



BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM
WASHINGTON, DC 20551

Supervisory Stress Test Model Documentation

Pre-Provision Net Revenue (PPNR) Models

Fall 2026

This document summarizes the pre-provision net revenue (PPNR) models that the Federal Reserve Board of Governors (Board) intends to use in the 2027 Supervisory Stress Test. The Board finalized the models to project PPNR for the 2027 Stress Test (Finalized PPNR Model) after publishing the proposed models in October 2025 (2025 PPNR Model) and receiving input from the public. The following sections provide an overview of net interest income, noninterest income, and noninterest expense models. The Board is proposing for public input an alternative set of models to project noninterest income for the 2027 Supervisory Stress Test. These proposed models are described in the documentation at the following link: <https://www.federalreserve.gov/supervisionreg/dfa-stress-tests-2027.htm>. Documentation on the other models that the Board intends to use in the 2027 Supervisory Stress Test is available at the same link.

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A. Pre-Provision Net Revenue Models

The Board finalized the models to project pre-provision net revenue for the 2027 Stress Test (Finalized PPNR Model) after publishing the proposed models in October 2025 (2025 PPNR Model) and receiving input from public comments. The finalized models aim to capture the business practices of firms participating in the supervisory stress test by using granular position data to model net interest income and banks' own internal projections to model noninterest income and expense.

Each section of the model documentation was updated in 2026 to reflect changes from the models proposed in 2025. The model documentation proposed in 2025 continues to be available on the Board's website.¹

i. Statement of Purpose

The Board estimates the effect of supervisory scenarios on firms participating in the stress test by projecting net income and other components of regulatory capital for each firm over the nine-quarter projection horizon. A key component of net income is pre-provision net revenue, which is defined as income from banking services, activities, and products, net of expenses related to the provision of these same services, activities, and products, excluding loan loss provisions. The components of pre-provision net revenue are net interest income (interest income minus interest expense), noninterest income, and noninterest expense, as provided in the equation below.

Equation A1 – Components of Pre-Provision Net Revenue

$$\text{Pre-Provision Net Revenue} = \text{Interest Income} - \text{Interest Expense} + \\ \text{Noninterest Income} - \text{Noninterest Expense}$$

¹ See <https://www.federalreserve.gov/supervisionreg/dfa-stress-tests-2026.htm>.

The Board projects components of pre-provision net revenue using a suite of models that relate specific revenue and expense components to firm characteristics and macroeconomic variables. This suite of models is designed to project these components under the macroeconomic scenarios of the supervisory stress test. The models exclude components of pre-provision net revenue that are either capital neutral or modeled elsewhere in the supervisory stress test.²

Revenue and expense components projected by the models generally vary based on changes in economic conditions over the nine quarters of the projection horizon. Those conditions are described in the models by interest rates, stock market returns and volatility, corporate bond spreads, and gross domestic product growth.

The Board separately models 24 components of pre-provision net revenue, which correspond to the terms in Equation A1 and are described below.³

- **Interest Income.** The Board models seven components of interest income: (1) loans, (2) deposits with banks and other, (3) U.S. Treasuries, (4) agency mortgage-backed securities, (5) other securities, (6) other interest/dividend-bearing assets, and (7) net interest income on trading assets and liabilities.

² Capital-neutral excluded revenue or expense components are: (i) goodwill impairment losses, (ii) provisions to repurchase reserve/liability for residential mortgage representations and warranties, (iii) valuation adjustment for the firm's own debt under the fair value option, and (iv) impact of debt valuation adjustment of trading revenue changes on the firm's derivative liabilities creditworthiness. Because projecting capital-neutral flows would not impact stress testing outcomes, the Board excludes these components from the pre-provision net revenue models. Excluded revenue or expense components that are projected by other model suites consist of: (i) net gains (losses) on sales of other real estate owned and (ii) operational risk expenses. These two components were judged by the Board to be sufficiently different in nature from the remaining pre-provision net revenue components to justify separate modeling approaches.

³ In modeling pre-provision net revenue, the Board makes adjustments to eliminate or minimize potential double-counting of losses. For example, the Board adjusts historical data series to exclude losses from operational-risk events and other real estate owned expenses, which are modeled separately. The Board also excludes expenses related to special assessments from the Federal Deposit Insurance Corporation, as well as certain non-recurring expenses, when modeling pre-provision net revenue. Non-recurring expenses - such as merger related expenses - are excluded from the stress testing exercise on the grounds that there is no expectation they would occur in the hypothetical scenario being tested. Qualifying non-recurring noninterest expenses are those which are either (1) driven by business divestitures, write-downs of consolidated investment entities (CIEs), or mergers and acquisitions (M&A); or (2) not reasonably likely to recur within two years and with no similar item reported within the prior two years.

- **Interest Expense.** The Board models five components of interest expense: (1) domestic time deposits, (2) other domestic deposits, (3) foreign deposits, (4) federal funds purchased and securities sold under agreements to repurchase, and (5) other borrowing.
- **Noninterest Income.** The Board models 11 components of noninterest income: (1) deposit-related, (2) credit and charge card interchange plus international retail and small business revenue, (3) other loan-related, (4) sales and trading, (5) investment banking and merchant banking/private equity, (6) asset management, (7) wealth management/private banking, (8) investment services, (9) treasury services, (10) non-interchange credit and charge card, and (11) miscellaneous.
- **Noninterest Expense.** The Board uses one model to project noninterest expense, excluding losses from operational risk events and other real estate owned expenses.

For each component of pre-provision net revenue, the Board uses one of four different model types (structural, regression, discount factor, and efficiency ratio) to calculate stress test projections. The models seek to capture firm-specific business practices by using granular position data to model net interest income and bank projections to model noninterest income and expense. In designing the models for estimating pre-provision net revenue, the Board has prioritized the principles in the Board’s Stress Testing Policy Statement that are designed to produce a system of models that are generated from simpler and more transparent approaches, and robust and stable.⁴

Table A1 presents the model types for each of the 24 pre-provision net revenue components.

Table A1 – Pre-Provision Net Revenue Components Summary

PPNR Component	Model Type
Interest income	
Loans	Structural
Deposits with banks and other	Structural
U.S. Treasuries	Structural
Agency mortgage-backed securities	Structural

⁴ 12 CFR 252, App’x B, section 1.

PPNR Component	Model Type
Other securities	Structural
Other interest/dividend-bearing assets	Structural
Net interest income on trading assets and liabilities	Regression
Interest expense	
Domestic time deposits	Structural
Other domestic deposits	Structural
Foreign deposits	Structural
Federal funds purchased and securities sold under agreements to repurchase	Structural
Other borrowing	Regression
Noninterest income	
Deposit-related	Discount factor
Credit and charge card interchange plus international retail and small business revenue	Discount factor
Other loan-related	Discount factor
Sales and trading	Discount factor
Investment banking and merchant banking/private equity	Discount factor
Asset management	Discount factor
Wealth management / private banking	Discount factor
Investment services	Discount factor
Treasury services	Discount factor
Non-interchange credit and charge card	Discount factor
Miscellaneous	Discount factor
Noninterest expense	
Noninterest expense	Efficiency ratio

For net interest components (interest income and interest expense), the Board employs structural models that generally use granular data on maturities and interest rate characteristics of

assets and liabilities to project future revenues or expenses. These granular structural models tie projections more closely to banks' actual assets and liabilities at the beginning of the projection horizon. These models rely on known characteristics of bank positions and therefore are conceptually simple and transparent. For certain net interest components, granular data are not available. For these components, the models consist of structural models in the form of calculators or simple panel regressions that tie interest income earned on the relevant assets and liabilities to a contemporaneous reference interest rate. While these approaches are not as precise as the granular models, they are simple, stable, and transparent by construction.

For noninterest income and expense components of pre-provision net revenue, the models rely on firm projections under the supervisory severely adverse scenario from the FR Y-14A. While these two sets of components are modeled using FR Y-14A data, they are motivated by different considerations.

Similar to net interest income components, a bank's noninterest income depends on specific aspects of its business practices. Given challenges in modeling these business practices via the available historical data, industry projections of noninterest income under stress are an effective way to capture and reflect knowledge of the relevant business practices. The Board's approach uses 11 distinct components of noninterest income, and firms are considered in three different groups according to size and business practices. For each component, aggregate bank projections for each group, obtained from the FR Y-14A schedules, are used to produce a path of noninterest income over the projection horizon. Firm-level supervisory projections are then obtained by weighting the component-level projections according to a given bank's recent mix of revenues across these components.

In the model for noninterest expense, the Board leverages long-term relationships that exist between a bank's income and expense streams via the efficiency ratio. The efficiency ratio (ER) is a commonly used financial metric defined as the ratio of noninterest expense to the sum of net interest and noninterest income. The model rests on the observation that after controlling for variation in the mix of business activities, banks tend to predict an expense ratio path under stress that is stable across firms and over different stress testing cycles. The efficiency ratio path is estimated via an industry model of firm projections from previous stress testing exercises. This industry model is then used to project a given bank's noninterest expense using income projections from the other supervisory models and the bank's revenue mix in the period before the start of the projection horizon. This modeling approach is simple and transparent. It also reflects the business practice of managing net revenues in total, in addition to managing individual revenue and expense components. Therefore, this approach supports the Board's principle of stability, as the efficiency ratio-based expense projections will by construction rise and fall with the projected income.

In constructing the models for noninterest income and noninterest expense, the Board weighed the tradeoff between the Policy Statement principles of independence and those of simpler and more transparent approaches and stability. In particular, basing these models on firm-provided inputs represents a certain departure from the principle of independence. However, the Board believes that the potential gains seen with respect to other principles outweigh any losses with respect to the independence principle. Furthermore, the Board intends to monitor the firm projections, and the internal models that generate those projections, to ensure that the projections remain robust and informative over time given their heightened importance in the models.

The pre-provision net revenue models for all components are described in the following sections of this document.

ii. Interest Income Models

The Board models seven components of interest income, which are:

1. interest income on loans;
2. interest income on deposits with banks and other;
3. interest income on U.S. Treasuries;
4. interest income on agency mortgage-backed securities;
5. interest income on other securities;
6. interest income on other interest/dividend-bearing assets; and
7. net interest income on trading assets and liabilities.

The first six components listed above are projected using structural models, while the last component is modeled using a regression approach. The structural models are based on granular data reported in FR Y-14Q, Schedule A; FR Y-14Q, Schedule B; FR Y-14Q, Schedule G; FR Y-14Q, Schedule H; FR Y-14Q, Schedule M; and FR Y-14M. The regression model for net interest income on trading assets and liabilities uses data reported on FR Y-14Q, Schedule G.

Structural models directly calculate a revenue or expense projection based on economic relationships, the underlying contractual terms of the modeled component, and the asset or liability composition of each firm at the date of lift-off. Structural models are not statistical in nature but instead utilize a well-defined relationship between contracted financial instruments or balances at lift-off date, the expected income or expense flow, and the path of the interest rate in the scenario in order to calculate projections. The Board generally uses contractual obligations, applicable accounting rules, and scenario interest rate paths to generate projections for structural models.

The Board uses structural models in two distinct situations. First, the Board uses structural models to address firm heterogeneity when detailed, granular microdata is available and there is a strong conceptual relationship between one of the macroeconomic variables and the outcome variable (i.e., a relationship with interest rates) that is specific to the component. Second, the Board uses structural models when the interest or expense component is homogeneous in composition (both within and across firms) and the expected flow of the income or expense component exhibits a static, pre-determined relationship with a macroeconomic variable, usually an interest rate. Details regarding how each component is modeled are described below.

a. Interest Income on Loans

(a) Model Description

The model for interest income on loans projects interest income generated from a firm's loan portfolio using a granular, bottom-up approach with data from the FR Y-14M and FR Y-14Q regulatory reports. This granular approach provides the ability to derive changes in interest income in the projected scenario directly from loan characteristics, specifically the type of interest rate variability. There are multiple benefits to using this bottom-up approach: it more closely resembles the business-as-usual calculations performed by institutions for accounting and forecasting purposes and more accurately reflects the income impact of loan characteristics within a scenario, enabling more interpretable results.

The loan interest income model projects 9 quarters of interest income using the following specification:

Equation A2 – Interest Income on Loans Projection

$$\begin{aligned} \text{Loan interest income}_{b,p,i,t} \\ = \text{Loan balance}_{b,p,i,t} \times \text{Interest income rate}_{b,p,i,t} \end{aligned}$$

where:

- b = firm;
- p = product;
- i = segment; and
- t = projection quarter

$\text{Loan balance}_{b,p,i,t}$ is calculated by taking the percentage of outstanding balance for segment i by firm b and product p and then multiplying it by the portfolio balance. Loan balances are sourced from the portfolio balance measures reported in the FR Y-14, Schedule M and held constant throughout the nine projection quarters, consistent with the constant balance assumption used for the stress test exercise and consistent with the Stress Testing Policy Statement.⁵ The model assumes that reductions in exposure resulting from prepayment, maturity, amortization, or default will be offset by newly originated loans within the same projection quarter. Under the constant balance sheet assumption, the model also assumes no additional draws on revolving credit products.⁶

$\text{Interest income rate}_{b,p,i,t}$ represents the interest rate in quarter t for firm b , product p , and segment i . Interest rate characteristics from FR Y-14 reports are used to determine the interest rate sensitivity in the projected scenario. The loan interest income model does not estimate any components but simply calculates interest rates from the scenario, loan information, and estimated default or loss rates from the Retail and Wholesale models. The interest rate reset indices provide a direct link between the scenario and the projected interest rates.

⁵ 12 CFR 252, App'x B, section 2.7.

⁷ The wholesale FR Y-14Q data is at the facility level, but for ease of readability by matching with Retail this document references FR Y-14Q data as at the loan level.

(b) Portfolio Segmentation

The model for interest income on loans segments portfolios to reflect differences in interest rate sensitivity and projected interest income paths across exposures. For each segment, the model uses the outstanding balance-weighted average jump-off interest rate as the initial interest rate for projecting segment-level interest income.

The weighted average jump-off rate captures differences in interest income across banks and portfolios. Differences in loan characteristics within a segment, such as risk profile, are reflected in this weighted average. Interest rate sensitivity is the primary determinant of the segmentation scheme. Accordingly, each retail and wholesale portfolio with loan-level data is divided into fixed-rate and variable-rate exposures so that the model can separately account for changes in interest rates during the projection horizon.

Wholesale

Wholesale interest income projections are organized into two portfolios: Corporate and Commercial Real Estate (CRE). Data used in the segmentation of wholesale balances are sourced from FR Y-14Q.⁷ Each sub-portfolio is segmented by asset classification: held for investment (HFI) and fair value option/held for sale (FVO/HFS).

Corporate

The corporate portfolio of loan-level interest income is segmented by 11 disclosure categories and asset classification (referenced as sub-portfolios). Sub-portfolios included in the corporate portfolio are: (1) commercial and industrial loans, (2) domestic owner-occupied CRE loans, (3) other non-consumer loans, (4) other leases, (5) loans to foreign governments, (6)

⁷ The wholesale FR Y-14Q data is at the facility level, but for ease of readability by matching with Retail this document references FR Y-14Q data as at the loan level.

international owner-occupied CRE loans, (7) agricultural loans, (8) loans to financial institutions, (9) loans for purchasing and carrying securities, (10) domestic farmland loans, and (11) international farmland loans. Most corporate sub-portfolios (16 out of 22) are further segmented by the interest rate variability since this provides a clear distinction on when the interest rate will be adjusted. The two broad types of interest rate variability, fixed-rate and variable-rate,⁸ are used to segment each sub-portfolio with loan level data. The interest income model treats the interest rate variability category mixed-rate as variable-rate. Fee-only loans are assumed to generate no interest income. Hence, they are not used to calculate the average interest rate, and their outstanding balance percentages are excluded from the total balances calculation.

Loans for purchasing and carrying securities, domestic farmland loans, and international farmland loans are not segmented by interest rate variability because they have no loan-level data on the FR Y-14Q, Schedule H.1. This limits further segmentation and requires additional assumptions to model interest income for these portfolios. The Board assumes, for these sub-portfolios, the same bank-level interest rate spread as reported in their variable-rate lending to financial institutions. This assumption is based on loan-level data, when non-purpose margin loans (NPML) were able to be identified because NPMLs have similar characteristics to loans for purchasing and carrying securities. The majority of NPMLs were variable-rate, so the Board assumes loans for purchasing and carrying securities have variable rates.

