

# Bank stress tests - an overview of the supervisory approaches in different jurisdictions

Dr. Andreas Ita<sup>1</sup>

Orbit36 Risk Finance Solutions AG

andreas.ita@orbit36.com

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## Abstract

Bank stress tests became an important tool in nowadays banking regulation. For large and system relevant banks, supervisors rely increasingly on microprudential stress tests to take a forward-looking perspective on a bank's capital position. As stress tests are still a relatively new and evolving instrument, the variety in design and methodology is large and lacks global alignment. This paper gives an overview on the different stress testing approaches in the United States, the European Union, the United Kingdom, Switzerland and Japan. The discussion concentrates on scope, methodology and use of microprudential stress tests in these jurisdictions.

**Keywords:** stress testing; bank capital management; banking regulation; risk management

**JEL-Classification:** G21, G28

<sup>1</sup>Andreas Ita is Managing Partner at Orbit36 Risk Finance Solutions AG. Orbit36 Risk Finance Solutions AG does not accept any liability over the content of this material or any claims, losses or damages arising from the use or reliance of all or any part thereof.

## Appreviations

|       |  |
|-------|--|
| AMA   | Advanced Measurement Approach                              |
| BCBS  | Basel Committee on Banking Supervision                     |
| BHC   | Bank Holding Company                                       |
| BIS   | Bank of International Settlements                          |
| BoE   | Bank of England  |
| BoJ   | Bank of Japan  |
| CCAR  | Comprehensive Capital Analysis and Review                  |
| CET1  | Common Equity Tier 1                                       |
| CRD   | Capital Requirements Directive                             |
| CRR   | Capital Requirements Regulation                            |
| CVA   | Credit Valuation Adjustment                                |
| DFAST | Dodd-Frank Act Stress Test                                 |
| D-SIB | Domestic Systemically Important Bank                       |
| EBA   | European Banking Authority                                 |
| EC    | European Commission  |
| ECB   | European Central Bank                                      |
| ECL   | Expected Credit Loss                                       |
| EIOPA | European Insurance and Occupational Pension Authority      |
| ESFS  | European System of Financial Supervision                   |
| ESMA  | European Securities and Markets Authority                  |
| ESRB  | European Systemic Risk Board                               |
| FINMA | Financial Markets Supervisory Authority                    |
| FSB   | Financial Stability Board                                  |
| G-SIB | Global Systemically Important Bank                         |
| ICAAP | Internal Capital Adequacy Assessment Process               |
| IFRS  | International Financial Reporting Standards                |
| IHC   | Intermediate Bank Holding Company                          |
| JFSA  | Japanese Financial Services Authority                      |
| LCPD  | Largest Counterparty Default                               |
| LGD   | Loss Given Default   |
| LPA   | Loss Potential Analysis                                    |
| MDA   | Maximum Distributable Amount                               |
| MREL  | Minimum Requirement for own Funds and Eligible Liabilities |
| NII   | Net Interest Income  |
| PD    | Probability of Default                                     |
| PRA   | Prudential Regulation Authority                            |
| REA   | Risk Exposure Amount                                       |
| RWA   | Risk Weighted Assets                                       |
| SREP  | Supervisory Review and Evaluation Process                  |

# 1 Executive Summary

In the aftermath of the 2008/2009 financial crisis, stress tests have gained increasing popularity among banking supervisors and central banks. As opposed to capital adequacy measures under Pillar 1 of the Basel framework, stress tests take by their nature a forward-looking view on a bank's capital position. Stress tests are therefore an ideal instrument to inform the size of a sufficiently large capital buffer which ensures that the bank's minimum capital requirements are satisfied even under severely adverse economic conditions.

Stress tests are performed for different purposes. On the one hand, supervisors conduct macro-prudential stress tests to assess the resilience of the banking sector overall. Typically, such stress tests are performed top-down using the supervisor's own models and methodology. On the other hand, supervisors conduct micro-prudential stress tests to assess the capital adequacy of individual institutions. Often, such tests are performed bottom-up and supervisors rely on the banks' models or data.

