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Stress-testing banks – a comparative analysis

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Online Annex – Key aspects of system-wide stress tests (ST) for banks in selected jurisdictions

Overview			Table 1
Euro area	Japan	Switzerland	United States
Single Supervisory Mechanism (SSM) ST: a bottom-up microprudential exercise using individual bank data to primarily assess solvency risk.[1] As part of the Quality Assurance (QA) process, top-down models are used to benchmark the banks' ST results.[2] **Macroprudential extension (MPE) ST:** a top-down macroprudential exercise using individual bank's microprudential ST results.[1,2] The ST can account for banks' reactions, such as a reduction in credit supply, to a deterioration in the macroeconomic environment, with feedback to the macroeconomy, leading to further adverse effects on banks' capital (see Table 15 for modelling of second-round effects). The ST can also account for cross-bank contagion effect. **Macroprudential top down (MTD) ST:** a top-down macroprudential exercise using individual bank as well as aggregated data to assess the potential impact of specific scenarios and policy measures on the banking system and the economy at large.[2]	**Bank of Japan (BoJ) ST**: a top-down exercise using individual bank data, mainly to assess solvency risk. Primarily a macroprudential exercise, but increasingly used for microprudential purposes. **Japan Financial Services Agency (JFSA) ST**: a bottom-up exercise using individual bank-level data to assess solvency risk. Mainly a tool for microprudential risk assessment, but also used for financial stability risk assessment for a macroprudential perspective.	**Building block analysis – large banks (BBA-LB):** a top-down exercise using individual bank data, mainly to assess the solvency risk of the two Swiss global systematically important banks (G-SIBs).[3] **Building block analysis – domestically focused banks (BBA-DFB):** a top-down exercise using individual bank data, mainly to assess the solvency risk of domestically focused banks.[3] **Swiss Financial Market Supervisory Authority (FINMA) ST:** a bottom-up microprudential exercise using individual bank data and bank-internal models, mainly to assess the capital adequacy of the two Swiss G-SIBs.	**Dodd-Frank Act Stress Test (DFAST**): a primarily top-down microprudential exercise using individual bank and industry level data to assess the impact of stressful economic and financial market conditions on the solvency of banks with $100 billion or more in total assets.[4] **Comprehensive Capital Analysis and Review (CCAR**): a primarily top-down microprudential exercise using individual bank and industry level data, consisting of (i) a quantitative assessment, evaluating a bank's capital adequacy and planned capital distributions, and (ii) a qualitative assessment, evaluating the reliability of each bank's analyses and other processes for capital planning.[4]

[1]   The ST may also assess liquidity risk as well as impacts on GDP and credit.

[2]   All top-down exercises use a specific set of modeling tools known as Stress Test Analytics for Macroprudential Purposes in the Euro Area (STAMP€). See Dees et al (2017) for more details.

[3]   Used for both macroprudential and microprudential risk assessment.

[4]   Macroprudential perspectives are also assessed within these ST exercises, including: comprehensiveness and consistency of banks subjected to the stress test and the incorporation of countercyclical features in scenario design.

Objective

Table 2

Euro area	Japan	Switzerland	United States
SSM ST: (i) assesses capital/liquidity resilience to adverse conditions, (ii) provides input to Supervisory Review Evaluation Process (SREP) or Pillar II requirements, (iii) promotes transparency through consistent disclosure, and (iv) increases banks' awareness and preparedness through this process. **MPE ST**: assesses the resilience of the banking system from a macroprudential perspective, accounting for banks' reactions to shocks and spillover effects within the banking sector and to the rest of the economy. **MTD ST**: (i) provides a systemic risk impact assessment from a macroprudential perspective, accounting for banks' reactions and spillover effects, (ii) provides input for macroprudential policy analyses at the European Central Bank (ECB) on topics such as systemic resilience and measure calibrations.	**BoJ ST**: (i) assesses the risk resilience of the banking system as a whole against solvency risk, (ii) assesses the risk resilience of individual banks by gauging the capital sufficiency of individual banks, and (iii) provides a tool for communicating financial stability issues to the banking sector and public. **JFSA ST**: (i) assesses the level of capital sufficiency of individual banks, (ii) achieves financial stability through the oversight of ST exercises, (iii) improves banks' awareness and preparedness towards potential risks, (iv) increases banks' managerial efficiency and financial intermediation function during periods of stress, and (v) promotes banks to utilise the ST results in managerial decisions, which leads to the flexible revision of individual portfolio and business strategy in proper timing.	**BBA-LB/DFB**: (i) assesses the resilience of the Swiss banking sector (macroprudential assessment), (ii) monitors (independently from banks) the impact of stress scenarios on capital levels of G-SIBs and the Swiss banking sector (micro- and macroprudential assessment), and (iii) provides a tool for communicating financial stability issues to banks and the public. **FINMA ST**: serves as an instrument of the supervisory review and assessment process to (i) challenge the banks' internal capital adequacy assessment and (ii) analyse the risk measurement and capital management capabilities of individual banks (microprudential assessment).	**DFAST**: provides the public, banks and supervisors with forward-looking information to help gauge the potential effect of stressful conditions on the ability of banks to absorb losses, while meeting obligations to creditors and other counterparties and continuing to lend. **CCAR**: (i) the quantitative assessment evaluates a bank's capital adequacy and planned capital distributions to assess if a bank has sufficient capital to continue operating and lending throughout times of economic and financial market stress, and (ii) the qualitative assessment evaluates the reliability of each bank's analyses for capital planning, focusing on how a bank identifies, measures and determines capital needs for its material risks, as well as a bank's controls and governance around those practices.

