

supervisory models are not provided as required by the Capital Assessments and Stress Testing (FR Y–14) information collection or are reported erroneously, then a conservative value will be assigned to the specific data based on all available data reported by covered companies, depending on the extent of the data deficiency. If the data deficiency is severe enough that a modeled estimate cannot be produced for a portfolio segment or portfolio, then the Federal Reserve may assign a conservative rate (e.g., 10th or 90th percentile PPNR or loss rate, respectively) to that segment or portfolio.

This policy reflects a conservative assumption given a lack of information sufficient to produce a risk-sensitive estimate of losses or revenues. This policy promotes policy 1.3 by ensuring consistent treatment for all covered companies that report data deemed insufficient to produce a modeled estimate. Finally, this policy is simple and transparent, consistent with Principle 1.4.

#### 2.10. Treatment of Immaterial Portfolio Data

The Federal Reserve makes a distinction between missing or insufficient data reported by covered companies for material and immaterial portfolios. To limit regulatory burden, the Federal Reserve allows covered companies not to report detailed loan-level or portfolio-level data for loan types that are not material as defined in the FR Y–14 reporting instructions. In these cases, a loss rate representing the median rates among covered companies for whom the rate is calculated will be applied to immaterial portfolios. This approach is consistent across covered companies, simple, and transparent, promoting Principles 1.3 and 1.4.

*Question number 5: Each of the modeling policies described in Section 2 are consistent with at least one of the central principles of supervisory stress test modeling described herein. Are there other policies the Federal Reserve could implement to further promote the principles of independence, forward-looking perspective, consistency and comparability, simplicity, robustness and stability, or conservatism, or that would focus on the ability to evaluate the impact of severe economic stress?*

### 3. Principles and Policies of Supervisory Model Validation

Independent and comprehensive model validation is key to the credibility of the supervisory stress test. An independent unit of validation staff within the Federal Reserve, with input from an advisory council of academic experts not affiliated with the Federal Reserve, ensures that stress test models are subject to effective challenge, defined as critical analysis by objective, informed parties that can identify model limitations and recommend appropriate changes.

The Federal Reserve's supervisory model validation program, built upon the principles of independence, technical competence, and stature, is able to subject models to effective challenge, expanding upon supervisory modeling teams' efforts to manage model risk and confirming that supervisory models are appropriate for their intended uses. The supervisory model validation program

produces reviews that are consistent, thorough, and comprehensive. Its structure ensures independence from the Federal Reserve's model development function, and its prominent role in communicating the state of model risk to the Board of Governors assures its stature within the Federal Reserve.

#### 3.1. Structural Independence

The management and staff of the internal model validation program are structurally independent from the model development teams. Validators do not report to model developers, and vice versa. This ensures that model validation is conducted and overseen by objective parties. Validation staff's performance criteria include an ability to review all aspects of the models rigorously, thoroughly, and objectively, and to provide meaningful and clear feedback to model developers and users.

In addition, a council of external academic experts provides independent advice on the Federal Reserve's process to assess models used in the supervisory stress test. In biannual meetings with Federal Reserve officials, members of the council discuss selected supervisory models, after being provided with detailed model documentation for those models, including some confidential supervisory information. The documentation and discussions enable the council to assess the effectiveness of the models used in the supervisory stress tests and of the overarching model validation program.

#### 3.2. Technical Competence of Validation Staff

The model validation program is designed to provide thorough, high-quality reviews that are consistent across supervisory models.

First, the model validation program employs technically expert staff with knowledge across model types. Second, reviews for every supervisory model follow the same set of review guidelines, and take place on an ongoing basis. The model validation program is comprehensive, in the sense that validators assess all models currently in use, and expand the scope of validation beyond basic model use, and cover both model soundness and performance.

The model validation program covers three main areas of validation: (1) Conceptual soundness; (2) ongoing monitoring; and (3) outcomes analysis. Validation staff evaluate all aspects of model development, implementation, and use, including but not limited to theory, design, methodology, input data, testing, performance, documentation standards, implementation controls (including access and change controls), and code verification. Finally, the model validation program seeks to balance technical expertise with fresh scrutiny of supervisory models. In order to provide a new perspective on established models and practices, validation staff are re-allocated across models at regular intervals.

#### 3.3. Stature of Validation Function

Through clear communication and participation in the model decision making process, the validation function has the influence and stature within the Federal

Reserve to ensure that any issues and deficiencies are appropriately addressed in a timely and substantive manner.

The model validation program communicates its findings and recommendations regarding model risk to all internal stakeholders. Validators provide detailed feedback to model developers and provide thematic feedback or observations on the overall system of models to the management of the modeling teams. Model validation feedback is also communicated to the users of supervisory model output for use in their deliberations and decisions about supervisory stress testing. In addition, the Federal Reserve Board's Director of Supervision and Regulation approves all models used in the supervisory stress test in advance of each exercise, based on validators' recommendations, development responses, and suggestions for risk mitigants. In several cases, models have been modified or implemented differently based on validators' feedback. The advisory council of academic experts also contributes to the stature of the Federal Reserve's validation program, by providing an external point of view on modifications to supervisory models and on validation program governance.

Ultimately, the validation program serves to inform the Board of Governors about the state of model risk in the overall stress testing program, along with ongoing practices to control and mitigate model risk.

By order of the Board of Governors of the Federal Reserve System, December 7, 2017.

**Ann E. Misback,**  
*Secretary of the Board.*

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## FEDERAL RESERVE SYSTEM

### 12 CFR Part 252

[Regulation YY; Docket No. OP–1588]

#### Policy Statement on the Scenario Design Framework for Stress Testing

**AGENCY:** Board of Governors of the Federal Reserve System (Board).

**ACTION:** Proposed rule; policy statement with request for public comment.

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**SUMMARY:** The Board is requesting public comment on amendments to its policy statement on the scenario design framework for stress testing. The proposed amendments to the policy statement would clarify when the Board may adopt a change in the unemployment rate in the severely adverse scenario of less than 4 percentage points; institute a counter-cyclical guide for the change in the house price index in the severely adverse scenario; and provide notice that the Board plans to incorporate wholesale funding costs for banking organizations in the scenarios. The Board would continue to use the policy

statement to develop the macroeconomic scenarios and additional scenario components that are used in the supervisory and company-run stress tests conducted under the Board's stress test rules and the Board's capital plan rule.

**DATES:** Comments must be received by January 22, 2018.

**ADDRESSES:** You may submit comments, identified by Docket No. OP-1588 by any of the following methods:

- *Agency website:* <http://www.federalreserve.gov>. Follow the instructions for submitting comments at <http://www.federalreserve.gov/generalinfo/foia/ProposedRegs.aspx>.

- *Federal eRulemaking Portal:* <http://www.regulations.gov>. Follow the instructions for submitting comments.

- *Email:* [regs.comments@federalreserve.gov](mailto:regs.comments@federalreserve.gov). Include the docket number and RIN number in the subject line of the message.

- *Fax:* (202) 452-2819 or (202) 452-3102.

- *Mail:* Ann Misback, Secretary, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue NW, Washington, DC 20551.

All public comments will be made available on the Board's website at <http://www.federalreserve.gov/generalinfo/foia/ProposedRegs.aspx> as submitted, unless modified for technical reasons. Accordingly, your comments will not be edited to remove any identifying or contact information. Public comments may also be viewed electronically or in paper form in Room 3515, 1801 K St. NW (between 18th and 19th Streets NW), Washington, DC 20006 between 9:00 a.m. and 5:00 p.m. on weekdays. For security reasons, the Board requires that visitors make an appointment to inspect comments. You may do so by calling (202) 452-3684. Upon arrival, visitors will be required to present valid government-issued photo identification and to submit to security screening in order to inspect and photocopy comments.

**FOR FURTHER INFORMATION CONTACT:** Lisa Ryu, Associate Director, (202) 263-4833, Joseph Cox, Supervisory Financial Analyst, (202) 452-3216, or Aurite Werman, Financial Analyst (202) 263-4802, Division of Supervision and Regulation; Benjamin W. McDonough, Assistant General Counsel, (202) 452-2036, or Julie Anthony, Counsel, (202) 475-6682, Legal Division; or William Bassett, Associate Director, (202) 736-5644, Luca Guerrieri, Deputy Associate Director, (202) 452-2550, or Bora

Durdu, Chief, (202) 452-3755, Division of Financial Stability.

#### **SUPPLEMENTARY INFORMATION:**

##### **I. Background**

###### *A. Supervisory Scenarios*

Pursuant to the Board's stress test rules, the Board conducts supervisory stress tests of bank holding companies and U.S. intermediate holding companies subsidiaries of foreign banking organizations with total consolidated assets of \$50 billion or more (covered companies) and requires covered companies to conduct semi-annual company-run stress tests.<sup>1</sup> In addition, savings and loan holding companies, state member banks with greater than \$10 billion in total consolidated assets, and bank holding companies with assets of more than \$10 billion but less than \$50 billion are required to conduct annual company-run stress tests.<sup>2</sup>

To conduct the supervisory stress tests, the Board develops three scenarios—a baseline, adverse, and severely adverse scenario—and projects a firm's balance sheet, risk-weighted assets, net income, and resulting post-stress capital levels and regulatory capital ratios under each scenario. Similarly, a firm subject to company-run stress tests under the Board's rules uses the same adverse and severely adverse scenarios that apply in the supervisory stress test to conduct an annual company-run stress test. The scenarios also serve as an input into a covered company's capital plan under the Board's capital plan rule (12 CFR 225.8), and the Federal Reserve also uses these scenarios to evaluate each firm's capital plan in the supervisory post-stress capital assessment.<sup>3</sup>

On November 29, 2013, the Board adopted a final policy statement on its scenario design framework for stress testing (policy statement).<sup>4</sup> The policy statement outlined the characteristics of the supervisory stress test scenarios and explained the considerations and procedures that underlie the formulation of these scenarios. The

considerations and procedures described in the policy statement apply to the Board's stress testing framework, including to the stress tests required under 12 CFR part 252, subparts B, E, and F, and the Board's capital plan rule. The policy statement describes in greater detail than the stress test rules the baseline, adverse, and severely adverse scenarios. The policy statement also describes the Board's approach for developing these three macroeconomic scenarios and additional components of the stress test scenarios, which apply to a subset of covered companies.

As described in the policy statement, the severely adverse scenario is designed to reflect conditions that have characterized post-war U.S. recessions (the "recession approach"). Historically, recessions typically feature increases in the unemployment rate and contractions in aggregate incomes and economic activity. In light of the typical comovement of measures of economic activity during economic downturns, such as the unemployment rate and gross domestic product, in developing the severely adverse scenario, the Board first specifies a path for the unemployment rate and then develops paths for other measures of activity broadly consistent with the course of the unemployment rate.

The Board's scenario design framework includes a counter-cyclical design element in the change in the unemployment rate in the severely adverse scenario. The policy statement provides that the Board anticipates the unemployment rate in the severely adverse scenario would increase by between 3 and 5 percentage points from its initial level. However, if a 3 to 5 percentage point increase in the unemployment rate does not raise the level of the unemployment rate to at least 10 percent, the path of the unemployment rate in most cases will be specified so as to raise the unemployment rate to at least 10 percent. The policy statement also notes that the typical increase in the unemployment rate in the severely adverse scenario will be about 4 percentage points. The policy statement provides that the Board intends to set the unemployment rate at the higher end of the 3 to 5 percentage point range if the Board believes that cyclical systemic risks are high (as they would be after a sustained long expansion), and to the lower end of the range if cyclical systemic risks are low (as they would be in the earlier stages of a recovery).