This paper provides an overview on the stress testing frameworks used by supervisors for micro-prudential purposes in different jurisdictions. The focus is on the United States, the European Union, the United Kingdom, Switzerland and Japan because the banking sector is very important in these countries.

The variety in design and methodology of the supervisory stress tests used in the above jurisdictions is large and lacks global alignment. This is rather surprising given the attempts of the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) to harmonize capital rules at least for the largest banks. Next to the risk of unequal treatment of banks across jurisdictions, the largely uncoordinated introduction of supervisory stress testing methodologies provides also an extra burden to large international banking groups which operate in different jurisdictions. Such institutions are forced to implement different stress testing methodologies at various levels within their organization.

Supervisory stress tests are most advanced in the US, where Comprehensive Capital Analysis and Review (CCAR) was introduced already in 2011. Large US banks have to apply extensive capital planning and stress testing procedures on a yearly basis. Moreover, banks subject to CCAR also need to satisfy minimum post-stress capital ratio hurdles in order to make capital distributions to their shareholders. By contrast, the European Union undergoes its largest banks a bi-annual stress testing exercise which informs the supervisory review process, but without any formal hurdles. While for CCAR the Federal Reserve developed their own models, the EU-wide stress test relies on the bank's model results, under strict methodological guidance by the European Central Bank (ECB). The EU-wide stress test puts a lot of emphasis on the comparability of results across banks and countries. This leads to convenient but sometimes overly simplistic modelling assumptions, for instance the assumption of a fully static balance sheet. By contrast, the UK stress test encourages banks to model their capital situation as realistically as possible using approaches tailored to

their specific business models and risk profiles. Similar approaches are used in Switzerland and Japan, albeit the amount of publicly available information is quite limited and stress testing results are also not disclosed in these two jurisdictions.

In addition to the above-mentioned conceptual differences, the supervisory stress testing approaches also vary largely with respect to the length of the scenario time horizon, the number and severity of the stress scenarios, as well as the frequency with which the tests are conducted. There is, however, good alignment in terms of scope. In all jurisdictions, supervisory stress tests are applied to the largest banks, often with total assets of \$30 billion or above.

The remainder of this paper is organized as follows. Section two provides an overview of the Pillar 2 supervisory review process and the therewith related use of stress tests. Section three discusses the micro-prudential stress testing approaches used in major jurisdictions. Finally, section four concludes.

## **2 Purpose of supervisory stress tests**

### **2.1 Pillar 2 supervisory review process**

When talking about capital requirements for large banks, a lot of attention is given to the minimum capital requirements under Pillar 1 of the Basel framework. Analysts, investors and the broader public are often not or only vaguely familiar with the supervisory review process under Pillar 2 of the Basel framework. However, with the increasing use of supervisory stress tests and the possibility that these may ultimately result in incremental capital requirements for banks, this is likely to change in the future. For this reason, this subsection provides a brief general overview of the Pillar 2 supervisory review practices and approaches.

The Pillar 2 supervisory review process aims to ensure that banks do not only maintain an adequate level of capital to support the risks in their business but also develop and implement risk management techniques for monitoring and managing these risks. Specifically, bank managements are responsible to ensure that their banks have a sufficient amount of capital to support risks beyond the minimum requirements. In addition, supervisors evaluate the quality of the banks' own assessment of their capital needs relative to their risks, and prompt decisive action if needed.

Importantly, Pillar 2 of the Basel framework does not provide prescriptive guidance or direction on supervisory approaches. Rather, supervisors enter into an active dialogue with banks, with the aim to identify and address potential issues like excessive risks, insufficient capital or other deficiencies. Given their complementary purpose, the supervisory approaches are principle-based and tailored towards specific risks and circumstances in different jurisdictions. As a consequence, the regulatory approaches vary significantly across countries.