CRE

The CRE portfolio of loan-level interest income is first segmented into six disclosure loan types (also referred to as sub-portfolios) as defined in FR Y-9C: (1) domestic construction

⁸ The wholesale FR Y-14Q H.1 and H.2 interest rate variability category is floating, but for ease of readability by matching with Retail the document references the floating category as variable-rate.

loans, (2) domestic multifamily loans, (3) domestic non-owner occupied commercial real estate loans, (4) international construction loans, (5) international multifamily loans, and (6) international non-owner occupied commercial real estate loans. CRE segmentation is similar to Corporate segmentation where interest rate variability splits the sub-portfolio by fixed and variable interest rates. With the asset classification segmentation (HFI vs. HFS/FVO), the total number of CRE segments is 24.

Retail

Retail interest income projections are organized into four sections: (1) domestic mortgage (including first lien, home equity loans, and home equity lines of credit), (2) domestic auto loan, (3) domestic and international consumer credit card and SME card, and (4) other retail loans such as small business loans, private student loans, consumer finance products, and international retail products. Segmentation within a retail portfolio is driven by the rate structure (i.e., fixed vs. variable rate), product type, and credit risk. Data used in the segmentation of retail products are sourced from regulatory reports including FR Y-14M and FR Y-14Q schedules and include both loan-level and segment-level attributes. Data limitations prevent further segmentation of the Other Retail products.

Domestic Mortgage

Domestic mortgage and home equity products are reported in FR Y-14 Schedules A.1 and B.1, and the segmentation of them is driven primarily by asset classification, loan rate, and loan structure. They are segmented first by asset classification (HFI and FVO/HFS) and then rate structure (i.e., fixed-rate mortgage vs. adjustable-rate mortgage [ARM]).⁹ Additional interest

⁹ Using the Y-14M loan-level data, mortgage loans are categorized as adjustable rate mortgage or fixed rate mortgage via the reported product type (FR Y-14M schedule A.1 line item 133, MDRM M955), reported interest

rate segmentation variables, such as loan term (30-year vs. 15-year) and origination risk segments ($FICO \geq 720$ vs. $FICO < 720$), were considered, but ultimately not adopted due to their immaterial impact on projected interest income. Balance-weighted average loan rates are calculated by segment and by firm based on the FR Y-14M loan-level data and used as inputs in interest income projections.

Domestic Auto Loan

Domestic auto loans interest rates are reported in the FR Y-14Q, Schedule A.2 aggregated into segments as defined in the schedule. Auto loans are typically fixed-rate products, so the Board assumes that the portfolio is comprised of auto loans with fixed interest rates. The Board treats immaterial HFS auto loan balances reported in FR Y-9C as HFI loans at the firm level.

The portfolio is segmented into new vehicle loans and used vehicle loans, driven primarily by the differences in rates between these two categories. The Board calculates balance-weighted average interest rates by segment and by firm and uses them as inputs for interest income projection. The Board analyzed average interest rates for new and used vehicle loans and compared them with the prime rate to estimate the spread used for rates on new originations.

Domestic and International Consumer and Small Business Credit Card

Consumer credit cards are segmented into two product types: consumer bank cards, where consumers can carry a balance; and consumer charge cards, which are historically expected to be paid off by the due date, but recent charge card products allow minimum payment with accrued interest income, which are reflected in the model. Because about 90 percent of

type (FR Y-14M schedule A.1/B.1, MDRM M244), and if the loan is reported as an option ARM (FR Y-14M schedule A.1 line item 41, MDRMM182). All option ARM loans are considered to be ARM loans. All other loans are assigned to a segment via the reported product type, with loans that have “other” or missing product types assigned a segment via reported interest type at origination.

credit cards have variable rates,¹⁰ for modeling simplicity, the Board assumes that all credit card accounts are variable rate and reprice quarterly according to changes in the prime rate.

Credit card interest income depends on both the portion of balance that revolves¹¹ and the interest rate. The key modeling challenge lies in estimating the percentage of balances that revolve and bear interest charges. Balances paid in full prior to the due date do not incur interest charges and therefore do not contribute to interest income. An account is classified as a revolver if it has been active in the last 12 months and has had at least one positive finance charge in any of the last 3 months. This classification is used to estimate the percentage of balances revolving and therefore earning interest income.

Credit card interest rates are generally benchmarked to the prime rate in FR Y-14M, Schedule D.1, and the interest rate spread is reported for floating-rate card accounts. The prime rate, the balance-weighted interest rate and interest spread calculated for revolving accounts only, are used to determine a constant projected spread at the segment level.¹² The Prime Rate from the scenario is utilized as the benchmark variable rate. Balance-weighted average interest rate, imputed interest spread, and percentage of balance revolving are calculated by segment and firm and used as inputs in credit card interest income projection. Due to the lack of loan-level interest rate data in the FR Y-14M Credit Card Schedule for international exposures, the Board uses the industry-level interest rate and revolver ratio derived from aggregate domestic credit card portfolios as proxies for each firm's international consumer card portfolio.

¹⁰ There is some variation across firms, with some firms having a higher share of variable-rate credit cards and others having a lower share.

¹¹ Card balance revolves means balance not paid in full.

¹² For additional details on spread estimation, please refer to the Spread Estimation section on variable-rate products.

The Board models small business cards separately but following a similar structure. Small business cards are also assumed to carry variable rates, with interest income driven by the interest rate and the portion of balances that revolve. The transactor-revolver methodology applied to consumer cards is similarly used to estimate the revolving balance share for small business cards.

Other Retail Loans

Other Retail loans are a heterogeneous category that includes multiple consumer credit products for which interest rate is typically not reported in the FR Y-14Q, Schedule A (Retail) form. This category includes, but is not limited to, student loans, domestic and international other consumer loans, international auto loans, domestic and international auto leases, international mortgage, international home equity, domestic and international small business loans, and non-purpose lending.

Due to the lack of interest rate data, aside from the categorizations defined above, no additional segmentation is applied to these credit products. Instead, jump-off interest rates are assigned at the aggregate product-type level, using the firm-level earned interest rates reported in the FR Y-14Q, Schedule G.2 (PPNR) line-item report for the most closely aligned business line. The jump-off spread is derived as the difference between jump-off interest rate and Prime Rate and is held constant over projection quarters. This approach aligns with the stress test Board's Stress Testing Policy Principles of simplicity, and consistency and comparability.¹³

Projected Interest Income Rate

Interest income consists of interest income from existing portfolios and from new originations during the projection periods under the flat balance assumption. The models for

¹³ 12 CFR 252, App'x B, section 1.

both wholesale and retail portfolios project new originations at each projection quarter based on sub-portfolio-specific runoff rates. The runoff assumptions are generally aligned with the credit risk model and incorporate prepayments, defaults, amortization, and maturities, as applicable.¹⁴

The loan interest income model projects the interest rate path differently for fixed-rate and variable-rate products over the projection window. All portfolios have a portfolio-specific interest rate floor that will bind if the projected interest rate decreases to the stated floor.¹⁵

Variable-rate products

For variable-rate products, projected interest rates are determined using the base rate-related variables from the scenario file, combined with an estimated spread. Variable rates reset quarterly while balances of variable-rate products remain unchanged under the flat balance sheet assumption. The projected interest rate is calculated as:

Equation A3 – Variable-Rate Products Interest Rate Projection

$$IR_{(b,p,i,t)} = BaseRate_{(p,i,t)} + Spread_{(b,p,i,t=0)}$$

where:

- $IR_{(b,p,i,t)}$ represents interest rate for firm b , product p , and segment i at time t ;
- $BaseRate_{(p,i,t)}$ represents the scenario base rate at quarter t for product p ; and
- $Spread_{(b,p,i,t=0)}$ represents the initial spread for firm b , product p , and segment i which is held constant over time.

Base rate assumptions¹⁶

The base rate determines the magnitude of interest rate change in the scenario. For retail variable-rate products, such as consumer and small business credit cards and home equity line of credit, the Board uses the Prime Rate as the base rate. The prime rate is used as the general base

¹⁴ For more detail, see Credit Risk Model Documentation, Section B.ii.a.(3).

¹⁵ The model applies an interest rate floor of 0.001 (0.1%) for retail portfolio, 0.058 (5.8%) for Wholesale, and 0.0126 (1.26%) for CRE. These floors are calibrated during Y-14Q floating rate data from 2020Q2-2021Q4 (first percentile).

¹⁶ Base rate selection summary is included in Table A2 – Interest Rate Assumption and Spread Data Estimation Period.

rate for retail variable-rate portfolios because it is commonly used for many retail lending products, and retail portfolio rates generally track changes in the prime rate in the Y-14 retail data. Mortgage FVO loans are assumed to be variable rate mortgage that use the 30-year mortgage rate as the base rate. For the wholesale portfolio, the Board uses the 3-month Treasury yield as the base rate for variable-rate products. The majority of balances in the wholesale portfolio are variable-rate; thus, the projected 3-month Treasury yield is the largest driver of changes in projected interest income.

Spread Estimation

The spread is defined as the difference between the balance-weighted average interest rate¹⁷ and the selected base rate, and it varies by firm, product, and segment. The variable-rate spread is averaged over four quarters. Specifically, the spread at the jump-off quarter and the previous three quarters are averaged to increase model stability.¹⁸ The level of granularity for spread estimation depends on the product segment and data availability. When data is limited, the Board determines spreads through other alternative data sources, especially for the Other Retail portfolio where the Board uses expert judgment to split it into variable rate and fixed-rate products.

Given that the stress test assumes constant balances, and the fact that the interest rate spread will not get updated during the projection horizon, the model replaces variable rate facilities that default, mature, or run-off with the same loan type. This allows the interest income equation above to calculate the interest rate at time t . Changes in the interest rate for variable-rate balances are completely determined by changes in the scenario variable.

¹⁷ Average interest rates in the model are weighted by outstanding balances.

¹⁸ Detailed spread data estimation period is provided in Table A2 – Interest Rate Assumption and Spread Data Estimation Period.

Fixed-Rate Products

For the fixed-rate products, the Board uses the balance-weighted origination rate by firm, product, and segment at jump-off, and the rates are assumed to remain unchanged throughout the stress test projection horizon except if they terminate.

Equation A4 – Fixed-Rate Products Interest Rate Projection

$$IR_{(existing,t)} = IR_{(existing,t=0)}$$

For new originations, origination interest rates are projected using a modification to the fixed-rate product interest rate equation:

Equation A5 – Origination Interest Rates Projection

$$IR_{(b,p,i,t,new\ orig)} = BaseRate_{(p,i,t)} + Spread_{(b,p,i,t=0)}$$

The spread for fixed-rate balances is calculated differently than variable-rate balances. For retail, instead of using the average rate of all loans, only newly originated loans originated at the jump-off quarter are used to reflect more recent portfolio characteristics. Fixed-rate retail products include fixed-rate mortgage and home loans, auto loans, and most other retail loans. A hybrid adjustable-rate mortgage provides a fixed interest rate during an initial period, after which the rate becomes variable and adjusts periodically based on market interest rates. Hybrid mortgages are treated as fixed-rate mortgages, reflecting the observation that the aggregate weighted-average remaining fixed period generally extends beyond the nine-quarter stress horizon. The fixed-rate mortgage loan uses 30-year mortgage rate as the base rate, and the other fixed-rate retail products use the prime rate as the base rate.

Equation A6 – Spread for Retail Portfolio Fixed-Rate Projection

$$Spread_{(b,p,i,t=0)} = weighted\ avg\ IR\ for\ new\ originations_{(b,p,i,t=0)} - Base\ rate_{(p,i,t=0)}$$

For fixed-rate wholesale products, the Board uses the 10-year Treasury yield as the base rate, reflecting that wholesale fixed-rate loan generally have longer maturities and consistent with stronger empirical support for the 10-year Treasury rate as the benchmark rate. For each wholesale product segment, the number of new originations at the jump-off quarter may be limited. As a result, the wholesale portfolio uses a different approach from the retail portfolio to calculate spread. Specifically, the spread is calculated from the average rate of all loans at the jump-off quarter and the base rate from the balance-weighted average origination date for that sub-portfolio. The base rate applied for wholesale fixed-rate product is the 10-year Treasury yield because it broadly reflects the common loan tenures in the wholesale FR Y-14Q schedules.¹⁹

Equation A7 – Spread for Wholesale Projection

$$\text{Spread}_{(b,p,i,t=0)} = \text{balance}_{\text{weighted}} \text{avg } IR_{(b,p,i,t=0)} - \text{Base rate}_{(p,i,t=\text{balance weighted origination date})}$$

The projected fixed-rate interest rate is a weighted average of the existing interest rate, which is not updated, and the new origination rate calculated from the spread and base rate. The new origination rate is used to capture when the interest rate was set. Both interest rates are combined to calculate the fixed interest rate for that sub-portfolio.

Equation A8 – Projected Fixed-Rate Interest Rate

$$IR_{\text{existing},(b,p,i,t)} = (1 - wt_{(b,p,i,t)}) \times IR_{(\text{existing},(b,p,i,t-1))} + wt_{(b,p,i,t)} \times IR_{(\text{new},b,p,i,t)}$$

The weight, $wt_{(b,p,i,t)}$ is the fraction of the portfolio that needs to be re-originated. This is derived from the default rate, prepayment rate, and maturity rate. For the wholesale corporate portfolio, $wt_{(b,p,i,t)} = AvgPD_{(b,p,t)} + 5\%$, where $AvgPD_{(b,p,t)}$ is the average EAD weighted

¹⁹ FR Y-14Q wholesale schedules indicate that corporate fixed-rate loans are primarily concentrated in five-year and ten-year maturities, and ten years is the most common maturity for fixed-rate CRE loans.

quarterly probability of default (PD) from the corporate credit risk models for sub-portfolio p at time t , plus the additional constant runoff parameter (calibrated at 5%) which represents the average historical non-default runoff rate based on the share of committed balance paid off each quarter. For the wholesale CRE portfolio, $wt_{(b,p,t)} = AvgPD_{(b,p,t)} + atmaturity_{(b,p,t)}$, where $AvgPD_{(b,p,t)}$ is the average EAD weighted quarterly PD from the CRE credit risk models for sub-portfolio p at time t and $atmaturity_{(b,p,t)}$ is the percentage of the sub-portfolio at maturity at time t . In the wholesale portfolio, fixed-rate products are more common for CRE income-producing loans. Fixed-rate products are less sensitive to changes in the base rate because only a fraction of the sub-portfolio reflects updated interest rates.

Spread and base rate summary

In general, the model estimates the spread as the difference between the balance-weighted average interest rate and the base rate, and it varies by firm, product, and segment. The level of granularity for spread estimation depends on the product segment and data availability. When data is limited, the model determines spreads using other alternative data sources, especially for the Other Retail portfolio which the Board splits into variable rate and fixed-rate products. Interest Rate Assumption and Spread Data Estimation Period summarizes key segments, interest rate type assumptions (variable versus fixed rate), and data estimation periods by credit risk model.

Table A2 – Interest Rate Assumption and Spread Data Estimation Period
for Interest Income on Loans Models

Credit Risk Model	Segment	Interest Rate Type Assumption	Base Rate Assumption	Spread Data Estimation Period
Wholesale-Corporate	Floating HFI loans	Variable Rate	3-month Treasury rate	4 quarters

	Floating FVO loans			
	Fixed HFI loans	Fixed Rate	10-year Treasury rate	1 quarter
	Fixed FVO loans			
Wholesale-CRE	Floating HFI loans	Variable Rate	3-month Treasury rate	4 quarters
	Floating & fixed FVO loans			
	HFI fixed	Fixed Rate	10-year Treasury rate	1 quarter
Retail-Domestic Auto	New auto loans	Fixed Rate	Prime rate	1 quarter (3 months)
	Used auto loans			
Retail-Domestic Cards	US bank cards	Variable Rate	Prime rate	4 quarters (12 months)
	US charge cards			
Retail-Domestic First Lien	FVO loans	Variable Rate	30-year mortgage rate	4 quarters (Mar, June, Sept, Dec data)
	FRM HFI loans	Fixed Rate		1 quarter (last 1 month)
	ARM HFI loans			
Retail-Domestic Home Equity	HELOC HFI & FVO loans	Variable Rate	Prime rate	4 quarters (4 months)
	HELOAN FVO loans		30-year mortgage rate	
	HELOAN HFI loans	Fixed Rate	30-year mortgage rate	1 quarter (last 1 month)
Other Retail	US SME cards	Variable Rate	Prime rate	4 quarters (12 months)
	International SME cards	Variable Rate	Prime rate	4 quarters (12 months)
	International bank cards	Variable Rate	Prime rate	4 quarters
	Non-purpose lending	Variable Rate	Prime rate	4 quarters

	US other consumer loans	Fixed Rate	Prime rate	1 quarter
	US small business loans	Fixed Rate	Prime rate	1 quarter
	Student loans	Fixed Rate	Prime rate	1 quarter
	International home equity	Fixed Rate	Prime rate	1 quarter
	International first lien mortgage	Fixed Rate	Prime rate	1 quarter
	International other consumer loans	Fixed Rate	Prime rate	1 quarter
	International small business loans	Fixed Rate	Prime rate	1 quarter
	International auto loans	Fixed Rate	Prime rate	1 quarter

Industry Scalar

The Board calculates the interest income from different loan portfolios utilizing the methodology described above, which has several assumptions that are necessary primarily to address data limitations. The Board evaluates and adjusts for these data limitations by utilizing aggregated information from other reporting forms. Specifically, firms report interest income from each loan category in regulatory forms as well as financial statements. The Board applies “true-up” to the reported values using a multiplicative scalar by industry for each loan category.²⁰ For example, if the calculated interest income in the domestic CRE portfolio is 95% of the value reported in the FR Y-14Q, Schedule G.2 (PPNR), then the Board uses a scalar of $1/0.95 = 1.05$ to

²⁰ For firms that report domestic bank card revenue and loss sharing agreement payments in loan interest income, these amounts are not projected by the Interest Income on Loans Model but are projected separately in a consistent manner for all firms. The Supervisory Stress Test Model Documentation – Credit Risk Models provides detailed methodology.

