

## An International Perspective on Bank Stress Testing

This overview describes stress test regimes in four jurisdictions, with a focus on: (1) scenario design; (2) use of models; (3) capital-related use of stress tests; and (4) transparency of scenarios and models.

### Summary of Stress-Testing Frameworks

	United States Federal Reserve	European Banking Authority	Bank of England	Bank of Japan
<b><i>Scenario Design</i></b>				
Number of stress scenarios	1 (under current statute)	1	1-2	2
Countercyclical	Yes	No	Yes	Yes
Global shock component	Yes	Yes	Yes	Yes
Counterparty default component	Yes	Yes	Yes	No
Time horizon	Nine-quarter planning horizon based on thirteen-quarter scenario	Three years	Five years	Three years
<b><i>Use of Models</i></b>				
Source of models	Authorities	Banks	Hybrid	Authorities
<b><i>Capital-Related Uses</i></b>				
Bank-specific capital requirements	Yes	Yes	Yes	No
System-wide capital requirements	No	Yes	Yes	No
<b><i>Transparency</i></b>				
Disclosure of models	No	N/A	No	No
Advance discussion of scenarios	No	No	No	No
Disclosure of bank-specific results	Yes	Yes	Yes	No

## United States

The Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010 (Dodd-Frank) requires the Federal Reserve (Fed), in conjunction with other financial regulatory agencies, to conduct an annual stress test to determine if bank holding companies with \$100 billion or more in total consolidated assets have the capital necessary to absorb losses as a result of adverse economic conditions. In 2018, 35 bank holding companies were subject to the Fed's stress tests. Consistent with the Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018 (EGRRCPA),<sup>1</sup> the Fed recently invited public comment on a proposed rule in which the supervisory stress tests for domestic bank holding companies with \$100 billion to \$250 billion in total consolidated assets would move to a two-year cycle. Approximately 13 bank holding companies would remain subject to the annual supervisory stress tests.

### *Scenario Choice and Design*

- Dodd-Frank, as amended by EGRRCPA, requires that the Fed test conditions referred to as “severely adverse” scenarios.
- The Fed's policy statement explains that in developing the “severely adverse” scenario it uses a “recession approach” whereby the economic and financial variables in the scenario reflect the conditions that characterize post-war U.S. recessions. The Fed uses the unemployment rate as the primary basis for specifying the severely adverse scenario and uses unemployment rates observed in severe post-war U.S. recessions. The minimum unemployment rate used in the severely adverse scenario is 10 percentage points. As the economy strengthens and unemployment drops, the severely adverse scenario becomes relatively more intense. Scenarios for a thirteen-quarter period are used to project capital levels over a nine-quarter “planning horizon.”
- The Fed's regulations also apply a market shock component to banks with significant trading activities. The market shock component is an instantaneous shock to a large number of risk factors that determine the mark-to-market value of trading positions. The Fed's regulations also provide it with the discretion to apply other scenario components to particular banks. Currently, the Fed applies the large counterparty default component to banks with significant trading or custodial operations.

### *Use of Models*

- The Dodd-Frank Act does not specify the models that the Fed should use in projecting changes in bank net income and regulatory capital from the stress scenarios. The statute provides that the Fed may develop and apply any analytic techniques necessary.
- The Fed relies largely on its own internally developed models, which are validated by an internal validation team. As noted in the transparency section, on the next page, the Fed does not

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<sup>1</sup> The Economic Growth, Regulatory Relief, and Consumer Protection Act passed and signed into law in May 2018 raised the enhanced prudential supervision threshold from \$50 billion to \$250 billion. As a result, banks with total consolidated assets of less than \$100 billion became exempt from Federal Reserve stress tests immediately. Bank holding companies with between \$100 billion to \$250 billion in total consolidated assets will be exempt starting in November 2019. After that time, the Federal Reserve is authorized to apply enhanced prudential standards, including stress tests on banks with between \$100 billion to \$250 billion in total consolidated assets on a tailored, case-by-case basis. Accordingly, the Fed will have the authority, but will not be required, to subject banks with more than \$100 billion but less than \$250 billion in assets to the supervisory stress test. If the Fed subjected all banks with more than \$100 billion in assets to the supervisory stress tests, 34 banks would currently be subject to the stress test.

publish the quantitative econometric models that it uses to project bank net income and regulatory capital. The Fed has a group of outside experts known as the Model Validation Council that provide advice on the Fed's process to assess the models. This outside group has not released public reports or other public disclosure that permits the public to see or understand its work.