The policy statement provides that economic variables included in the scenarios may change over time, or that

<sup>1</sup> 12 CFR part 252, subparts E and F. In addition, the supervisory stress test rules would apply to any nonbank financial company supervised by the Board that becomes subject to these requirements pursuant to a rule or order of the Board. Currently, no nonbank financial companies supervised by the Board are subject to the capital planning or stress test requirements.

<sup>2</sup> 12 CFR part 252, subpart B.

<sup>3</sup> Bank holding companies with \$50 billion or more in total consolidated assets and U.S. intermediate holding companies of foreign banking organizations additionally conduct mid-cycle company-run stress tests under scenarios that they develop. See 12 CFR 252.55.

<sup>4</sup> See 12 CFR part 252, appendix A.

the Board may augment the recession approach to account for salient risks.<sup>5</sup> The Board has not historically captured stress to funding markets in the supervisory stress test exercise. However, it is exploring the inclusion of such a stress in the scenarios, given the potential impact that funding shocks could have on firms subject to the supervisory stress test.

#### B. Review of Stress Test Exercises

The Federal Reserve routinely reviews its experience with each year's stress testing and capital planning programs as implemented through DFAST and CCAR. These reviews have included formal engagements with public interest groups, meetings with academics in the fields of economics and finance, and internal assessments.

In the course of its review of the stress test exercises, the Federal Reserve has received feedback on the Board's framework for designing stress scenarios. Some participants advocated developing a structured process for strengthening scenario design over time. Other participants were concerned that the Federal Reserve would be pressured to reduce the severity of the scenario over time. As part of its internal assessment of the stress test exercises,

the Federal Reserve also considered ways to further enhance the countercyclical elements, transparency, and risk coverage of the scenario design framework.

After considering feedback received in these reviews and possible improvements to the methodology for specifying the macroeconomic scenarios used in the supervisory stress test and the annual company-run stress tests, the Board is proposing to modify the policy statement to enhance the countercyclical and transparency of the Board's scenario design framework and improve the risk coverage of the scenarios.

## II. Review of the Supervisory Scenarios

### A. Unemployment and House Prices in the Severely Adverse Scenario

The Board investigated possible improvements to the methodology for specifying the macroeconomic scenarios used in supervisory and company-run stress tests. A main area of inquiry was the severity of macroeconomic scenarios used in previous stress test exercises. As noted, the scenario design framework was formulated to increase the severity of the severely adverse scenario during economic expansions in order to limit

the procyclicality of the financial system by increasing the resilience of the banking system to building risks. The review evaluated the path of key variables in the severely adverse scenarios since 2011, and determined that amendments to the scenario design framework could further limit procyclicality.<sup>6</sup>

The severity of a scenario can be gauged by considering both the maximum (or minimum) levels obtained by key variables and changes of the variables from their starting points. Table 1 shows the peak and change in the unemployment rate in the supervisory severely adverse scenarios since 2011.<sup>7</sup> The peak unemployment rate in the severely adverse scenario has been falling since CCAR 2012 as the economy improved. Beginning in 2016, the countercyclical element of the Board's scenario design framework acted to increase scenario severity, so while the peak level of the unemployment rate remained about the same, the change in the unemployment rate increased. The countercyclical design of the scenarios is also reflected in the change in real GDP, which, in 2017, declined by the largest amount since 2012.

TABLE 1—UNEMPLOYMENT RATE AND REAL GDP IN THE SEVERELY ADVERSE SCENARIO

	Stress test exercise							Great recession <sup>b</sup>	Severe recessions <sup>c</sup>
	2011 <sup>a</sup>	2012 <sup>a</sup>	2013	2014	2015	2016	2017		
<b>Panel A: Developments as published in the supervisory scenarios</b>									
Unemployment Rate:									
Peak Level (pct.) .....	11.1	12.6	12.1	11.3	10.1	10.0	10.0	10.0	9.3
Change Start-to-peak (pp.) .....	1.5	3.6	4.0	4.0	4.0	5.0	5.3	4.5	3.6
Real GDP:									
Change Start-to-trough (pct.) .....	-4.1	-6.9	-4.8	-4.7	-4.7	-6.2	-6.6	-4.7	-3.4

#### Note:

<sup>a</sup> In 2011 and 2012 the scenario was referred to as the "supervisory stress scenario."

<sup>b</sup> Great Recession is defined as that which occurred in Q4:2007–Q2:2009.

<sup>c</sup> Recessions classified as severe: 1957:Q3–1958:Q2, 1973:Q4–1975:Q1, 1981:Q3–1982:Q4, and 2007:Q4–2009:Q2.

The Board also evaluated its approach to developing the path of house prices, which is a key scenario variable, to assess whether it could improve the transparency of the measure and to identify a guide that would formalize the Board's countercyclical objectives. To date, the Board has developed the path of house prices using a judgmental approach, and has not established a quantitative guide for the trajectory of house prices.

As demonstrated in Panel A of table 2, the existing approach to house prices has resulted in increasing severity over time. The declines in the nominal house price index (nominal HPI) from the start to the trough have increased from 21 percent (in 2012 and 2013) to about 25–26 percent (in 2014 through 2017). The increased severity in the decline in nominal HPI in supervisory scenarios beginning in 2014 offset the rise in

observed house prices over that period, and hence limited procyclicality.

Assessing the procyclicality of house price paths over time is complicated by the fact that house prices—in contrast to the unemployment rate—naturally trend upward over time. The ratio of nominal house prices to nominal, per capita, disposable personal income (HPI–DPI ratio, henceforth), does not exhibit an upward trend and, as such, provides an alternative way to assess the

<sup>5</sup> For example, if scenario variables do not capture material risks to capital, or if historical relationships between macroeconomic variables change such that one variable is no longer an appropriate proxy for another, the Board may add variables to a supervisory scenario. The Board may also include additional scenario components or

additional scenarios that are designed to capture the effects of different adverse events on revenue, losses, and capital.

<sup>6</sup> For completeness, the tables present data from the 2017 severely adverse scenario, however, this data was not available at the time of the review conducted by the Board. The data from 2017 was

generally consistent with the analysis of the earlier scenarios.

<sup>7</sup> The change in real gross domestic product (real GDP) is also presented as an additional gauge of severity because the path of real GDP is formulated based on the path of the unemployment.

procyclicality of the scenarios' house price paths. The severity of a scenario depends on both the change and the trough level of the HPI-DPI ratio. Panel A of table 2 indicates that the change in

the HPI-DPI ratio increased in absolute terms in the years 2014 to 2017 compared to the years 2012 and 2013. However, the trough of the HPI-DPI ratio achieved in the severely adverse

scenarios has generally moved up since 2012. Scenarios with higher HPI-DPI troughs may be less severe even if they feature the same decline in the ratio.

TABLE 2—HOUSE PRICES IN THE SEVERELY ADVERSE SCENARIO

	Stress test exercise							Great recession <sup>b</sup>	Housing recessions <sup>c</sup>
	2011 <sup>a</sup>	2012 <sup>a</sup>	2013	2014	2015	2016	2017		
<b>Panel A: Developments as published in the supervisory scenarios</b>									
Nominal HPI:									
Change Start-to-trough (pct.) .....	-11	-21	-21	-26	-26	-25	-25	-30	2.5
Trough Level <sup>c</sup> .....	124	106	111	116	126	135	134	130	.....
HPI-DPI Ratio:									
Change Start-to-trough (pct.) .....	-11	-19	-18	-27	-25	-25	-24	-41	-25
Trough Level <sup>c</sup> .....	89	76	78	75	79	82	81	87	95
<b>Panel B: Developments as implied by the HPI-DPI Guide</b>									
Nominal HPI:									
Change Start-to-trough (pct.) .....	-25	-27	-27	-24	-25	-25	-26	-30	2.5
Trough Level <sup>c</sup> .....	104	98	102	119	127	134	134	130	.....
HPI-DPI Ratio:									
Change Start-to-trough (pct.) .....	-25	-25	-25	-25	-25	-25	-25	-41	-25
Trough Level <sup>d</sup> .....	75	70	72	76	80	82	79	87	95

**Note:**

<sup>a</sup>In 2011 and 2012 the scenario was referred to as the "supervisory stress scenario."

<sup>b</sup>Great Recession is defined as that which occurred in Q4:2007–Q2:2009.

<sup>c</sup>Housing recessions are defined as the following date ranges: 1980–1985, 1989–1996, and 2006–2011. The date-ranges of housing recessions are based on the timing of house-price retracements. These dates were also associated with sustained declines in real residential investment, although, the precise timings of housing recessions would likely be slightly different were they to be classified based on real residential investment in addition to house prices.

<sup>d</sup>Both the nominal HPI and HPI-DPI ratios are indexed to 100 in 2000:Q1.

Based on this analysis, the Board determined that its scenario design framework could be strengthened by (1) enhancing the counter-cyclicality of the scenarios when conditions at the start of the exercise already reflected stress; and (2) improving the transparency of the scenario design framework by developing an explicit guide for formulating the path of house prices in the severely adverse scenario.

**B. Risk Coverage in Supervisory Scenarios**

The Board also has examined whether there were important dimensions of risk that had not featured in supervisory scenarios to date. The review suggested that a key risk dimension that had not been directly addressed in the supervisory stress test was banking organizations' reliance on certain types of runnable liabilities, which has been an important source of financial stress on banking organizations, as well a channel by which one firm's distress affects other firms. For example, shocks to the costs of short-term wholesale funding played a prominent role in the recent financial crisis, and had a notable effect on firms' ability to operate as financial intermediaries. Accordingly, the Board is exploring incorporating an increase in the cost of short-term wholesale funding in its scenarios and stress tests.

**III. Proposed Amendments to the Policy Statement**

The proposal includes three modifications to the Board's scenario design framework. First, the proposal would modify the current guide in the policy statement for the peak unemployment rate in the severely adverse scenario to include a description of the circumstances in which an increase in the unemployment rate at the lower end of the 3 to 5 percentage point range suggested by the guide would be warranted. Second, the proposal would add to the policy statement an explicit guide for house prices in the severely adverse scenario based on the HPI-DPI ratio that features both a minimum level and a fixed change in the HPI-DPI ratio. Third, the proposal would provide notice that the Board is exploring the inclusion of an increase in the cost of funds for banking organizations as an explicit factor in the scenarios. Finally, the policy statement would be amended to update references and remove obsolete text.

**A. Unemployment Rate in the Severely Adverse Scenario**

The proposal would include more specific guidance for the change in the unemployment rate when the stress test is conducted during a period in which the unemployment rate is already elevated. The Board currently calibrates the peak unemployment rate in the

severely adverse scenario as the greater of a 3 to 5 percentage point increase from the unemployment rate at the beginning of the stress test planning horizon, or 10 percent. This approach introduces an element of counter-cyclicality to the scenario design process, as lower levels of the unemployment rate at the beginning of the stress planning horizons imply a larger increase in unemployment over the severely adverse scenario to a level that is at least consistent with past severe recessions.

Consistent with the current policy statement, the Board believes that the typical increase in the unemployment rate in the severely adverse scenario will be about 4 percentage points, and that a lower increase may be appropriate in certain circumstances. In determining the increase in the unemployment rate, the Board would consider the level of unemployment at the start of the scenarios, the strength of the labor market, and the strength of firms' balance sheets. The proposed framework would clarify that the Board may adopt an increase in the unemployment rate of less than 4 percentage points when the unemployment rate at the start of the scenarios is elevated but the labor market is judged to be strengthening and higher-than-usual credit losses stemming from previously elevated unemployment rates were either already realized—or are in the process of being

realized—and thus removed from banks' balance sheets. Evidence of a strengthening labor market could include a declining unemployment rate, steadily expanding nonfarm payroll employment, or improving labor force participation. Evidence that credit losses are being realized could include elevated charge-offs on loans and leases, loan-loss provisions in excess of gross charge-offs, or losses being realized in securities portfolios that include securities that are subject to credit risk.