²² To prevent measuring duplicative revenue and loss sharing agreement payments in interest income projections, the Board isolates these amounts in a new FR Y-14Q Schedule G.2 field line 33A when firms report them in loan interest income. This field is excluded from industry scalar calculations. Until these newly added fields are available for four quarters, the period used to calculate industry scalars, the Board will use Special Data Collections to obtain necessary inputs.

adjust the calculated value. This constant scalar is used to multiply the calculated domestic CRE interest income in each quarter in the projection horizon and this true-up adjustment minimizes the potential impact of data limitations on the projections. To improve stability, the multiplier applied is a four-quarter balance-weighted average of the multipliers from the jump-off quarter going back three additional quarters using the formula below:

$$Multiplier_{group,t0} = \frac{\sum_{\tau=t0-3}^{\tau=t0} G2 \text{ interest income}_{group,\tau} / \sum_{\tau=t0-3}^{\tau=t0} G2 \text{ balance}_{group,\tau}}{\sum_{\tau=t0-3}^{\tau=t0} FRB \text{ interest income}_{group,\tau} / \sum_{\tau=t0-3}^{\tau=t0} FRB \text{ balance}_{group,\tau}}$$

Where *group* denotes a loan portfolio category reported in the table below, and τ denotes a quarter; $G2 \text{ interest income}_{group,\tau}$ and $G2 \text{ balance}_{group,\tau}$ denote interest income and loan balance reported in Y-14Q, Schedule G.2. $FRB \text{ interest income}_{group,\tau}$ and $FRB \text{ balance}_{group,\tau}$ denote interest income and loan balance reported in the Y-14Q/M retail and wholesale schedules, using granular loan-level or segment-level data, and in Y-14Q, Schedule G.2, using aggregate data.

The scalars are presented in the later subsection of this document “Estimated Parameters for Interest Income Models”, while the grouping composition for each portfolio category is summarized in the table below.

Table A3 – PPNR Interest Income for Loans Scalar Mapping

Portfolio Category	Y-14Q, Schedule G.2 PPNR Category	FR Y-14Q Balance Category
Mortgage	Item 1. First Lien Residential Mortgages (in Domestic Offices); Item 2. Second/Junior Lien Residential Mortgages (in Domestic Offices)	US First-Lien Mortgages; HELOCs; Junior Lien HELOANs
Credit Card	Item 5: Credit Cards	US and International Bank Cards; US and International Charge Cards
Auto (exclude lease)	Item 6A: Other Consumer-Auto loans	US Auto Loans

C&I, Other Retail SME loan and card	Item 7: C&I Loans – Report C&I graded, small business (scored/delinquency managed), corporate card, business card	US and Intl Grade C&I; US and Intl Small Business; US and Intl SME Card
Domestic CRE	Item 4: CRE Loans (in Domestic Offices)	US Construction; US Multifamily; US Nonowner; US Owner-Occupied
Rest of Wholesale	Item 8: Other Loans & Leases – Include loans secured by farmland here and other loans not accounted for in the other categories	Agricultural Loans; US and International Farm; International Government; Financial Institutions; Other Non-Consumer Leases; Other Non-Consumer Loans; Loans to Purchase & Carry Securities;
Other Retail (exclude SME)	Item 6B: Other Consumer – Student Loans; Item 6C: Other Consumer – Other, incl. loans backed by securities (non-purpose lending); Item 7A: Real Estate Loans (Not in Domestic Offices) – Residential Mortgages (First and Second Lien); Item 7B: Real Estate Loans (Not in Domestic Offices) – Other	US Student; Non-purpose Lending; US Other Consumer; Intl Auto Loans; US and International Auto Leases; International Home Equity; International Mortgage; International Construction; International Multifamily; International Nonowner; International Owner-Occupied

(c) Model Assumptions and Limitations

This model is comprehensive and covers all the retail and wholesale products covered in the stress test. Consistent with the principle of simplicity in the Board’s Stress Testing Policy Statement,²¹ the model incorporates the following assumptions and acknowledges certain limitations:

Assumptions

- (1) The model assumes a flat balance over the projection horizon, meaning that portfolio balances are held constant over time. The projected balance is the sum of remaining balances of the existing portfolio and the new originations which are due to prepay, maturity, amortization and defaults.
- (2) The model assumes that delinquent loans generate interest income.

²¹ 12 CFR 252. App’x B, section 1.

- (3) Interest spreads are assumed to be constant over projection quarters.
- (4) Most variable rates are repriced quarterly, aligning with changes in the projected base rate.
- (5) Balance-weighted segment-level fixed interest rates are assumed to remain unchanged throughout the projection window, except for new originations.
- (6) To reduce complexity, the model groups various products with similar rate structures and applies consistent base rate and spread assumptions across products.
- (7) For wholesale sub-portfolios that would otherwise report loan-level characteristics, an immaterial sub-portfolio does not report loan-level characteristics and is assumed to generate no interest income.²² For sub-portfolios that do not report loan-level characteristics, such as loans to purchase and carrying securities, there are no materiality thresholds for generating interest income.

Limitations

The model segments loans with similar interest rate sensitivities—specifically, variable versus fixed rates—into groups within sub-portfolios. This allows for a simplified model structure and minimizes firm and product variance but is not as granular as loan-level models.

For example, in the model, all retail products (except for mortgages) use the prime rate as the base rate and constant spread by product, segment, and firm in projecting variable-rate and new origination rates. The scenario-provided 3-month and 10-year Treasury yields are strong proxies for the reference values actually used to set interest rates for individual wholesale loans. Although 10-year tenors are common within the fixed-rate FR Y-14Q wholesale schedules, a loan-level model could allow for the incorporation of more granular tenors in projecting interest income.

A loan-level model could match the tenor and index to each loan to more accurately calculate projected changes in interest rates. For fixed-rate loans, it would be more accurate to use the exact origination date in the interest rate spread calculation. Also, for fixed-rate loans,

²² “Immaterial portfolios” are defined in reference to the FR Y-14Q Instructions, which defines “material portfolios”. Board, Instructions for the Capital Assessments and Stress Testing information collection (Reporting Form FR Y-14Q) (modified Mar. 31, 2026).

using actual maturity dates and facility-specific probabilities of default would allow the model to more precisely time interest rate changes. For variable-rate loans, the interest rate floor could be applied with greater precision at the loan level.

The Board uses an industry-level scalar methodology to map modeled jump-off interest rates to the reported income rates in Y-14Q, Schedule G.2. The scalar is calibrated at the industry-by-product-group level and is intended to account for systematic differences between modeled pricing outputs and reported accounting income, including effects related to amortization, fee timing, hedging, and other portfolio-level reporting dynamics. One limitation of the industry-level scalar methodology could be if there are persistent differences across firms in the importance of these effects. The scalar is not computed at firm level because firm-specific scalars could increase the sensitivity of results to temporary portfolio mix shifts, unexplained reporting changes at the firm level, or accounting differences.

Consistent with the flat balance sheet assumption, the model does not assume an increase in revolving credit line utilization throughout the projection period. Although the credit loss models assume additional drawdowns when estimating exposure at default, these additional draws are associated with defaulting borrowers and therefore are not expected to contribute meaningfully to interest income. The choice not to model interest income from additional drawdowns by borrowers nearing default is also consistent with the principle of simplicity. The model also assumes a constant spread throughout the projection horizon, consistent with the stress test objective of ensuring that firms can provide credit supply during stress under terms broadly similar to those prevailing before the stress horizon. Specifically, given the credit supply maintenance assumption, the model does not allow for firms to increase spreads for creditworthy borrowers due to intermediation frictions that might arise in a downturn.

Retail Portfolio

Data availability is limited for some retail products, requiring interest rate assumptions in the projection of interest income for each portfolio. The Board currently does not collect data from firms on interest rates for most Other Retail products including student loans, consumer finance products, international related loan products, and non-purpose loans. As a result, the model relies on aggregate income information from FR Y-14Q, Schedule G.2 to estimate these products' interest income.

Wholesale Portfolio

There are three wholesale loan sub-portfolios for which the Board lacks any interest rate information: margin loans, domestic farmland loans, and international farmland loans. The Board assumes, for these sub-portfolios, the same bank-level interest rate spread as reported for variable-rate lending to financial institutions. The reason is because the Board does not collect loan-level data on these categories, and on FR Y-14Q, Schedule G.2, they are components of broader categories and cannot be separately identified even as aggregates. Because non-purpose margin loans (NPML) were reportable on FR Y-14Q, Schedule H.1 prior to recent changes to the FR Y-9C, the model uses them as a proxy for the broader category of margin loans, which now include NPML and have broadly similar characteristics. While no suitable reference population was identified for domestic and international farmland loans, the Board applies the same assumption to these portfolios as to margin loans, based on their low materiality and the principle of simplicity. The Board used the loan-level analysis of NPML to guide its treatment of these sub-portfolios and institutions.

Because the corporate loan credit loss model does not dynamically simulate non-default terminal states such as prepayment and extension, the corporate interest income model assumes a constant non-defaulted roll-off rate. This implies that extensions, prepayment and amortizations are not endogenous. It is reasonable to expect that an obligor is more likely to pay back a loan or seek an extension with different terms when interest rates are falling. Prepayment penalties and the requirement for lender approval may somewhat limit the extent of increased roll-off in a decreasing interest rate environment. Additionally, spreads will increase during stress, further mitigating the impact of an endogenous roll-off rate. The model accounts for this dynamic by applying a conservative roll-off rate to fixed-rate loans.

b. Interest Income on Deposits with Banks and Other

The Board uses a structural approach to model interest income on interest-bearing balances. Interest income from interest-bearing balances consists of interest-bearing deposits, including deposits held at the Federal Reserve and other institutions such as the Federal Home Loan Banks. The relevant balances are reported in line item 14 of the net interest income worksheet of FR Y-14Q, Schedule G. These balances have short durations, typically less than a single quarter, and the rate earned is usually directly linked to short-term interest rates.

(a) Model Description

Under this structural approach, interest income for this component at each quarter of the projection is calculated starting from a simple and intuitive assumption: interest-bearing balances earn a rate that responds directly to the short-term interest rate, as this is consistently observed in historical data. In particular, the Board assumes that the rate on this component is the 3-month U.S. Treasury rate.

More formally, let B_b be the total balance on interest-bearing balances and F_b be the interest income earned on this component. Then, for each firm b and for every period t :

Equation A9 – Interest Income on Deposits with Banks and Other

$$F_{b,t} = B_{b,t} \text{Treasury3m}_t$$

where:

- *Treasury3m* is the 3-month Treasury yield.

Using this equation for the projection period, the projected flow of income $F_{b,q}$, for firm b in quarter q on the projection horizon, thus, can be calculated as:

$$F_{b,q} = B_{b,q} \text{Treasury3m}_q$$

The stress test assumes constant balances for all firms; therefore, $B_{b,q} = B_{b,q0}$ for all periods, where $B_{b,q0}$ represents the balances for the firm b at lift-off quarter $q0$. This means that the projected flow of income is calculated based on the balances at the last quarter before the start of the projection.

(b) Assumptions and Limitations

When using the structural model to model interest income on interest-bearing balances, the Board assumes that the rate each firm earns over the projection horizon is given by the 3-month U.S. Treasury rate. While the rate that the Federal Reserve pays on reserves tracks the 3-month U.S. Treasury rate closely, some fluctuations may be observed. Additionally, the rates paid by other depository institutions may be higher or lower.

c. Interest Income on U.S. Treasuries

The model for interest income on U.S. Treasuries projects interest income on U.S. Treasuries and U.S. government agency obligations (excluding mortgage-backed securities) based on security-level microdata available in form FR Y-14Q, Schedule B.

The approach relies on calculating interest income based on the sum of (a) coupon accruals for securities and (b) the amortization/accretion of amortized cost. To calculate these items, the Board uses bond-specific details from FR Y-14Q, Schedule B.1 along with vendor data,²³ including coupon rate and maturity. The Board makes certain simplifying assumptions or adjustments due to lack of information regarding the security in question.

There are multiple benefits to using the structural, calculation-based approach. While straightforward, this structural approach is closer to the business-as-usual calculations performed by institutions that comply with applicable accounting practices. Additionally, interpreting the results can be more easily tied to the characteristics of the securities and the stress test scenarios. Also, this approach more accurately reflects the income impact of securities characteristics within a stress test scenario.

(a) Model Specification

The model calculates interest income for any security i at time t as follows:

Equation A10 – Interest Income on U.S. Treasuries Projection

$$Interest\ Income_{i,t} = Coupon\ Accrual_{i,t} + AccretionAmortization_{i,t}$$

where:

- $Coupon\ Accrual_{i,t} = Current\ Face\ Value_{i,t} \times \frac{Coupon\ Rate_{i,t}}{4}$
- $AccretionAmortization_{i,t} = \frac{Current\ Face\ Value_{i,t=0} - Amortized\ Cost_{i,t=0}}{4 \times Years\ to\ Maturity_{i,t=0}}$

Coupon accrual is calculated using the beginning-of-the-period current face value at time t and the coupon rate of a given bond. For fixed rate bonds, both coupon rate and face value are kept constant as of jump-off. The Board uses vendor data to source coupon rates, which in some cases may not be available. Although most securities in this category are fixed rate bonds, some

²³ The vendor model is further discussed in the Market Risk Model Documentation of the Supervisory Stress Test, specifically at Section A.iii.a.1.c.

firms have small amounts of floating-rate securities. For these floating-rate securities, $Coupon\ Rate_{i,t}$ equals a floating component plus a margin over the floating rate. In the case of floating-rate securities, data on margin is not available. As a result, the model will estimate the margin, assuming an index of the 3-month Treasury par rate. Specifically, the margin is estimated as the difference between the coupon rate and the 3-month Treasury par rate at $t=0$, with that difference floored at zero. That estimated margin is added to the 3-month Treasury par rate applicable in all forward quarters.

Accretion/Amortization is calculated to account for the pull-to-par of the amortized cost of the security and its impact on income. Accretion/Amortization is calculated using the straight-line method for this subset of securities. Specifically, the difference between face value and amortized cost is spread over the number of quarters until maturity, which corresponds to four times the number of years until maturity in the formula.

After accounting for the two components listed above, the model also incorporates the maturity of securities. To maintain a constant balance assumption, the Board uses a reinvestment assumption. Reinvestments represent securities purchased during the projection horizon to replace those securities that paydown during the projection quarters. The same reinvestment assumption is used across both the interest income on securities models and the Securities Model.²⁴ For additional details on the reinvestment assumptions, please refer to the Securities Model Description. For the purposes of coupon accrual, the Board assumes that all purchases in future quarters are made on the first day of the subsequent quarter to the maturing quarter of the security.

²⁴ See Securities Model “Reinvestment Assumption” in section c. OCI Calculation Overview.