In most cases supervisors use a bank's Internal Capital Adequacy Assessment Process (ICAAP) and/or stress testing results as a starting point when performing their review process. These documents provide supervisors periodic information related to a bank's risk profile and associated capital resources. In particular stress testing results are considered useful for this purpose, as they offer a holistic, forward-looking assessment of a bank's overall viability. Supervisors want banks to understand all their risks and that they acknowledge full responsibility for managing and mitigating these risks. More specifically, supervisors expect to see a consistent linkage between a bank's risk appetite and the limits, targets, triggers and thresholds. Further, the risk appetite of a bank needs to be aligned with the bank's strategy, business plan and capital planning practices.

In terms of Pillar 2 capital requirements, supervisors usually distinguish between binding and non-binding requirements. Binding requirements (typically referred to as 'Pillar 2A' or 'Pillar 2R') are similar to those under Pillar 1 and need to be met all times. They are for instance imposed for risks not fully captured or factors not taken into account by the Pillar 1 process. By contrast, non-binding requirements (typically referred to as 'Pillar 2B' or 'Pillar 2G') represent rather expectations or guidance that banks should meet in normal times, but that can be deviated from in times of stress. Non-binding Pillar 2 requirements serve therefore as additional capital buffer to withstand a severe economic crisis. The size of this buffer can be informed by a bank's stress testing results.

## **2.2 Purpose and use of stress tests**

Supervisory stress tests provide a forward-looking perspective on an individual bank's capital situation. Typically, such tests are performed with the aim of understanding the capital situation of a bank after a prolonged period of severe macroeconomic stress. In this context, it is important to recall that a bank's capital requirement under Pillar 1 of the Basel Framework is determined by the combination of a minimum requirement plus additional buffers (e.g. capital conservation buffer, systemic risk buffer for G-SIB/D-SIB, countercyclical buffer). As the buffers aim to ensure that a bank continues to operate above its minimum requirements even under severe stress, it follows by design that these buffers can be used to absorb losses that may occur during a severe macroeconomic crisis. Thus, the capital ratios projected under a stress scenario are typically below the capital requirements that a bank needs to satisfy in normal times, but above the minimum requirements. Stress tests provide therefore a suitable tool for supervisors to calibrate the size of capital buffers on both industry and bank level if needed. And similarly, stress tests can be used by individual banks to define their risk appetite and to inform their capital need from a bank internal perspective. In many jurisdictions, the latter view is via the ICAAP process even mandatorily required for regulatory capital adequacy purposes.

## 3 Stress testing approaches in different jurisdictions

Supervisory stress tests are still a relatively new and evolving tool in banking regulation. As a consequence, no uniform global approach or standard has established. This section provides an overview over the different approaches used in the US, the EU, the UK, Switzerland and Japan. The discussion concentrates on scope, methodology and use of micro-prudential banking stress tests in these jurisdictions.

### 3.1 United States

#### 3.1.1 Scope of CCAR/DFAST

In the United States, CCAR was introduced by the Federal Reserve in autumn 2011, initially applying to US Bank Holding Companies (BHCs) with consolidated assets of \$50 billion or more. In the meantime, this threshold has been increased to \$100 billion. Since 2018, CCAR also applies to foreign banks with large U.S. operations, so called Intermediate Bank Holding Companies (IHCs). BHCs and IHCs subject to CCAR are required to submit detailed capital plans over a nine-quarter horizon under different scenarios, namely the three supervisory scenarios *baseline*, *adverse*, and *severely adverse*, as well as the two internally generated scenarios *BHC baseline* and *BHC adverse* which both consider bank specific vulnerabilities.

The Federal Reserve's annual CCAR cycle for the largest BHCs and IHCs consists of a quantitative and a qualitative part. The quantitative assessment in the first part is based on supervisory and company-run stress tests under the Dodd-Frank Wall Street Reform and Consumer Protection Act and is commonly referred to as Dodd-Frank Act Stress Test (DFAST). The second part is a qualitative assessment which considers the firms' capital planning practices, specifically a firm's ability to determine its capital needs on a forward-looking basis.

