).</p> <p>Loans HFS balances are projected based on considerations of Issuers' origination activity and volume (both purchase and refinance), time in warehouse, and available warehouse lending line capacity. In stressed periods, deterioration in Issuer performance may impact available warehouse lending capacity and therefore origination volume, which will then be reflected in the Loans HFS balances.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<p>Loans Held For Investment</p>	<p>For Issuers that maintain an on-balance sheet loan portfolio, loans HFI balances are primarily projected based on a) prior period balance less an estimated runoff and charge-off amount based on servicing UPB runoff from the MSR projection model; plus b) current period ratios of retained volume amounts relative to total securitization amounts from MBFRF. Other factors affecting loans HFI balances include early buyouts and mortgage repurchases.</p> <p>For Issuers that report Allowance for Loan and Lease Losses (“ALLL”) balances, ALLL is also projected as a contra-asset to the Issuer’s Loans HFI portfolio based on recent period relationships in MBFRF.</p>
<p>Mortgage Servicing Rights</p>	<p>For most Issuers, MSRs are the primary asset and source of income. MSR balances and related cash flows are projected using the MSR projection model which utilizes outputted estimates of prepayments, credit losses, and projected loan origination volume by Issuer and by loan segment from other models used in the Framework.</p> <p>The cash flow characteristics of the MSR portfolio are calculated using the Issuer’s current servicing portfolio composition as well as market-based assumptions for servicing income and costs, foreclosure timing, and servicing advances. Once the cash flows are estimated, a discount rate is estimated (based on an after-tax cost of equity) and applied to arrive at the MSR fair value in projection period. The after-tax cost of equity assumption is derived from an external source.</p> <p>The MSR outstanding UPB is determined in each projection period based on scheduled amortization and applying modeled assumptions for default and prepayment. In each projection period, each Issuer’s servicing portfolios are re-amortized based on changes in macroeconomic variables and other inputs. The projected UPB is then used as the basis for calculating cash inflows and outflows.</p> <p>The final MSR asset values are calculated as a result of several factors, including new securitizations, MSR amortization, fair value adjustments, and MSR sales. The projections are performed for both the Issuer’s existing portfolio as well as new volume. New volume is estimated as the product of projected origination volume and recent ratios of securitization volume to origination volume in MBFRF. In order to minimize differences in current period vs projected MSR values, the outputs of the MSR projection model are converted into common size ratios and applied to the starting period MSR values from MBFRF.</p> <p>MSRs may be adversely impacted in stressed periods by changes in interest rates leading to increased prepayments, shorter portfolio lives, and lower MSR fair values. In addition, increases in delinquencies may result in higher projected servicing advances, longer foreclosure periods, and higher LGD. In the MSR projection model, these additional liquidity demands are partially mitigated by Issuers utilizing prepayment balances in custodial accounts to temporarily fund eligible servicing advances, reducing the servicing advance receivable asset.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
Servicing Advances	<p>Servicing advances represent periodic payments made by Issuers on behalf of delinquent borrowers to the security investors. For many Issuers, servicing advances may represent a significant constraint on liquidity as they require temporary cash outlays which may not fully be recovered in future periods.</p> <p>For all Issuers, servicing advances were separated into principal and interest (“P&I”), taxes and insurance (“T&I”), and foreclosure and maintenance costs (“F&M”). This was done in order to model the recoverability of each type of servicing advance and the differing sources and ability to fund each type of advance payment. F&M recoveries are also adjusted for non-reimbursable F&M-related expenses.</p> <p>Projected servicing advances are calculated within the MSR projection model based on scheduled payments missed by delinquent borrowers, market assumptions for other related costs, and recoverability of prior servicing advances based on insuring agency claim guidelines. In addition, the length of the recovery and reimbursement process differs based on the underlying loan type and agency.</p> <p>The MSR projection model incorporates usage of prepayment balances in the custodial accounts to temporarily fund P&I servicing advances up to the available roll-forward capacity in each period, which partially mitigates stress on Issuer liquidity. The MSR projection model also calculates losses on the resolution of foreclosed loans using inputs from other sources and insuring agency claim guidelines.</p>
Derivatives	<p>For Issuers that utilize derivative instruments for hedging purposes, various derivative balances are projected based on changes in underlying macroeconomic variables. In stressed economic environments, changes in the underlying variables may lead to certain derivatives changing from net asset to liability positions or vice versa. Changes in projected derivative fair values may also impact the unrealized gain or loss on derivatives reported in non-interest income section of the Issuer’s income statement.</p>