### ***Capital-Related Uses of Stress Tests***

- Dodd-Frank requires that the Fed evaluate whether a bank has the capital, on a total consolidated basis, to absorb losses as a result of “adverse economic conditions.”
- The Fed's regulations require that banks' projected capital ratios meet or exceed certain regulatory capital ratios after experiencing losses from its stress tests. If projected ratios fall below these standards during the nine-quarter period covered by the stress test, the Fed regulations provide that the Fed can object to a bank's planned share buybacks and dividend distribution.
- In April 2018, the Fed proposed regulatory changes to the stress tests that would further integrate the stress tests with capital requirements. Banks would be required to restrict capital distributions and discretionary bonus payments if their existing capital ratios are insufficient to meet the new “stress capital buffer” and “stress leverage buffer” requirements, which will be determined from the stress test results.

### ***Transparency of Scenarios, Models and Results***

- The Fed policy statement on scenarios explains the general approach it takes in developing scenarios. While scenarios are publicly disclosed by February 15 each year, scenarios are not subject to public notice and comment, are not revised once disclosed, and are applied to bank balance sheets as existing at the previous calendar year end.
- Neither statute nor Fed regulations specifically require that the Fed's models be disclosed to the public. The Fed does not publish its quantitative econometric models, but each year does provide a ten- to fifteen-page written description providing some information on how various models work. The Fed has proposed enhanced model-related disclosure by: (1) providing greater qualitative descriptions of the models; (2) disclosing modeled loss rates on loans grouped by risk characteristics; and (3) disclosing estimated loss rates associated with loans in a hypothetical portfolio.
- Results are disclosed in late-June each year. The Fed discloses results for each bank, including the minimum applicable capital ratios during the stress testing horizon. It also discloses whether it has objected or not to each bank's capital distribution plans.

### ***References***

- Dodd-Frank Wall Street Reform and Consumer Protection Act of 2010, Pub. L. No. 111-203, § 165, 124 Stat. 1376, 1430–31.
- Economic Growth, Regulatory Relief, and Consumer Protection Act of 2018, Pub. L. No. 115-174, § 401, 132 Stat. 1296, 1356–59.
- 12 C.F.R. § 225.8.
- 12 C.F.R. §§ 252.40–47.
- 12 C.F.R. App'x A to Pt. 252 (Policy Statement on the Scenario Design Framework for Stress Testing).
- Stress Testing Policy Statement, 82 Fed. Reg. 59,528 (Dec. 15, 2017).

- Policy Statement on the Scenario Design Framework for Stress Testing, 82 Fed. Reg. 59,533 (Dec. 15, 2017).
- Enhanced Disclosure of the Models Used in the Federal Reserve's Supervisory Stress Test 82 Fed. Reg. 59,547 (Dec. 15, 2017).
- Board of Governors of the Federal Reserve System, Comprehensive Capital Analysis and Review 2018: Assessment Framework and Results (June 2018).
- "Federal Reserve Board announces the formation of the Model Validation Council," April 20, 2012, <https://www.federalreserve.gov/newsevents/pressreleases/bcreg20120420a.htm>.

## European Union

The European Union's Capital Requirements Directive IV (CRD IV) requires competent authorities (national regulatory authorities and, in the case of euro area banks, the Single Supervisory Mechanism (SSM)) to conduct annual stress tests on certain banking institutions that they supervise. CRD IV also requires that the European Banking Authority (EBA) issue guidelines to ensure that common methodologies are used by the relevant competent authorities when conducting stress tests. The EBA has published guidelines on stress testing that describe different forms and objectives, cover issues related to organization, resources and methodologies, and address the use of stress test outcomes when assessing capital and liquidity adequacy as part of the supervisory review process. In addition, the EBA initiates and coordinates the EU-wide stress tests, with the aim of providing a clear and transparent picture of how well EU banks are capitalized and whether they are likely to withstand financial downturns. The EBA's EU-wide stress tests are conducted applying banks' own internal models, using consistent methodologies, scenarios and key assumptions. The most recent EU-wide stress test, in 2018, covered 48 banks – 33 from SSM countries. Each bank had a minimum of EUR 30 billion in assets.