(b) Assumptions and Limitations

The model for estimating interest income on U.S. Treasuries makes various assumptions and has a number of limitations. One of the key limitations of the approach is the lack of data on the income impact of hedges. For example, it is common practice for firms to enter into pay-fixed swaps to hedge fair value changes of Treasury securities. These hedges change the income stream to that of a floating instrument. Qualified accounting hedges can dramatically change the income profile of securities. While qualified accounting hedges against securities held in the investment portfolio are reported in FR Y-14Q, Schedule B.2, the current data attributes reported within this schedule do not allow for independent calculation. There are no data elements that provide the terms of either the fixed or floating legs for swaps. Methods to incorporate the effect of hedges based on the updated version of FR Y-14Q, Schedule B.2 and B.3 could be implemented in this model in the future.²⁵

The reinvestment assumption can have a material impact on interest income on securities. The characteristics of securities assumed to be purchased over the forecast horizon can change the level of income. In particular, the choice not to apply hedges against reinvestments and the coupon type (i.e., fixed/floating) of those reinvestments have an outsized impact on income model results.

There are a variety of other items related to securities and hedging that impact interest income, which the model described above does not incorporate. One of these items is the impact on income from other comprehensive income (OCI) releases from securities previously transferred from available for sale (AFS) to held-to-maturity (HTM).

²⁵ See Final Enhanced Transparency and Public Accountability Federal Register Notice for a discussion of changes to FR Y-14Q, Schedule B.2 and B.3.

d. Interest Income on Agency Mortgage-Backed Securities

The model for agency mortgage-backed securities (MBS) projects interest income on agency mortgage-backed securities based on security-level microdata available in form FR Y-14Q, Schedule B. The approach relies on calculating interest income based on the sum of (a) coupon accruals for securities and (b) the amortization/accretion of amortized cost. The Board uses bond-specific details from FR Y-14Q, Schedule B.1 along with vendor data, including coupon rate and maturity. Certain simplifying assumptions or adjustments are made due to lack of information regarding the security in question. For this securities category, the Board uses a vendor model²⁶ to account for the prepayment behavior of residential mortgage-backed bonds.

There are multiple benefits to using this calculation-based approach. While straightforward, this approach is closer to the business-as-usual calculations performed by institutions to comply with accounting practices. Additionally, interpreting the results can be more easily tied to the characteristics of the securities and the stress testing scenario in question. This approach would accurately reflect the income impact of securities within a given stress testing scenario.

(a) Model Specification

The model calculates interest income for any security i at time t as follows:

Equation A11 – Interest Income on Agency Mortgage-Backed Securities Projection

$$Interest\ Income_{i,t} = Coupon\ Accrual_{i,t} + AccretionAmortization_{i,t}$$

where:

- $Coupon\ Accrual_{i,t} = Current\ Face\ Value_{i,t} \times \frac{Coupon\ Rate_{i,t}}{4}$
- $\Delta AC_{i,t}^{PAYDOWN} = paydown_{i,t} \cdot \left[1 - \frac{AC_{t-1}}{F_{i,t-1}} \right]$; and $\Delta AC_{i,t}^{OUTSTANDING} = \frac{[F_{i,t} - (AC_{i,t}^{PAYDOWN} - paydown_{i,t})]}{(4 \cdot WAL_{i,0} - [t-1])}$

²⁶ The vendor model is further discussed in the Market Risk Model Documentation of the Supervisory Stress Test, specifically at Section A.iii.a.1.c.

- $AccretionAmortization_{i,t} = \Delta AC_{i,t}^{PAYDOWN} + \Delta AC_{i,t}^{OUTSTANDING}$

Accretion/amortization is calculated to account for the pull-to-par of the amortized cost of the security and its impact on income. For agency residential mortgage-backed securities, accretion/amortization reflects the paydown of securities. The accretion/amortization term has two components: the accelerated amortization of the discount/premium due to early paydown $\Delta AC_{i,t}^{PAYDOWN}$ and the change in amortized cost due to the remaining outstanding balance $\Delta AC_{i,t}^{OUTSTANDING}$. Prepayments on agency residential mortgage-backed securities are incorporated through the use of a third-party vendor model.²⁷

For all other agency mortgage-backed securities, accretion/amortization is calculated using the effective interest method for this subset of securities. It is assumed that both the coupon rate and the book yield remain constant throughout the life of the security. If either the coupon rate or book yield data is not available, a straight-line approach will be used for accretion/amortization amounts. The Board does not model prepayments for all other agency mortgage-backed securities because these securities are mostly commercial mortgage-backed securities, which are expected to have low or no prepayments. Coupon accrual is computed based on current face value and coupon rate. For agency residential mortgage-backed securities, the third-party vendor model is used to dynamically adjust the current face value for prepayments. For all other agency mortgage-backed securities, coupon accrual is calculated using the beginning-of-the-period current face value at time $t=0$ and the coupon rate of the bond in question. The coupon rate is sourced from vendor data and in some cases may not be

²⁷ This vendor model is used only for prepayments in this model specification. This vendor model is also used in the Securities Model. For additional details on the incorporation of macroeconomic variables into the vendor model, please refer to the 2026 Market Risk Models Documentation, Section A.ii.a.(1), available at <https://www.federalreserve.gov/supervisionreg/dfa-stress-tests-2027.htm>.

available. To the extent that the coupon rate is not available, the book yield reported in the FR Y-14Q, Schedule B.1 will be used. In the case of zero-coupon bonds, the security is assumed to accrue at the book yield. In the case of floating-rate securities, data on margin is not available. As a result, the model will estimate the margin assuming an index of the 3-month Treasury spot rate. Specifically, the margin is estimated as the difference between the coupon rate and the 3-month Treasury spot rate at $t=0$, with that difference floored at zero. That estimated margin is then added to the 3-month Treasury spot rate applicable in all forward quarters.

In addition to accounting for the coupon accrual and accretion/amortization, the model also incorporates the maturity of securities. To maintain a constant balance assumption, a reinvestment assumption is used. Reinvestments represent securities purchased during the projection horizon to replace those securities with paydown during the projection quarters. The same reinvestment assumption is used across both the interest income on securities models and the Securities Model. For the purposes of coupon accrual, the Board assumes that all purchases in future quarters are made on the first day of the quarter subsequent to the maturing quarter of the security.

(b) Assumptions and Limitations

The model for estimating interest income on mortgage-backed securities makes various assumptions and has a number of limitations.

One of the key limitations of this approach is the lack of data on the income impact of hedges. For example, it is common practice for firms to enter into pay-fixed swaps to hedge fair value changes of mortgage-backed securities. This changes the income stream to that of a floating instrument. Qualified accounting hedges can dramatically change the income profile of securities. While qualified accounting hedges against securities held in the investment portfolio

are reported in FR Y-14Q, Schedule B.2, the current data attributes reported within this schedule do not allow for independent calculation. There are no data elements that provide the terms of either the fixed or floating leg for swaps. Methods to incorporate the effect of hedges based on the updated version of FR Y-14Q, Schedules B.2 and B.3 could be implemented in this model in the future.²⁸

The reinvestment assumption can have a material impact on interest income on securities. The characteristics of securities assumed to be purchased over the forecast horizon can change the level of income. In particular, the choice not to apply hedges against reinvestments and the coupon type (i.e., fixed/floating) of those reinvestments have an outsized impact on income model results. Given limitations regarding securities data from vendors, the Board does not have reliable margin information for all floating rate instruments (except for Agency residential mortgage-backed securities). As a result, an assumption is made that all floating instruments are indexed to the 3-month Treasury rate. This could be impactful for securities indexed to longer tenor rates or rates other than Treasuries. This model relies on a vendor model for prepayment behavior on Agency residential mortgage-backed securities.

The model assumes no prepayment for securities other than Agency residential mortgage-backed securities. This could dampen the impact of scenario rate paths on interest income on mortgage-backed securities projections and assume existing securities remain on balance sheets for longer than otherwise expected.

There are a variety of other items related to securities/hedges which impact interest income, which the model does not incorporate. One of these items is the impact on interest income from OCI releases from securities previously transferred from AFS to HTM.

²⁸ See Final Enhanced Transparency and Public Accountability Federal Register Notice for a discussion of changes to FR Y-14Q, Schedule B.2 and B.3.

e. Interest Income on Other Securities

Interest income on other securities is modeled through a structural approach that is based on the security level microdata available in form FR Y-14Q, Schedule B. The approach relies on calculating interest income based on the sum of (a) coupon accruals for securities and (b) the amortization/accretion of amortized cost. The Board uses bond-specific details, including rate and maturity from FR Y-14Q, Schedule B.1 along with vendor data. The Board makes certain simplifying assumptions or adjustments due to lack of information regarding the security in question.

Compared with alternative approaches like regression models, the structural, calculation-based approach has multiple advantages. While straightforward, this structural approach is closer to the business-as-usual calculations performed by institutions that comply with accounting practices. Additionally, interpreting the results can be more easily tied to the characteristics of the securities and the stress test scenarios. Also, this approach more accurately reflects the income impact of securities characteristics within a stress test scenario.

(a) Model Specification

The Board's approach classifies Other Securities into four subgroups for which different methodologies are applied. For each subgroup ((1) fixed-rate bonds, (2) zero-coupon bonds, (3) floating-rate securities, and (4) mutual funds and common stocks), interest income for any security i at time t is calculated as follows:

Equation A12 – Interest Income on Other Securities Projection

$$Interest\ Income_{i,t} = Coupon\ Accrual_{i,t} + AccretionAmortization_{i,t}$$

- 1) Fixed-rate bonds: Interest income is calculated by the effective interest method based on amortized cost and book yield.

- $Coupon\ Accrual_{i,t} + AccretionAmortization_{i,t} = Amortized\ Cost_{i,t} \times \frac{Book\ Yield_{i,t}}{4}$.
- 2) Zero-coupon bonds: Accretion/amortization is calculated by the effective interest method based on current face value and book yield.
- $Coupon\ Accrual_{i,t} = 0$;
 - $AccretionAmortization_{i,t} = Current\ Face\ Value_{i,t} \times \frac{Book\ Yield_{i,t}}{4}$.
- 3) Floating rate securities: Interest income is calculated using the beginning-of-the-period current face value and the coupon rate. $Coupon\ Rate_{i,t}$ is reset to the sum of the fixed margin and 3-month Treasury rate in each projection quarter, where the fixed margin is the difference between $t=0$ coupon rate and $t=0$ spot 3-month Treasury rate.
- $Coupon\ Accrual_{i,t} = Current\ Face\ Value_{i,t} \times \frac{Coupon\ Rate_{i,t}}{4}$;
 - $AccretionAmortization_{i,t} = 0$.
- 4) Mutual funds and common stocks: Interest income is assumed to be zero throughout the projection horizon for simplicity and conservativeness, reflecting substantial dividend cuts in a stressful scenario.

The Board uses the book yield reported in the FR Y-14Q, Schedule B.1. In the case of floating rate securities, data on margins is not available. As a result, the Board imputes the margin by assuming a 3-month Treasury index. Specifically, the margin is estimated as the difference between the coupon rate and the 3-month Treasury spot rate at $t=0$, with that difference floored at zero. That estimated margin is then added to the 3-month Treasury spot rate applicable in all forward quarters.

There are many securities in this category that are expected to experience prepayment in advance of final maturity. Given the broad number of asset classes and security types within this category, it is difficult to model all prepayment characteristics. As a result, no prepayments are modeled on securities within this category.

Accretion/amortization is calculated to account for the pull-to-par of the amortized cost of the security and its impact on income. For this subset of securities, the Board calculates

accretion/amortization using the effective interest rate method. The Board assumes that both the coupon rate and the book yield remain constant throughout the life of the security. If either the coupon rate or book yield data is not available, the Board uses a straight-line approach for computing accretion/amortization amounts. In this straight-line approach, securities will mature at the reported contractual maturity for direct obligations or weighted average life (WAL) for structured products.

After accounting for the two components listed above, the model also incorporates the maturity of securities. To maintain a constant balance assumption, a reinvestment assumption is used. Reinvestments represent securities purchased during the projection horizon to replace those securities with paydown during the projection quarters. The same reinvestment assumption is used across both the interest income on securities models and the Securities Model. For additional details on the reinvestment assumptions, please refer to the Securities Model Description. For the purposes of coupon accrual, the Board assumes that all purchases in future quarters are made on the first day of the quarter subsequent to the maturing quarter of the security.

(b) Assumptions and Limitations

There are various assumptions and limitations to the model for interest income on other securities. One of the key limitations of this approach is the lack of data on the interest income impact of qualified accounting hedges. For example, it is common practice for firms to enter into pay-fixed swaps to hedge fair value changes of the underlying securities being hedged. This changes the income stream to that of a floating instrument. Qualified accounting hedges can dramatically change the income profile of securities. While qualified accounting hedges against securities held in the investment portfolio are reported in FR Y-14Q, Schedule B.2, the current

data attributes reported within this schedule do not allow for independent calculation. There are no data elements that provide the terms of either the fixed or floating legs for swaps. Methods to incorporate the effect of hedges based on the updated version of the FR Y-14Q, Schedules B.2 and B.3 could be implemented in this model in the future.²⁹

The reinvestment assumption can have a material impact on interest income on securities. The characteristics of securities assumed to be purchased over the forecast horizon can change the level of income. In particular, the choice not to apply qualified accounting hedges against reinvestments and the coupon type (i.e., fixed/floating) of those reinvestments has an outsized impact on interest income model results.

Given limitations regarding securities data from vendors, the Board does not have reliable margin information for all floating rate instruments. As a result, an assumption is made that all floating instruments are indexed to the 3-month Treasury rate. This could be impactful for securities indexed to longer tenor rates or rates other than Treasuries.

The model assumes no prepayment for securities in this category. This could dampen the impact of the stress test scenario rate paths on income projections and assume the full balance of existing securities remain on the balance sheet longer than otherwise expected. If prepayments were modeled, the principle paydowns would be reinvested according to the reinvestment assumptions of the Securities model and would likely earn a lower rate of interest than the reported security.

There are a variety of other items related to securities and their underlying qualified accounting hedges which impact interest income and that the model does not incorporate. One

²⁹ See Final Enhanced Transparency and Public Accountability Federal Register Notice for a discussion of changes to FR Y-14Q, Schedule B.2 and B.3.

of these items is the impact on interest income from other comprehensive income (OCI) releases from securities previously transferred from available for sale (AFS) to held-to-maturity (HTM).

f. Interest Income on Other Interest/Dividend-Bearing Assets

The Board uses a structural approach to model interest income from other interest/dividend-bearing assets. Interest income from other interest/dividend-bearing assets consists of interest earned on federal funds sold and securities purchased under agreements to resell, as well as interest and dividends on other assets, such as Federal Reserve Bank or Federal Home Loan Bank stock.

The relevant balances for this component are the assets reported in line item 15 of the Net Interest Income Worksheet of FR Y-14Q, Schedule G (G.2). The portion of the portfolio that is federal funds sold and securities purchased under agreements to resell has short duration and is directly linked to short term interest rates. This portion can be quantified by utilizing the additional fields provided by the firms in the footnotes to the worksheet and by cross-referencing with the balances reported in FR Y-9C (BHCK3365). Federal funds sold and securities purchased under agreements to resell comprise most of other interest/dividend-bearing assets reported in FR Y-14Q.

(a) Model Description

Under this structural approach, interest income for this component at each quarter of the projection is calculated starting from a simple and intuitive assumption: the federal funds sold and securities purchased under agreements to resell earn a yield that responds directly to the short-term interest rate, as this is consistently observed in historical data. In particular, the Board assumes that the yield on this component is the 3-month U.S. Treasury rate. The remaining

assets of this portfolio are assumed to earn a yield that responds to longer-term rates captured by the 10-year U.S. Treasury rate to account for assets with longer maturity or higher yields.³⁰

More formally, let α_b be the proportion of assets consisting of federal funds sold and securities purchased under agreements to resell for each firm b , B_b be the total balance on other interest/dividend bearing assets, and F_b be the income earning from this component. Then, for each firm b at any quarter t :

Equation A13 – Interest Income on Other Interest/Dividend-Bearing Assets

$$F_{b,t} = \alpha_{b,t} B_{b,t} \text{Treasury}3m + (1 - \alpha_{b,t}) B_{b,t} \text{Treasury}10y$$

where:

- *Treasury3m* is the 3-month Treasury yield; and
- *Treasury10y* is the 10-year Treasury yield.

Using this equation for the projection period, the projected flow of income $F_{b,q}$, for firm b in quarter q over the projection horizon, can be calculated as:

$$F_{b,q} = \alpha_{b,q} B_{b,q} \text{Treasury}3m_q + (1 - \alpha_{b,q}) B_{b,q} \text{Treasury}10y_q$$

The stress test assumes constant balances for all firms; therefore, $B_{b,q} = B_{b,q0}$ for all quarters where $B_{b,q0}$ represents the balances of firm b at lift-off quarter $q0$. This means that the projected flow of income is calculated based on the balances at the start of the projection horizon. The share $\alpha_{b,q} = \alpha_{b,q0}$ is also assumed to stay constant over the projection quarters.