Use of ST results   Table 3

Euro area	Japan	Switzerland	United States
SSM ST: the bottom-up microprudential ST is an input to SREP and Pillar II decisions, promoting a consistent and transparent disclosure on banks' risk exposures and increasing banks' awareness and preparedness through this process. Other relevant elements may be a focus on specific risks, such as non-performing loans (NPLs) or the impact and implementation of IFRS 9. The results of the STs alone would not mechanically lead to any policy decisions, but would serve to formulate policy decisions as part of the SREP on an independent timeframe. **MPE ST / MTD ST**: pure top-down macroprudential STs are used for risk and policy impact assessment, and possibly informing policy calibrations going forward.	**BoJ ST**: the ST results are used for risk assessment and communication with banks. The use of results is consistent with the objectives of macro stress testing for the BoJ, which are to (i) reveal the characteristics of potential risk factors faced by the banking sector and evaluate the extent to which the banking system as a whole is resilient against these risk factors, and (ii) facilitate communication with relevant domestic and foreign parties in order to secure the stability of the financial system (communication with both banks and the public). As such, the results of the BoJ ST do not in themselves lead to any automatic policy measures taken against the banks; but through continued dialogue with banks, the results may encourage banks to take certain measures.	**BBA-LB/DFB**: the main role of the BBA exercise is to serve as a tool to monitor the resilience of the banking sector and to explore potential systemic vulnerabilities. In that context, it is also used as a tool of reference to regularly test, in a forward-looking manner, the adequacy of capital buffers of SIBs and the banking sector. The insights from the ST exercises are used (i) as a communication basis to emphasise specific financial stability concerns in the Financial System Report (FSR), and (ii) for discussions with the top management of SIBs about their risk and capital situation. Results and observations from the Swiss National Bank (SNB) STs are shared with FINMA, who is responsible for supervisory actions at the level of individual banks.	**DFAST**: the ST results are used primarily to build and maintain capitals of banks at levels high enough to withstand losses and still remain viable financial intermediaries. The disclosed information allows the public to generally make more informed judgements on the conditions of banks subject to the STs, especially in the event of a severe recession. **CCAR**: the Federal Reserve may object to a bank's capital plan on the basis of the ST outcomes. If a bank receives an objection to its capital plan, it may not make any capital distribution unless expressly permitted by the Federal Reserve. In 2017, the Federal Reserve announced a proposed rule on the Stress Capital Buffer (SCB) to link the ST results to the regulatory capital framework. The proposal would simplify the current capital regime by more closely integrating the capital rule and CCAR, reduce the burden for smaller, less complex firms subject to the supervisory exercise, and align certain elements of the ST with expected actions by banks in a stress scenario.

Use of ST results

Table 3

Euro area	Japan	Switzerland	United States
	JFSA ST: the exercise aims to increase banks' awareness and preparedness toward potential risks, and assess the banks' managerial efficiency and financial intermediation function during periods of stress. The JFSA uses the exercise to raise awareness of the impact of underlying risks to banks' profits, and get banks to consider and clarify strategies and management actions in light of these underlying risks. The results are also used as a benchmark for dialogue with banks, held with a view to enhance business and risk management. The results of the STs alone would not mechanically lead to any policy decisions, but would serve to formulate policy decisions as part of the supervisory program on an independent timeframe. The JFSA uses the results to see whether banks have sufficient managerial resources if business plans are executed according to the banks overall strategies over the medium term. Furthermore, the JFSA builds on the results of the bottom-up STs to assess whether financial institutions would be able to provide sufficient financial intermediation under stress, and to achieve financial stability through the oversight of ST exercises.	**FINMA ST**: the exercise is part of the supervisory review and assessment process. In that context, it is used to assess the adequacy of capital buffers and banks' risk and capital management processes. Insights from the ST may influence decisions on supervisory actions, where necessary. In the risk areas where FINMA is not convinced by banks' modelling approaches or the results of bank-run stress tests, FINMA explains its concerns and expectations to the banks and applies specific quantitative add-ons to banks' ST results. These add-ons are maintained until the banks have sufficiently enhanced their approach.	

History

Table 4

Euro area	Japan	Switzerland	United States
SSM ST: following the inception of the ECB/SSM, STs were conducted from 2014 onwards, in parallel with the European Banking Authority (EBA) ST on larger EU banks. Prior to this, the first EU-wide microprudential ST dates back to 2009 and was conducted under the aegis of the Committee of European Banking Supervisors (CEBS). **MPE ST**: initiated in 2016 after the ECB was granted a macroprudential mandate and the first SSM system-wide stress testing exercise, which provided the needed basis for the MPE. **MTD ST**: developed as a systemic risk assessment tool when the European Systemic Risk Board was created in 2011. The suite of models employed to carry out this stand alone macroexercise was published in 2017; components had been developed and published in 2013.	**BoJ ST**: initiated in 2011 as a structural, formal macroprudential ST exercise. The exercise was considered to be one of the BoJ's important initiatives on the macroprudential front and has been reported in the FSR. **JFSA ST**: the requirement for major banks to develop bottom-up STs to assess capital resilience was introduced in 2005 as part of supervisory guidance. In 2006, the need to develop bottom-up STs to assess capital resilience was written into regulatory standards as part of the Basel 2 domestic implementation for internal ratings-based approach banks (IRB banks).	**BBA-LB**: introduced in 2008 as a granular standardised database for benchmarking banks' stress tests and conducting top-down stress tests independently from banks (in response to experience gained from the International Monetary Fund's Financial Sector Assessment Program (FSAP). Since 2012, the database has been used to conduct multi-scenario top-down stress testing. **BBA-DFB**: initiated in 2012 in order to increase coverage of BBA. **FINMA ST**: introduced in 2009 in immediate response to the Great Financial Crisis (GFC) in order to estimate the loss potentials of the two Swiss G-SIBs. Since 2014, the exercise has been complemented by a systematic benchmarking of the FINMA results with the internal stress frameworks (both scenario-based and statistical frameworks) of the two Swiss G-SIBs (Integrated Capital and Risk Analysis – ICRA).	Stress testing was first used as a supervisory tool starting with the 2009 Supervisory Capital Assessment Program (SCAP), as a response to the GFC. **DFAST**: the first round of exercise under the authority of the Dodd-Frank Act was carried out in 2013 after the Federal Reserve implemented the required rules. **CCAR**: initiated in 2011, in response to the GFC and in accordance with the Federal Reserve's Regulation Y capital plan rule.