### *Scenario Choice and Design*

- The European Systemic Risk Board (ESRB) and the European Central Bank (ECB), in close cooperation with competent authorities, the EBA and national central banks, are responsible for designing an adverse scenario. The ECB supplies the baseline scenario. The scenarios for the 2018 stress test covered a three-year time horizon.
- The adverse scenario is designed to be relevant for all jurisdictions – additional domestic real and financial shocks are applied to some countries to increase the severity of the GDP deviation from the baseline so that the cumulative GDP growth under the adverse scenario is negative.
- The adverse scenario reflects four systemic risks representing the most material threats to the stability of the EU financial sector at the time when the scenario was developed: (1) the abrupt and sizeable repricing of risk premia in global financial markets; (2) adverse feedback loop between weak bank profitability and low nominal growth, amid structural challenges in the EU banking sector; (3) public and private debt sustainability concerns amid a potential repricing of risk premia and increased political fragmentation; and (4) liquidity risks in the non-bank financial sector with potential spillovers to the broader financial system.

### *Use of Models*

- The EBA, in cooperation with the ESRB, the ECB and the European Commission, defines for each edition of the stress test a common pan-EU methodology for modeling risks which specifically allows for the testing of the resilience of banks in case of plausible financial crisis scenarios at a given time and which is meant to identify structural weaknesses in the EU banking sector.
- Banks apply the common methodology and constraints but use their own internal models to project the impact of the adverse scenario on their capital and leverage ratios. Banks' results are reviewed and their quality assured by the relevant competent authorities. The EBA also provides common quality assurance guidelines and EU-wide descriptive statistics on the main risk parameters to enable competent authorities to perform consistency checks and review banks' results.

### ***Capital-Related Uses of Stress Tests***

- The stress tests are designed with the objective of providing input into the supervisory review and evaluation process. Specifically, stress tests factor into the determination by competent authorities of capital buffers to be maintained by banks in order to withstand stressed situations (Pillar 2 Guidance, or P2G).
- Failure to meet P2G expectations does not subject a bank to automatic sanctions, such as restrictions on distributions. Rather, such failure subjects a bank to discretionary supervisory measures including working with competent authorities to develop a plan of action aimed at restoring capital. If the competent authority determines that a bank has failed to incorporate the impact of stress tests on P2G into its risk management framework or does not establish capital to meet P2G within the timeline established by the relevant competent authority, the competent authority can require mandatory use of net profits to strengthen a bank's capital position and impose restrictions on distributions or interest payments.

### ***Transparency of Scenarios, Models and Results***

- CRD IV requires competent authorities to publish the general criteria and methodologies that they use in conducting stress tests and as part of the general supervisory review and evaluation process.
- In advance of the EU-wide stress testing exercise, the EBA provides the participating banks with a detailed timeline and publishes its common methodology and templates in advance to facilitate discussions with industry participants. In connection with the 2018 stress test, the EBA provided a tentative timeline in February 2017 (finalized in October 2017), and published a draft methodology in July 2017 (finalized in November 2017). However, the adverse scenario was not subject to advance discussion with industry participants.
- The EBA releases granular bank-level results of the EU-wide stress tests along with aggregate reports. The EBA released the results of the 2018 stress test in November 2018.

### ***References***

- Directive 2013/36, of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49/EC, 2013 O.J. (L176) 338.
- Regulation 1093/2010, of the European Parliament and of the Council of 24 November 2010 establishing a European Supervisory Authority (European Banking Authority), amending Decision No 716/2009/EC and repealing Commission Decision 2009/78/EC, 2010 O.J. (L331) 12.
- *Final Report: Guidelines on Institutions' Stress Testing*, European Banking Authority (July 19, 2018), available at <https://www.eba.europa.eu/documents/10180/2282644/Guidelines+on+institutions+stress+testing+%28EBA-GL-2018-04%29.pdf/2b604bc8-fd08-4b17-ac4a-cdd5e662b802>.
- *2018 EU-Wide Stress Test: Methodological Note*, European Banking Authority (Jan. 31, 2018), available at <http://www.eba.europa.eu/documents/10180/2106649/2018+EU-wide+stress+test+-+Methodological+Note.pdf>.

## United Kingdom

The Bank of England (BOE) conducts an annual stress test under the guidance of its Financial Policy Committee (FPC) and its Prudential Regulation Committee (PRC). The results of the annual stress test are used to inform both system-wide policy interventions by the FPC (including the setting of system-wide capital buffers) and bank-specific supervisory actions by the Prudential Regulatory Authority (PRA) (including the setting of bank-specific buffers). The most recent annual stress test, in 2018, covered seven major UK banks: Barclays, HSBC, Lloyds Banking Group, Nationwide, The Royal Bank of Scotland Group, Santander UK Group Holdings plc and Standard Chartered. The Bank of England also runs a biennial exploratory stress test to assess bank resilience to risks that are not captured by the annual stress test and are not necessarily linked to the financial cycle, including macroeconomic developments that are unusual from a historical perspective. Neither the annual stress test nor the biennial exploratory stress test is mandated by legislation.