This proposed change would keep the unemployment rate in the macroeconomic scenario broadly similar to that in previous scenarios except during times when a smaller change would be appropriate based on the credit cycle. By adopting a smaller change in the unemployment rate when the economy was recovering and losses had already been broadly recognized by the industry, the proposal would complement the current countercyclical design elements.

*Question number 1: In connection with this proposal, the Federal Reserve considered an alternative guide for the unemployment rate, in which the path of the unemployment rate would reach the lesser of a level 4 percentage points above its level at the beginning of the scenario or 11 percent. On average, this alternative would increase the severity of severely adverse scenarios but also would be more countercyclical than the current guide. What are the advantages or disadvantages to this alternative relative to the proposed guide?*

#### *B. House Prices in the Severely Adverse Scenario*

The policy statement would also be amended to include guidance for the path of the nominal house price index in the severely adverse scenario. The nominal house price index is a key scenario variable, and providing explicit guidance for its path over the planning horizon would enhance the transparency and countercyclical design of the scenario design framework.

The proposal would establish a quantitative guide for house prices. The guide for house prices would be informed by the ratio of the nominal house price index to nominal per capita disposable income (HPI–DPI ratio). Unlike the level of house prices, the HPI–DPI ratio does not exhibit a trend over time. Under most circumstances, the decline in the HPI–DPI ratio in the severely adverse scenario is expected to be 25 percent from its starting value or enough to bring the ratio down to its Great Recession trough, whichever is greater. A rule with both a minimum change in the ratio and a level of

severity that the ratio must reach is consistent with the rule for the path of the unemployment rate and would further the Board's countercyclical goals in scenario design.

In its analysis, the Board identified the HPI–DPI trough reached during the Great Recession as the lowest trough attained in housing recessions since 1976, and considered this trough an appropriate basis for explicit guidance for the path of house prices. Setting a minimum decline in the HPI–DPI ratio would ensure that additional economic stress would be incorporated into the macroeconomic scenario, even if house prices were depressed at the outset of the scenario. The Board would typically set a minimum decline in the HPI–DPI ratio of 25 percent from its starting value. A decline of 25 percent is consistent with the average decline in housing recessions (see table 2 in the Policy Statement) and with the path of house prices in the supervisory severely adverse scenarios since 2015.

Procyclicality in house prices would be limited by setting a maximum level for the trough of the HPI–DPI ratio in the severely adverse scenario. This would increase the severity of the decline in house prices as house prices rise relative to disposable personal incomes, as is the case in times of economic expansion. When the HPI–DPI ratio rises above the level at which a 25 percent decline would bring the ratio to its Great Recession trough, at the start of the stress test, the change in the ratio would be greater than 25 percent in order to bring the ratio to its Great Recession trough.<sup>8</sup> This proposal would offer a more systematic approach to specifying house price paths than does the current approach, and would limit procyclicality while broadly preserving the decline in the nominal HPI featured in recent stress testing cycles.

*Question number 2: In connection with this proposal, the Federal Reserve considered alternative guides for projecting house prices, including guides based on the ratio of the nominal house price index to an index of nominal rent prices for residential housing. What are the advantages or disadvantages to such alternatives relative to the proposed guide?*

<sup>8</sup> The Great Recession trough depends on the reference date used for indexing. For example, with nominal HPI and HPI–DPI ratios indexed to 100 in 2000:Q1, a decline in the HPI–DPI index of more than 25 percent would be necessary to reach the Great Recession trough of 87 when the HPI–DPI ratio at the start of the supervisory scenario was 116 or greater.

#### *C. Incorporating Short-Term Wholesale Funding Costs in the Adverse and Severely Adverse Scenarios*

To date, the Board's adverse and severely adverse scenarios have not incorporated stress to funding markets. The proposal states that the Board may include variables or an additional component in the scenario to capture the cost of funds, particularly wholesale funds, to banking organizations. Including stress to funding costs in the scenarios would account for the impact of increased costs of certain runnable liabilities on net income and capital of banking organizations reliant on short-term wholesale funding. The Board would not expect to incorporate wholesale funding costs in the scenarios before 2019, and would expect to include wholesale funding costs in the adverse scenario before the severely adverse scenario. Accordingly, the Board would not expect to include a stress to funding costs in the severely adverse scenario until 2020 at the earliest.

*Question number 3: What variable or combinations of variables would best represent stress to funding costs or availability in the supervisory scenarios?*

*Question number 4: What, if any, other risks should the Federal Reserve consider capturing in the supervisory scenarios?*

#### *D. Impact Analysis*

Generally, the proposed amendments would not affect the severity of the scenarios in a manner that persists throughout the economic cycle. The one exception is the introduction of an increase in the cost of certain runnable liabilities. Generally, the inclusion of a stress to wholesale funding would be expected to increase the stringency of the stress test. The extent of the increased stringency would depend on the implementation of the stress, such as the type of liabilities stressed, and the duration and magnitude of the stress considered.

The proposed unemployment rate clarification would reduce the stringency of the scenario if the economy had already experienced stress and was recovering, and would not impact the stringency of the scenario in other points during the economic cycle. The house price guide would formalize an approach that was previously judgmental with little persistent impact on the severity of the stress to house prices in the severely adverse scenarios. However, the countercyclical element of the guide would increase the severity of the stress to house prices when the ratio

of house prices to disposable personal income was particularly elevated at the start of the stress test.

*Question number 5: The Federal Reserve is proposing changes to the Scenario Design Policy Statement to enhance the countercyclicality, risk coverage, and transparency of the scenario development process. Are there other modifications not included in this proposal that could further enhance the scenario development process?*

#### IV. Administrative Law Matters

##### A. Use of Plain Language

Section 722 of the Gramm-Leach-Bliley Act (Pub. L. 106–102, 113 Stat. 1338, 1471, 12 U.S.C. 4809) requires the Federal banking agencies to use plain language in all proposed and final rules published after January 1, 2000. The Board has sought to present the proposed rule in a simple and straightforward manner, and invites comment on the use of plain language.

##### B. Paperwork Reduction Act

In accordance with the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3506), the Board has reviewed the proposed policy statement to assess any information collections. There are no collections of information as defined by the Paperwork Reduction Act in the proposal.

##### C. Regulatory Flexibility Act Analysis

In accordance with section 3(a) of the Regulatory Flexibility Act (RFA), the Board is publishing an initial regulatory flexibility analysis of the proposed policy statement. The RFA, 5 U.S.C. 601 *et seq.*, requires each federal agency to prepare an initial regulatory flexibility analysis in connection with the promulgation of a proposed rule, or certify that the proposed rule will not have a significant economic impact on a substantial number of small entities.<sup>9</sup> The RFA requires an agency either to provide an initial regulatory flexibility analysis with a proposed rule for which a general notice of proposed rulemaking is required or to certify that the proposed rule will not have a significant economic impact on a substantial number of small entities. Based on its analysis and for the reasons stated below, the Board believes that the proposed policy statement would not have a significant economic impact on a substantial number of small entities.

Under regulations issued by the Small Business Administration (SBA), a “small entity” includes those firms within the “Finance and Insurance” sector with asset sizes that vary from \$7

million or less in assets to \$175 million or less in assets.<sup>10</sup> The Board believes that the Finance and Insurance sector constitutes a reasonable universe of firms for these purposes because such firms generally engage in activities that are financial in nature. Consequently, bank holding companies, savings and loan holding companies, state member banks, or nonbank financial companies with assets sizes of \$175 million or less are small entities for purposes of the RFA.

As discussed in the **SUPPLEMENTARY INFORMATION**, the proposed policy statement generally would affect the scenario design framework used in regulations that apply to covered companies, savings and loan holding companies, and state member banks with greater than \$10 billion in total consolidated assets and bank holding companies with assets of more than \$10 billion but less than \$50 billion. Companies that are affected by the proposed policy statement therefore substantially exceed the \$175 million asset threshold at which a banking entity is considered a “small entity” under SBA regulations.<sup>11</sup> The proposed policy statement would affect a nonbank financial company designated by the Council under section 113 of the Dodd-Frank Act regardless of such a company’s asset size. Although the asset size of nonbank financial companies may not be the determinative factor of whether such companies may pose systemic risks and would be designated by the Council for supervision by the Board, it is an important consideration.<sup>12</sup> It is therefore unlikely that a financial firm that is at or below the \$175 million asset threshold would be designated by the Council under section 113 of the Dodd-Frank Act because material financial distress at such firms, or the nature, scope, size, scale, concentration, interconnectedness, or mix of its activities, are not likely to pose a threat to the financial stability of the United States.

As noted above, because the proposed policy statement is not likely to apply to any company with assets of \$175 million or less, if adopted in final form, it is not expected to affect any small entity for purposes of the RFA. The Board does not believe that the proposed policy statement duplicates,

overlaps, or conflicts with any other Federal rules. In light of the foregoing, the Board does not believe that the proposed policy statement, if adopted in final form, would have a significant economic impact on a substantial number of small entities supervised. Nonetheless, the Board seeks comment on whether the proposed policy statement would impose undue burdens on, or have unintended consequences for, small organizations, and whether there are ways such potential burdens or consequences could be minimized in a manner consistent its purpose.

##### List of Subjects in 12 CFR Part 252

Administrative practice and procedure, Banks, Banking, Federal Reserve System, Holding companies, Nonbank financial companies supervised by the Board, Reporting and recordkeeping requirements, Securities, Stress testing.

##### Authority and Issuance

For the reasons stated in the **SUPPLEMENTARY INFORMATION**, the Board of Governors of the Federal Reserve System proposes to amend 12 CFR part 252 as follows:

#### **PART 252—ENHANCED PRUDENTIAL STANDARDS (Regulation YY)**

■ 1. The authority citation for part 252 continues to read as follows:

**Authority:** 12 U.S.C. 321–338a, 1467a(g), 1818, 1831p–1, 1844(b), 1844(c), 5361, 5365, 5366.

■ 2. Appendix A to part 252 is revised to read as follows:

#### **Appendix A to Part 252—Policy Statement on the Scenario Design Framework for Stress Testing**

##### 1. Background

a. The Board has imposed stress testing requirements through its regulations (stress test rules) implementing section 165(i) of the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act or Act) and through its capital plan rule (12 CFR 225.8). Under the stress test rules issued under section 165(i)(1) of the Act, the Board conducts an annual stress test (supervisory stress tests), on a consolidated basis, of each bank holding company with total consolidated assets of \$50 billion or more, intermediate holding company of a foreign banking organization, and nonbank financial company that the Financial Stability Oversight Council has designated for supervision by the Board (together, covered companies).<sup>1</sup> In addition, under the stress test rules issued under section 165(i)(2) of the Act, covered companies must conduct stress tests semi-annually and other financial

<sup>10</sup> 13 CFR 121.201.

<sup>11</sup> The Dodd-Frank Act provides that the Board may, on the recommendation of the Council, increase the \$50 billion asset threshold for the application of certain of the enhanced standards. See 12 U.S.C. 5365(a)(2)(B). However, neither the Board nor the Council has the authority to lower such threshold.

<sup>12</sup> See 76 FR 4555 (January 26, 2011).

<sup>1</sup> 12 U.S.C. 5365(i)(1); 12 CFR part 252, subpart E.