In 2018, a number of relieves were granted to banks. On the one hand, the Economic Growth, Regulatory Relief, and Consumer Protection Act passed in May 2018 released institutions with under \$100 billion in assets from CCAR. On the other hand, the so-called Tailoring Rule introduced by the Federal Reserve in October 2018 divided US BHCs with more than \$100 billion of total assets into four different categories subject to different stress-testing requirements. Category I firms include the US global systemically important banks (G-SIBs), which are subject to CCAR and annual DFAST. Category II firms include firms with \$700 billion or more in total consolidated assets or significant international activities.<sup>1</sup> These BHCs are also subject to CCAR and annual DFAST. Category III firms include firms with \$250 billion or more in total consolidated assets or \$75 billion or more in either i) nonbank assets ii) weighted short-term wholesale funding and iii) off-balance-sheet exposure. Among others, these

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<sup>1</sup>BHCs with assets of less than \$700 billion belong to Category II if they have \$75 billion or more in cross-jurisdictional activity not otherwise subject to Category I standards

firms are relieved from advanced approaches capital requirements and have to perform company-run DFAST only every two years, but remain subject to the qualitative assessment under the Federal Reserve's CCAR program on a yearly basis.<sup>2</sup> Lastly, category IV firms include all remaining firms with total consolidated assets over \$100 billion. These firms benefit from the largest releases, but they remain subject to the qualitative assessment under the Federal Reserve's CCAR program on a semi-annual instead of annual basis.<sup>3</sup> Requirements for IHC's of foreign bank organizations are ruled separately.

In total, 35 banks are subject to stress testing requirements under DFAST. These firms are listed in Appendix A. As a number of less complex banks with total assets of less than \$250 billion were granted relief for the 2019 cycle, only 18 firms were tested under DFAST in 2019, including the IHCs of Barclays, Credit Suisse, Deutsche Bank and UBS.

### 3.1.2 Quantitative Approach

The quantitative assessment under DFAST and CCAR helps to ensure that banks maintain a sufficient level of capital so that they can continue their operations even under severe economic and financial markets stress. The CCAR process also aims to act as counterweight to pressures banks may face to use capital distributions to signal financial strength.

While both DFAST and CCAR are supervisory stress tests under the same hypothetical set of stressful economic conditions developed by the Federal Reserve, it is important to note that there are material differences between DFAST and CCAR. A summary of the different assumptions is provided in table 1.

For DFAST, the Federal Reserve projects capital levels and capital ratios over nine quarters of stress using their own models and a standardized set of capital action assumptions specified in the Dodd-Frank Act stress test rules (e.g. same level of dividends as in the previous year, no issuance of new common stock or preferred stock, no repurchases of capital instruments). By contrast, CCAR applies the firms' own capital planning assumptions, i.e., proposed capital issuances and proposed capital distributions as per BHC's baseline capital plan.<sup>4</sup> Otherwise, the CCAR supervisory post-stress capital analysis is based on the results as available from the Federal Reserve's supervisory stress test under DFAST. In addition, the CCAR quantitative assessment also takes into account the results of the firms' internal stress tests. For those, the firms rely on their own models. The BHCs are required to evaluate the same scenarios as provided by the Federal Reserve for DFAST, plus in addition an own baseline scenario and at least one self-developed stress scenario which takes into account the BHC's idiosyncratic risks.