Institutional setup

Table 5

Euro area	Japan	Switzerland	United States
SSM ST: the ECB/SSM is responsible for the ST, covering all so-called significant institutions (SIs) that are directly supervised by the ECB.[5] The SSM ST involves some 300-plus staff members for the QA of banks' results. **MPE ST / MTD ST**: the ECB is responsible for the corresponding STs. For MTD STs conducted with STAMP€, five to ten staff members are needed.	**BoJ ST**: the BoJ is responsible for the exercise. The ST is conducted in accordance with its mandate to ensure financial stability, as stipulated in the Bank of Japan Act. The BoJ ST is conducted typically by around five staff members of the Financial System Research Division and supervised by a few senior executives of the Financial System and Bank Examination Department. There is a formal process of reporting ST results to the BoJ's Policy Board, mainly to facilitate the feedback of the Board members to the contents of the FSR. **JFSA ST**: JFSA is responsible for the exercise. The ST is conducted in accordance with its mandate to ensure financial stability as stipulated in the Act for Establishment of the Financial Services Agency. The JFSA ST is conducted by the monitoring teams that cover individual banks and an ST specialised team comprising six staff members.	**BBA-LB/DFB**: both LB and DFB exercises are conducted by the SNB. STs are conducted in accordance with SNB's mandate to contribute to the financial stability of the Swiss banking sector. The BBA exercise is conducted by around six staff members who work on this exercise part time (amounting to a total of approximately three full-time equivalent (FTE) per year). **FINMA ST**: FINMA is responsible for this exercise. STs are conducted in accordance with FINMA's mandate to supervise banks. The FINMA ST is conducted by around two staff members who work on this exercise part time (amounting to a total of approximately one FTE per year).	**DFAST:** the Federal Reserve is responsible for conducting the supervisory ST for banks with $100 billion or more in total consolidated assets. DFAST is a national supervisory programme that involves staff across the Federal Reserve System. At the Board of Governors, there are 40-plus full-time staff members working in the Stress Testing Section. **CCAR**: the Federal Reserve is responsible for conducting both quantitative and qualitative assessments for large and complex banks. [6] CCAR qualitative assessment mainly involves two groups of supervisors – dedicated supervisory teams (DSTs) focused on individual bank's capital planning assessment and horizontal evaluation teams (HETs) focused on practices across banks, as well as the Large Institution Supervision Coordinating Committee (LISCC) Operating Committee.

[5]   SIs are designated institutions based on criteria such as size and economic importance. Before being supervised by the ECB, such institutions have to undergo a comprehensive assessment, which embeds a stress test and an asset quality review.

[6]   CCAR qualitative assessment is required for the largest and most complex banks only, which are defined based on criteria such as bank size and operational complexity.

Coverage of exercise   Table 6

Euro area	Japan	Switzerland	United States
All SSM SIs would represent roughly 80% of the total euro area bank assets. **SSM ST**: covers some 100 banks, roughly banks under the direct supervision of the ECB. **MPE ST / MTD ST**: has increased over time, broadly aligned with the coverage of SSM ST since 2014.	**BoJ ST**: covers a total of roughly 370 financial institutions, ranging from major banks including G-SIBs to smaller community orientated banks, representing roughly 80 to 90% of total credit outstanding. **JFSA ST**: covers three designated G-SIBs and four designated D-SIBs, roughly about 70% of total assets in the banking sector.	Banks covered in BBA exercises represent roughly about 80% of total assets in the Swiss banking sector. **BBA-LB**: covers two Swiss G-SIBs on the basis of their systemic relevance to the global financial system and the Swiss economy. **BBA-DFB**: covers three D-SIBs and approximately 90 banks with a mainly domestic portfolio, considering their relevance for supplying the Swiss economy with credit. **FINMA ST**: covers two Swiss G-SIBs.	**DFAST**: the 35 banks tested in 2018 represent approximately 80% of domestic bank assets. Among them, six banks with large trading operations are subjected to a global market shock (GMS) and eight banks with substantial trading or processing operations are required to incorporate a counterparty default scenario. **CCAR**: the coverage for the quantitative assessment is the same as for DFAST. The qualitative assessment includes only large and complex banks (18 in 2018).

Proportionality Table 7

Euro area	Japan	Switzerland	United States
SSM ST: limited to designated SIs. There is no system-wide ST for less significant institutions. Within the SI population, smaller banks – eg those not in the EBA sample – may face less demanding information requirements. **MPE ST / MTD ST**: not relevant as they are TD exercises.	**BoJ ST**: the coverage is fairly extensive, and the exercise itself is applied across all banks, so proportionality is not a prioritised issue. **JFSA ST**: fairly flexible application of proportionality concept, in terms of data availability, modelling limitations etc. Nevertheless, banks are subject to peer review by the JFSA.	**BBA-LB**: scope of the ST is applied through the concept of systemic importance. Concerning the two G-SIBs, a structured data collection mechanism is in place where granular, risk category specific information is collected. **BBA-DFB**: the ST relies mostly on data which were not specifically produced for stress testing purposes. Risk coverage is chosen depending on materiality for domestically focused banks. **FINMA ST**: scope of the ST is defined through the concept of materiality.	**DFAST**: in accordance with Dodd-Frank Act, up until 2017, banks (including both bank holding companies (BHCs) and US intermediate holding companies (IHCs)) with total assets of $50 billion or more were subject to top-down STs supervised by the Federal Reserve. In 2018, the Economic Growth, Regulatory Relief, and Consumer Protection Act (EGRRCPA) raised the asset thresholds for the application of DFAST. **CCAR**: same as DFAST for the quantitative assessment. The qualitative assessment is tailored to large and complex banks and started in 2017.

Relationship between ST exercises

Table 8

Euro area	Japan	Switzerland	United States
SSM ST: a standalone exercise. However, in the QA process a suite of top-down risk models are used to benchmark the banks' results, inspired by those employed for macroprudential purposes. **MPE ST**: the MPE ST uses the SSM ST results as a starting point. Specifically, the SSM ST's static balance-sheet (B/S) assumption is relaxed, to account for banks' corresponding reactions to macro and financial stress. **MTD ST**: a standalone exercise.	**BoJ ST:** a standalone exercise. **FSA ST:** a standalone exercise.	**BBA-LB**: independent from the FINMA exercise, but the ST results are shared with FINMA for benchmarking purposes. Run in parallel with the BBA-DFB exercise using the same stress scenarios, however differing in terms of bank-level data and methods used. **BBA-DFB**: runs in parallel with the BBA-LB exercise using the same stress scenarios, however differing in terms of bank-level data and methods used. **FINMA ST**: independent from the BBA-LB exercise, but the ST results are shared with SNB for benchmarking purposes.	**DFAST**: a standalone exercise. **CCAR**: the quantitative assessment uses the same top-down models and assumptions as DFAST. They also share the same set of supervisory scenarios. The differences are that the CCAR quantitative analysis uses the bank's planned capital actions and the bank's baseline scenario rather than the capital action assumptions required in the DFAST rules.