<sup>9</sup> See 5 U.S.C. 603, 604 and 605.

companies with total consolidated assets of more than \$10 billion and for which the Board is the primary regulatory agency must conduct stress tests on an annual basis (together, company-run stress tests).<sup>2</sup> The Board will provide for at least three different sets of conditions (each set, a scenario), including baseline, adverse, and severely adverse scenarios for both supervisory and company-run stress tests (macroeconomic scenarios).<sup>3</sup>

b. The stress test rules provide that the Board will notify covered companies by no later than February 15 of each year of the scenarios it will use to conduct its annual supervisory stress tests and provide, also by no later than February 15, covered companies and other financial companies subject to the final rules the set of scenarios they must use to conduct their annual company-run stress tests.<sup>4</sup> Under the stress test rules, the Board may require certain companies to use additional components in the adverse or severely adverse scenario or additional scenarios. For example, the Board expects to require large banking organizations with significant trading activities to include a trading and counterparty component (market shock, described in the following sections) in their adverse and severely adverse scenarios. The Board will provide any additional components or scenario by no later than March 1 of each year.<sup>5</sup> The Board expects that the scenarios it will require the companies to use will be the same as those the Board will use to conduct its supervisory stress tests (together, stress test scenarios).

c. In addition, § 225.8 of the Board's Regulation Y (capital plan rule) requires covered companies to submit annual capital plans, including stress test results, to the Board to allow the Board to assess whether they have robust, forward-looking capital planning processes and have sufficient capital to continue operations throughout times of economic and financial stress.<sup>6</sup>

d. Stress tests required under the stress test rules and under the capital plan rule require the Board and financial companies to calculate pro-forma capital levels—rather than “current” or actual levels—over a specified planning horizon under baseline and stressful scenarios. This approach integrates key lessons of the 2007–2009 financial crisis into the Board's supervisory framework. During the financial crisis, investor and counterparty confidence in the capitalization of financial companies eroded rapidly in the face of changes in the current and expected economic and financial conditions, and this loss in market confidence imperiled companies' ability to access funding, continue operations, serve as a credit intermediary, and meet obligations to creditors and counterparties. Importantly, such a loss in confidence occurred even

when a financial institution's capital ratios were in excess of regulatory minimums. This is because the institution's capital ratios were perceived as lagging indicators of its financial condition, particularly when conditions were changing.

e. The stress tests required under the stress test rules and capital plan rule are a valuable supervisory tool that provide a forward-looking assessment of large financial companies' capital adequacy under hypothetical economic and financial market conditions. Currently, these stress tests primarily focus on credit risk and market risk—that is, risk of mark-to-market losses associated with companies' trading and counterparty positions—and not on other types of risk, such as liquidity risk. Pressures stemming from these sources are considered in separate supervisory exercises. No single supervisory tool, including the stress tests, can provide an assessment of a company's ability to withstand every potential source of risk.

f. Selecting appropriate scenarios is an especially significant consideration for stress tests required under the capital plan rule, which ties the review of a company's performance under stress scenarios to its ability to make capital distributions. More severe scenarios, all other things being equal, generally translate into larger projected declines in banks' capital. Thus, a company would need more capital today to meet its minimum capital requirements in more stressful scenarios and have the ability to continue making capital distributions, such as common dividend payments. This translation is far from mechanical, however; it will depend on factors that are specific to a given company, such as underwriting standards and the company's business model, which would also greatly affect projected revenue, losses, and capital.

## 2. Overview and Scope

a. This policy statement provides more detail on the characteristics of the stress test scenarios and explains the considerations and procedures that underlie the approach for formulating these scenarios. The considerations and procedures described in this policy statement apply to the Board's stress testing framework, including to the stress tests required under 12 CFR part 252, subparts B, E, and F, as well as the Board's capital plan rule (12 CFR 225.8).<sup>7</sup>

b. Although the Board does not envision that the broad approach used to develop scenarios will change from year to year, the stress test scenarios will reflect changes in the outlook for economic and financial conditions and changes to specific risks or vulnerabilities that the Board, in consultation with the other federal banking agencies, determines should be considered in the annual stress tests. The stress test scenarios should not be regarded as forecasts; rather, they are hypothetical paths of economic variables that will be used to assess the strength and resilience of the companies' capital in various economic and financial environments.

c. The remainder of this policy statement is organized as follows. Section 3 provides a broad description of the baseline, adverse, and severely adverse scenarios and describes the types of variables that the Board expects to include in the macroeconomic scenarios and the market shock component of the stress test scenarios applicable to companies with significant trading activity. Section 4 describes the Board's approach for developing the macroeconomic scenarios, and section 5 describes the approach for the market shocks. Section 6 describes the relationship between the macroeconomic scenario and the market shock components. Section 7 provides a timeline for the formulation and publication of the macroeconomic assumptions and market shocks.

## 3. Content of the Stress Test Scenarios

a. The Board will publish a minimum of three different scenarios, including baseline, adverse, and severely adverse conditions, for use in stress tests required in the stress test rules.<sup>8</sup> In general, the Board anticipates that it will not issue additional scenarios. Specific circumstances or vulnerabilities that in any given year the Board determines require particular vigilance to ensure the resilience of the banking sector will be captured in either the adverse or severely adverse scenarios. A greater number of scenarios could be needed in some years—for example, because the Board identifies a large number of unrelated and uncorrelated but nonetheless significant risks.

b. While the Board generally expects to use the same scenarios for all companies subject to the final rule, it may require a subset of companies—depending on a company's financial condition, size, complexity, risk profile, scope of operations, or activities, or risks to the U.S. economy—to include additional scenario components or additional scenarios that are designed to capture different effects of adverse events on revenue, losses, and capital. One example of such components is the market shock that applies only to companies with significant trading activity. Additional components or scenarios may also include other stress factors that may not necessarily be directly correlated to macroeconomic or financial assumptions but nevertheless can materially affect companies' risks, such as the unexpected default of a major counterparty.

c. Early in each stress testing cycle, the Board plans to publish the macroeconomic scenarios along with a brief narrative summary that provides a description of the economic situation underlying the scenario and explains how the scenarios have changed relative to the previous year. In addition, to assist companies in projecting the paths of additional variables in a manner consistent with the scenario, the narrative will also provide descriptions of the general path of some additional variables. These descriptions will be general—that is, they will describe developments for broad classes of variables rather than for specific variables—and will specify the intensity and direction of variable

<sup>2</sup> 12 U.S.C. 5365(i)(2); 12 CFR part 252, subparts B and F.

<sup>3</sup> The stress test rules define scenarios, baseline scenario, adverse scenario, and severely adverse scenario. See 12 CFR 252.12(b), (f), (p), and (q); 12 CFR 252.42(b), (e), (n), and (o); 12 CFR 252.52(b), (e), (o), and (p).

<sup>4</sup> *Id.*

<sup>5</sup> *Id.*

<sup>6</sup> See 12 CFR 225.8.

<sup>7</sup> 12 CFR 252.14(a), 12 CFR 252.44(a), 12 CFR 252.54(a).

<sup>8</sup> 12 CFR 252.14(b), 12 CFR 252.44(b), 12 CFR 252.54(b).

changes but not numeric magnitudes. These descriptions should provide guidance that will be useful to companies in specifying the paths of the additional variables for their company-run stress tests. Note that in practice it will not be possible for the narrative to include descriptions on all of the additional variables that companies may need for their company-run stress tests. In cases where scenarios are designed to reflect particular risks and vulnerabilities, the narrative will also explain the underlying motivation for these features of the scenario. The Board also plans to release a broad description of the market shock components.

### 3.1 Macroeconomic Scenarios

a. The macroeconomic scenarios will consist of the future paths of a set of economic and financial variables.<sup>9</sup> The economic and financial variables included in the scenarios will likely comprise those included in the “2014 Supervisory Scenarios for Annual Stress Tests Required under the Dodd-Frank Act Stress Testing Rules and the Capital Plan Rule” (2013 supervisory scenarios). The domestic U.S. variables provided for in the 2013 supervisory scenarios included:

i. Six measures of economic activity and prices: Real and nominal gross domestic product (GDP) growth, the unemployment rate of the civilian non-institutional population aged 16 and over, real and nominal disposable personal income growth, and the Consumer Price Index (CPI) inflation rate;

ii. Four measures of developments in equity and property markets: The Core Logic National House Price Index, the National Council for Real Estate Investment Fiduciaries Commercial Real Estate Price Index, the Dow Jones Total Stock Market Index, and the Chicago Board Options Exchange Market Volatility Index; and

iii. Six measures of interest rates: The rate on the three-month Treasury bill, the yield on the 5-year Treasury bond, the yield on the 10-year Treasury bond, the yield on a 10-year BBB corporate security, the prime rate, and the interest rate associated with a conforming, conventional, fixed-rate, 30-year mortgage.

b. The international variables provided for in the 2014 supervisory scenarios included, for the euro area, the United Kingdom, developing Asia, and Japan:

i. Percent change in real GDP;

ii. Percent change in the Consumer Price Index or local equivalent; and

iii. The U.S./foreign currency exchange rate.<sup>10</sup>

c. The economic variables included in the scenarios influence key items affecting financial companies' net income, including pre-provision net revenue and credit losses on loans and securities. Moreover, these variables exhibit fairly typical trends in

adverse economic climates that can have unfavorable implications for companies' net income and, thus, capital positions.

d. The economic variables included in the scenario may change over time. For example, the Board may add variables to a scenario if the international footprint of companies that are subject to the stress testing rules changed notably over time such that the variables already included in the scenario no longer sufficiently capture the material risks of these companies. Alternatively, historical relationships between macroeconomic variables could change over time such that one variable (e.g., disposable personal income growth) that previously provided a good proxy for another (e.g., light vehicle sales) in modeling companies' pre-provision net revenue or credit losses ceases to do so, resulting in the need to create a separate path, or alternative proxy, for the other variable. However, recognizing the amount of work required for companies to incorporate the scenario variables into their stress testing models, the Board expects to eliminate variables from the scenarios only in rare instances.

e. The Board expects that the company may not use all of the variables provided in the scenario, if those variables are not appropriate to the company's line of business, or may add additional variables, as appropriate. The Board expects the companies will ensure that the paths of such additional variables are consistent with the scenarios the Board provided. For example, the companies may use, as part of their internal stress test models, local-level variables, such as state-level unemployment rates or city-level house prices. While the Board does not plan to include local-level macro variables in the stress test scenarios it provides, it expects the companies to evaluate the paths of local-level macro variables as needed for their internal models, and ensure internal consistency between these variables and their aggregate, macroeconomic counterparts. The Board will provide the macroeconomic scenario component of the stress test scenarios for a period that spans a minimum of 13 quarters. The scenario horizon reflects the supervisory stress test approach that the Board plans to use. Under the stress test rules, the Board will assess the effect of different scenarios on the consolidated capital of each company over a forward-looking planning horizon of at least nine quarters.

