



**BOARD OF GOVERNORS**  
OF THE  
**FEDERAL RESERVE SYSTEM**

WASHINGTON, D.C. 20551

DIVISION OF SUPERVISION  
AND REGULATION

**Subject: Enhancements to Federal Reserve Models Used to Estimate Post-Stress Capital Ratios**

Dear Sir or Madam,

The Federal Reserve is committed to continuous assessment and enhancement of the supervisory models used in the stress testing program required under the Dodd-Frank Wall Street Reform and Consumer Protection Act.<sup>1</sup> As has been the practice in previous years,<sup>2</sup> the purpose of this description of model changes is to notify firms participating in this year's Dodd-Frank Act Stress Test (DFAST) and the Comprehensive Capital Analysis and Review (CCAR) of key enhancements to certain aspects of these models.<sup>3</sup>

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<sup>1</sup> See 12 USC 5365(i)(1).

<sup>2</sup> For letters in previous years, see "Enhancements to Federal Reserve Models Used to Estimate Post-Stress Capital Ratios," February 3, 2017: <https://www.federalreserve.gov/newsevents/pressreleases/files/bcreg20170203a1.pdf>; "Enhancements to Federal Reserve Models Used to Estimate Operational Risk and Capital," February 16, 2016: <https://www.federalreserve.gov/bankinfo/reg/model-changes-20160217.pdf>; "Enhancements to Federal Reserve Projected Capital," December 12, 2014: <http://www.federalreserve.gov/bankinfo/reg/scm-changes-letter-20141215.pdf>; and, "Federal Reserve Independent Balance Sheet and RWA Projections," December 16, 2013: <http://www.federalreserve.gov/bankinfo/reg/independent-projections-letter-20131216.pdf>

<sup>3</sup> In addition to enhancements to the supervisory models, a number of other factors can affect year-over-year changes in projected regulatory capital ratios. Those factors include changes in the supervisory scenarios, recent performance of the bank holding companies and U.S. intermediate holding companies subject to the supervisory stress test (collectively, firms), portfolio composition, business mix on the "as-of" date of the stress test, any material restatement of prior regulatory reports, and the overall quality of regulatory data submitted by participating firms. Combined, these factors could have material effects on firms' projected capital ratios each year without any change in supervisory models.

### *Changes to account for tax law changes in the Tax Cuts and Jobs Act*

The Tax Cuts and Jobs Act (TCJA) contains a number of changes to the tax code that must be taken into account in DFAST and CCAR 2018. Firms must reflect TCJA in their regulatory filings as of December 31, 2017. In addition, the supervisory models have been amended to take into account the effect of TCJA on the projected path of post-stress capital. TCJA changes that directly affect the supervisory post-stress capital projections include: (1) the reduction in the corporate tax rate; (2) the elimination of net operating loss (NOL) carrybacks; and (3) the limitation on NOL carryforwards to 80 percent of taxable income.

In prior years, supervisory projections applied a tax rate assumption of 35 percent, consistent with the then-prevailing corporate tax rate, and also incorporated NOL carrybacks as well as tax credit and NOL carryforwards. Starting in DFAST 2018, supervisory projections will assume a tax rate of 21 percent, which is consistent with the current prevailing corporate tax rate, and will reflect the elimination of NOL carrybacks by TCJA. Finally, TCJA places a limit on the amount of NOLs a firm can use to 80 percent of taxable income. The projections will reflect both the 80-percent limit for NOLs generated in 2018 and beyond and the grandfathering of tax benefits resulting from pre-2018 NOLs.

Analysis using data and scenarios from DFAST 2017 suggests the changes in TCJA will have negative effects on many firms' post-stress capital ratios, with the effects being material for some firms. The reduction in the corporate tax rate will lead to larger declines in capital ratios for firms that are projected to have large post-stress NOLs. The elimination of NOL carrybacks will result in a larger decline in post-stress capital ratios for firms with taxes paid in the two years leading up to the stress test that then experience losses in the stress test. Finally, the limitation on the use of NOL carryforwards will reduce regulatory capital for firms projected to have negative net income early in the planning horizon and positive net income in later periods. The effect on projections for DFAST 2018 and future years is uncertain and will depend on changes in bank portfolios, data, and scenarios.

Consistent with prior practice in implementing legal and regulatory changes, supervisory projections will incorporate the provisions of the tax law and associated rules, including any relevant phase-in provisions.<sup>4</sup>

### *Enhancements to the pre-provision net revenue model*

The Federal Reserve began a two-year transition to an updated pre-provision net revenue (PPNR) model in DFAST 2017, and the updated model will be fully in effect for DFAST 2018. The two-year phase-in policy was employed because the PPNR model enhancement materially affected the PPNR projections

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<sup>4</sup> In contrast to changes in laws or regulations, and as discussed below, material changes to Federal Reserve stress test models will be phased in over two stress test cycles.

and post-stress capital ratios for a number of firms.<sup>5</sup> These changes to the PPNR model were described in the 2017 model change disclosure letter.<sup>6</sup>

The PPNR model for DFAST 2018 was also updated to include a more granular model of deposit expenses. The deposit expense model used in prior years was estimated on aggregate deposit data that included time, non-time, and foreign deposits. The more granular model adopted for DFAST 2018 estimates separate models for the three types of deposits (time, non-time, and foreign), allowing for different relationships with the macroeconomic variables. Analysis based on data and scenarios from DFAST 2017 suggests that, for most firms, the more granular deposit expense model results in small changes to PPNR. The effect on projections for DFAST 2018 and future years is uncertain and will depend on changes in bank portfolios, data, and scenarios.