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<sup>2</sup>Internal stress tests are still required in connection with the annual capital plan submission

<sup>3</sup>Capital plans still need to be submitted annually

<sup>4</sup>While arguably easy and in most cases conservative, using proposed capital planning assumptions from the baseline capital plan is questionable from a methodological viewpoint. Banks will typically react to stressful conditions by suspending planned repurchase of capital instruments, reducing or cancelling planned dividends, or even by raising new common stock or preferred stock to the extent market conditions permit

**Table 1: Comparison of assumptions**

This table provides a comparison of the assumptions for the Dodd-Frank Stress Test, the CCAR supervisory assessment and the internal CCAR stress tests performed by the BHCs.

| <b>Component</b>             | <b>Dodd-Frank Stress Test (DFAST)</b>   | <b>CCAR supervisory assessment</b>  | <b>CCAR internal stress test</b>                         |
|------------------------------|---|---|--|
| Models                       | developed by Federal Reserve  | developed by Federal Reserve  | developed by BHC   |
| Data inputs                  | provided by BHC   | provided by BHC   | provided by BHC  |
| Macroeconomic scenario       | developed by Federal Reserve (baseline, adverse, severely adverse)                              | developed by Federal Reserve (baseline, adverse, severely adverse)                              | developed by BHC (BHC baseline, BHC stress)              |
| Capital planning assumptions | standardized set of assumptions prescribed by Federal Reserve                                   | BHC's capital planning assumptions for baseline scenario  | BHC's capital planning assumptions for baseline scenario |
| Risk-weighted assets         | standardized approach   | standardized approach   | standardized approach                                    |
| Additional components        | global market shock and largest counterparty default for adverse and severely adverse scenarios | global market shock and largest counterparty default for adverse and severely adverse scenarios |  |

Firms with large trading and private equity exposures are additionally subject to a global market shock component and a largest counterparty default (LCPD) component under the adverse and severely adverse scenarios.<sup>5</sup> The global market shock component aims to cover losses on trading and private equity positions. It assumes that losses occur instantaneously, i.e., at the beginning of the stress period. The global market shock component considers also losses due to changes in Credit Valuation Adjustments (CVA) and incremental default risk on positions in the trading book, in excess of the mark-to-market losses. The largest counterparty default component requires firms to assume the unexpected default of their largest counterparty, i.e., the counterparty whose default on all derivatives and securities financing positions would generate the biggest loss. Similarly as for the global market shock, the estimated loss from the default of the largest counterparty has to be considered in the first quarter of the stress scenario.

For both DFAST and CCAR, risk-weighted assets are computed under the standardized approach, even for firms which apply advanced approaches under Pillar 1. The use of advanced approaches risk-weighted asset calculations for stress-testing is indefinitely delayed.

Irrespective of the used scenarios and models, firms have to demonstrate their ability to maintain their capital ratios above the regulatory minimum in each quarter throughout the entire planning horizon. For the 2019 CCAR cycle, the firms had to satisfy the minimum capital ratios provided in table

<sup>5</sup>The global market shock component applies to firms with trading assets or liabilities of more than \$50 billion or more than 10 percent of consolidated assets, provided it is not a large and noncomplex firm.

2. It is interesting to note that the CCAR minimum requirements for CET1,

**Table 2: CCAR minimum post-stress capital ratios**

This table provides the minimum capital ratios the firms have to meet under CCAR in each quarter of the baseline and the adverse and severely adverse stress scenarios

| <b>Regulatory ratio</b>                   | <b>Definition</b>                     | <b>Minimum</b> |
|---|---------------------------------------|----------------|
| Common Equity Tier 1 (CET1)               | CET1/RWA                              | 4.5%           |
| Tier 1                                    | Tier 1/RWA                            | 6.0%           |
| Total capital                             | Total capital/RWA                     | 8.0%           |
| Tier 1 Leverage Ratio                     | Tier 1/average assets                 | 4.0%           |
| Supplementary Leverage Ratio <sup>a</sup> | Total capital/total leverage exposure | 3.0%           |

<sup>a</sup>Supplementary Leverage Ratio applies only to advanced approaches firms

Tier 1 and Total capital over the next 9 quarters under both expected and stressful conditions correspond to the minimum requirements under the Basel III framework (4.5% CET1 ratio, 6.0% Tier 1 ratio, 8.0% total capital), not including any buffers. The CCAR stress testing requirements set therefore de-facto the BHC's overall capital buffer requirement based on a BHC's individual risk profile, at least in those cases where it exceeds the capital buffer requirement under Pillar 1 of the Basel III framework.