### 3.2 Market Shock Component

a. The market shock component of the adverse and severely adverse scenarios will only apply to companies with significant trading activity and their subsidiaries.<sup>11</sup> The

<sup>11</sup> Currently, companies with significant trading activity include any bank holding company or intermediate holding company that (1) has aggregate trading assets and liabilities of \$50 billion or more, or aggregate trading assets and liabilities equal to 10 percent or more of total consolidated assets, and (2) is not a large and noncomplex firm. The Board may also subject a state member bank subsidiary of any such bank holding company to the market shock component. The set of companies subject to the market shock component could change over time as the size, scope, and complexity of financial company's trading activities evolve.

component consists of large moves in market prices and rates that would be expected to generate losses. Market shocks differ from macroeconomic scenarios in a number of ways, both in their design and application. For instance, market shocks that might typically be observed over an extended period (e.g., 6 months) are assumed to be an instantaneous event which immediately affects the market value of the companies' trading assets and liabilities. In addition, under the stress test rules, the as-of date for market shocks will differ from the quarter-end, and the Board will provide the as-of date for market shocks no later than February 1 of each year. Finally, as described in section 4, the market shock includes a much larger set of risk factors than the set of economic and financial variables included in macroeconomic scenarios. Broadly, these risk factors include shocks to financial market variables that affect asset prices, such as a credit spread or the yield on a bond, and, in some cases, the value of the position itself (e.g., the market value of private equity positions).

b. The Board envisions that the market shocks will include shocks to a broad range of risk factors that are similar in granularity to those risk factors trading companies use internally to produce profit and loss estimates, under stressful market scenarios, for all asset classes that are considered trading assets, including equities, credit, interest rates, foreign exchange rates, and commodities. Examples of risk factors include, but are not limited to:

i. Equity indices of all developed markets, and of developing and emerging market nations to which companies with significant trading activity may have exposure, along with term structures of implied volatilities;

ii. Cross-currency FX rates of all major and many minor currencies, along term structures of implied volatilities;

iii. Term structures of government rates (e.g., U.S. Treasuries), interbank rates (e.g., swap rates) and other key rates (e.g., commercial paper) for all developed markets and for developing and emerging market nations to which companies may have exposure;

iv. Term structures of implied volatilities that are key inputs to the pricing of interest rate derivatives;

v. Term structures of futures prices for energy products including crude oil (differentiated by country of origin), natural gas, and power;

vi. Term structures of futures prices for metals and agricultural commodities;

vii. “Value-drivers” (credit spreads or instrument prices themselves) for credit-sensitive product segments including: Corporate bonds, credit default swaps, and collateralized debt obligations by risk; non-agency residential mortgage-backed securities and commercial mortgage-backed securities by risk and vintage; sovereign debt; and, municipal bonds; and

viii. Shocks to the values of private equity positions.

### 4. Approach for Formulating the Macroeconomic Assumptions for Scenarios

a. This section describes the Board's approach for formulating macroeconomic

<sup>9</sup> The future path of a variable refers to its specification over a given time period. For example, the path of unemployment can be described in percentage terms on a quarterly basis over the stress testing time horizon.

<sup>10</sup> The Board may increase the range of countries or regions included in future scenarios, as appropriate.

assumptions for each scenario. The methodologies for formulating this part of each scenario differ by scenario, so these methodologies for the baseline, severely adverse, and the adverse scenarios are described separately in each of the following subsections.

b. In general, the baseline scenario will reflect the most recently available consensus views of the macroeconomic outlook expressed by professional forecasters, government agencies, and other public-sector organizations as of the beginning of the annual stress-test cycle. The severely adverse scenario will consist of a set of economic and financial conditions that reflect the conditions of post-war U.S. recessions. The adverse scenario will consist of a set of economic and financial conditions that are more adverse than those associated with the baseline scenario but less severe than those associated with the severely adverse scenario.

c. Each of these scenarios is described further in sections below as follows: Baseline (subsection 4.1), severely adverse (subsection 4.2), and adverse (subsection 4.3).

#### 4.1 Approach for Formulating Macroeconomic Assumptions in the Baseline Scenario

a. The stress test rules define the baseline scenario as a set of conditions that affect the U.S. economy or the financial condition of a banking organization, and that reflect the consensus views of the economic and financial outlook. Projections under a baseline scenario are used to evaluate how companies would perform in more likely economic and financial conditions. The baseline serves also as a point of comparison to the severely adverse and adverse scenarios, giving some sense of how much of the company's capital decline could be ascribed to the scenario as opposed to the company's capital adequacy under expected conditions.

b. The baseline scenario will be developed around a macroeconomic projection that captures the prevailing views of private-sector forecasters (e.g. Blue Chip Consensus Forecasts and the Survey of Professional Forecasters), government agencies, and other public-sector organizations (e.g., the International Monetary Fund and the Organization for Economic Co-operation and Development) near the beginning of the annual stress-test cycle. The baseline scenario is designed to represent a consensus expectation of certain economic variables over the time period of the tests and it is not the Board's internal forecast for those economic variables. For example, the baseline path of short-term interest rates is constructed from consensus forecasts and may differ from that implied by the FOMC's *Summary of Economic Projections*.

c. For some scenario variables—such as U.S. real GDP growth, the unemployment rate, and the consumer price index—there will be a large number of different forecasts available to project the paths of these variables in the baseline scenario. For others, a more limited number of forecasts will be available. If available forecasts diverge notably, the baseline scenario will reflect an

assessment of the forecast that is deemed to be most plausible. In setting the paths of variables in the baseline scenario, particular care will be taken to ensure that, together, the paths present a coherent and plausible outlook for the U.S. and global economy, given the economic climate in which they are formulated.

#### 4.2 Approach for Formulating the Macroeconomic Assumptions in the Severely Adverse Scenario

The stress test rules define a severely adverse scenario as a set of conditions that affect the U.S. economy or the financial condition of a financial company and that overall are more severe than those associated with the adverse scenario. The financial company will be required to publicly disclose a summary of the results of its stress test under the severely adverse scenario, and the Board intends to publicly disclose the results of its analysis of the financial company under the adverse scenario and the severely adverse scenario.

##### 4.2.1 General Approach: The Recession Approach

a. The Board intends to use a recession approach to develop the severely adverse scenario. In the recession approach, the Board will specify the future paths of variables to reflect conditions that characterize post-war U.S. recessions, generating either a typical or specific recreation of a post-war U.S. recession. The Board chose this approach because it has observed that the conditions that typically occur in recessions—such as increasing unemployment, declining asset prices, and contracting loan demand—can put significant stress on companies' balance sheets. This stress can occur through a variety of channels, including higher loss provisions due to increased delinquencies and defaults; losses on trading positions through sharp moves in market prices; and lower bank income through reduced loan originations. For these reasons, the Board believes that the paths of economic and financial variables in the severely adverse scenario should, at a minimum, resemble the paths of those variables observed during a recession.

b. This approach requires consideration of the type of recession to feature. All post-war U.S. recessions have not been identical: Some recessions have been associated with very elevated interest rates, some have been associated with sizable asset price declines, and some have been relatively more global. The most common features of recessions, however, are increases in the unemployment rate and contractions in aggregate incomes and economic activity. For this and the following reasons, the Board intends to use the unemployment rate as the primary basis for specifying the severely adverse scenario. First, the unemployment rate is likely the most representative single summary indicator of adverse economic conditions. Second, in comparison to GDP, labor market data have traditionally featured more prominently than GDP in the set of indicators that the National Bureau of Economic Research reviews to

inform its recession dates.<sup>12</sup> Third and finally, the growth rate of potential output can cause the size of the decline in GDP to vary between recessions. While changes in the unemployment rate can also vary over time due to demographic factors, this seems to have more limited implications over time relative to changes in potential output growth. The unemployment rate used in the severely adverse scenario will reflect an unemployment rate that has been observed in severe post-war U.S. recessions, measuring severity by the absolute level of and relative increase in the unemployment rate.<sup>13</sup>

c. The Board believes that the severely adverse scenario should also reflect a housing recession. The house prices path set in the severely adverse scenario will reflect developments that have been observed in post-war U.S. housing recessions, measuring severity by the absolute level of and relative decrease in the house prices.

d. The Board will specify the paths of most other macroeconomic variables based on the paths of unemployment, income, house prices, and activity. Some of these other variables, however, have taken wildly divergent paths in previous recessions (e.g., foreign GDP), requiring the Board to use its informed judgment in selecting appropriate paths for these variables. In general, the path for these other variables will be based on their underlying structure at the time that the scenario is designed (e.g., economic or financial-system vulnerabilities in other countries).

e. The Board considered alternative methods for scenario design of the severely adverse scenario, including a probabilistic approach. The probabilistic approach constructs a baseline forecast from a large-scale macroeconomic model and identifies a scenario that would have a specific probabilistic likelihood given the baseline forecast. The Board believes that, at this time, the recession approach is better suited for developing the severely adverse scenario than a probabilistic approach because it guarantees a recession of some specified severity. In contrast, the probabilistic approach requires the choice of an extreme tail outcome—relative to baseline—to characterize the severely adverse scenario (e.g., a 5 percent or a 1 percent tail outcome). In practice, this choice is difficult as adverse economic outcomes are typically thought of in terms of how variables evolve in an absolute sense rather than how far away they lie in the probability space away from the baseline. In this sense, a scenario featuring a recession may be somewhat clearer and more straightforward to communicate. Finally, the

<sup>12</sup> More recently, a monthly measure of GDP has been added to the list of indicators.

<sup>13</sup> Even though all recessions feature increases in the unemployment rate and contractions in incomes and economic activity, the size of this change has varied over post-war U.S. recessions. Table 1 of this appendix documents the variability in the depth of post-war U.S. recessions. Some recessions—labeled mild in Table 1—have been relatively modest with GDP edging down just slightly and the unemployment rate moving up about a percentage point. Other recessions—labeled severe in Table 1—have been much harsher with GDP dropping 3¼ percent and the unemployment rate moving up a total of about 4 percentage points.

probabilistic approach relies on estimates of uncertainty around the baseline scenario and such estimates are in practice model-dependent.

#### 4.2.2 *Setting the Unemployment Rate Under the Severely Adverse Scenario*

a. The Board anticipates that the severely adverse scenario will feature an unemployment rate that increases between 3 to 5 percentage points from its initial level over the course of 6 to 8 calendar quarters.<sup>14</sup> The initial level will be set based on the conditions at the time that the scenario is designed. However, if a 3 to 5 percentage point increase in the unemployment rate does not raise the level of the unemployment rate to at least 10 percent—the average level to which it has increased in the most recent three severe recessions—the path of the unemployment rate in most cases will be specified so as to raise the unemployment rate to at least 10 percent.

b. This methodology is intended to generate scenarios that feature stressful outcomes but do not induce greater procyclicality in the financial system and macroeconomy. When the economy is in the early stages of a recovery, the unemployment rate in a baseline scenario generally trends downward, resulting in a larger difference between the path of the unemployment rate in the severely adverse scenario and the baseline scenario and a severely adverse scenario that is relatively more intense. Conversely, in a sustained strong expansion—when the unemployment rate may be below the level consistent with full employment—the unemployment in a baseline scenario generally trends upward, resulting in a smaller difference between the path of the unemployment rate in the severely adverse scenario and the baseline scenario and a severely adverse scenario that is relatively less intense. Historically, a 3 to 5 percentage point increase in unemployment rate is reflective of stressful conditions. As illustrated in Table 1 of this appendix, over the last half-century, the U.S. economy has experienced four severe post-war recessions. In all four of these recessions the unemployment rate increased 3 to 5 percentage points and in the three most recent of these recessions the unemployment rate reached a level between 9 percent and 11 percent.

c. Under this method, if the initial unemployment rate were low—as it would be after a sustained long expansion—the unemployment rate in the scenario would increase to a level as high as what has been seen in past severe recessions. However, if the initial unemployment rate were already high—as would be the case in the early stages of a recovery—the unemployment rate would exhibit a change as large as what has been seen in past severe recessions.

d. The Board believes that the typical increase in the unemployment rate in the

severely adverse scenario will be about 4 percentage points. However, the Board will calibrate the increase in unemployment based on its views of the status of cyclical systemic risk. The Board intends to set the unemployment rate at the higher end of the range if the Board believed that cyclical systemic risks were high (as it would be after a sustained long expansion), and to the lower end of the range if cyclical systemic risks were low (as it would be in the earlier stages of a recovery). This may result in a scenario that is slightly more intense than normal if the Board believed that cyclical systemic risks were increasing in a period of robust expansion.<sup>15</sup> Conversely, it will allow the Board to specify a scenario that is slightly less intense than normal in an environment where systemic risks appeared subdued, such as in the early stages of an expansion. Indeed, the Board expects that, in general, it will adopt a change in the unemployment rate of less than 4 percentage points when the unemployment rate at the start of the scenarios is elevated but the labor market is judged to be strengthening and higher-than-usual credit losses stemming from previously elevated unemployment rates were either already realized—or are in the process of being realized—and thus removed from banks' balance sheets.<sup>16</sup> However, even at the lower end of the range of unemployment-rate increases, the scenario will still feature an increase in the unemployment rate similar to what has been seen in about half of the severe recessions of the last 50 years.

e. As indicated previously, if a 3 to 5 percentage point increase in the unemployment rate does not raise the level of the unemployment rate to 10 percent—the average level to which it has increased in the most recent three severe recessions—the path of the unemployment rate will be specified so as to raise the unemployment rate to 10 percent. Setting a floor for the unemployment rate at 10 percent recognizes the fact that not only do cyclical systemic risks build up at financial intermediaries during robust expansions but that these risks are also easily obscured by the buoyant environment.

f. In setting the increase in the unemployment rate, the Board will consider the extent to which analysis by economists, supervisors, and financial market experts finds cyclical systemic risks to be elevated (but difficult to be captured more precisely in one of the scenario's other variables). In addition, the Board—in light of impending shocks to the economy and financial system—will also take into consideration the extent to which a scenario of some increased severity might be necessary for the results of

<sup>15</sup> Note, however, that the severity of the scenario would not exceed an implausible level: even at the upper end of the range of unemployment-rate increases, the path of the unemployment rate would still be consistent with severe post-war U.S. recessions.