(b) Assumptions and Limitations

When using the structural model, the Board makes the assumption that the yield each firm earns over the projection horizon is given by the 3-month U.S. Treasury rate for the portion of the portfolio that consists of the federal funds sold and securities purchased under agreements to resell, and is given by the 10-year U.S. Treasury rate for the remainder of the portfolio. While

³⁰ For instance, stock in Federal Reserve Banks yields the lesser of six percent and the 10-year Treasury yield.

the 3-month U.S. Treasury rate tracks the overnight and other short-term lending rates closely, some fluctuations may be observed, especially when the short-term lending is collateralized by special or rare securities. Similarly, the remainder of each firm's portfolio may exhibit heterogeneity and earn a rate that is higher or lower than the 10-year U.S. Treasury rate. However, this portion of the portfolio is relatively small, and alternative rates do not result in material differences in the projected income.

The Board determined that the structural model described above had several advantages over a panel regression framework, including enhanced clarity and explainability as well as simplicity (since it does not involve coefficients estimation). Structural models avoid statistical estimation, meaning that the variability of projections over stress testing cycles can be fully explained by reported balances for each bank, and by the variation in the interest rate scenario paths. In addition, due to firm discretion, and consistent with the accounting rules on balance sheet offsetting, some firms may report their balances or income on a gross or net basis. Due to lack of consistency in firm reporting, this could produce less precise projections when a regression approach is adopted.

The Board models interest income on other interest/dividend-bearing assets as one component that consists of several categories of interest income earned on interest-earning assets. The Board chose this approach due to data limitations when identifying these components using FR Y-14Q reporting schedules.

g. Net Interest Income on Trading Assets and Liabilities

The Board uses a regression approach to model interest income and interest expense on trading assets. Interest income and expense on trading assets are modeled as a single net

quantity (interest minus expense), expressed as a ratio normalized by net trading assets (assets minus liabilities). The Board models a single net quantity rather than separate income and expense quantities to mitigate challenges in cross-firm comparability that could be introduced by differences in the extent of offsetting used in reporting trading assets and liabilities.

(a) Model Specification

In the regression model for net interest income on trading assets and liabilities, the ratio for each firm depends on the contemporaneous level of the 3-month Treasury yield and a fixed effect estimated for that firm. Estimation data on firm-level quarterly interest income and expense on trading assets and liabilities, and the associated balances, are sourced from the Net Interest Income Worksheet of the FR Y-14Q, Schedule G. The interest income and expense quantities used in the numerator of the ratio are derived by multiplying the reported average asset (liability) balance by the reported average asset (liability) rate, divided by four to convert annual to quarterly rates.

The model is specified according to the following equation:

Equation A14 – Net Interest Income on Trading Assets and Liabilities Regression Model

$$Ratio(b, t) = \beta Treasury3m(t) + \alpha_b + \varepsilon(b, t)$$

where:

- $Treasury3m(t)$ is the 3-month Treasury yield, representing the risk-free short-term rate;
- α_b represents firm-level fixed effects, which account for heterogeneity in the average level of the ratio over time across firms; and
- $\varepsilon(b, t)$ is the error term of the regression.

The data sample used for model estimation is an unbalanced panel of all FR Y-14Q reporters. The model is estimated as a weighted least squares (WLS) regression, weighted by the net trading asset balance (trading assets minus trading liabilities) in each firm-quarter. The Board selected a weighted panel regression to strike an appropriate balance between capturing

data on all firms and avoiding undue influence from firm-quarters with very small trading positions that may generate volatile ratios.

In order to calculate dollar projections, first, the ratio is projected for the nine-quarter horizon in the stress test projection, for each firm, using the previous equation and the path of the macroeconomic variable under the scenario. Second, the Board multiplies the projected ratio path, at each quarter, by the balances at lift-off for each firm.

(b) Variable Selection

While three macroeconomic factors were considered, only the 3-month Treasury yield is included as an explanatory variable in the model. Three macroeconomic factors were examined that could be plausibly related to net interest income on trading positions: the 3-month Treasury yield, the term spread (10-year minus 3-month Treasury yields), and the BBB corporate credit spread (BBB corporate bond yield minus 10-year Treasury yield). These variables could reflect interest income and expense streams arising from exposure to, respectively, short-term interest rates, long-term interest rates, and credit spreads.

The coefficient estimate on the 3-month Treasury yield was consistently positive and statistically significant, whether included in the model on its own or with any combination of the other two factors. However, the signs and statistical significance of the coefficient estimates on the other two factors varied depending on which other factors were included in the regression. This fact pattern is likely explained by the high correlations between the three macroeconomic factors over the sample period of the model. When short-term interest rates are low, the term spread and the credit spread both tend to be high; thus, it is difficult for the model to identify the effects of each factor separately. Furthermore, adding the two spread variables to the model with the 3-month Treasury yield did little to increase the overall explanatory power of the model.

Therefore, in the interest of simplicity and model stability, only the 3-month Treasury yield is included as an explanatory variable in the model.

Firms have individual preferences for holding trading assets, which can vary in risk, origination date, underlying interest rate terms (e.g., fixed vs. variable), and duration. Consequently, average yields vary across firms, even after controlling for macroeconomic factors. The regression model includes firm-specific fixed effects to account for this fact.

(c) Assumptions and Limitations

The model for this ratio is top-down in nature and does not attempt to capture the specific composition of any firm's trading portfolio at any given point in time. Such compositional details could affect both the level of net interest income on trading positions at a given firm and its sensitivity to macroeconomic factors. As an example, firms with higher proportions of equity trading activity might have lower sensitivity to short-term interest rates, since equity positions do not generate interest income.

While differences in net interest income level are captured through the firm-specific fixed effects, differences in sensitivities are not. The Board considered including such compositional details in the model by, for example, incorporating information on trading asset and liability composition from the FR Y-9C, Schedules HC-D and HC-L or information on risk factor sensitivities from the FR Y-14Q, Schedule F. These additional data sources, however, would themselves be subject to significant limitations. The compositional information on the FR Y-9C, for example, focuses primarily on exposures to different types of cash securities, but has limited information on derivatives, which can have a significant impact on net interest income dynamics. The information on the FR Y-14Q, Schedule F, while more detailed, is only available for the

subset of firms filing that schedule, meaning that a separate model would be needed for non-filers.

The Board assessed that using firm-specific fixed effects struck an appropriate balance of capturing cross-sectional variation in position profiles while retaining simplicity. In addition, the Board tested the assumption that sensitivity to the 3-month Treasury yield is constant across firms by running firm-specific regressions for all large trading firms using the same specification. In general, the coefficient estimates for the individual firms fell within the 95% confidence interval of the estimate from the weighted panel regression, supporting the use of a single common sensitivity estimate.

An implied assumption of this model is that the spread and interest rate sensitivity of net interest income on trading positions for a given firm is stable over time. This assumption could conflict with the observation that firms may adjust their trading positions depending on macroeconomic conditions and other factors. The Board considered rolling-window firm-specific fixed effects as a possible alternative to full-sample fixed effects, which might help to capture changes over time in such firm preferences. However, introducing rolling-window fixed effects would also decrease the model's stability and increase the volatility of projections, so the Board elected not to include rolling-window fixed effects.

Similarly, the Board assessed whether average sensitivity to macroeconomic factors across firms might vary over time by running rolling-window regressions and comparing coefficient estimates. This analysis suggested that the sensitivity to the 3-month Treasury rate may have increased over the most recent interest rate cycle compared to prior cycles. However, the Board decided that the full-sample sensitivity estimate was preferable to an estimate over a shorter recent period or using a model that weighed recent periods more heavily. Such

approaches that assign higher importance to more recent periods could potentially result in less stable coefficient estimates and correspondingly higher volatility of projections.

Finally, as discussed above, the model has difficulty identifying separate effects from the term spread and credit spread factors due to high empirical correlations with the 3-month Treasury yield in the estimation data sample. This could result in a limitation where the model fails to capture sensitivity to these factors. One potential way of mitigating this limitation would be to use a data source with a longer time sample available, such as the FR Y-9C. However, this alternative data source has its own limitations, such as the fact that interest expense on trading liabilities is combined with interest expense on other borrowed money, and the correlations between the macroeconomic factors are likely to remain high even over longer samples. The Board believes that the potential concern is mitigated by the fact that firms with large trading operations are conceptually likely to limit the sensitivity of their net interest income on trading positions to long-term interest rates and credit spreads. This is because sensitivity of interest income implies sensitivity of market value, which large trading firms typically try to limit.

h. Estimated Parameters for Interest Income Models

The tables included in this section present the estimated parameters for interest income models. Table A4 presents the industry scalars for interest income on loans model projections.

Table A4 – Industry Scalars for Interest Income on Loans Model

Portfolio	Scalar
Auto	0.871
C&I, noncore SME loan and card	1.048
Credit card	0.968

Domestic CRE	1.077
Mortgage	1.005
Other retail loans	0.978
Rest of wholesale	1.153

Table A5 – Estimated Parameters for Net Interest Income on

Trading Assets and Liabilities Model presents the estimated coefficients for the regression model for net interest income on trading assets and liabilities. The table includes the estimated coefficient for the independent macroeconomic variable used in this model. Estimated coefficients for firm fixed effects are not included in the table. The Board calculated these coefficients based on data submitted on form FR Y-14Q, as described above in Section A.ii.g. Net Interest Income on Trading Assets and Liabilities.

Table A5 – Estimated Parameters for Net Interest Income on Trading Assets and Liabilities Model

Component (Relevant Equation)	3M Treasury yield	Standard Error	Firm fixed- effects
Net interest income on trading assets and liabilities (Equation A14)	0.278***	0.023	Yes

Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively.

iii. Interest Expense Models

The Board models five components of interest expense, which are:

1. interest expense on domestic time deposits;
2. interest expense on other domestic deposits;

3. interest expense on foreign deposits;
4. interest expense from federal funds purchased and securities sold under agreements to repurchase; and
5. interest expense on other borrowing.

The first four components listed above are projected using structural models, while the last component is modeled using a regression approach. The structural models for the above components are based on granular data reported in FR Y-14Q, Schedule G, and FR Y-14Q, Schedule M. The regression model for interest expense on other borrowing uses data reported on FR Y-14Q, Schedule G, and FR Y-9C. Details regarding how each component is modeled are described below.

a. Interest Expense on Domestic Time Deposits

The Board uses a structural model for interest expense on domestic time deposits. The model assumes a fraction of the firm's domestic time deposit portfolio matures each period. Maturing balances are replaced with new funding each period priced to a reference rate. The remaining fraction of the firm's portfolio receives the rate paid on domestic time deposits in the previous period. The dependent variable in the model is the domestic time deposit rate as reported in the FR Y-14Q, Schedule G, line item 42E. The dollar projections for interest expense on domestic time deposits are computed by multiplying the rate projected by the model below by the average balance on domestic time deposits as reported in the FR Y-14Q, Schedule G, line item 34E.

(a) Model Specification

The model is specified according to the following equation:

Equation A15 – Interest Expense on Domestic Time Deposits Rate Projection

$$Rate_{b,t} = \rho_b * Treasury1y_t + (1 - \rho_b) * Rate_{b,t-1}$$

where:

- $Rate_{b,t}$ is the rate paid on domestic time deposits by firm b at quarter t ;
- $\rho_b \equiv \frac{1}{WAL_b}$: is the fraction of the portfolio that reprices every period (quarter). WAL_b is the weighted average life of domestic time deposits for firm b ; and
- $Treasury1y_t$: is the 1-year Treasury yield at quarter t .

The initial rate paid on domestic time deposits is the average rate paid on domestic time deposits in the jump-off quarter as reported in the FR Y-14Q, Schedule G, line item 42E (“Time Deposits”). The fraction of the portfolio which reprices each period is computed as one divided by the Weighted Average Life of the portfolio as reported by firms in the FR Y-14Q, Schedule G, line item 71 (“Domestic Deposits – Time”). This fraction is reflective of the portfolio’s maturity profile and remains constant throughout the projection.

(b) Assumptions and Limitations

A structural model specification necessarily requires assumptions about future behavior. First, a constant percentage of the portfolio is assumed to be repriced every period. This assumption abstracts from the heterogeneity of the rate and maturity profile in a firm’s time deposit portfolio. Using only one piece of information about maturity profiles, the Weighted Average Life, necessitates this simplifying assumption.

A second assumption is that all re-originated time deposits are priced at the 1-year Treasury yield. In this model, firms do not have market power in time deposit pricing. The only difference in the level of rates throughout the projection period comes from the rate paid on domestic time deposits at lift-off and the firm-specific Weighted Average Life. Assuming all re-originations are paid, the 1-year Treasury yield also ignores the heterogeneity in rates that comes with the origination of new time deposits.

A limitation of the model is that richer maturity structures are not possible. Time deposits have contractual maturities that do not factor into this mechanism. For example, a time deposit balance that reprices to the 1-year Treasury yield in one quarter is as equally likely to be repriced in the following quarter as any other time deposit. There is no mechanism for the time deposit balance to be held for the contractual term.

b. Interest Expense on Other Domestic Deposits

The Board uses a structural model for interest expense on other domestic deposits, using as a data source the interest rates on subcomponents of domestic deposits reported in form FR Y-14Q, Schedule G. These FR Y-14Q, Schedule G subcomponents are money market accounts, savings accounts, and transaction accounts (negotiable order of withdrawal [NOW], automatic transfer service [ATS], and other accounts). The model is split into two regimes, each with its own model specification, depending on the level of the 3-month Treasury yield in a particular projection quarter. The effective lower-bound period occurs when the 3-month Treasury yield is equal to or below 25 basis points in a projection quarter. The non-effective lower bound occurs when the 3-month Treasury yield is above 25 basis points in a projection quarter.

In the non-effective lower-bound regime, the interest rate on deposits is equal to the previous period interest rate plus the change in the 3-month Treasury yield multiplied by a coefficient named “beta”. The beta is given by the median of firm-reported betas, sourced from the Y-14Q, Schedule G, corresponding to the direction of the 3-month Treasury yield movement. If the computed deposit interest rate falls below an assumed floor, the deposit rate is set to the assumed floor. In the effective lower-bound regime, the interest rate on deposits is equal to the 3-month Treasury yield plus a firm-specific spread.

(a) Model Specification

Each individual subcategory of other domestic deposits reported in the FR Y-14Q (money market accounts, savings accounts, and transaction accounts) is modeled separately and then aggregated. The model is split into two regimes: one during an effective lower-bound period defined as the 3-month Treasury yield being equal to or below 25 basis points, and one during a non-effective lower-bound period. The general model is specified according to the following equation during the effective lower-bound period:

Equation A16 – Interest Expense on Other Domestic Deposits Rate Projection, Effective Lower Bound Period

$$Rate_{i,b,t} = floor_{i,b,t}$$

where:

- $i \in (MMA, Savings, Transaction)$;
- b indicates the firm;
- t indicates the quarter;
- $floor_{i,b,t} = Treasury3m_t + Spread_{i,b}$;
- $Spread_{i,b}$ is the firm- and deposit-type-specific spread to the 3-month Treasury yield during an effective lower bound period; and
- $Treasury3m_t$ is the 3-month Treasury yield.

The firm-specific spread to the 3-month Treasury yield is empirically estimated as the average distance between the deposit rate paid by the firm during the most recent effective lower-bound period. Following the definition assumed above, the most recent effective lower-bound period occurred from 2020:Q2 to 2021:Q4. The calculated spread will remain constant in subsequent stress test cycles.

During a non-effective lower bound period ($Treasury3m_t > 25bps$) the general model specification is:

Equation A17 – Interest Expense on Other Domestic Deposits Rate Projection, Non-Effective Lower Bound Period

$$Rate_{i,b,t} = \max(Rate_{i,b,t-1} + \delta_{i,t}, assumed_floor_{i,b})$$

where:

- $i \in (MMA, Savings, Transaction)$;
- $\delta_{i,t} = \max(\Delta Treasury3m_t, 0) * \beta_i^{up} + \min(\Delta Treasury3m_t, 0) * \beta_i^{down}$;
- $\Delta Treasury3m_t$ is the change in the 3-month Treasury yield;
- β_i^{up} and β_i^{down} are the constant betas for the up and down rate respectively;
- $assumed_floor_{i,b} = First_ELB_Treasury3m + Spread_{i,b}$;
- $Spread_{i,b}$ is the firm- and deposit-type-specific spread to the 3-month Treasury yield during an effective lower bound period; and
- $First_ELB_Treasury3m$ is the minimum between 25 basis points and the first observation of the 3-month Treasury yield which goes below the 25 basis points in the scenario (if available).