Deferred Tax Assets / Liabilities	<p>Deferred tax assets (“DTAs”) and liabilities (“DTLs”) represent a wide array of tax-related differences between financial reporting income and tax income. These may include temporary timing differences as well as permanent differences.</p> <p>While many components of calculating DTAs are not impactful or driven by changes in economic scenarios, a significant DTA item that may arise in stressed periods is net operating losses (“NOLs”). Due to recent changes in federal tax law, Issuers’ NOLs can no longer be carried back to prior years’ taxes paid and instead become a temporary DTA that can only be utilized to offset future taxes payable. For Issuers with negative profitability, this causes a greater short term stress on liquidity as the ability to revert DTAs related to NOLs to cash is restricted.</p>
Other Assets	<p>Due to their relative immateriality and/or lack of variability in stressed periods, several other categories of non-earning assets were not stressed in the Framework, but were segmented out to calculate certain compliance ratios. These include other liquid investments, other real estate owned, goodwill & intangibles, and other assets.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<i>Balance Sheet - Liabilities</i>	
Warehouse Lending Lines	<p>Warehouse lending lines represent lines of credit used by Issuers primarily to fund loan originations. Warehouse lines generally represent the most significant source of funding and can directly impact an Issuer's ability to originate and securitize new loans if its availability were to be reduced.</p> <p>Warehouse line starting balances were identified based on line purpose identifiers reported for each Issuer in MBFRF Schedule K. For Issuers who had warehouse lines in excess of the current position of loans HFS, the warehouse line balances were bifurcated between loan HFS funding and other funding. In the projection period, warehouse line balances were estimated using an LTV assumption as a percentage of loans HFS, based on research of industry standard LTVs and line utilization during historical periods.</p> <p>Other factors that may influence projected warehouse line balances include reduction of available line capacity due to potential violation of covenants or compliance ratios, changes in loan time in warehouse resulting in higher line utilization, and changes in loan origination volume. For Issuers with deteriorating financial performance, cumulative violations of covenants on warehouse lending lines can lead to reduction in overall availability of lines or non-renewal of existing lines, constraining their ability to continue originating at their current levels.</p> <p>Warehouse line balances identified as other funding were deemed to be not related to origination activity and are not stressed in the IST model.</p>
Financing for Servicing Advances	<p>Servicing advances can be a significant stress on liquidity for Issuers due to the temporary mismatch in timing arising from the payment of cash flows to the security holders on delinquent loans and the recovery of prior advanced amounts after the delinquent loan has been resolved (e.g., reimbursement by agencies or subject to early buyout arrangements). Servicing advances are reclassified from cash to a servicing advance receivable on the balance sheet, which reduces the basis for adjusted net worth and liquidity compliance ratios.</p> <p>As a mitigating factor to potential stress to liquidity, many Issuers have access to a line of credit facility that allows for draws to cover the servicing advance payments through the foreclosure, liquidation, and recovery process instead of cash. As identifiers for servicing advance facilities were not widely reported within MBFRF, all Issuers were considered to have access to funding for servicing advances.</p> <p>The portion of servicing advance receivables that could be financed is based on the type and recoverability of the servicing advances, which forms the basis of the facility's LTV. More stringent LTV limitations are applied during stressed periods. As underlying collateral is recovered, the servicing advance receivable is reduced by the cash amount, with a corresponding servicing advance funding paid off and the remaining proceeds recorded as cash.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
Long-Term Debt	<p>Long-term debt typically has a wide variety of uses in Issuers' balance sheets, including for operating capital as well as funding loans HFI and fixed asset purchases. For Issuers that retain originated loans on their balance sheet, long-term debt is the most common funding source used. As such, projected increases in the loans HFI balance were funding with long term debt based on an assigned LTV. The assigned LTV was derived from either data reported in the Issuer's MBFRF data or an industry standard LTV.</p> <p>Other long-term debt not related to loans HFI are not considered material and are not stressed in the projection period. No paydowns of such balances are assumed during the projection period, and maturing debt balances are assumed to be renewed.</p>