Scenario

Table 9

Euro area	Japan	Switzerland	United States
SSM ST: incorporates one adverse scenario as well as a common baseline scenario; several stress scenarios would lead to a very heavy operational burden and possibly compromise the QA of the ST. **MPE ST**: incorporates the same adverse scenario as the SSM ST but includes credit dynamics and the impact on the macroeconomy of possible banks' capital shortfall (leading to an update of the initial scenario). **MTD ST**: uses a number of scenarios (generally a baseline and up to four adverse ones), developed for financial stability purposes, and thus do not replicate macro-financial assumptions of the SSM ST. Contagion and liquidity analyses are based on multiple scenarios.	**BoJ ST**: two stress scenarios are compared against a baseline scenario (i) a "tail event" scenario, assessing the stability of the banking system under severely adverse economic and financial conditions, and (ii) a "tailored event" scenario, which is an ad hoc scenario designed to investigate the vulnerability of the financial system under specific circumstances. The tail event scenario involves a wide range of macro-financial variables and is projected regularly in a time consistent manner, whereas the tailored event scenario incorporates specific variables of interest to capture specific risks. **JFSA ST**: JFSA does not specify the detail of the ST scenario, but publicly announces the potential risks that the individual banks need to prepare for from the perspectives of micro and macro prudence. Individual banks are advised to run STs under the scenario that includes the risks provided by JFSA, in addition to banks' own scenarios. The scenarios made by banks are challenged by JFSA, to ensure that those bank scenarios are appropriate.	**BBA-LB/DFB**: consists of a baseline and multiple stress scenarios (in the range of three to five), which are evaluated in parallel, in order to avoid ex ante focus on a specific stress scenario. For benchmarking purposes, stress scenarios used in the FINMA ST, in the US DFAST exercise or in the ECB SSM/EBA exercise are evaluated. The simulation of the impact of these scenarios used by other authorities allows a comparison of the severity of the exercises as well as of the results (in particular, benchmarking of credit loss rates produced with these approaches and the approaches used in other exercises). **FINMA ST**: consists of two stress scenarios defined by FINMA, of which one is held largely constant over time in order to allow comparisons across rounds of stress tests. The other serves primarily to explore new vulnerabilities, but also to assess the performance of banks' approaches. The results of these scenarios are compared with the most relevant bank-internal scenarios and economic capital metrics.	**DFAST**: consists of one baseline and two adverse scenarios (adverse and severely adverse). The scenarios are based on narratives published by the Federal Reserve and the baseline scenario does not represent official forecasts. For the severely adverse scenario, the Federal Reserve uses a recession approach, which is an ad hoc calibration of a path of scenario variables to reflect conditions that typically characterise historical post-war US recessions. **CCAR**: in addition to the three supervisory scenarios provided by DFAST, in CCAR two additional scenarios are included: a baseline and a stress scenario. Both are provided by the banks subjected to CCAR.

Severity of stress

Table 10

Euro area	Japan	Switzerland	United States
SSM ST/ MPE ST / MTD ST: the severity of the scenario is first assessed via the probability of its drivers (eg 5% critical values for all exogenous shocks). Exogenous shocks can be adjusted to reach sufficient severity in relative terms, comparing the macro-financial (model-based) outcomes with past crises. No specific probability is assigned to the scenario, given the technical difficulties to estimate this and the voluntary departure from historical regularities or standard modelling. In any case, the ST impact largely depends on banks' business model/exposures, on how the impact is modelled in terms of risk parameters rather than on the scenario only, and on the approach taken for B/S projection (dynamic or static, see Table 16).	**BoJ ST**: the severity of the shocks in the scenarios is compared against past experiences. The tail event scenarios are calibrated to reflect situations when economic and financial developments at home and abroad deteriorate to a level comparable to that seen during the GFC. For the tailored event scenarios, the BoJ looks at the empirical distribution (based on past real data) for selected scenario variables and show an indication of where the selected scenario variables fall within their historical distribution. The tail event scenarios are designed to be countercyclical. In the tail event scenario, the more overheated the recent economic activities are, the greater the degree of stress is applied. **JFSA ST**: individual banks decide the severity of the stress scenario based on their own risk profile in consideration of the dialogue with the JFSA before they finalise. JFSA assesses the severity of the stress scenario, and suggests reconsidering it if necessary (see Table 9).	**BBA-LB/DFB**: the severity of the stress scenario is measured in a variety of ways, such as by benchmarking against historical stress events and the stress scenarios of other jurisdictions (eg the United States, the United Kingdom and the European Union). Broadly, the severity of the stress scenarios relative to the baseline scenario is kept constant over time, ie it is not explicitly adjusted in a countercyclical manner. The reason is that the stress scenarios are calibrated toward tail events so that cyclical fluctuations in the economy play a secondary role. **FINMA ST**: similar approach to BBA-LB/DFB, ie the severity of the stress scenario(s) is benchmarked against historical stress scenarios, in particular against the GFC or turbulences observed in the euro zone, complemented by a forward-looking expert-based assessment. Stress scenarios are regularly updated to account for new developments in relevant economies, markets or banks' vulnerabilities, with the aim to capture the most harmful situations for the monitored banks at a given severity level.	**DFAST/CCAR**: the Federal Reserve's scenario design policy statement indicates that the severely adverse scenario generally includes an increase in the unemployment rate of several percentage points (usually in the range of 3 to 5%) with the general expectation that the maximum unemployment rate would rise to at least 10% in the scenario. This approach typically yields a larger unemployment rate increase when the economy is strong, and vice versa. Thus, it is also consistent with the aim of limiting pro-cyclicality in stress scenarios (see Table 9). In 2017, the Federal Reserve announced a proposal for improved transparency around its scenario design framework, and to further enhance the countercyclicality of the scenarios by developing an explicit guide for formulating the path of house prices in the severely adverse scenario.

Data inputs

Table 11

Euro area	Japan	Switzerland	United States
SSM ST: uses bank-level supervisory data, based on templates similar to those employed in the EBA EU-wide exercises. **MPE ST**: incorporates bottom-up individual bank SSM ST results and underlying bank-level data, complemented by publicly available data for macroeconomic and financial variables. **MTD ST**: uses publicly available macroeconomic and financial data, along with supervisory data.	**BoJ ST**: uses supervisory data as well as publicly available macroeconomic data. **JFSA ST**: JFSA uses both public and supervisory data to makes sure the ST process and result from individual banks' bottom-up submission are appropriate.	**BBA-LB**: utilises a structured data collection mechanism where risk-category specific information is collected. Risk-category specific data relevant to the individual bank is collected per building block, ranging from market risk, credit risk to other risk data, such as business risk and funding risk. **BBA-DFB**: utilises mainly existing regular banking statistics (annual or monthly data), complemented with additional, more granular supervisory reporting, such as quarterly interest rate risk (IRR) or specific mortgage exposure reports. **FINMA ST**: banks use their own exposure data directly sourced from their internal risk infrastructure to run ST. Most banks' stress models are also calibrated using internal data (exceptions include models for pension risk).	**DFAST/CCAR**: uses a combination of regulatory reporting data provided by banks and the industries. The banks' portfolio data are collected through the Capital Assessments and Stress Testing information collection (FR Y-14A/Q/M), which is a specific data collection designed for the purpose of DFAST and CCAR.