The interest rates on money market accounts, savings accounts, and transaction accounts are retrieved from the Y-14Q, Schedule G, line items 42B, 42C, and 42D, respectively. The up and down rate betas are retrieved from the Y-14Q, Schedule G, line items 79A, 79B, 80A, 80B, 81A, and 81B. The beta used in the model is the median of the firm-reported betas for the respective deposit category at lift-off. The reasons for using a median beta are both to mitigate the reliance on individual firm-provided estimates, as well as to address outliers in the data.

The interest rate on other domestic deposits is aggregated up from the subcomponents as follows:

Equation A18 – Interest Rate on Other Domestic Deposits Aggregation

$$Rate_{b,t} = (\sum_i Rate_{i,b,t} * Balance_{i,b,t}) / (\sum_i Balance_{i,b,t})$$

where:

- $i \in (MMA, Savings, Transaction)$; and
- $Balance_{i,b,t}$ is the balance reported in the Y-14Q corresponding to the rate i for firm b at time t .

The aggregate interest rate on other domestic deposits is then multiplied by the average balance on other domestic deposits as reported in the FR Y-14Q, Schedule G, (the sum of line items 3B, 34 C and 34D), to produce the projected interest expense on other domestic deposits.

(b) Assumptions and Limitations

An assumption is that the effective lower bound occurs when the 3-month Treasury yield falls to or below 25 basis points. This is consistent with the lowest observed historical policy target range for the federal funds rate of 0–25 basis points. The 3-month Treasury yield is commonly used as the quarterly proxy for the risk-free rate.

A second assumption is that non-effective lower-bound periods are treated as normal periods. This abstracts from the relative distance of deposit rates to the effective lower bound where yield compression can occur. A third assumption is that during non-effective lower-bound periods, a firm's rate floor is the first observation of the 3-month Treasury yield that goes below 25 basis points in the scenario or 25 basis points. This assumption eliminates the possibility that the rate on other domestic deposits will go below the assumed floor during the non-effective lower-bound period.

A third assumption of the model is the use of a constant beta, taken as the median of firm-reported betas, for all firms. By construction, this eliminates the possibility of considering market power in the pricing of non-time deposits. Additionally, this assumption abstracts from time variation in betas which has been noted in academic literature and is observed in the firm's reporting of betas.

c. Interest Expense on Foreign Deposits

The Board uses a model for interest expense on foreign deposits, which is similar to the model for other domestic deposits previously described. The data for foreign deposits is retrieved from the Y-14Q, Schedule G. Aggregate foreign deposits have a smaller impact with respect to the larger categories of domestic time deposits and other domestic deposits.

(a) Model Specification

The model for foreign deposits is identical to the model for other domestic deposits detailed above with the exception that the subcategories of deposit rates from the Y-14Q are foreign deposits and foreign deposits-time (Schedule G.2, line items 43A and 43B, respectively). The equivalent balances are retrieved from the Y-14Q to combine foreign non-time deposits and foreign time deposits (Schedule G.2, line items 35A and 35B, respectively) to an aggregate foreign deposit rate. The up and down rate for betas for foreign deposits are retrieved from the Y-14Q, Schedule G.3, line items 83A, 83B, 84A, and 84B.

(b) Assumptions and Limitations

When developing the interest expense on foreign deposits model, the Board assumed that both foreign time and foreign non-time deposits should follow the same model. This decision abstracts from the inherent differences in the contractual characteristics of time and non-time deposits while it prioritizes the Board's Stress Testing Policy Statement principle of simplicity.³¹

A second assumption is that re-originated foreign deposits are priced at the 3-month Treasury yield. This assumption aligns with the scenario, which assumes a worldwide recession in which all central banks lower interest rates substantially. Similarly, there is no consideration of the effect of exchange rates on projected expenses.

³¹ 12 CFR 252, App'x B, section 1.

d. Interest Expense on Federal Funds Purchased and Securities Sold under Agreements to Repurchase

The Board uses a structural approach to model interest expense on federal funds purchased and securities sold under agreements to repurchase.

The liabilities under interest expense on federal funds purchased and securities sold under agreements to repurchase have short durations and are directly linked to short-term interest rates. The relevant balance for this component is the liabilities reported in line items 44A (“Fed Funds”) and 44B (“Repos”) of the Net Interest Income Worksheet of FR Y-14Q, Schedule G.

(a) Model Description

Under this structural approach, interest expense for this component at each projection quarter is calculated starting from a simple and intuitive assumption: the federal funds purchased and securities sold under the agreement to repurchase earn a rate that responds directly to the short-term interest rate, as this is consistently observed in historical data. In particular, the Board assumes that the rate on this component is the 3-month U.S. Treasury rate. This approach is equivalent to the one previously described for interest income on federal funds sold and securities purchased under agreements to resell, except that the federal funds and repo positions on the asset side are subsumed within the component other interest/dividend-bearing assets. For the sake of completeness, it is summarized below.

Let B_b be the total balance on federal funds purchased and securities sold under agreements to repurchase, and F_b be the expense paid from this component. Then, for each firm b at any quarter t :

Equation A19 – Interest Expense on Federal Funds Purchased and Securities Sold under the Agreement to Purchase

$$F_{b,t} = B_{b,t} \text{Treasury3m}_t,$$

where:

- *Treasury3m* is the 3-month Treasury yield for quarter t .
Using this equation for the projection period, the projected flow of expense $F_{b,q}$, for firm

b in quarter q on the projection horizon, thus, can be calculated as:

$$F_{b,q} = B_{b,q} \text{Treasury3m}_q.$$

The stress test assumes constant balances for all firms; therefore, $B_{b,q} = B_{b,q0}$ for all periods, where $B_{b,q0}$ represents firm's b balances at lift-off quarter $q0$. This means that the projected flow of expense is calculated based on the balances at lift-off.

(b) Assumptions and Limitations

When using the structural model, the Board makes the assumptions that the rate each firm earns over the projection horizon is given by the 3-month U.S. Treasury rate. While the 3-month U.S. Treasury rate tracks the overnight and other short-term borrowing rates closely, some fluctuations may be observed, especially when the short-term borrowing is collateralized by special or rare securities.

The Board determined that the structural model described above had several advantages over a panel regression framework, including enhanced clarity and explainability as well as simplicity (since it does not involve coefficients estimation). Structural models avoid statistical estimation, meaning that the variability of projections over stress testing cycles can be fully explained by reported balances for each bank and the variation in the interest rate scenario paths. In addition, due to firm discretion, and consistent with the accounting rules on balance sheet offsetting, some firms may report their balances or income on gross or net basis. Due to lack of

consistency in firm reporting, this could produce less precise projections when a regression approach is adopted.

e. Interest Expense on Other Borrowing

Interest expense on other borrowing, which includes interest expense paid on short-term borrowing, subordinated debt, and all other interest-bearing liabilities is modeled as a single quantity. The relevant balances for this component are the liabilities reported in line item 44C (“Other Short-Term Borrowing”), line item 46 (“Subordinated Notes Payable to Unconsolidated Trusts Issuing TruPS and TruPS Issued by Consolidated Special Purpose Entities”) and line item 47 (“Other Interest-Bearing Liabilities”) of the Net Interest Income Worksheet of FR Y-14Q, Schedule G. Parts of subordinated debt, however, may also be reported in line items 44C and 47 per reporting instructions. The Board selected the approach to model expenses on these liabilities together due to the relative simplicity of the approach, and due to lack of further granularity to cleanly separate subordinated debt from other borrowing from line items 44C and 47. The combined liabilities include subordinated debt, short-term borrowing such as commercial paper, advances from Federal Home Loan Bank, and other mid- to long-term debt.

(a) Model Description

Under this modeling approach, the rate that each firm pays on its other borrowing depends on the contemporaneous level of the BBB corporate bond yield, the compositional mix of each firm’s portfolio, and a fixed effect estimated for each firm. More formally,

Equation A20 – Interest Expense on Other Borrowing Regression Model

A20(1):

$$Expense(b, t) = R(b, t) \times B(b, t) = (Treasury3m(t) + \widehat{\delta(b, t)}) \times B(b, t)$$

with:

A20(2):

$$\delta(b, t) = \beta_1 BBB(t) + \beta_2 Commercial\ Paper(b, t) + \beta_3 Subdebt(b, t) + \alpha_b + \varepsilon(b, t)$$

where:

- $Expense(b, t)$ is the expense on Other Borrowing for each firm b at time t ;
- $B(b, t)$ is the total balance of other borrowing defined as the sum of other short-term, borrowing, subordinated debt, and other interest-bearing liabilities;
- $R(b, t)$ represents the rate paid on other borrowings;
- $Treasury3m(t)$ is the 3-month Treasury rate at time t ;
- $\delta(b, t)$ is the firm-specific credit spread;
- $BBB(t)$ is the BBB corporate bond yield at time t ;
- $Commercial\ Paper(b, t)$ is the share of commercial paper relative to other borrowings for each firm b at time t , calculated as the balance of commercial paper divided by the total balance of other borrowing;
- $Subdebt(b, t)$ is the share of subordinated debt relative to other borrowings for each firm b at time t , calculated as the balance of subordinated debt divided by the total balance of other borrowing;
- α_b is the firm fixed effect for firm b ; and
- $\varepsilon(b, t)$ is the error term in the regression.

The data sample used for model estimation is an unbalanced panel of all FR Y-14Q reporters from 2020:Q2 to 2021:Q4. Restricting the sample to the specified time period was chosen so that the sensitivity to the economic and firm-specific factors, including the portfolio composition, is more precisely calibrated to a period where the interest rates are low.

The coefficients in the regression specified in equation A20(2) are estimated using ordinary least squares and are applied to each firm's portfolio composition that is held constant at the lift-off quarter, as well as the scenario variable for the BBB corporate bond yield. Hence, for each projection quarter q , the firm's interest expense is given by:

$$Expense(b, q) = (Treasury3m(q) + \widehat{\delta(b, q)}) \times B(b, 0),$$

where the lift-off quarter is denoted by $q = 0$, and

$$\delta(b, q) = \widehat{\beta}_1 BBB(q) + \widehat{\beta}_2 Commercial\ Paper(b, 0) + \widehat{\beta}_3 Subdebt(b, 0) + \alpha_b.$$

(b) Variable Selection

The Board examined three macroeconomic factors that could be plausibly related to interest expense on other borrowing: the 5- and 10-year U.S. Treasury rate and the BBB corporate bond yield. These variables could reflect interest expense streams arising from exposure to, respectively, medium-term interest rates, long-term interest rates, and the overall credit conditions. The coefficient estimate on the BBB corporate bond yield was consistently positive and statistically significant, whether included in the model on its own or with any combination of the other two factors. However, the statistical significance of the coefficient estimates on the other two factors varied depending on which other factors were included in the regression. This fact pattern is likely explained by the high correlations between the three macroeconomic factors over the sample period of the model.

The Board also considered the balance sheet composition variables for the firms' liabilities. These variables are sourced from the FR Y-9C report. The balances on subordinated debt are reported in BHDM4062 and BHDMC699 in the FR Y-9C. The balances on commercial paper are reported in BHCK2309. The coefficients on these portfolio composition variables have the intuitive sign: since subordinated debt is more expensive, its coefficient is positive and statistically significant. Similarly, since commercial paper has a shorter time duration and is therefore more responsive to short-term interest rates (besides being usually highly rated with lower credit risk), its coefficient is negative and economically significant.

The mix of other borrowing, as well as interest rate risk hedging intensity, varies across firms, and this variation is not fully captured by the available portfolio composition variables. Consequently, average rates vary across firms, and the regression model includes firm-specific fixed effects to account for this heterogeneity.

(c) Assumptions and Limitations

The model for this component does not fully capture the composition of each firm's other borrowing beyond short-term commercial paper and subordinated debt. Such compositional details could affect both the level and sensitivity of the rate that each firm pays on its other borrowing. As an example, firms with a higher share of floating rate debt would have a higher sensitivity to changes in interest rates. Conversely, fully collateralized debt would be expected to have a lower rate due to its lower risk profile. This approach also does not account for the existing duration and maturity structure of various portions of each firm's liabilities balances.

Additionally, the model is estimated over a specific time period when interest rates are low, assuming that the composition of other borrowing and the impact of interest rate risk hedges are similar during low interest rate periods, and the sensitivity of this component to credit conditions stays stable over other low interest rate periods. These assumptions may conflict with the observation that the firms may adjust their borrowing sources and hedging strategies over time, depending on the availability of alternative funding sources, such as deposits, as well as macroeconomic and overall credit conditions.

f. Estimated Parameters for Interest Expense Models

The tables included in this section present the estimated parameters for the models of interest expense. Table A6 presents the median betas for the interest expense on other domestic deposits and for the interest expense on foreign deposits models. The Board calculated these parameters based on data submitted on Form FR Y-14Q, as described above in Sections A.iii.a, A.iii.b, A.iii.c.

Table A6 – Median Betas for Deposit Models

Deposit Type	Interest Rate Movement	Median Beta
Other Domestic: Money Market Accounts	Up	0.620
	Down	0.645
Other Domestic: Savings	Up	0.310
	Down	0.335
Other Domestic: Other	Up	0.465
	Down	0.490
Foreign: Non-time	Up	0.890
	Down	0.790
Foreign: Time	Up	1.000
	Down	1.000

Table A7 presents the estimated coefficients for the interest expense on other borrowing regression model. Included in the table are the independent macroeconomic variables estimated coefficients. Estimated coefficients for firm fixed effects are not included in the table. The Board calculated these coefficients based on data submitted on forms FR Y-14Q and FR Y-9C, as described above in Section A.iii.e.

Table A7 – Estimated Parameters for the Interest Expense on Other Borrowing Regression Model

Component	BBB corporate bond yield	Share of commercial paper relative to other borrowing	Share of subordinated debt relative to other borrowing	Firm fixed-effects
Interest expense on other borrowing	0.254** (0.117)	-0.036*** (0.014)	0.066** (0.031)	Yes

Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively. Standard errors are reported in parentheses.

iv. Noninterest Income Models

The Board utilizes data reported in the FR Y-14A and FR Y-14Q to model noninterest income. The FR Y-14A data contain firm projections for Category I – III banks³² for the supervisory baseline and severely adverse scenarios. Firm projections provide insights into which macroeconomic variables are the most relevant for different categories of noninterest income and are a key element of the discount factor path method used to project noninterest income.

a. Projection Method Overview

The Board projects noninterest income following the eight steps described below:

1. Use data reported in the FR Y-14A schedule to construct aggregate group-level time series for nine components of noninterest income for the following three industry groups: U.S.-based global systemically important banks³³ (“GSIB”), other U.S.-based banks³⁴ (“Non-GSIB”) and foreign banking organizations³⁵ (“FBO”).
2. Each group-level aggregate time series will include available data from the Cat I – III banks within the group that are participating in the current exercise. There will be a total of 27 distinct time series (nine components for each of the three industry groups).
3. For each noninterest income component in each historical stress testing exercise, calculate the discount factor path for the group. The group-level discount factor path

³² Under the Board’s tailoring framework, Category I banks comprise U.S. Global Systemically Important Banks (G-SIBs), Category II includes institutions with $\geq$ \$700 billion in assets or $\geq$ \$75 billion in cross-jurisdictional activity, and Category III includes institutions with \$250 billion to \$700 billion in assets or $\geq$ \$75 billion in specific risk indicators like short-term wholesale funding (12 CFR Part 252).

³³ A Global Systemically Important Bank (G-SIB) is a large banking organization whose size, complexity, interconnectedness, and lack of cross-border substitutes mean its failure could trigger a wider global financial crisis, subjecting it to a mandatory risk surcharge and annual Category I supervisory stress testing (12 CFR Part 217, Appendix D; 12 CFR 252.5)

³⁴ Other U.S.-based banks (Non-GSIB) are here considered firms subject to stress test which are not classified as G-SIBs or FBOs.

³⁵ A Foreign Banking Organization (FBO) is defined as a non-U.S. bank that operates a branch or agency, or controls a commercial bank subsidiary within the United States, as well as any parent company that controls such a foreign bank (12 CFR § 211.21(o); 12 CFR § 252.2).

represents the cumulative percentage growth of the component relative to its average over the 12 quarters immediately preceding that exercise.