Mortgage Putback Liabilities	<p>Mortgage putback liabilities are a reserve account for anticipated future delinquent loans that Issuers may need to be repurchased from due to issues related to performance or the underwriting process (e.g., TRID compliance, non-compliant Veterans Affairs ("VA") loans).</p> <p>The balance of the putback liability is projected based on a ratio of the Issuer's starting liability balance as a proportion to the underlying UPB of the applicable balances, as derived from reported data in MBFRF. As the UPB changes in projected periods, the mortgage putback liability may increase or decrease accordingly.</p>
Other Liabilities	<p>Due to their relative immateriality and/or lack of variability in stressed periods, several other categories of liabilities were segmented due to requirements to calculate certain compliance ratios but not stressed in the modeling process. These include short term debt, servicing liabilities, and other liabilities.</p>
<i>Balance Sheet - Equity</i>	
Retained Earnings	<p>Retained earnings forms the basis of the Issuer's overall equity performance, capturing the results of operations in each period in a cumulative balance net of any dividends paid. Retained earnings is projected simply as the prior period balance plus net income less dividends paid.</p> <p>Dividends paid are considered to be discretionary and are commonly also paired with capital infusions from a related entity. For purposes of assessing potential liquidity stress, no dividends are forecasted to be paid in the projection period.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<p>Other Equity</p>	<p>Due to their relative immateriality and/or lack of variability in stressed periods, several other categories of equity were segmented due to requirements to calculate certain compliance ratios but not stressed in the modeling process. These include common stock, treasury stock, preferred stock, AOCI, and other equity. As Issuers are modeled as standalone entities, incremental capital infusions are not included in the projection period.</p>
<p><u>Income Statement - Net Interest Income</u></p>	
<p>Net Interest Income</p>	<p>While net interest income is not the primary source of income for most Issuers, the impact of changes in interest rates on Issuer liquidity can be significant. Issuers often maintain interest-earning assets and finance large portions of their operations through debt and revolving facilities that may be sensitive to changes in market conditions. As such, it is necessary to assess the impacts of changes in the interest rate environment on Issuers' interest income and expense in order to project their overall liquidity and capital performance.</p> <p>To facilitate the projection of net interest income, interest earning assets and interest bearing liabilities were separated into segments according to the underlying asset and granularity of data available from MBFRF. These categories included AFS & other securities, loans HFS, loans HFI, and other interest income as well as warehouse lending, servicing advance funding, and other debt interest expense.</p> <p>The yields for the line items were calculated for each Issuer based on a percentage of the underlying asset or liability as reported data from MBFRF. In the projection period, yields are adjusted for line items determined to be variable rate in nature based on changes in reference rates from the economic variable projections. The resulting yield is then applied to the average balance during the quarter to arrive at the overall interest income or expense. To mitigate data issues within the MBFRF dataset, certain yield caps were employed where necessary to prevent yields from exceeding certain maximum thresholds.</p>
<p><u>Income Statement - Non-Interest Income</u></p>	
<p>Loan Origination Fees</p>	<p>Loan origination fees represent the fee income that the Issuer receives during the loan underwriting process from the borrower. Origination fee income is a primary source of income for Issuers that originate loans to be held or securitized.</p> <p>Loan origination fees are calculated as a percentage of total origination volume based on fee income and origination volumes reported in recent quarters' MBFRF data for the Issuer. As Issuer's origination volume changes over the projection period, the calculated loan origination fee income will move in the same direction.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
Ginnie Mae Commitment Authority Expense	<p>Ginnie Mae CA expenses are costs paid by Issuers in order to acquire additional capacity to issue Ginnie Mae securities. As Issuers securitize eligible loans, their available capacity is depleted and they must replenish available capacity in order to continue issuing securities.</p> <p>Purchases of Ginnie Mae CA are calculated based on Ginnie Mae stated rates of \$500 for the first \$1.5 million and \$200 for each \$1 million thereafter. Purchased commitment capacity is calculated using Issuers' projected short term future origination and securitization volume, with Issuers assumed to maintain a minimum available capacity to allow for swift clearance of loans within their warehouse and securitization pipeline.</p>