Risk coverage and modelling approaches

Table 12

Euro area	Japan	Switzerland	United States
SSM ST: covers a wide range of risk categories (such as credit risk, net interest income (NII) risk, market risk, fees and commission (F&C) risk, operational risk and conduct risk)). Liquidity risk is covered indirectly/partially. Banks can use their own models to compute the ST results but adjustments to outcomes/models may be required during QA.	**BoJ ST**: covers the major risk categories relevant to Japanese banks, including credit risk, IRR, and funding risk. Operational risk is not covered in the current exercise.	**BBA-LB/DFB**: covers all major risk categories, depending on the risk profile of the corresponding banking category, including credit risk, market risk, IRR, funding risk, F&C risk and operational risk.	**DFAST/CCAR:** key risk categories covered include credit risk, IRR, market risk and operational risk, and other types of risk, such as counterparty default risk.
MPE ST / MTD ST: covers all major risk categories (similar to the SSM ST). Credit risk is modelled at the macro sectoral level with scenario variables explaining the probability of default (PD), eg mortgage loans in a given country. Similarly, NII modelling relates funding and lending rates/spreads for a given asset/liability class in a given country (eg wholesale secured funding) to macro variables with an option to use bank panel data estimates. Market risk modelling uses bank-level information/holdings jointly with scenario financial assumptions to derive stressed valuations and counterparty risk impact. Operational risk is a purely statistical exercise run for each bank and risk types. F&C modelling is panel-based linked to scenario variables.	For credit risk, credit costs are modelled using changes in provisions for loan losses and charge-offs, which are derived from the information of a standardised borrower rating system, as stipulated in the *Financial inspection manual* of the JFSA. Other estimated losses include unrealised losses on securities holdings and equity exposures, and relevant components of pre-provision net revenue (PPNR), such as NII (a function of changes in funding costs, lending rates and volume) and non-interest income (a function of sales revenue from investment trusts and insurance products).	Credit risk is modelled using regression-type or structural approaches, depending on the availability of representative empirical data and the need to address potential structural breaks. In structural models, the loss process is modelled using structural relationships on how changes in macro and financial variables impact the PD, the loss given default (LGD) and the exposure at default (EAD), by taking into account relevant portfolio characteristics.	Credit risk modelling involves two general approaches to model losses on accrual loan portfolios (i) the estimation of losses using projections of credit risk parameters (PD, LGD, EAD), and (ii) the modelling of historical behaviour of net charge-offs. Other estimated losses would consist of components such as securities in the available for sale (AFS) and held to maturity (HTM) portfolios, trading and private equity, credit valuation adjustments (CVA), incremental default risk (ie losses associated with the default of issuers of credit instruments) and largest counterparty default (the default of counterparties to derivatives and securities financing transactions).
Liquidity risk can be covered indirectly via a funding stress model or a fully fledged top-down systemic liquidity ST.	**JFSA ST**: covers the major risk categories depending on banks' portfolio. Individual banks are responsible for deciding the risk coverage and modelling approaches. However, through dialogue with the individual banks, JFSA makes sure that major risk categories including credit risk, IRR, and market risk are appropriately addressed, and the modelling approach of the individual banks are appropriate.	Where relevant (ie in particular for the G-SIBs with important, complex trading books), market risk is modelled based on granular sensitivities (related to various shock levels, including severe and extreme standardised risk factor shocks). Shocks are applied overnight, ie without assuming portfolio adjustments.	Various PPNR components, such as interest income and non-interest income, are modelled using a variety of models, such as autoregressive, simple non-parametric to structural models. Operational risks are modelled by combining a historical simulation approach and a regression model and are deducted from PPNR.
		Changes in NII are modelled using granular cash-flow projections, including behavioural assumptions on how client rates and portfolio compositions are adjusted over the projection horizon.	Liquidity risk stress testing is covered separately in the comprehensive liquidity assessment review (CLAR) exercise.

	Risk coverage and modelling approaches		Table 12
Euro area	Japan	Switzerland	United States
		Other risk categories are modelled using simple structural models (calibrated based on empirical experience) or regression-type approaches, complemented by expert judgment.	In 2017, the Federal Reserve announced a proposal to incorporate stresses to funding markets. Additional components in the scenario may be considered to capture the cost of funds, particularly wholesale funds.
		Liquidity stress testing is covered in a separate liquidity coverage ratio (LCR)-type exercise. The cost of closing liquidity gaps may be integrated in the solvency ST.	
		FINMA ST: covers all major financial risk categories such as credit risk, market risk, IRR, funding risk, F&C risk, operational risk and pension risk.	
		Liquidity stress testing is covered in a separate ST exercise.	
		Banks use their internal approaches to expand the scenario shocks that the stress models need and to estimate the stress impacts. In a granular supervisory review process, the adequacy of approaches used is closely monitored.	