4. Develop a simple regression model to express each group-level discount factor path as a function of variables from the supervisory severely adverse scenario of the corresponding historical stress testing exercise.
5. Use the estimated regression to project the nine component-level discount factor paths for each group conditional on the supervisory severely adverse scenario of the current exercise.
6. To obtain a firm's income for each component, multiply its trailing 12-quarter average income for that component by the relevant group-level discount factor path.
7. Two additional components of noninterest income—non-interchange credit and charge card revenue and miscellaneous revenue—will not be modeled using discount factors. Instead, these items will be projected using firm-specific models (described in more detail below).
8. Sum up the eleven component-level projections (the nine generated with discount factors models and two produced by firm-specific models) to obtain the projected path of total noninterest income for the firm.

b. *Components of Noninterest Income*

The Board models 11 components of noninterest income utilizing the approach described above, and the data from FR Y-14Q and FR Y-14A schedules.³⁶ The components are as follows:

1. Deposit-related noninterest income (row 14O of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
2. Credit and charge card interchange noninterest income plus international retail and small business revenue (row 14C of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a plus row 14T of FR Y-14Q, Schedule G and FR Y-14A Schedule A.7.a);
3. Other loan-related noninterest income³⁷ (rows 14E, 14S, and 15 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
4. Sales and trading noninterest income (row 18 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);

³⁷ A floor of zero is applied to the firm-level data for the commercial lending (under the Other loan-related noninterest income component) and syndicated/corporate lending (under the investment banking component) line items before the information is aggregated into the discount factors. This adjustment eliminates the outsized losses that firms may report in their Y-14A projections due to the market stress associated with the severely adverse scenario.

³⁷ A floor of zero is applied to the firm-level data for the commercial lending (under the Other loan-related noninterest income component) and syndicated/corporate lending (under the investment banking component) line items before the information is aggregated into the discount factors. This adjustment eliminates the outsized losses that firms may report in their Y-14A projections due to the market stress associated with the severely adverse scenario.

5. Investment banking and merchant banking/private equity (excluding the net investment mark-to-market portion³⁸) noninterest income (rows 16 and 17 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a, less row 17A of each schedule);
6. Asset management noninterest income (row 19A of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
7. Wealth management /private banking noninterest income (row 19B of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
8. Investment services noninterest income (row 20 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
9. Treasury services noninterest income (row 21 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a);
10. Non-interchange credit and charge card noninterest income (row 14D of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a); and
11. Miscellaneous noninterest income (rows 22 – 25 of FR Y-14Q, Schedule G and FR Y-14A, Schedule A.7.a).

The first nine components in the above list are projected using discount factors and the last two components are projected with firm-specific models.

The Board considered the following factors in constructing the components to measure noninterest income:

- Utilization of broad categories (asset management fees, investment banking fees, trading, etc.) that large banks themselves typically use in their communications with investors to report noninterest income;
- Ability to control for revenue changes that result from balance sheet dynamics to ensure that projections are consistent with the Board's constant balance sheet assumption where necessary;
- Separation into categories that have distinct reactions to macroeconomic factors based on historical FR Y-14Q data and projection data from the FR Y-14A; and
- Avoiding categories in which most of the revenue is generated by a small number of firms.

To control for fluctuations in noninterest income across firms due to balance sheet dynamics, the Board uses scaling balances for certain components. For example, loan-related noninterest income may fall in the projection period because firms are projecting lower balance

³⁸ The net investment mark-to-market portion of merchant banking/private equity is modeled and projected by a separate process outside of the PPNR model.

amounts and not because they are cutting fees. To account for this and to make the projection path consistent with the assumption that firms maintain constant balance sheets over the projection horizon, the Board divides the revenue measure by an appropriate scaling balance where available. Scaling balances are obtained from the balance sheet portion of FR Y-14A or FR Y-9C.

A scaling balance is applied to four components of noninterest income in the current framework:

1. Deposit-related noninterest income, which uses deposits as the scaling balance (row 134 of FR Y-14A, Schedule A.1.b and row 13.a of FR Y-9C, Schedule HC);
2. Credit and charge card interchange noninterest income, which uses credit card loans as the scaling balance (row 35 of FR Y-14A, Schedule A.1.b and row 6.a of FR Y-9C, Schedule HC);
3. Other loan-related noninterest income, which uses non-credit card loans as the scaling balance (row 51 of FR Y-14A, Schedule A.1.b minus row 35 FR Y-14A, Schedule A.1.b and row 12 of FR Y-9C, Schedule HC minus row 6.a. of FR Y-9C, Schedule HC);
4. Sales and trading noninterest income, which uses trading assets as the scaling balance (row 112 of FR Y-14A, Schedule A.1.b and row 5 of FR Y-9C, Schedule HC).

The remaining components, aside from non-interchange credit and charge card noninterest income,³⁹ are assumed to not require a scaling balance. None of the fluctuations in revenue that occur in the projection period are assumed to result from changing balances.⁴⁰

³⁹ Non-interchange credit and charge card noninterest income is projected as scalar multiple of the interchange portion of credit and charge card noninterest income. As such, a separate scaling balance adjustment is not required for the item. Additional information regarding the projection the item is provided below.

⁴⁰ It could be argued that assets under management (AUM) is a suitable scaling balance for asset management, wealth management, and investment servicing components. However, using AUM as a scaling balance would embed the assumption that AUM is constant over the projection horizon. This would be inconsistent with the decline in market indices that is a prominent feature of the supervisory severely adverse scenario.

c. Discount Factor Calculation

The Board defines a group-level discount factor for a given component of noninterest income as follows:

Equation A21 – Discount Factor Calculation for Noninterest Income Components

$$DF(c)_t^{E,G} = [NII(c)_t^{E,G} / SB(c)_t^{E,G}] / [NII(c)_{Base}^{E,G} / SB(c)_{Base}^{E,G}]$$

where:

- $DF(c)_t^{E,G}$ is the discount factor for component c in exercise E for group G in quarter t ;
- $NII(c)_t^{E,G}$ is the group-level noninterest income for component c in exercise E for group G in quarter t ;
- $SB(c)_t^{E,G}$ is the group-level scaling balance for component c in exercise E for group G in quarter t (for components with no scaling balance, $SB(c)_t^E$ equals one);⁴¹
- E is the stress testing exercise (from DFAST 2020 until DFAST 2025);
- G is the industry group: U.S.-based global systemically important banks (“GSIB”), other U.S.-based banks (“Non-GSIB”) and foreign banking organizations (“FBO”);
- t is the projection quarter (PQ1 – PQ9);
- $NII(c)_{Base}^{E,G}$ is the average group-level noninterest income for component c across the trailing 12 historical quarters before PQ1 of exercise E for group G ; and
- $SB(c)_{Base}^{E,G}$ is the average group-level scaling balance for component c across the trailing 12 historical quarters before PQ1 of exercise E for group G (for components with no scaling balance, $SB(c)_{Base}^E$ equals one).

In the above calculations, group-level measures are the simple sums across all firms in the group that have projections reported in FR Y-14A for a given stress testing exercise.

Revenue and scaling balances in the base period are measured over a trailing 12-quarter period.

The selection of 12 quarters satisfies competing considerations of reducing volatility in projections from one exercise to another and reflecting changes over time in the level and composition of a firm’s noninterest income.

The Board estimates a regression model for each component within a group, where the dependent variable is the group-level discount factor path for that component. Discount factors

⁴¹ If the component is one for which there is no scaling balance, this quantity is set to 1.

from multiple exercises and across all of the projection quarters for a given group are combined, and a single pooled ordinary least squares model for the group component is estimated with no exercise-specific fixed effects.

The independent variables are drawn from the severely adverse scenario and are differenced as appropriate to ensure stationarity. Differences are in general calculated with respect to PQ0 for consistency with the discount factor path, which is calculated on a cumulative basis. This approach is appropriate for most components where differencing is applied. For example, firms' noninterest income from asset management is a function of assets under management and is thus expected to fluctuate with the cumulative change in the Dow Jones index. As indicated below, for sales and trading, investment banking and other loan related income, the Board applies a 1-quarter difference to the independent variable rather than a cumulative difference. For these businesses, the 1-quarter difference provides improved fit and greater explanatory power relative to the cumulative difference. Applying a 1-quarter difference is also consistent with the observation that revenues in these businesses may recover before market indices return to their previous levels.

The following models were designed to be simple and include macroeconomic variables that have stable and intuitive relationships with the underlying noninterest income components. In some cases, it was not possible to identify a specific macroeconomic variable that reliably explained the variation in the discount factor. The resulting model for these items includes a constant but no macroeconomic variables. Note that projections from such models will still be scenario dependent (the projection will be equal to the average discount factor). The Board would plan to monitor the performance of the models and may update the estimation sample in future cycles to include additional years of firm projections. The current estimation sample

includes firm projections from the 2020 to 2025 stress test cycles. The Board applies an adjustment to mergers and acquisitions reported in the FR Y-14Q form only in years when the firm's projections reflect the merged entity. Specifically, a mergers and acquisitions adjustment is applied when the lookback period includes data reported separately for predecessor entities but the FR Y-14A data is for the merged entity.

d. Regression Specifications for Discount Factor Components

This section describes the detailed specification of discount factor regressions for each component of noninterest income. For modeling group-level deposit-related noninterest income, the following specifications apply:

Equation A22 – Deposit-related Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A23 – Deposit-related Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A24 – Deposit-related Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level credit and charge card interchange noninterest income, the following specifications apply:

Equation A25 – Credit and Charge Card Interchange Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDPC(E, t)$ is the cumulative change in real GDP⁴² in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A26 – Credit and Charge Card Interchange Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \beta_1 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;

⁴² The cumulative change in real GDP is calculated as follows. First, the annual growth rate on real GDP (from the stress test scenario) is transformed into a quarterly rate. Then, the quarterly rates are compounded (multiplied in sequence), from quarter 1 until the quarter of interest.

- $RGDPC(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A27 – Credit and Charge Card Interchange Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \beta_1 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDPC(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level other loan-related noninterest income, the following specifications apply:

Equation A28 – Other Loan-related Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 T10Q(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $T10Q$ is the quarterly change in the 10-year Treasury yield⁴³ in exercise E at projection quarter t , representing changes in the level of interest rates; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A29 – Other Loan-related Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \beta_1 T10(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;

⁴³ The quarterly change in the 10-year Treasury yield is calculated simply as the first difference of the yield (in levels).

- β_0 is the constant term estimated by the regression;
- $T10$ is the level of the 10-year Treasury yield in exercise E at projection quarter t , representing the level of interest rates; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A30 – Other Loan-related Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling sales and trading related noninterest income, the Board uses the following specifications:

Equation A31 – Sales and Trading Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 DJQ(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $DJQ(E, t)$ is the quarterly change in the Dow Jones Total Stock Market Index⁴⁴ in exercise E at projection quarter t , representing changes in financial market conditions; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A32 – Sales and Trading Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

⁴⁴ The quarterly change in the Dow Jones Total Stock Market Index is calculated simply as the index value at t divided by the index value at $t-1$.

Equation A33 – Sales and Trading Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \beta_1 VIXQ(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $VIXQ(E, t)$ is the quarterly change in the VIX⁴⁵ in exercise E at projection quarter t , representing changes in financial market conditions; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level investment banking and merchant banking/private equity noninterest income, the following specifications apply:

Equation A34 – Investment Banking and Merchant Banking / Private Equity Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 RGDPQ(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDPQ(E, t)$ is the quarterly change in real GDP⁴⁶ in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A35 – Investment Banking and Merchant Banking / Private Equity Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \beta_1 URC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;

⁴⁵ The quarterly change in the VIX is calculated simply as the index value at t divided by the index value at $t-1$.

⁴⁶ The quarterly change in real GDP is calculated by taking the annual growth rate on real GDP and transforming it into a quarterly rate.

- β_0 is the constant term estimated by the regression;
- $URC(E, t)$ is the cumulative change in the unemployment rate⁴⁷ in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A36 – Investment Banking and Merchant Banking / Private Equity Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \beta_1 RGDPQ(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDPQ(E, t)$ is the quarterly change in real GDP in exercise E at projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level asset management noninterest income, the Board uses the following specifications:

Equation A37 – Asset Management Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 RGDP(C, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDP(C, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A38 – Asset Management Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \varepsilon(E, t)$$

⁴⁷ The cumulative change in the unemployment rate is calculated as the first difference of the rate in the quarter of interest and the rate at the lift-off quarter.

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A39 – Asset Management Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level wealth management / private banking noninterest income, the Board uses the following specifications:

Equation A40 – Wealth Management / Private Banking Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 DJC(E, t) + \beta_2 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $DJC(E, t)$ is the cumulative change in the Dow Jones Total Stock Market Index⁴⁸ in exercise E from Q0 to projection quarter t , representing changes in equity market conditions;
- $RGDPC(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

⁴⁸ The cumulative change in the Dow Jones Total Stock Market Index is calculated as the index value at the quarter of interest divided by the index value at lift-off quarter.

Equation A41 – Wealth Management / Private Banking Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \beta_1 DJC(E, t) + \beta_2 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $DJC(E, t)$ is the cumulative change in the Dow Jones Total Stock Market Index in exercise E from Q0 to projection quarter t , representing changes in equity market conditions;
- $RGDPC(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A42 – Wealth Management / Private Banking Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \beta_1 DJC(E, t) + \beta_2 RGDPC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $DJC(E, t)$ is the cumulative change in the Dow Jones Total Stock Market Index in exercise E from Q0 to projection quarter t , representing changes in equity market conditions;
- $RGDPC(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level investment services noninterest income, the Board uses the following specifications:

Equation A43 – Investment Services Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \beta_1 BBBSpread(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $BBBSpread(E, t)$ is the spread of the BBB Bond Index Yield to the 10-year Treasury Yield in exercise E at projection quarter t , representing revaluation adjustments due to changes in the risk premium; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A44 – Investment Services Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \beta_1 RGDP C(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression;
- $RGDP C(E, t)$ is the cumulative change in real GDP in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A45 – Investment Services Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

For modeling group-level treasury services noninterest income, the Board uses the following specifications:

Equation A46 – Treasury Services Noninterest Income Discount Factor for GSIBs

$$DF_t^{E,GSIB} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,GSIB}$ is the group-level discount factor for GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A47 – Treasury Services Noninterest Income Discount Factor for non-GSIBs

$$DF_t^{E,NGSIB} = \beta_0 + \varepsilon(E, t)$$

where:

- $DF_t^{E,NGSIB}$ is the group-level discount factor for non-GSIBs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $\varepsilon(E, t)$ is the error term of the regression.

Equation A48 – Treasury Services Noninterest Income Discount Factor for FBOs

$$DF_t^{E,FBO} = \beta_0 + \beta_1 URC(E, t) + \varepsilon(E, t)$$

where:

- $DF_t^{E,FBO}$ is the group-level discount factor for FBOs from exercise E in projection quarter t ;
- β_0 is the constant term estimated by the regression; and
- $URC(E, t)$ is the cumulative change in the unemployment rate in exercise E from Q0 to projection quarter t , representing changes in the overall macroeconomic environment; and
- $\varepsilon(E, t)$ is the error term of the regression.

To obtain a firm's noninterest income projection for each of the above components, the Board multiplies the trailing 12-quarter average income for the component by the relevant discount factor path.

As noted earlier, two components of noninterest income—non-interchange credit and charge card revenue and miscellaneous revenue—will not be modeled using discount factors. Instead, these items will be projected using firm-specific models, which is better suited to

capture the high degree of firm-level heterogeneity present in these two components. The firm-specific models are the following:

- a. Non-interchange credit and charge card revenue for a firm will be forecasted using a historical scalar unique to the firm that is equal to the average ratio of interchange revenue to non-interchange revenue for credit and charge cards over the 12-quarter base period. Projected non-interchange revenue will be equal to the historical scalar of the firm multiplied by the projected amount of interchange revenue for the firm.⁴⁹
- b. Miscellaneous revenue for a firm will be held constant over the projection period at a level equal to the average value of miscellaneous revenue over the 12-quarter base period.

The Board obtains the projected path of total noninterest income for the firm by adding together the nine component paths derived using discount factors with the two components derived from the firm-specific models.

e. Assumptions and limitations

The Board made assumptions and faced trade-offs when considering the approach to modeling noninterest income as described above. The FR Y-14 schedules identify twelve summary categories of noninterest income, many of which are sub-divided into smaller components. The modeling approach described herein could be undertaken using the full set of granular components. However, the Board chose to use eleven high-level aggregates for simplicity and tractability.

⁴⁹ For firms that report domestic bank card revenue and loss sharing agreement payments in noninterest income, these amounts are not projected by the Noninterest Income Model but are projected separately in a consistent treatment for all firms. The Supervisory Stress Test Model Documentation – Credit Risk Models provides detailed methodology.

To prevent measuring duplicative revenue and loss sharing amounts in noninterest income projections, the Board isolates these amounts in a new FR Y-14Q Schedule G.1 field line 14D.1 when firms report them in noninterest income. This field is excluded from historical scalar calculations. Until these newly added fields are available for twelve quarters, the period used to calculate the historical scalar, the Board will use Special Data Collections to obtain necessary inputs.