### *Scenario Choice and Design*

- The BOE's annual stress test – the annual cyclical scenario (ACS) – projects the profitability and capital ratios of individual banks under a baseline macroeconomic scenario and examines the potential impact of a hypothetical stress scenario on the banking system and individual banks. The stress testing framework is countercyclical: the severity of the adverse scenario increases as risks build (as the economy improves) and decreases as risks subside or crystalize (as the economy gets worse). The ACS covers a five-year time horizon.
- The stress scenario includes three components, which are assumed to be synchronized: (1) a UK and global macroeconomic stress, involving deep simultaneous recessions in the UK and global economies; (2) a traded risk stress, which examines the resilience of the investment banking operations of UK banks to a severe financial market shock linked to the global macroeconomic stress (including their ability to withstand the default of seven counterparties—two collateralized and five uncollateralized—that would be vulnerable to the macroeconomic stress); and (3) an independent misconduct risk stress, which projects misconduct cost.

### *Use of Models*

- Both the BOE's models and individual banks' own models play a role in informing projected profitability and capital and leverage ratios under the baseline and stress scenarios. The BOE uses its own models to produce independent projections of bank profitability and capital and to cross-check the individual banks' models.
- The relative weight that the BOE's models and banks' own models play in the results is subject to the BOE's discretion: in earlier stress tests, individual banks' own projections were used as the starting point for the final projections. More recently, the BOE has occasionally used its own models, together with policymaker judgment, to make material adjustments to participating banks' projections. The BOE's stated intention is to give its own in-house models more weight in order to improve the consistency of results across banks, explore the sensitivities and uncertainties of stress-test results in more depth, and guard against any incentive banks may have to underestimate losses.

### ***Capital-Related Uses of Stress Tests***

- The FPC and the PRC use the results of the ACS, alongside other inputs, to set the level of system-wide and bank-specific regulatory capital buffers. The impact of the stress on banks' capital positions helps inform the FPC's setting of the system-wide capital buffer rate (the countercyclical capital buffer, or CCyB). The PRC uses the results of the ACS to help inform any additional bank-specific buffer that individual banks are required to hold.
- The PRC uses ACS results to inform its determination of whether an individual bank's current capital positions are adequate or need strengthening. A projection, at any point in the stress, that a bank will breach either its common equity Tier One (CET1) capital or leverage ratio stress test hurdle rates creates a strong presumption in favor of requiring a bank to take action to strengthen its capital position.<sup>2</sup>

### ***Transparency of Scenarios, Models and Results***

- The BOE generally does not disclose the models its staff uses to independently assess the impact of the baseline and stress scenarios on banks' profitability and capital and leverage ratios. However, the BOE has previously published detailed descriptions of certain related models, including the Risk Assessment Model of Systemic Institutions (RAMSI).
- The scenarios developed by the BOE generally are not disclosed in advance of the stress-test process and are not subject to comment from industry participants. However, the BOE expects that its systematic approach to designing the ACS will enable markets and banks to anticipate the broad shape and severity of the stress scenario over time.
- The results of the ACS are published in the fourth quarter of each year. In 2018, headline results will be incorporated into the BOE's *Financial Stability Report* and bank-specific disclosures will be published separately on the BOE's website.

### ***References***

- *Financial Policy Committee statement from its policy meeting*, Bank of England (March 19, 2013), available at [www.bankofengland.co.uk/statement/fpc/2013/financial-policy-committeestatement-march-2013](http://www.bankofengland.co.uk/statement/fpc/2013/financial-policy-committeestatement-march-2013).
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- *Stress testing the UK banking system: 2018 guidance for participating banks and building societies*, Bank of England (March 2018), available at <https://www.bankofengland.co.uk/-/media/boe/files/stress-testing/2018/stress-testing-the-uk-banking-system-2018-guidance.pdf>.
- *Stress testing the UK banking system: key elements of the 2018 stress test*, Bank of England (March 2018), available at <https://www.bankofengland.co.uk/-/media/boe/files/stress-testing/2018/stress-testing-the-uk-banking-system-key-elements-of-the-2018-stress-test.pdf>.
- Oliver Burrows, David Learmonth, Jack McKeown and Richard Williams, *RAMSI: a top-down stress-testing model developed at the Bank of England*, Bank of England: Quarterly Bulletin

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<sup>2</sup> The BOE is reviewing the way in which stress tests hurdle rates are determined in light of IFRS 9 accounting changes. Stress test hurdle rates will be no lower than banks' minimum capital requirements.