Gain on Securitization Sales	<p>A primary source of income for Issuers within the Ginnie Mae program is the gain on sale of securitized assets. For IST modeling purposes, the gain on sale of securitized assets represents the gross proceeds from the securitization (i.e., the price paid over book for the securities) and is not net of other income and expense line items. Those items are netted out separately in the IST model.</p> <p>The securitization price can vary depending on the security type. As a starting point, the aggregate gain on sale is calculated based on reported data from MBFRF. Given volatility in this ratio in a given quarter, an average over a longer time period is used to calculate the starting gain on sale percentage. This ratio is then bifurcated by security type based on implied pricing from the MSR projection model and market data regarding to be announced ("TBA") pricing.</p> <p>In the expected scenario, the starting gain on sale ratio is held constant over the projection period. In the stressed scenario, the gain on sale ratio is reduced initially, then trends back to the starting ratio over the projection period. The short term reduction to Issuers' gains on sale percentages is based on market research regarding changes in securitization pricing during previous recessionary periods.</p>
Putback Reserve Expense	<p>The putback reserve expense represents the net increase or decrease of the reserve account quarter over quarter, and is calculated based on the change in projected mortgage putback liability balances. Given the population that this is line item is applicable to, the impact of this line item on financial performance is not significant.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<p>MSR-related Income Items</p>	<p>On an Issuer’s income statement, MSR-related line items are comprised of a wide array of both cash and non-cash amounts. These line items include capitalized MSRs from newly securitized loans, servicing income on currently outstanding loan balances, subservicing income for loans subserviced by or for other entities, MSR amortization, fair value adjustments for changes in economic and market conditions, and adjustments to MSR balances arising from the sale of MSR assets.</p> <p>MSR-related items are modeled by the proprietary MSR projection model using loan-level data, econometrically modeled estimates of prepayments, credit losses, macroeconomic variables, and origination volumes by Issuer. Outputs from the projection model include MSR fair values on existing and newly originated MSRs, as well as servicing income and amortization of outstanding MSRs.</p> <p>The specific components of servicing income include net servicing fee collections, ancillary income, float income (for non-Ginnie Mae servicing), servicing costs for both performing and non-performing loans, and out-of-pocket foreclosure expenses. Net servicing fee collections are projected based on forecasted mortgage rates, security rates, and guaranty fees as a percentage of the overall performing UPB. The other income and expense components are based on industry data on a per-loan or UPB basis as appropriate. Non-performing servicing costs are affected by increases in defaulted loan inventory.</p> <p>Using the outputs provided by the MSR projection model, fair value adjustments for MSRs are calculated based on the MSR fair value percentage applied to the outstanding UPB, with adjustments made for changes in balance and sale of MSRs.</p> <p>For many Issuers, ongoing MSR sales are part of their operating strategy to create operational liquidity. As periodic MSR sales amounts are reported within MBFRF data, these amounts are used within the modeling process to determine recent trends in the rate of MSR sales as a percentage of the Issuer’s MSR balance in each period. In the expected scenario, MSR sales are assumed to be at fair market value, and adjustments to servicing loan UPB and other MSR-related line items are made to account for reductions due to MSR sales. In stressed periods, MSR sales are halted due to a general economic liquidity constraints and the potential discount on the MSR price required to transfer the MSR asset.</p> <p>While subservicing assets are not discretely modeled using the same loan-level data as the servicing portfolios within the MSR projection model, the projection of subservicing assets is based on growth rates, yields, and runoff assumptions from the servicing portfolios in the MSR projection model, applied to the subservicing portfolio for each Issuer. The subservicing income is then determined using the recent ratios of subservicing income to servicing income from MBFRF, applied to the net subservicing assets for the Issuer.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
Fair Value Adjustments	Fair value adjustments measure changes in the recorded fair value of certain balance sheet line items due to changes in economic and market conditions that can be independent of other factors (e.g., credit losses). Fair value adjustments were assessed for loans HFS, derivatives, and MSRs based on changes in projected economic variables.
Fees Paid To Brokers	Fees paid to brokers represents expenses incurred by Issuers during the loan origination process and represent an expense line item commensurate with origination volume. Reported data from MBFRF was used to calculate a current period ratio of fees paid to brokers to total origination volume, which is then applied to origination volumes in projected periods to derive forecasted fees paid to brokers.
Other Servicing Related Income	Other servicing related income includes income and expenses that are not explicitly forecast by the MSR projection model. These amounts are based on the reported other servicing related income from MBFRF, and are projected using changes in projected servicing loan UPB in each of the projection periods.
Other Non-Interest Income	Due to their relative immateriality on an individual basis, several other categories of non-interest income were not stressed in the modeling process. These line items were projected in aggregate based on changes in Issuer's origination volume where available.