Changes in the models and methodology of ST exercises and trade-offs | Table 13

Euro area	Japan	Switzerland	United States
SSM ST: regular review of methodology during years when no system-wide ST takes place, based on lessons learnt. Changes may affect templates, or specific methodological points such as for market risk or NII. Sometimes regulation governs changes, eg with new accounting standards such as IFRS 9. There is a trade-off between the need to simplify and calls for new areas of stress to be explored. **MPE ST / MTD ST:** methodology constantly evolving, reflecting model developments/improvements, reviews needed when supervisory ST methodology changes, or specific assessment needs on the macro side (eg deleveraging, NPL, interest rate policy changes, etc). The top-down models undergo regular model reviews conducted by external experts.	**BoJ ST**: changes in the models and methodology of ST exercises may include modifications to or advancements in modelling (such as the inclusion of new explanatory variables in structural equations), and more granular specification of structural equations. In line with the goal of transparency with these changes, all significant changes are documented in the relevant FSRs. The changes in models and methodology are considered to be improvements that better capture the underlying risks, and such improvements are prioritised over time consistency. **JFSA ST**: banks are responsible for continuously developing models and updating methodology. JFSA reviews and challenges their methodologies regularly through dialogue and documentation.	**BBA-LB/DFB**: monitoring of system-wide resilience and the exploration of potential vulnerabilities require both consistency over time and changes in the approach to improve models and to capture new situations. Differences in results between two regular runs are decomposed into methodological changes, scenario changes and exposure changes. This allows constant methodological progress, while, at the same time, using the results for monitoring purposes. In addition, regular runs are complemented by ad hoc analyses (using new scenarios, models or assumptions) for exploring new potential vulnerabilities. **FINMA ST**: while consistency over time is sought in the supervisory capital assessment, constant progress is pursued for what concerns banks' capacity to simulate the impact of stress scenarios. The goal is to integrate the results in their internal capital adequacy assessment process (ICAAP) and to explore potential vulnerabilities in a forward-looking manner. Comparative analysis of stress results based on scenarios and economic capital metrics, and active dialogues with the banks' model risk management units actively support the process.	**DFAST/CCAR**: the Federal Reserve periodically revises its supervisory models to include more advanced techniques, enhancements in response to validation findings, incorporation of more detailed data, and/or identification of more stable models or models with improved performance, particularly under stressful economic conditions. There is a general policy of phasing material model changes over two years. The purpose is to ensure that changes in model projections primarily reflect changes in underlying risk factors and scenarios. The model validation programme subjects supervisory ST models to effective challenge, expanding upon modelling teams' efforts to manage model risk and confirming that these models are appropriate for their intended uses in stress tests.

Feedback effects on initial shocks[7]

Table 14

Euro area	Japan	Switzerland	United States
SSM ST: typically, scenarios result from a model-based outcome derived from specific exogenous inputs. The scenario has an impact on each bank's risk parameters and capital. The scenario is not updated in view of the system results. **MPE ST / MTD ST**: accounts for second-round effects[7] by updating the initial scenario, accounting for banks' reaction to the results, in particular new capital demands that impact banks themselves as well as other players via eg the credit channel and market price effects on commonly held assets.	**BoJ ST**: all stress scenarios incorporate exogenous shocks to either the macroeconomic sector or the financial sector components of the ST model (financial macroeconometric model). In addition, the model incorporates the feedback loops between the real sector and the banking system to ensure that the exogenous shocks are transmitted from the real economy to the banking sector, and vice versa (see Table 15). **JFSA ST**: no specification to banks in their exercise.	**BBA-LB/DFB:** all stress scenarios are set up as exogenous shocks to macroeconomic and financial variables. Implicitly the shocks are calibrated severely enough to account for feedback. **FINMA ST**: the stress scenarios are set up as exogenous shocks to macroeconomic and financial variables. The chosen level of stress severity implicitly considers macro-financial feedback as occurred in past stressed episodes.	**DFAST/CCAR**: the supervisory models assume first round effects of shocks, such as the evolution of B/S items and risk-weighted assets, revenue and loss estimates, and the quality of newly originated loans.

[7] First round effects are defined as the direct impact of shocks on individual banks' profit and loss (P&L) statement and B/S, taking each bank in isolation. In contrast, second-round or feedback effects may occur as a response from banks, depositors, financial markets, policymakers and other economic agents to the impact of the initial shocks on banks. The response may affect individual banks (eg an increase in idiosyncratic funding spreads due to a deterioration of their solvency situation; default of a single counterparty) or have an aggregate impact on the initial shocks (eg a decline in asset values arising from the fire sales of assets; a reduction in GDP growth due to an (additional) decline in credit supply in response to losses in the banking sector)).

Modelling second-round effects[8]

Table 15

Euro area	Japan	Switzerland	United States
SSM ST: second-round effects are not incorporated. **MPE ST / MTD ST**: second-round effects transmit through various channels such as bank lending, asset prices, equity holdings and interbank markets. Specific macro models are designed and used for quantifying macro feedback (see Table 16 on the dynamic B/S projection). The impact on financial agents other than banks are explored via flow of funds data. Stress impact on financial agents other than banks, such as insurers, other financial institutions can be incorporated via the interrelationship identified via the flow of funds. As work in progress, liquidity stress testing exercises are also being extended beyond the banking sector, to cover funds and asset managers and their relation to banks or markets where banks operate, since liquidity conditions on these markets are significantly influenced by non-banks.	**BoJ ST**: second-round effects focus on the credit channel. For the BoJ exercise, the main second-round effects are generated mainly through a change in credit costs. Financial conditions of the sector (measured by metrics such as the interest coverage ratio) feed through as a change in credit costs for banks, altering the capital adequacy ratio of banks, which affects the banks' ability to lend. This affects nominal GDP, which feeds into the financial conditions of the non-financial corporate sector again. More recently, the second-round effects emerging from funding risks have been embedded in the ST models. The deterioration of bank capital leads to increased funding costs, mainly in the foreign currency funding domain. **JFSA ST**: no specification to banks in their exercise.	**BBA-LB/DFB**: in general, second-round effects are implicitly taken into account in the calibration of the stress scenarios. To a limited extent, they are explicitly modelled on the level of individual banks. For example, funding spreads are linked to the development of banks' solvency situation. Also, the effect of a default of a major counterparty as a consequence of the stress scenario is considered. In ad hoc analyses, the SNB has tested the system-wide impact of direct contagion within the banking system and is currently working on the explicit modelling of indirect contagion. **FINMA ST**: no ex-ante specification to banks in their exercise. Depending on the scenario, concentrations, in particularly exposed single names, regions or industries are considered, implicitly assuming contagion effects in these exposures.	**DFAST/CCAR**: the supervisory modes currently do not explicitly incorporate any second-round effects. From a macroprudential perspective, the STs are conducted horizontally across banks representing roughly 80% of banking sector assets, which implies that, on aggregate, some co-movements are accounted for. In particular, the exercises generally use industry level models and, in a restricted way, bank-specific fixed effects. This practice ensures that projected future losses are a function of a portfolio or instrument's own characteristics, rather than the historical experience of the participating banks. In addition, aggregated portfolio statistics are used in case of missing data and/or immaterial portfolio loss estimates when appropriate.

[8]   See footnote 7 in Table 14.