#### *Re-estimation of and refinements to the domestic credit card model*

The Federal Reserve regularly re-estimates model parameters and makes other model refinements resulting from ongoing model validation and performance monitoring. The frequency of model parameter re-estimation is informed by data availability and the results of performance monitoring. Although in most cases model re-estimations and refinements do not materially change projections, in some cases they can have material effects. For example, large changes in the data sample used for model estimation can result in material changes in projections.

For DFAST 2018, there were changes to the estimation sample for the probability of default (PD) component of the domestic credit card model and a number of other refinements were made to each of the three components of the model—PD, loss-given-default and exposure-at-default. Analysis suggests the enhanced model performs better than the previous models relative to a number of internal and external benchmarks, including realized loss rates on bank card portfolios during the financial crisis. Analysis using data and scenarios from DFAST 2017 suggests that, collectively, the re-estimation and other refinements will result in materially higher projected losses for firms with large bank card exposures. The Federal Reserve will phase this model change in over two years to smooth the effect on post-stress capital ratios, similar to the treatment of the PPNR model changes for DFAST 2017 and stated policy.<sup>7</sup>

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<sup>5</sup> Starting in DFAST 2017, the Federal Reserve began to adhere to a policy of phasing in the most material model enhancements over two stress test cycles to smooth the effect on post-stress capital ratios. See, 82 Fed. Reg. 59,528 (Dec. 15, 2017).

<sup>6</sup> See supra note 2.

<sup>7</sup> See supra note 5.

### *Enhancements to the model of other-than-temporary impairments for debt securities*

The model to project other-than-temporary impairments (OTTI) for debt securities was revised to increase simplicity and consistency across security types. Under the approach used in prior years, a number of different models were used to project OTTI for different types of debt securities, creating conceptual inconsistency. Under the new approach, a single conceptual framework is used to project OTTI on all debt securities.<sup>8</sup> The new framework is based on the historical relationship between OTTI write-downs on securities and measures of the fair value of the securities. That relationship is estimated on a comprehensive set of data on OTTI write-downs.<sup>9</sup> Projections of OTTI write-downs are made using this estimated relationship and projections of the fair value of securities from the supervisory fair value model.

The new OTTI framework represents a significant conceptual change to the Federal Reserve's approach to project OTTI on debt securities. The revised approach more consistently captures the OTTI response to the economic scenarios across the different asset types. Analysis based on data and scenarios from DFAST 2017 suggests the change will result in small changes to post-stress capital ratios, both in the aggregate and for individual firms. The effect on projections for DFAST 2018 and future years is uncertain and will depend on changes in bank portfolios, data, and scenarios.

### *Re-estimation of and refinements to other supervisory models*

In addition to the domestic credit card model, there were changes to the estimation samples for the auto loan, first-lien residential mortgage, and home equity models, and a number of other refinements were made to those models. Analysis using data and scenarios from DFAST 2017 suggests that, collectively, the re-estimation and other refinements will result in higher projected losses for firms with large auto loan exposures, particularly exposures to subprime auto loans. Analysis also suggests the enhanced auto loan model performs better than the previous model relative to a number of internal and external benchmarks, including realized loss rates on auto loan portfolios during the financial crisis. For first-lien residential mortgages and home equity loans and lines of credit, analysis using data and scenarios from DFAST 2017 suggests the effects of the model changes are small – model changes are projected to result in a small increase in the portfolio loss rate for first-lien residential mortgages and a small decrease in the portfolio loss rate for home equity loans and lines of credit. The effect on projections for DFAST 2018 and future years is uncertain and will depend on changes in bank portfolios, data, and scenarios.

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<sup>8</sup> Losses on equity securities will continue to be based on the projected fair value of each security as determined by the path of the U.S. equities index and the sensitivity of each security's returns to the overall returns of the index.

<sup>9</sup> The dataset of OTTI write-downs is comprised of data from the FR Y-14Q as well as data from U.S. life insurance companies.

Both operational-risk models – the historical simulation model and the regression model – were re-estimated on updated operational-risk historical data. Analysis suggests the model re-estimation and enhancements result in modestly higher operational-risk losses for all firms. The effect on projections for DFAST 2018 and future years is uncertain and will depend on changes in bank portfolios, data, and scenarios.