When constructing discount factors the Board followed an approach that captures firm heterogeneity while avoiding excessive complexity. The method first defines three different groups of firms (GSIBs, non-GSIBs, FBOs), then adds total revenue across firms for each group, and finally divides that amount by the sum of the scaling balance for each group. This method is equivalent to constructing a weighted average within the firm group, where the scaling balances are used to determine the weights.

Certain assumptions were made to compute the base value of the discount factor calculation. The trailing 12-quarter period is used because it balances competing considerations of reducing volatility in projections from one exercise to another, while also reflecting recent changes in the level and composition of a firm's noninterest income.

In assessing the macroeconomic variables, the Board conducted analysis of different variables available in the scenario to consider whether to include or not each of these variables. The variables selected for each component and/or industry group have strong explanatory power and correlations with the corresponding components of noninterest income within each industry group. As such, the explanatory variables used to model a given component may vary across the industry groups – as can be seen in the following tables of estimated parameters. Utilization of different explanatory variables reflects the fact that firms within separate industry groups will likely have different business lines with different sensitivities to macroeconomic conditions.

When constructing the discount factors, data was selected beginning in the 2020 stress test exercise, and the projections considered were from the severely adverse scenarios. Using 2020 as a starting point provided a sufficient number of observations to properly estimate models and capture key macroeconomic relationships while balancing concerns about using projection data that no longer reflect current business lines, risk profiles, or modeling methodologies. In

this context, “properly estimating models” means that the Board was able to find statistically significant relationships between macroeconomic variables and the dependent variables in the discount factor regressions, which were also consistent with general economic intuition.

f. Estimated Parameters for Noninterest Income Models

The tables included in this section present the estimated parameters (coefficients) for all discount factor regression models of noninterest income.

**Table A8 – Estimated Coefficients for Noninterest Income (NII)
Discount Factor Models (GSIB firms)**

Model	Variable	Coefficient	Standard Error
NII Deposits	Intercept	0.67657***	0.01017
NII Credit and Charge Card Interchange	Intercept	1.01380***	0.01632
	Cumulative Change in Real GDP	1.89497***	0.28466
NII Other Loans	Intercept	0.80692***	0.02365
	Quarterly Change in the 10-year Treasury Yield	0.22028***	0.03124
NII Sales & Trading	Intercept	0.82336***	0.02460
	Quarterly Change in the Dow Jones Total Stock Market Index	1.39219***	0.16017
NII Investment Banking and Merchant Banking / Private Equity	Intercept	0.63341***	0.01523
	Quarterly Change in Real GDP	8.48250***	1.10107
NII Asset Management	Intercept	0.74160***	0.01979
	Cumulative Change in Real GDP	1.50895***	0.34509
NII Wealth Management / Private Banking	Intercept	1.13180***	0.05366
	Cumulative Change in Real GDP	1.99979***	0.32043
	Cumulative Change in the Dow Jones Total Stock Market Index	0.57976***	0.11548
NII Investment Services	Intercept	1.04905***	0.03512
	Spread of the BBB Bond Index Yield to the 10-year Treasury Yield	-0.03877***	0.00718

NII Treasury Services	Intercept	1.04681***	0.00988
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Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively.

Table A9 – Estimated Coefficients for Noninterest Income (NII)
Discount Factor Models (non-GSIB firms)

Model	Variable	Coefficient	Standard Error
NII Deposits	Intercept	0.70795***	0.01164
NII Credit and Charge Card Interchange	Intercept	1.11647***	0.02030
	Cumulative Change in Real GDP	3.06201***	0.35406
NII Other Loans	Intercept	0.67132***	0.03773
	10-year Treasury Yield	0.13796***	0.03682
NII Sales & Trading	Intercept	0.49757***	0.02404
NII Investment Banking and Merchant Banking / Private Equity	Intercept	0.91396***	0.04575
	Cumulative Change in the Unemployment Rate	-0.06101***	0.00959
NII Asset Management	Intercept	0.73490***	0.03206
NII Wealth Management / Private Banking	Intercept	1.10685***	0.05948
	Cumulative Change in Real GDP	2.30317***	0.35519
	Cumulative Change in the Dow Jones Total Stock Market Index	0.36472**	0.12801
NII Investment Services	Intercept	1.03509***	0.02340
	Cumulative Change in Real GDP	3.35407***	0.40805
NII Treasury Services	Intercept	0.96472***	0.01059

Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively.

Table A10 – Estimated Coefficients for Noninterest Income (NII)
Discount Factor Models (FBO firms)

Model	Variable	Coefficient	Standard Error
NII Deposits	Intercept	0.81406***	0.01329

NII Credit and Charge Card Interchange	Intercept	1.02052***	0.02080
	Cumulative Change in Real GDP	3.50572***	0.36277
NII Other Loans	Intercept	1.10140***	0.10709
NII Sales & Trading	Intercept	1.05634***	0.02453
	Quarterly Change in the VIX	-0.27548***	0.04738
NII Investment Banking and Merchant Banking / Private Equity	Intercept	0.51943***	0.02200
	Quarterly Change in Real GDP	5.24059***	1.58991
NII Asset Management	Intercept	0.60169***	0.01287
NII Wealth Management / Private Banking	Intercept	1.08475***	0.05018
	Cumulative Change in Real GDP	1.94667***	0.29964
	Cumulative Change in the Dow Jones Total Stock Market Index	0.52311***	0.10799
NII Investment Services	Intercept	0.92645***	0.01535
NII Treasury Services	Intercept	0.95927***	0.03594
	Cumulative Change in the Unemployment Rate	-0.02409***	0.00753

Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively.

v. Noninterest Expense Model

The noninterest expense model in pre-provision net revenue is based on the efficiency ratio (ER) concept. The efficiency ratio is a measure commonly used by financial firms that quantifies how effectively a bank converts revenue into profit by comparing total operating expenses to total revenue. The model integrates firm-submitted projections with Board internal projections of revenues to produce projections of total noninterest expense, excluding operational risk.

(a) Model Description

The finalized model treats total noninterest expense as a single component, using the efficiency ratio concept. By leveraging variation in revenue composition across business lines and recent historical efficiency ratios, this approach captures differences in firm business models, while ensuring that projected expenses are more closely aligned with projected revenues.

The efficiency ratio, expressed as a percentage, is calculated as follows:

Equation A49 – Efficiency Ratio Calculation

$$\text{Efficiency Ratio} = \frac{\text{Total Noninterest Expense} - \text{Operational Risk}}{\text{Net Interest Income} + \text{Noninterest Income}} * 100$$

A lower efficiency ratio indicates higher efficiency, meaning the bank is spending less to generate each dollar of revenue. Although this ratio typically includes operational risk losses when used by the financial industry, the Board excludes these losses in this model as they are already modeled separately, and due to their unique characteristics under stress.

The linear model includes changes in the efficiency ratio for each firm over the projection horizon depend on business segment revenue shares. The linear model⁵⁰ is specified as follows:

Equation A50 – Efficiency Ratio Projection Model

$$\Delta ER_{i,t}^{ST} = \alpha + \beta Q_t + \sum_{j=1}^J \gamma_j \left(\frac{\text{Revenue}_{i,j}^{ST}}{\text{TotalRevenue}_i^{ST}} \right) + \sum_{j=1}^J \delta_j \left(Q_t * \frac{\text{Revenue}_{i,j}^{ST}}{\text{TotalRevenue}_i^{ST}} \right) + \epsilon_{i,t}^{ST}$$

where:

- the dependent variable $\Delta ER_{i,t}^{ST} = ER_{i,t}^{ST} - ER_{i,0}^{ST}$ is the change in the efficiency ratio for bank i in projection quarter t of stress-test year ST , relative to the bank's average

⁵⁰ Note that with a linear model, efficiency ratios above 100% are possible, which would then imply negative pre-provision net revenue for the firm in that quarter. Some firms report projections with efficiency ratios above 100%. Negative pre-provision net revenue (and efficiency ratios above 100%) was observed for some firms during the 2008 financial crisis.

efficiency ratio over the three years preceding the start of the projection horizon, denoted $ER_{t,0}^{ST}$;

- Q_t is the projection quarter, and the coefficient β captures the trend in changes in the efficiency ratio over the projection horizon;
- $\frac{Revenue_{i,j}^{ST}}{TotalRevenue_i^{ST}}$ is the share of revenue in category j relative to total revenue, for bank i in stress-test year ST ;
- the coefficients γ_j capture the effect of different business segment revenue shares on the level of the dependent variable;
- the coefficients δ_j capture the effect of different business segment revenue shares on the slope of the dependent variable, thereby introducing additional heterogeneity in the projected efficiency ratio dynamics;
- the term $\epsilon_{i,t}^{ST}$ represents the stochastic error term in the regression.

Revenue shares are calculated using the following definition:

Equation A51 – Revenue Shares Calculation

$$\frac{Revenue_j}{TotalRevenue} = \frac{\text{Total revenue from category } j \text{ for the past 3 years}}{\text{Total revenue across all category for the past 3 years}} * 100$$

The revenue share varies across banks, stress test years, and revenue categories. This specification implies that all banks share the same sensitivity to both quarter and the various revenue categories. The Board uses three revenue share categories, which are defined as: consumer banking, markets and capital markets activities, and miscellaneous business categories. The consumer banking category consists of net interest income and noninterest income from retail and small business (rows 1 and 14 of FR Y-14Q, Schedule G). The markets category includes net interest income and noninterest income from sales and trading, investment banking, and merchant banking/private equity (rows 3, 4, 5, 16, 17, and 18 of FR Y-14Q, Schedule G). The miscellaneous category is defined as the remaining operating income after deducting the previous two categories. This specification is selected based on both economic intuition and statistical evidence. This specification strikes an appropriate balance between flexibility and

parsimony by combining economically similar categories while limiting parameter proliferation, which could lead to increased variance of the estimators or model overfitting.⁵¹

To calculate revenue shares at the jump-off quarter for each stress test year, a 3-year lookback window is established. This window strikes a balance between the stability of year-over-year results and the need to reflect the firm's recent performance. When revenue composition is stable over time, the predicted efficiency ratios, and thus expenses, will also tend to be more stable. In terms of data, the model incorporates firm projections submitted through FR Y-14A, and calculates revenue shares and jump-off efficiency ratio levels based on historical data from FR Y-14Q.⁵² Using post-2020 projections better reflects firms' recent experience and incorporates projections derived from more mature and refined projection models. For example, in the 2025 stress test, the sample includes projections from 2020 to 2024. When appropriate, the Board will re-estimate applicable model parameters, and any updates will be reflected in the final models for a given stress test year.

The firm sample for estimation includes Category I-III banking organizations subject to the stress test. Category IV firms are not included in the estimation sample because they do not

⁵¹ An overfitted model captures the stochastic noise within the historical data rather than the underlying data-generating process, leading to high variance and poor generalization on out-of-sample forecasts, which are undesirable characteristics for a predictive model.

⁵² For firms that report domestic bank card revenue and loss sharing agreement payments in noninterest expense, these amounts are not projected by the Noninterest Expense Model but are projected separately in a consistent treatment for all firms. The Supervisory Stress Test Model Documentation – Credit Risk Models provides detailed methodology.

To prevent measuring duplicative revenue and loss sharing amounts in noninterest expense projections, the Board isolates these amounts in a new FR Y-14Q Schedule G.1 field line 34.C when firms report them in noninterest expense. This field is excluded from inputs used to project the efficiency ratio. Until these newly added fields are available for twelve quarters, the period used to calculate the inputs to the efficiency ratio projection, the Board will use Special Data Collections to obtain necessary inputs.

The estimation of the efficiency ratio model was not adjusted to remove revenue and loss sharing amounts as the data required to make the adjustment was not available in the FR Y-14A, and the Board assessed that the impact would likely be limited based on historical data.

report firm projections that could be used in the estimation. To mitigate the impact of outliers in firm projections, the Board implements 1% trimming by removing 1% at both the upper and lower tails of the efficiency ratio distribution. This threshold was determined after assessing the sample size and the nature of the outliers and is applied to the combined efficiency ratio distribution from the estimation sample. After the trimming is applied, observations with negative efficiency ratio projections are excluded. The Board excludes other real estate owned (OREO), off-balance-sheet credit exposure, and provisions for the mortgage repurchase reserve from the efficiency ratio calculation, as they are modeled in other Stress Test models and to avoid double-counting. The Board also excludes private equity net investment mark-to-market and adjusts fair value option (FVO) loan losses to mitigate duplicative measuring, consistent with the noninterest income discount factor methodology.

Additionally, the Board excludes non-recurring expenses to improve projection accuracy by focusing on recurring operating expenses (see footnote 3). The same data treatment is applied to this model as used in the revenue models. Any adjustments to data processes in the revenue models—such as modifications for outliers or non-recurring revenues—may consequently affect noninterest expense projections. An adjustment is applied for mergers and acquisitions to historical data from the FR Y-14Q (the full sample used in estimation) only in years when the firm’s projections reflect the merged entity. This adjustment ensures that, when evaluating firm projections, the Board does not treat a firm as if it was already merged at the time of projection.

For recent mergers within the 3-year lookback window, the model uses only post-merger data when calculating jump-off efficiency ratios and revenue shares at the projection stage, provided that post-merger data spans at least four quarters. When post-merger data covers fewer than four quarters, the model applies the same calculation methodology after conducting an

appropriateness assessment. This approach ensures the evaluation reflects the merged entity's current efficiency level and business mix.

Once the model is estimated using ordinary least squares, the model projects firm-specific efficiency ratio paths, including for Category IV firms.⁵³ Efficiency ratio paths are projected using this model for quarters 1 through 9. Beyond quarter 9, efficiency ratios paths are assumed to remain flat.

The projected efficiency ratio paths are combined with projected total revenues from the other pre-provision net revenue supervisory models to compute noninterest expense using the following formula, with a minimal floor of zero:

Equation A52 – Noninterest Expense Projection

$$\widehat{NIE}_{i,t} = \max(0, \widehat{ER}_{i,t} * \widehat{TotalRevenue}_{i,t})$$

The efficiency ratio approach previously described offers advantages over alternative methods to project noninterest expense. First, the method is simple and concise, reducing the number of estimated parameters while still capturing key drivers of efficiency by directly linking total noninterest expense to total revenue. Second, by incorporating revenue shares and their interactions with the time trend, the model captures heterogeneity in cost structure across business lines, not only in levels but also in the slope of projected efficiency ratio paths. Third, by integrating firm-submitted projections, it leverages forward-looking information about how banks expect to operate under the severely adverse scenario. Finally, using the change of

⁵³ Category IV means domestic bank holding companies and U.S. intermediate holding companies of foreign banks with \$100 billion or more in total assets that do not meet the requirements for every-year stress testing. *See* 12 CFR 252.5(e).

efficiency ratio as the dependent variable anchors the projections to each firm's jump-off level, enabling the model to better capture firm heterogeneity in projections.

(b) Assumptions and Limitations

The model reflects certain assumptions and limitations. While the model allows for firm-specific efficiency ratios paths, it assumes they are of linear form. Allowing more flexible functional forms could allow the model to capture different efficiency ratio dynamics, but at the cost of increasing model complexity and potentially increasing the volatility of projections year-over-year. A characteristic of the model is that, given the availability of data, it is estimated using information only from firms that submit projections. In particular, Category IV firms are excluded from the estimation sample since they do not provide firm projections. However, since the revenue shares (at jump-off) and the firm-specific efficiency ratio are used to project efficiency ratio paths over the horizon, including for Category IV firms, the model's projections reflect firm-specific characteristics for all firms considered in the stress test.

a. Estimated Parameters for the Noninterest Expense Model

Table A11 presents the estimated coefficients for the efficiency ratio path regression. Included in this table are the estimated coefficients for the intercept, the time trend, the revenue shares, and the interaction terms.

Table A11 – Estimated Parameters for the Proposed Efficiency Ratio Model (Equation A50)

Variable	Coefficient	Standard Error
Intercept	5.36898***	1.48831
Time trend	1.15765***	0.26669

Variable	Coefficient	Standard Error
Consumer revenue share	-0.02862	0.02949
Markets revenue share	0.20457***	0.03846
Interaction between consumer revenue share and time trend	-0.01518***	0.00523
Interaction between markets revenue share and time trend	-0.03631***	0.00684

Notes: Statistical significance levels of 1%, 5%, and 10% are indicated as ***, **, and *, respectively. The omitted category (base case) in this regression is “miscellaneous”.