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<i>Income Statement - Non-Interest Expense</i>	
Salaries and Benefits	<p>Salaries and benefits are the main source of non-interest expense for many Issuers. Reported salaries and benefits were split between loan origination, loan servicing, and other personnel.</p> <p>Salaries and benefits related to origination activities were bifurcated between variable and fixed expense categories. Variable compensation was based on an expense ratio developed from historical MBFRF data for each Issuer and applied to quarterly overall loan origination volume. Fixed compensation was assumed to grow at a nominal rate and was only adjusted when structural shifts in an Issuer's projected origination activity occur (e.g., assumed loss of warehouse lending facilities due to covenant violations, as well as assumed voluntary reductions of originations to avoid violations of compliance ratios).</p> <p>Salaries and benefits related to servicing activities were assumed to grow commensurate with the growth in the overall servicing portfolio. During periods of economic stress, salaries and benefits related to servicing activities were not projected to decline if the servicing portfolio UPB declines as potential reduction in staff to service the loans were considered to be reallocated to special servicing for delinquent loans.</p> <p>Salaries and benefits for other personnel were projected to grow based on changes in Issuer's origination volume where available.</p>
Other Non-Interest Expense	<p>Due to their relative immateriality and/or lack of variability in stressed periods, several other categories of non-interest income were not stressed in the modeling process. These line items were projected in aggregate based on changes in Issuer's origination volume where available.</p>
Taxes	<p>Taxes are based on an assumed national blended federal and state corporate income tax rate. The marginal tax rate is applied to pre-tax income and is consistent for all Issuers and projection periods. Calculated pre-tax income excludes certain non-cash line items, such as capitalized MSR and MSR amortization amounts.</p>

PROJECTION METHODOLOGY AND ASSUMPTIONS (CONTINUED)

Segment	Description
<i>Supplemental Items</i>	
<p>Loan Origination Volume</p>	<p>Projected origination volume is based on the product of: a) projected industry origination volumes (split by purchase and refinance); and, b) Issuer-level betas calculated in the origination volume model. The industry loan origination volume is then split into origination volume by security type (Ginnie Mae SF, Ginnie Mae MF, and GSE portfolios).</p> <p>Aside from changes in projected industry origination volume in each quarter, reductions in warehouse lending capacity will also impact projected origination volume. Reductions in warehouse lending capacity occur in the Framework when Issuers incur consecutive violations of warehouse lending covenants in the stressed scenario. After multiple covenant violations, warehouse lending capacity is reduced, which translates into a reduction in originations, securitizations, and related income. Certain of the origination-related expenses are also reduced, but to a lesser extent than the loss of income.</p> <p>Additionally, during periods where Issuers are facing severe liquidity or capital stress but have not yet violated warehouse lending covenants in consecutive quarters, Issuers are assumed to voluntarily reduce their origination volumes (and therefore their cash and equity requirements to fund new originations) in order to avoid or address violations of Ginnie Mae and GSE compliance ratios. Should Issuers improve their liquidity and/or capital position above the specified requirement without incurring consecutive covenant violations, full origination production is resumed in subsequent quarters.</p>
<p>Loan Securitization Sales Volume</p>	<p>Loan securitization sales volume utilizes projected loan origination volume in conjunction with an Issuer's average time in warehouse in order to calculate total securitized volume within a projection quarter. The securitized volume is adjusted for loans retained as HFI on an Issuer's balance sheet, as well as loans sold with servicing released. The remaining origination volume is assumed to be securitized and is an input into the MSR projection model as newly securitized MSR volume.</p> <p>The basis for an Issuer's time in warehouse, HFI retention ratio, and loans sold with servicing released is derived from reported data for each Issuer within MBFRF. Adjustments were made to the corresponding line items to incorporate the various outcomes of loans being securitized (MSR balances and UPB), retained (loans HFI balances), or sold (unrestricted cash), as appropriate.</p>

ISSUER STRESS TEST OUTPUTS AND RESULTS



Outputs and Use of IST Results

The following outputs are generated from the Framework:

- Issuer-level Financial Performance: including projected balance sheets, income statements, and other supplemental items necessary to assess overall Issuer performance and health in each projection period and scenario.
- Issuer-level Performance Metrics: including compliance ratios, key risk indicator metrics, IRG, and IST ratings for each Issuer in each projection period. Issuers that may be potentially non-compliant or potentially deficient with the selected performance metrics within each of the economic scenarios for further review and analysis of mitigating actions.
- Aggregate Performance Metrics: aggregated to illustrate trends in Issuer performance across different dimensions in the IST Model.

Results of the IST Model are used by Ginnie Mae to understand the significant drivers of stress on liquidity and capital over the projection period.