Assumptions regarding banks' B/S under stress

Table 16

Euro area	Japan	Switzerland	United States
SSM ST: assumes static B/S. **MPE ST / MTD ST:** the macroprudential STs have been designed to incorporate dynamic B/S. Either a simple deleveraging scenario, or a combination of deleveraging with equity issuance or using profits allowing for equity issuance could be assumed in the model setup. The first step is to align credit supply due to a deterioration in other macro-financial scenario variables (assuming all banks are affected in a similar fashion). Additional B/S changes may be triggered, eg by capital demand from the markets or supervisors. The implied deleveraging is assumed to occur essentially via loans, sometimes implemented with a pecking order across assets (such that domestic loans are reduced last) or even a portfolio choice. The banks' aggregate response to additional capital demands in terms of credit and GDP in a given country can be estimated. This is achieved by running conditional simulations of either a structural dynamic stochastic general equilibrium (DSGE) model or a reduced form global vector auto-regression (GVAR) model (which explicitly account for cross-country spillover).	**BoJ ST**: a dynamic B/S is assumed, especially for the loan portfolio. Other than a de-leveraging assumption, the BoJ does not incorporate any endogenous management actions, though it does sometimes assume forced management actions in certain scenarios. The deleveraging channel in the current model setup is via the stock of loans only. The de-leveraging actions are econometrically modelled, where a bank's capital level is positively related to its loan volume. **JFSA ST**: assumptions regarding banks' B/S under stress, which reflects banks' risk profile, are made by banks. These assumptions are challenged and analysed horizontally by JFSA.	**BBA-LB/DFB:** where relevant, the dynamic evolution of the risk profile of banks' portfolios is considered. Examples include (i) IRR in the banking book: Re-setting of client rates, changes in the composition of banks' portfolios (product mix, duration of positions) in relation to the IR environment. Assumptions on how the normalisation of monetary policy is implemented may impact the volume of central bank (CB) deposits and related funding positions. Results are tested against different IR hedging strategies. (ii) mortgage portfolio: changes in the product mix depending on the IR environment; changes in the duration of positions; changes in loan-to-value and loan-to-income distributions over the scenario horizon. **FINMA ST**: in general, banks cannot assume B/S shrinkage. The evolution of portfolio characteristics over the scenario horizon (like rating migrations, volumes of assets under management, market risk impacts on Lombard lending portfolios) are taken into account.	**DFAST/CCAR**: there is a general constraint that does not allow banks to plan a reduction in their B/S as a way to meet capital ratio requirements under stress. The current setup models a dynamic B/S, allowing it to change/grow to be in line with projected industry-wide loan and asset growth, which is estimated using the projections of the macroeconomic variables over the stress horizon. Over the projection horizon, each bank is assumed to maintain a constant share of the industry's total assets and is assumed to maintain a constant portfolio composition. The proposed rule for the SCB incorporates a suggested change to the assumption in CCAR, to better align this B/S assumption with a bank's expected actions during stress periods. Specifically, a proposal is made to effectively keep the bank's B/S size to remain constant (no endogenous reaction by the firm to shocks) under stress.

Assumptions regarding banks' incomes and expenses under stress

Table 17

Euro area	Japan	Switzerland	United States
SSM ST: high-level constraints are in place for NII, in effect capping the net interest rate earned on performing assets. Changes to margins as a result of sovereign bond spread changes for all relevant assets and liabilities are reflected. **MPE ST / MTD ST**: restrictions can be similar to those used in the SSM ST. Alternatively, these restrictions can be relaxed for top-down macroprudential STs, to the extent that these conservative assumptions may not reflect actual or estimated behaviour, as eg not capturing sectoral or bank-level idiosyncrasies.	**BoJ ST**: for the BoJ exercise, the main components for earnings are modelled and fluctuate endogenously. Modelled earnings are likely to deteriorate under stress scenarios, due to increases in funding costs, decreases in loan volume and decreases in non-interest income. Limited components of earnings, eg operating expenses, are assumed to be constant. **JFSA ST**: assumptions regarding banks' income and earnings under stress, which reflect banks' risk profile, are made by banks. These assumptions are challenged and analysed horizontally by JFSA.	**BBA-LB**: structural approach differentiating major income and expense components. Application of consistency conditions between the development of individual income and expense components. Earnings distribution: no dividend payments except for already accrued dividends. **BBA-DFB**: NII is modelled with a dynamic, granular cash-flow projection (including granular caps and floors). F&C income is projected using regression methods, controlled (and limited) however by expert judgement. Business expenses are held constant. A flat dividend distribution rate is applied if net earnings are positive and capital ratios are above target rates. **FINMA ST**: FINMA expects banks to estimate the net income shortfalls (business risk impact) between their baseline projections and stress projections assuming no B/S shrinkage; banks' stress assumptions and modelling techniques are challenged and benchmarked in the supervisory assessment of the results.	**DFAST/CCAR**: the exercise tries to capture bank-specific projections of incomes and expenses to reflect the state of the economy under stress. Starting in 2017, core components of PPNR are forecasted separately. Some components are modelled using an enhanced approach, which employ an assumption of the revenues and expenses coverage over time towards the bank's own post-crisis performance instead of industry average. In terms of management actions, contractual divestitures are included. Planned mergers and acquisitions are evaluated in stress. In addition, the treatment of net income is designed to reflect current US accounting rules and tax laws. For example, the post-stress capital calculation in DFAST 2018 reflects changes in accordance with the Tax Cuts and Jobs Act (TCJA).

Solvency and liquidity

Table 18

Euro area	Japan	Switzerland	United States
SSM ST: does not apply. **MPE ST / MTD ST**: interaction between solvency and liquidity is to some extent incorporated via additional shocks to funding costs that endogenously respond to solvency conditions. This is also formally embedded in the specific set of liquidity ST modelling tools (with a direct impact of solvency ratios on funding cost and access).	**BoJ ST:** despite efforts by the BoJ to incorporate liquidity risks in stress scenarios, the BoJ ST currently does not capture liquidity risk or the interaction between liquidity and credit risk. The BoJ has conducted tailored event scenarios where specific liquidity constraints in USD funding are examined. However, it would be difficult to say that the current model setup fully incorporates a transmission mechanism where liquidity risk and credit risk play an important role, and this is an area for further improvement. **JFSA ST**: the liquidity ST is conducted independently of the solvency ST. JFSA takes a bottom-up approach by using individual bank-level data in order to assess liquidity risk. It is mainly a tool for microprudential risk assessment, but is also used for financial stability risk assessments for a macroprudential perspective.	**BBA-LB/BBA-DFB**: only the reaction of funding spreads to changing solvency conditions is considered. The possibility of explicitly modelling the interaction of solvency and liquidity aspects is currently being explored in the form of network analyses. Liquidity stress tests are conducted separately. The cost of closing liquidity gaps may be integrated in the solvency stress test. However, this is not applied on a regular basis. **FINMA ST**: liquidity stress testing is covered in a separate stress testing exercise. However, banks are also requested to calculate the impact on net stable funding ratios based on the FINMA scenarios. Specific B/S roll views are applied to provide a conservative view in stress (constant B/S for capital vs shrinking B/S for liquidity).	**DFAST/CCAR**: liquidity stress testing is conducted independently of solvency stress testing. In 2012, the Federal Reserve launched CLAR for LISCC banks. Similar to CCAR, CLAR is an annual horizontal assessment, with quantitative and qualitative elements, overseen by a multidisciplinary committee of liquidity experts from across the Federal Reserve. In CLAR, supervisors assess the adequacy of LISCC portfolio firms' liquidity positions relative to their unique risks and test the reliability of these firms' approaches to managing liquidity risk. CLAR provides a regular opportunity for supervisors to respond to evolving liquidity risks and firm practices over time.