<sup>16</sup> Evidence of a strengthening labor market could include a declining unemployment rate, steadily expanding nonfarm payroll employment, or improving labor force participation. Evidence that credit losses are being realized could include elevated charge-offs on loans and leases, loan-loss provisions in excess of gross charge-offs, or losses being realized in securities portfolios that include securities that are subject to credit risk.

the stress test and the associated supervisory actions to sustain confidence in financial institutions.

g. While the approach to specifying the severely adverse scenario is designed to avoid adding sources of procyclicality to the financial system, it is not designed to explicitly offset any existing procyclical tendencies in the financial system. The purpose of the stress test scenarios is to make sure that the companies are properly capitalized to withstand severe economic and financial conditions, not to serve as an explicit countercyclical offset to the financial system.

h. In developing the approach to the unemployment rate, the Board also considered a method that would increase the unemployment rate to some fairly elevated fixed level over the course of 6 to 8 quarters. This will result in scenarios being more severe in robust expansions (when the unemployment rate is low) and less severe in the early stages of a recovery (when the unemployment rate is high) and so would not result in pro-cyclicality. Depending on the initial level of the unemployment rate, this approach could lead to only a very modest increase in the unemployment rate—or even a decline. As a result, this approach—while not procyclical—could result in scenarios not featuring stressful macroeconomic outcomes.

#### 4.2.3 *Setting the Other Variables in the Severely Adverse Scenario*

a. Generally, all other variables in the severely adverse scenario will be specified to be consistent with the increase in the unemployment rate. The approach for specifying the paths of these variables in the scenario will be a combination of (1) how economic models suggest that these variables should evolve given the path of the unemployment rate, (2) how these variables have typically evolved in past U.S. recessions, and (3) and evaluation of these and other factors.

b. Economic models—such as medium-scale macroeconomic models—should be able to generate plausible paths consistent with the unemployment rate for a number of scenario variables, such as real GDP growth, CPI inflation and short-term interest rates, which have relatively stable (direct or indirect) relationships with the unemployment rate (e.g., Okun's Law, the Phillips Curve, and interest rate feedback rules). For some other variables, specifying their paths will require a case-by-case consideration.

c. Declining house prices, which are an important source of stress to a company's balance sheet, are not a steadfast feature of recessions, and the historical relationship of house prices with the unemployment rate is not strong. Simply adopting their typical path in a severe recession would likely underestimate risks stemming from the housing sector. In specifying the path for nominal house prices, the Board will consider the ratio of the nominal house price index (HPI) to nominal, per capita, disposable income (DPI). The Board believes that the typical decline in the HPI-DPI ratio will be at a minimum 25 percent from its starting value, or enough to bring the ratio

<sup>14</sup> Six to eight quarters is the average number of quarters for which a severe recession lasts plus the average number of subsequent quarters over which the unemployment rate continues to rise. The variable length of the timeframe reflects the different paths to the peak unemployment rate depending on the severity of the scenario.

down to its Great Recession trough. As illustrated in Table 2 of this appendix, housing recessions have on average featured HPI–DPI ratio declines of about 25 percent and the HPI–DPI ratio fell to its Great Recession trough.<sup>17</sup>

d. In addition, judgment is necessary in projecting the path of a scenario's international variables. Recessions that occur simultaneously across countries are an important source of stress to the balance sheets of companies with notable international exposures but are not an invariable feature of the international economy. As a result, simply adopting the typical path of international variables in a severe U.S. recession would likely underestimate the risks stemming from the international economy. Consequently, an approach that uses both judgment and economic models informs the path of international variables.

#### 4.2.4 Adding Salient Risks to the Severely Adverse Scenario

a. The severely adverse scenario will be developed to reflect specific risks to the economic and financial outlook that are especially salient but will feature minimally in the scenario if the Board were only to use approaches that looked to past recessions or relied on historical relationships between variables.

b. There are some important instances when it will be appropriate to augment the recession approach with salient risks. For example, if an asset price were especially elevated and thus potentially vulnerable to an abrupt and potentially destabilizing decline, it would be appropriate to include such a decline in the scenario even if such a large drop were not typical in a severe recession. Likewise, if economic developments abroad were particularly unfavorable, assuming a weakening in international conditions larger than what typically occurs in severe U.S. recessions would likely also be appropriate.

c. Clearly, while the recession component of the severely adverse scenario is within some predictable range, the salient risk aspect of the scenario is far less so, and therefore, needs an annual assessment. Each year, the Board will identify the risks to the financial system and the domestic and international economic outlooks that appear more elevated than usual, using its internal analysis and supervisory information and in consultation with the Federal Deposit Insurance Corporation (FDIC) and the Office of the Comptroller of the Currency (OCC). Using the same information, the Board will then calibrate the paths of the

<sup>17</sup> The house-price retrenchments that occurred over the periods 1980–1985, 1989–1996, 2006–2011 (as detailed in Table 2 of this appendix) are referred to in this document as housing recessions. The date-ranges of housing recessions are based on the timing of house-price retrenchments. These dates were also associated with sustained declines in real residential investment, although, the precise timings of housing recessions would likely be slightly different were they to be classified based on real residential investment in addition to house prices. The ratios described in Table 2 are calculated based on nominal HPI and HPI–DPI ratios indexed to 100 in 2000:Q1.

macroeconomic and financial variables in the scenario to reflect these risks.

d. Detecting risks that have the potential to weaken the banking sector is particularly difficult when economic conditions are buoyant, as a boom can obscure the weaknesses present in the system. In sustained robust expansions, therefore, the selection of salient risks to augment the scenario will err on the side of including risks of uncertain significance.

e. The Board will factor in particular risks to the domestic and international macroeconomic outlook identified by its economists, bank supervisors, and financial market experts and make appropriate adjustments to the paths of specific economic variables. These adjustments will not be reflected in the general severity of the recession and, thus, all macroeconomic variables; rather, the adjustments will apply to a subset of variables to reflect co-movements in these variables that are historically less typical. The Board plans to discuss the motivation for the adjustments that it makes to variables to highlight systemic risks in the narrative describing the scenarios.<sup>18</sup>

#### 4.3 Approach for Formulating Macroeconomic Assumptions in the Adverse Scenario

a. The adverse scenario can be developed in a number of different ways, and the selected approach will depend on a number of factors, including how the Board intends to use the results of the adverse scenario.<sup>19</sup> Generally, the Board believes that the companies should consider multiple adverse scenarios for their internal capital planning purposes, and likewise, it is appropriate that the Board consider more than one adverse scenario to assess a company's ability to withstand stress. Accordingly, the Board does not identify a single approach for specifying the adverse scenario. Rather, the adverse scenario will be formulated according to one of the possibilities listed below. The Board may vary the approach it uses for the adverse scenario each year so that the results of the scenario provide the most value to supervisors, in light of current condition of the economy and the financial services industry.

b. The simplest method to specify the adverse scenario is to develop a less severe version of the severely adverse scenario. For example, the adverse scenario could be formulated such that the deviations of the paths of the variables relative to the baseline

<sup>18</sup> The means of effecting an adjustment to the severely adverse scenario to address salient systemic risks differs from the means used to adjust the unemployment rate. For example, in adjusting the scenario for an increased unemployment rate, the Board would modify all variables such that the future paths of the variables are similar to how these variables have moved historically. In contrast, to address salient risks, the Board may only modify a small number of variables in the scenario and, as such, their future paths in the scenario would be somewhat more atypical, albeit not implausible, given existing risks.

<sup>19</sup> For example, in the context of CCAAR, the Board currently uses the adverse scenario as one consideration in evaluating a firm's capital adequacy.

were simply one-half of or two-thirds of the deviations of the paths of the variables relative to the baseline in the severely adverse scenario. *A priori*, specifying the adverse scenario in this way may appear unlikely to provide the greatest possible informational value to supervisors—given that it is just a less severe version of the severely adverse scenario. However, to the extent that the effect of macroeconomic variables on company loss positions and incomes are nonlinear, there could be potential value from this approach.

c. Another method to specify the adverse scenario is to capture risks in the adverse scenario that the Board believes should be understood better or should be monitored, but does not believe should be included in the severely adverse scenario, perhaps because these risks would render the scenario implausibly severe. For instance, the adverse scenario could feature sizable increases in oil or natural gas prices or shifts in the yield curve that are atypical in a recession. The adverse scenario might also feature less acute, but still consequential, adverse outcomes, such as a disruptive slowdown in growth from emerging-market economies.

d. Under the Board's stress test rules, covered companies are required to develop their own scenarios for mid-cycle company-run stress tests.<sup>20</sup> A particular combination of risks included in these scenarios may inform the design of the adverse scenario for annual stress tests. In this same vein, another possibility would be to use modified versions of the circumstances that companies describe in their living wills as being able to cause their failures.

e. It might also be informative to periodically use a stable adverse scenario, at least for a few consecutive years. Even if the scenario used for the stress test does not change over the credit cycle, if companies tighten and relax lending standards over the cycle, their loss rates under the adverse scenario—and indirectly the projected changes to capital—would decrease and increase, respectively. A consistent scenario would allow the direct observation of how capital fluctuates to reflect growing cyclical risks.

f. The Board may consider specifying the adverse scenario using the probabilistic approach described in section 4.2.1 (that is, with a specified lower probability of occurring than the severely adverse scenario but a greater probability of occurring than the baseline scenario). The approach has some intuitive appeal despite its shortcomings. For example, using this approach for the adverse scenario could allow the Board to explore an alternative approach to develop stress testing scenarios and their effect on a company's net income and capital.

g. Finally, the Board could design the adverse scenario based on a menu of historical experiences—such as, a moderate recession (*e.g.*, the 1990–1991 recession); a stagflation event (*e.g.*, stagflation during 1974); an emerging markets crisis (*e.g.*, the Asian currency crisis of 1997–1998); an oil price shock (*e.g.*, the shock during the run up

<sup>20</sup> 12 CFR 252.55.

to the 1990–1991 recession); or high inflation shock (e.g., the inflation pressures of 1977–1979). The Board believes these are important stresses that should be understood; however, there may be notable benefits from formulating the adverse scenario following other approaches—specifically, those described previously in this section—and consequently the Board does not believe that the adverse scenario should be limited to historical episodes only.

h. With the exception of cases in which the probabilistic approach is used to generate the adverse scenario, the adverse scenario will at a minimum contain a mild to moderate recession. This is because most of the value from investigating the implications of the risks described above is likely to be obtained from considering them in the context of balance sheets of companies that are under some stress.