(2012 Q3), available at <https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2012/ramsi-a-top-down-stress-testing-model-developed-at-the-boe.pdf>.

- Oliver Burrows, David Learmonth and Jack McKeown, *RAMSI: a top-down stress-testing model*, Bank of England: Financial Stability Paper No. 17 (September 2012).

## Japan

The Bank of Japan (BOJ) conducts semi-annual stress tests of the financial system. As of April 2018, 10 major banks, 105 regional banks, and 253 *shinkin* banks (regional cooperative financial institutions) are subject to BOJ stress tests. In addition, Japan's Financial Services Agency (JFSA) conducts annual stress testing of global and domestic systematically important banks as part of those banks' annual capital planning exercises. In 2015, the JFSA designated three global systemically important banks and four additional domestic systemically important banks. The BOJ and JFSA stress tests are not legislatively-mandated.

### *Scenario Choice and Design*

- The BOJ's stress test projects the performance of banks in a "tail event scenario" that assumes a set of severe financial and economic conditions equivalent to the Lehman shock. The tail event scenario includes a downturn in global financial markets and growth rates. Since the tail event scenario assumes economic conditions comparable to the Lehman shock, the better the recent economic conditions, the greater the degree of the stress to be applied. The BOJ has also tested "tailored event scenarios" that vary according to macroprudential concerns at the time of the test and examines the vulnerabilities of the financial system to those specific concerns. In April 2018 (the most recent BOJ stress test) scenarios covered a three-year time horizon.
- The JFSA requires systemically important banks to conduct regular stress tests using both standard scenarios that reflect common risks (e.g. risks from a decline in economic output or a sharp increase in Japanese government bond yields) and bank-specific scenarios reflecting a particular bank's risk profile (e.g. risks from a decline in oil prices to a bank providing loans to the energy sector).

### *Use of Models*

- The BOJ's stress tests use a model developed by the BOJ to project the impact of the adverse scenario on the financial system as a whole (including incorporating feedback effects between the financial sector and the real economy) by analyzing both aggregate projected profitability and capital adequacy ratios for the financial sector and the projected profitability and capital adequacy ratios for individual banks.
- The JFSA reviews whether systemically important banks appropriately manage their internal models used for stress tests, including regular and independent verification processes for their models.

### *Capital-Related Uses of Stress Tests*

- The BOJ publishes the system-level results of its macro stress tests describing the projected performance of the financial system as a whole in its semi-annual *Financial System Report*, but the test results are not used to set capital requirements for banks.
- The JFSA does not publish the results of its stress tests of individual banks, though it does engage with banks throughout mandatory capital planning exercises (including stress testing) regarding the adequacy of their capital plans and can encourage banks to voluntarily carry more capital when the need arises. The JFSA, in consultation with the BOJ, can also activate

the countercyclical buffer to require all banks to carry more capital if the JFSA and BOJ develop concerns about the macro-financial environment.

### ***Transparency of Scenarios, Models and Results***

- The BOJ publishes the scenario variables for a “tail event scenario” and “tailored event scenarios” on the BOJ’s website. The scenario design for the “tailored event scenarios”, which aims to investigate the vulnerability of the financial system based on macroprudential concerns at the time of the test, is disclosed in the *Financial System Report Annex Series*.
- The stress test uses the BOJ’s Financial Macro-econometric Model, which is described in detail in a research paper published by the BOJ. Though the model has been revised and updated since the publication of that paper – some of the revisions have been separately described in the *Financial System Report Annex Series* – the core of the model remains the same.
- The BOJ publishes the system-level results of its stress tests in its semi-annual *Financial System Report*, but it does not publish bank-specific results.
- The common scenario provided by the JFSA for stress tests reflects the JFSA’s policy priorities, published in its Strategic Directions and Priorities. Bank-specific stress scenarios have in the past been designed jointly by the JFSA and the relevant bank. The JFSA does not publish the results of its stress tests.

### ***References***

- Tomiyuki Kitamura, Satoko Kojima, Koji Nakamura, Kojiro Takahashi, and Ikuo Takei, *Macro Stress Testing at the Bank of Japan*, BOJ Reports & Research Papers (October 2014), available at [https://www.boj.or.jp/en/research/brp/ron\\_2014/data/ron141008a.pdf](https://www.boj.or.jp/en/research/brp/ron_2014/data/ron141008a.pdf).
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