Key metrics for impact assessment

Table 19

Euro area	Japan	Switzerland	United States
SSM ST: the solvency ratio, as measured by the Common Equity Tier 1 (CET1) ratio, and the leverage ratio are the core metrics to assess the impact on banks.	**BoJ ST**: the solvency ratio, as measured by the CET1 ratio, is the core metric to assess the impact on capital resilience. This can be done on an individual bank basis. For the BoJ exercise, the main metric for the banking sector is the capital adequacy ratio. For internationally active banks, this is the CET1 capital ratio. For domestic banks, this is core capital ratios (equivalent CET1 ratios for domestic banks). Liquidity ratios are not specifically considered in the current assessments. For the BoJ exercise, the aggregate impact on the banking sector is calculated through the summation and interaction (second-round effects) of individual bank-level stress testing results. The impact on the banking sector is shown as aggregates but individual bank-level results could also be used in the bilateral dialogues with banks.	**BBA-LB/BBA-DFB**: the post-stress risk-weighted capital ratios and leverage ratios are the core metrics used to assess resilience and capital adequacy. The impact is assessed both at the level of individual banks and at the system-wide level (in aggregate and distributional terms). The impact of liquidity stress is measured in terms of the LCR. For the SIBs, the impact of liquidity stress on specific additional liquidity requirements is also examined.	**DFAST/CCAR**: the solvency ratio, as measured by the CET1 ratio, Tier 1 risk-based capital ratio and total risk-based capital ratio are the core metrics to assess the impact on capital resilience. Leverage is measured by the Tier 1 leverage ratio, and the supplementary leverage ratio. This can be done on an individual bank and aggregated basis. The regulatory capital ratios are calculated using the standardised risk-weighted assets.
MPE ST / MTD ST: the solvency ratio, as measured by the CET1 ratio, is the core metric to assess the impact on capital resilience. This can be done on an individual bank basis. On top of overall CET1 depletion, indicators such as the number/share of banks below given thresholds are computed.		**FINMA ST**: the solvency ratio, as measured by the CET1 ratio, and the leverage ratio are the core metrics to assess the impact on banks. Regulatory liquidity ratios, such as LCR, are assessed under separate liquidity STs. For the SIBs, the impact of liquidity stress on specific additional liquidity requirements is also examined.	In DFAST, there are no minimum capital ratio requirements. In the CCAR quantitative assessment, the minimum post-stress capital ratio requirements are: 4.5% of CET1, 6.0% Tier 1 capital ratio, 8.0% total capital ratio, 4.0% Tier 1 leverage ratio, and 3.0% supplementary leverage ratio applied firms adopted to the advanced approach capital framework only, which is the United States' implementation to the advance approaches rules in the Basel framework.
Contagion indicators, both within the banking sector and across financial sectors, in terms of CET1 depletion or asset share loss, are also considered. From a broader perspective, the macroeconomic impact, expressed in for instance GDP losses, are also important key metrics.	**JFSA ST**: metrics for stress testing would include (i) the CET1 ratio for the stress test simulation period of three years, (ii) the necessary information such as financial variables (including quantitative and qualitative add-ons used in estimation) needed for the simulation of the CET1 ratios, (iii) other relevant metrics, considered on a case-by-case basis (such as credit costs attributable to large exposures).		

Communication/disclosure of ST results

Table 20

Euro area	Japan	Switzerland	United States
SSM ST: banks have access to the SSM assessment of their results during the QA phase. Eventually, after completion of the QA and iterations on the bottom-up results by the banks, their final results are endorsed by the ECB/SSM. Results for banks in the EBA sample are made public. **MPE ST / MTD ST**: banks and the public get the same information, ie euro area level results with no country-specific or bank-specific results released. A version of the set of models employed for macroprudential purposes and partly used for microprudential QA purposes have been published in STAMP€.	**BoJ ST**: results of the macroprudential ST are publicly disclosed with no difference in disclosure between the banks and the public. However, an increasing use of the BoJ exercise is to benchmark against individual banks' stress test results from a microprudential perspective. **JFSA ST**: JFSA uses ST results of individual banks as communication tool with banks regarding their risk management so that the results are shared between banks and JFSA.	**BBA-LB/DFB**: results of the BBA exercise are summarised in qualitative terms in the FSR. Neither the scenarios nor the results of the BBA exercises themselves are disclosed in quantitative terms to banks or the public. Senior management within the SNB receives regular briefs on the results of the stress test. **FINMA ST**: results of the exercise are only disclosed to participating banks, not to the public.	**Public and Banks**: both CCAR and DFAST post-stress capital ratios are publicly disclosed at bank level. The Federal Reserve has also published information about its scenario design framework and annual letters detailing material model changes as part of its ongoing transparency initiative, and it hosts an annual symposium in which supervisors and financial industry practitioners share best practices in stress test modelling, model risk management and governance. **Banks Only**: for CCAR, the Federal Reserve provides each bank with a one time opportunity to adjust its planned capital distributions before the public disclosure of final post-stress capital ratios. Both sets of post-stress results are publicly disclosed. A letter is sent to each bank after the completion of the exercise, noting areas where the bank must take action to address weaknesses identified. A Questions & Answers is also prepared on an ongoing basis to assist with the interpretation of reporting instructions and related supervisory guidance. Starting in 2018, the questions and responses are published on the public Federal Reserve's website.