### 5. Approach for Formulating the Market Shock Component

a. This section discusses the approach the Board proposes to adopt for developing the market shock component of the adverse and severely adverse scenarios appropriate for companies with significant trading activities. The design and specification of the market shock component differs from that of the macroeconomic scenarios because profits and losses from trading are measured in mark-to-market terms, while revenues and losses from traditional banking are generally measured using the accrual method. As noted above, another critical difference is the time-evolution of the market shock component. The market shock component consists of an instantaneous “shock” to a large number of risk factors that determine the mark-to-market value of trading positions, while the macroeconomic scenarios supply a projected path of economic variables that affect traditional banking activities over the entire planning period.

b. The development of the market shock component that are detailed in this section are as follows: baseline (subsection 5.1), severely adverse (subsection 5.2), and adverse (subsection 5.3).

#### 5.1 Approach for Formulating the Market Shock Component Under the Baseline Scenario

By definition, market shocks are large, previously unanticipated moves in asset prices and rates. Because asset prices should, broadly speaking, reflect consensus opinions about the future evolution of the economy, large price movements, as envisioned in the market shock, should not occur along the baseline path. As a result, the market shock will not be included in the baseline scenario.

#### 5.2 Approach for Formulating the Market Shock Component Under the Severely Adverse Scenario

This section addresses possible approaches to designing the market shock component in the severely adverse scenario, including important considerations for scenario design, possible approaches to designing scenarios, and a development strategy for implementing the preferred approach.

#### 5.2.1 Design Considerations for Market Shocks

a. The general market practice for stressing a trading portfolio is to specify market shocks either in terms of extreme moves in observable, broad market indicators and risk factors or directly as large changes to the mark-to-market values of financial instruments. These moves can be specified either in relative terms or absolute terms. Supplying values of risk factors after a “shock” is roughly equivalent to the macroeconomic scenarios, which supply values for a set of economic and financial variables; however, trading stress testing differs from macroeconomic stress testing in several critical ways.

b. In the past, the Board used one of two approaches to specify market shocks. During SCAP and CCAR in 2011, the Board used a very general approach to market shocks and required companies to stress their trading positions using changes in market prices and rates experienced during the second half of 2008, without specifying risk factor shocks. This broad guidance resulted in inconsistency across companies both in terms of the severity and the application of shocks. In certain areas companies were permitted to use their own experience during the second half of 2008 to define shocks. This resulted in significant variation in shock severity across companies.

c. To enhance the consistency and comparability in market shocks for the stress tests in 2012 and 2013, the Board provided to each trading company more than 35,000 specific risk factor shocks, primarily based on market moves in the second half of 2008. While the number of risk factors used in companies’ pricing and stress-testing models still typically exceed that provided in the Board’s scenarios, the greater specificity resulted in more consistency in the scenario across companies. The benefit of the comprehensiveness of risk factor shocks is at least partly offset by potential difficulty in creating shocks that are coherent and internally consistent, particularly as the framework for developing market shocks deviates from historical events.

d. Also importantly, the ultimate losses associated with a given market shock will depend on a company’s trading positions, which can make it difficult to rank order, *ex ante*, the severity of the scenarios. In certain instances, market shocks that include large market moves may not be particularly stressful for a given company. Aligning the market shock with the macroeconomic scenario for consistency may result in certain companies actually benefiting from risk factor moves of larger magnitude in the market scenario if the companies are hedging against salient risks to other parts of their business. Thus, the severity of market shocks must be calibrated to take into account how a complex set of risks, such as directional risks and basis risks, interacts with each other, given the companies’ trading positions at the time of stress. For instance, a large depreciation in a foreign currency would benefit companies with net short positions in the currency while hurting those with net long positions. In addition, longer maturity positions may move differently from shorter

maturity positions, adding further complexity.

e. The instantaneous nature of market shocks and the immediate recognition of mark-to-market losses add another element to the design of market shocks, and to determining the appropriate severity of shocks. For instance, in previous stress tests, the Board assumed that market moves that occurred over the six-month period in late 2008 would occur instantaneously. The design of the market shocks must factor in appropriate assumptions around the period of time during which market events will unfold and any associated market responses.

#### 5.2.2 Approaches to Market Shock Design

a. As an additional component of the adverse and severely adverse scenarios, the Board plans to use a standardized set of market shocks that apply to all companies with significant trading activity. The market shocks could be based on a single historical episode, multiple historical periods, hypothetical (but plausible) events, or some combination of historical episodes and hypothetical events (hybrid approach). Depending on the type of hypothetical events, a scenario based on such events may result in changes in risk factors that were not previously observed. In the supervisory scenarios for 2012 and 2013, the shocks were largely based on relative moves in asset prices and rates during the second half of 2008, but also included some additional considerations to factor in the widening of spreads for European sovereigns and financial companies based on actual observation during the latter part of 2011.

b. For the market shock component in the severely adverse scenario, the Board plans to use the hybrid approach to develop shocks. The hybrid approach allows the Board to maintain certain core elements of consistency in market shocks each year while providing flexibility to add hypothetical elements based on market conditions at the time of the stress tests. In addition, this approach will help ensure internal consistency in the scenario because of its basis in historical episodes; however, combining the historical episode and hypothetical events may require small adjustments to ensure mutual consistency of the joint moves. In general, the hybrid approach provides considerable flexibility in developing scenarios that are relevant each year, and by introducing variations in the scenario, the approach will also reduce the ability of companies with significant trading activity to modify or shift their portfolios to minimize expected losses in the severely adverse market shock.

c. The Board has considered a number of alternative approaches for the design of market shocks. For example, the Board explored an option of providing tailored market shocks for each trading company, using information on the companies’ portfolio gathered through ongoing supervision, or other means. By specifically targeting known or potential vulnerabilities in a company’s trading position, the tailored approach will be useful in assessing each company’s capital adequacy as it relates to the company’s idiosyncratic risk. However, the Board does not believe this approach to

be well-suited for the stress tests required by regulation. Consistency and comparability are key features of annual supervisory stress tests and annual company-run stress tests required in the stress test rules. It would be difficult to use the information on the companies' portfolio to design a common set of shocks that are universally stressful for all covered companies. As a result, this approach will be better suited to more customized, tailored stress tests that are part of the company's internal capital planning process or to other supervisory efforts outside of the stress tests conducted under the capital rule and the stress test rules.

### 5.2.3 Development of the Market Shock

a. Consistent with the approach described above, the market shock component for the severely adverse scenario will incorporate key elements of market developments during the second half of 2008, but also incorporate observations from other periods or price and rate movements in certain markets that the Board deems to be plausible though such movements may not have been observed historically. Over time the Board also expects to rely less on market events of the second half of 2008 and more on hypothetical events or other historical episodes to develop the market shock.

b. The developments in the credit markets during the second half of 2008 were unprecedented, providing a reasonable basis for market shocks in the severely adverse scenario. During this period, key risk factors in virtually all asset classes experienced extremely large shocks; the collective breadth and intensity of the moves have no parallels in modern financial history and, on that basis, it seems likely that this episode will continue to be the most relevant historical scenario, although experience during other historical episodes may also guide the severity of the market shock component of the severely adverse scenario. Moreover, the risk factor moves during this episode are directly consistent with the "recession" approach that underlies the macroeconomic assumptions. However, market shocks based only on historical events could become stale and less relevant over time as the company's positions change, particularly if more salient features are not added each year.

c. While the market shocks based on the second half of 2008 are of unparalleled magnitude, the shocks may become less relevant over time as the companies' trading positions change. In addition, more recent events could highlight the companies' vulnerability to certain market events. For example, in 2011, Eurozone credit spreads in the sovereign and financial sectors surpassed those observed during the second half of 2008, necessitating the modification of the severely adverse market shock in 2012 and 2013 to reflect a salient source of stress to trading positions. As a result, it is important to incorporate both historical and hypothetical outcomes into market shocks for the severely adverse scenario. For the time being, the development of market shocks in the severely adverse scenario will begin with the risk factor movements in a particular historical period, such as the second half of 2008. The Board will then consider

hypothetical but plausible outcomes, based on financial stability reports, supervisory information, and internal and external assessments of market risks and potential flash points. The hypothetical outcomes could originate from major geopolitical, economic, or financial market events with potentially significant impacts on market risk factors. The severity of these hypothetical moves will likely be guided by similar historical events, assumptions embedded in the companies' internal stress tests or market participants, and other available information.

d. Once broad market scenarios are agreed upon, specific risk factor groups will be targeted as the source of the trading stress. For example, a scenario involving the failure of a large, interconnected globally active financial institution could begin with a sharp increase in credit default swap spreads and a precipitous decline in asset prices across multiple markets, as investors become more risk averse and market liquidity evaporates. These broad market movements will be extrapolated to the granular level for all risk factors by examining transmission channels and the historical relationships between variables, though in some cases, the movement in particular risk factors may be amplified based on theoretical relationships, market observations, or the saliency to company trading books. If there is a disagreement between the risk factor movements in the historical event used in the scenario and the hypothetical event, the Board will reconcile the differences by assessing *a priori* expectation based on financial and economic theory and the importance of the risk factors to the trading positions of the covered companies.

### 5.3 Approach for Formulating the Market Shock Under the Adverse Scenario

a. The market shock component included in the adverse scenario will feature risk factor movements that are generally less significant than the market shock component of the severely adverse scenario. However, the adverse market shock may also feature risk factor shocks that are substantively different from those included in the severely adverse scenario, in order to provide useful information to supervisors. As in the case of the macroeconomic scenario, the market shock component in the adverse scenario can be developed in a number of different ways.

b. The adverse scenario could be differentiated from the severely adverse scenario by the absolute size of the shock, the scenario design process (e.g., historical events versus hypothetical events), or some other criteria. The Board expects that as the market shock component of the adverse scenario may differ qualitatively from the market shock component of the severely adverse scenario, the results of adverse scenarios may be useful in identifying a particularly vulnerable area in a trading company's positions.

c. There are several possibilities for the adverse scenario and the Board may use a different approach each year to better explore the vulnerabilities of companies with significant trading activity. One approach is to use a scenario based on some combination of historical events. This approach is similar

to the one used for the market shock in 2012, where the market shock component was largely based on the second half of 2008, but also included a number of risk factor shocks that reflected the significant widening of spreads for European sovereigns and financials in late 2011. This approach will provide some consistency each year and provide an internally consistent scenario with minimal implementation burden. Having a relatively consistent adverse scenario may be useful as it potentially serves as a benchmark against the results of the severely adverse scenario and can be compared to past stress tests.

d. Another approach is to have an adverse scenario that is identical to the severely adverse scenario, except that the shocks are smaller in magnitude (e.g., 100 basis points for adverse versus 200 basis points for severely adverse). This "scaling approach" generally fits well with an intuitive interpretation of "adverse" and "severely adverse." Moreover, since the nature of the moves will be identical between the two classes of scenarios, there will be at least directional consistency in the risk factor inputs between scenarios. While under this approach the adverse scenario will be superficially identical to the severely adverse, the logic underlying the severely adverse scenario may not be applicable. For example, if the severely adverse scenario was based on a historical scenario, the same could not be said of the adverse scenario. It is also remains possible, although unlikely, that a scaled adverse scenario actually will result in greater losses, for some companies, than the severely adverse scenario with similar moves of greater magnitude. For example, if some companies are hedging against tail outcomes then the more extreme trading book dollar losses may not correspond to the most extreme market moves. The market shock component of the adverse scenario in 2013 was largely based on the scaling approach where a majority of risk factor shocks were smaller in magnitude than the severely adverse scenario, but it also featured long-term interest rate shocks that were not part of the severely adverse market shock.

e. Alternatively, the market shock component of an adverse scenario could differ substantially from the severely adverse scenario with respect to the sizes and nature of the shocks. Under this approach, the market shock component could be constructed using some combination of historical and hypothetical events, similar to the severely adverse scenario. As a result, the market shock component of the adverse scenario could be viewed as an alternative to the severely adverse scenario and, therefore, it is possible that the adverse scenario could have larger losses for some companies than the severely adverse scenario.

f. Finally, the design of the adverse scenario for annual stress tests could be informed by the companies' own trading scenarios used for their BHC-designed scenarios in CCAR and in their mid-cycle company-run stress tests.<sup>21</sup>

<sup>21</sup> 12 CFR 252.55.

### 6. Consistency Between the Macroeconomic Scenarios and the Market Shock

a. As discussed earlier, the market shock comprises a set of movements in a very large number of risk factors that are realized instantaneously. Among the risk factors specified in the market shock are several variables also specified in the macroeconomic scenarios, such as short- and long-maturity interest rates on Treasury and corporate debt, the level and volatility of U.S. stock prices, and exchange rates.

b. The market shock component is an addition to the macroeconomic scenarios that is applied to a subset of companies, with no assumed effect on other aspects of the stress tests such as balances, revenues, or other losses. As a result, the market shock component may not be always directionally consistent with the macroeconomic scenario. Because the market shock is designed, in part, to mimic the effects of a sudden market dislocation, while the macroeconomic scenarios are designed to provide a description of the evolution of the real economy over two or more years, assumed economic conditions can move in significantly different ways. In effect, the market shock can simulate a market panic, during which financial asset prices move

rapidly in unexpected directions, and the macroeconomic assumptions can simulate the severe recession that follows. Indeed, the pattern of a financial crisis, characterized by a short period of wild swings in asset prices followed by a prolonged period of moribund activity, and a subsequent severe recession is familiar and plausible.

c. As discussed in section 4.2.4, the Board may feature a particularly salient risk in the macroeconomic assumptions for the severely adverse scenario, such as a fall in an elevated asset price. In such instances, the Board may also seek to reflect the same risk in one of the market shocks. For example, if the macroeconomic scenario were to feature a substantial decline in house prices, it may seem plausible for the market shock to also feature a significant decline in market values of any securities that are closely tied to the housing sector or residential mortgages.

d. In addition, as discussed in section 4.3, the Board may specify the macroeconomic assumptions in the adverse scenario in such a way as to explore risks qualitatively different from those in the severely adverse scenario. Depending on the nature and type of such risks, the Board may also seek to reflect these risks in one of the market shocks as appropriate.

### 7. Timeline for Scenario Publication

a. The Board will provide a description of the macroeconomic scenarios by no later than February 15. During the period immediately preceding the publication of the scenarios, the Board will collect and consider information from academics, professional forecasters, international organizations, domestic and foreign supervisors, and other private-sector analysts that regularly conduct stress tests based on U.S. and global economic and financial scenarios, including analysts at the covered companies. In addition, the Board will consult with the FDIC and the OCC on the salient risks to be considered in the scenarios. The Board expects to conduct this process in October and November of each year and to update the scenarios based on incoming macroeconomic data releases and other information through the end of January.

b. The Board expects to provide a broad overview of the market shock component along with the macroeconomic scenarios. The Board will publish the market shock templates by no later than March 1 of each year, and intends to publish the market shock earlier in the stress test and capital plan cycles to allow companies more time to conduct their stress tests.

TABLE 1 TO APPENDIX A OF PART 252—CLASSIFICATION OF U.S. RECESSIONS

Peak	Trough	Severity	Duration (quarters)	Decline in real GDP	Change in the unemployment rate during the recession	Total change in the unemployment rate (incl. after the recession)
1957Q3 .....	1958Q2 .....	Severe .....	4 (Medium) ...	-3.6	3.2	3.2
1960Q2 .....	1961Q1 .....	Moderate .....	4 (Medium) ...	-1.0	1.6	1.8
1969Q4 .....	1970Q4 .....	Moderate .....	5 (Medium) ...	-0.2	2.2	2.4
1973Q4 .....	1975Q1 .....	Severe .....	6 (Long) .....	-3.1	3.4	4.1
1980Q1 .....	1980Q3 .....	Moderate .....	3 (Short) .....	-2.2	1.4	1.4
1981Q3 .....	1982Q4 .....	Severe .....	6 (Long) .....	-2.8	3.3	3.3
1990Q3 .....	1991Q1 .....	Mild .....	3 (Short) .....	-1.3	0.9	1.9
2001Q1 .....	2001Q4 .....	Mild .....	4 (Medium) ...	0.2	1.3	2.0
2007Q4 .....	2009Q2 .....	Severe .....	7 (Long) .....	-4.3	4.5	5.1
Average .....	.....	Severe .....	6 .....	-3.5	3.7	3.9
Average .....	.....	Moderate .....	4 .....	-1.1	1.8	1.8
Average .....	.....	Mild .....	3 .....	-0.6	1.1	1.9

Source: Bureau of Economic Analysis, National Income and Product Accounts, Comprehensive Revision on July 31, 2013.

TABLE 2 TO APPENDIX A OF PART 252—HOUSE PRICES IN HOUSING RECESSIONS

Peak	Trough	Severity	Duration (quarters)	Percent change in NHPI	Percent change in HPI-DPI	HPI-DPI Trough Level (2000:Q1 = 100)
1980Q2 .....	1985Q2 .....	Moderate .....	20 (long) .....	26.6	-15.9	102.1
1989Q4 .....	1997Q1 .....	Moderate .....	29 (long) .....	10.5	-17.0	94.9
2005Q4 .....	2012Q1 .....	Severe .....	25 (long) .....	-29.6	-41.3	86.9
Average .....	.....	.....	24.7 .....	2.5	-24.7	94.6

Source: CoreLogic, BEA.

Note: The date-ranges of housing recessions listed in this table are based on the timing of house-price retrenchments.

By order of the Board of Governors of the Federal Reserve System, December 7, 2017.

**Ann E. Misback,**  
Secretary of the Board.

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## FEDERAL RESERVE SYSTEM

### 12 CFR Chapter II

[Docket No. OP-1586]

#### Enhanced Disclosure of the Models Used in the Federal Reserve's Supervisory Stress Test

**AGENCY:** Board of Governors of the Federal Reserve System (Board).

**ACTION:** Notification with request for public comment.

**SUMMARY:** The Board is inviting comment on an enhanced disclosure of the models used in the Federal Reserve's supervisory stress test conducted under the Board's Regulation YY pursuant to the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) and the Board's capital plan rule.

**DATES:** Comments must be received by January 22, 2018.

**ADDRESSES:** You may submit comments, identified by Docket No. OP-1586 by any of the following methods:

- *Agency website:* <http://www.federalreserve.gov>. Follow the instructions for submitting comments at <http://www.federalreserve.gov/generalinfo/foia/ProposedRegs.aspx>.
- *Federal eRulemaking Portal:* <http://www.regulations.gov>. Follow the instructions for submitting comments.
- *Email:* [regs.comments@federalreserve.gov](mailto:regs.comments@federalreserve.gov). Include the docket number and RIN number in the subject line of the message.
- *Fax:* (202) 452-2819 or (202) 452-3102.

• *Mail:* Ann Misback, Secretary, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue NW, Washington, DC 20551.

All public comments will be made available on the Board's website at <http://www.federalreserve.gov/generalinfo/foia/ProposedRegs.aspx> as submitted, unless modified for technical reasons. Accordingly, your comments will not be edited to remove any identifying or contact information. Public comments may also be viewed electronically or in paper form in Room 3515, 1801 K St. NW (between 18th and 19th Streets NW), Washington, DC 20006 between 9:00 a.m. and 5:00 p.m.

on weekdays. For security reasons, the Board requires that visitors make an appointment to inspect comments. You may do so by calling (202) 452-3684. Upon arrival, visitors will be required to present valid government-issued photo identification and to submit to security screening in order to inspect and photocopy comments.

**FOR FURTHER INFORMATION CONTACT:** Lisa Ryu, Associate Director, (202) 263-4833, Kathleen Johnson, Assistant Director, (202) 452-3644, Robert Sarama, Manager (202) 973-7436, Division of Supervision and Regulation; Benjamin W. McDonough, Assistant General Counsel, (202) 452-2036, or Julie Anthony, Counsel, (202) 475-6682, Legal Division, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue NW, Washington, DC 20551. Users of Telecommunication Device for Deaf (TDD) only, call (202) 263-4869.

#### SUPPLEMENTARY INFORMATION:

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##### I. Overview

Each year the Federal Reserve publicly discloses the results of the supervisory stress test.<sup>1</sup> The disclosures include revenues, expenses, losses, pre-tax net income, and capital ratios that would result under two sets of adverse economic and financial conditions. As part of the disclosures, the Federal Reserve also describes the broad framework and methodology used in the supervisory stress test, including information about the models used to estimate the revenues, losses, and capital ratios in the stress test. The annual disclosures of both the stress test results and supervisory model framework and methodology represent a significant increase in the public transparency of large bank supervision in the U.S.<sup>2</sup> Indeed, prior to the first

<sup>1</sup> See, for example, Dodd-Frank Act Stress Test 2017: Supervisory Stress Test Methodology and Results, June 2017 and Comprehensive Capital Analysis and Review 2017: Assessment Framework and Results, June 2017.

<sup>2</sup> In addition to those public disclosures, the Federal Reserve has published detailed information

supervisory stress test in 2009, many analysts and institutions cautioned against these disclosures, arguing that releasing bank-specific loss estimates to the public would be destabilizing. However, experience to date has shown the opposite to be true—disclosing these details to the public has garnered public and market confidence in the process.

The Federal Reserve routinely reviews its stress testing and capital planning programs, and during those reviews the Federal Reserve has received feedback regarding the transparency of the supervisory stress test models.<sup>3</sup> Some of those providing feedback requested more detail on modeling methodologies with a focus on year-over-year changes in the supervisory models.<sup>4</sup> Others, however, cautioned against disclosing too much information about the supervisory models because doing so could permit firms to reverse-engineer the stress test.

The Federal Reserve recognizes that disclosing additional information about supervisory models and methodologies has significant public benefits, and is committed to finding ways to further increase the transparency of the supervisory stress test. More detailed disclosures could further enhance the credibility of the stress test by providing the public with information on the fundamental soundness of the models and their alignment with best modeling practices. These disclosures would also facilitate comments on the models from the public, including academic experts. These comments could lead to improvements, particularly in the data most useful to understanding the risks of particular loan types. More detailed disclosures could also help the public understand and interpret the results of the stress test, furthering the goal of maintaining market and public confidence in the U.S. financial system. Finally, more detailed disclosures of how the Federal Reserve's models assign losses to particular positions

about its scenario design framework and annual letters detailing material model changes. The Federal Reserve also hosts an annual symposium in which supervisors and financial industry practitioners share best practices in modeling, model risk management, and governance.

<sup>3</sup> During a review that began in 2015, the Federal Reserve received feedback from senior management at firms subject to the Board's capital plan rule, debt and equity market analysts, representatives from public interest groups, and academics in the fields of economics and finance. That review also included an internal assessment.

<sup>4</sup> Some of the comments in favor of additional disclosure included requests that the Federal Reserve provide additional information to firms only, without making the additional disclosures public. Doing so would be contrary to the Federal Reserve's established practice of not disclosing information related to the stress test to firms if that information is not also publicly disclosed.