As the firms determine their proposed capital issuances and capital distributions in the baseline capital plan without knowing the outcome of their DFAST results computed by the Federal Reserve, the firms are given a onetime opportunity to adjust their planned capital distributions after receiving the Federal Reserve's preliminary post-stress capital ratio estimates. The firms can specifically reduce their planned dividends, the planned repurchase of shares or the redemption of other regulatory capital instruments in their baseline capital plan to meet the post-stress hurdles. For the 2019 CCAR assessment, the Federal Reserve also considered planned issuances of common stocks in the third quarter of the planning horizon, provided that the firm has reduced its planned capital distributions to zero in the second quarter. Notably, all of these actions are considered in the firm's baseline capital plans and have therefore to be implemented even without the firms facing stress. This is different from other jurisdictions, where such measures are considered as planned mitigation actions under the stress scenario itself, i.e., as actions the firms would only implement in case stress were to materialize.

### 3.1.3 Qualitative Approach

The qualitative assessment in the CCAR process aims to promote better risk management and greater resiliency of the largest banks. It ensures that these institutions have strong capital planning processes in place, which allows them to better assess their capital needs on a forward-looking basis. The main focus of the qualitative assessment is on the effective identification, measurement and management of all material firm-wide risks, as well as on strong internal controls and governance. The Federal Reserve specifically evaluates the robustness of the firms' capital planning processes, the comprehensiveness of the capital plans, the reasonableness of the assumptions and analysis underlying the plans and to what extent they cover the potential risks of the specific firms.

In April of each year, banks have to submit their capital plans to the Federal Reserve. The firms' submissions have to include detailed descriptions of their capital planning practices, as well as the underlying analyses, internal processes and policies for assessing capital adequacy and capital actions. Subsequently, these plans are assessed by subject matter experts from the Federal Reserve over a three-month period. The assessment takes additionally into account information from supervisory reviews conducted throughout the year. The supervisory teams rate a firm's capital planning practices in six areas (see below). On the basis of their ratings and further reviews by senior staff, the Federal Reserve's Board makes its decisions to object or not to object a firm's capital plan for qualitative grounds. An objection for qualitative grounds can for example arise because of unresolved material supervisory issues, inappropriate assumptions and analysis underlying the capital plan, or inadequate governance, internal controls, risk management and risk identification in support of a firm's capital planning practices.<sup>6</sup> Qualitative objections in past CCAR cycles were typically due to multiple deficiencies in one or more areas of a firm's capital planning process.

For the largest and most complex firms, the qualitative assessment is based on a supervisory evaluation whether a firm has sound practices for determining its capital needs. The Federal Reserve relies specifically on an assessment of the underlying analyses and support for a firm's annual capital plan, the monitoring of the remediation of outstanding supervisory findings related to capital planning and the execution of targeted exams related to capital planning undertaken throughout the year. The six areas which are critical to sound capital planning are discussed below.

**1. Governance** For a firm's senior management to be able to make informed recommendations to the board of directors related to capital adequacy, it is crucial that a capital plan is reliable, based on sound analytical support and taking into account the expectations of the main stakeholders. Moreover, a capital plan has to adequately cover a firm's expected financial conditions and material risks. Senior management has therefore to design and oversee the capital planning process, including periodic review and approval by the board of directors. Further, senior management has to implement an independent review framework for the capital planning process, also covering the use of models and other estimation approaches.

**2. Risk Management** Firms have to establish a comprehensive risk identification process which allows identifying, measuring and assessing all material firm-wide risks. The process needs to be integrated with the capital planning process and should consider a firm's unique business activities and exposures. A firm also needs to understand how its material risks may evolve under both normal and stressed conditions, and it should take into account those when determining its capital needs.

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<sup>6</sup>Reasons for objections on qualitative ground explicitly stated by Federal Reserve in CCAR 2019 results publication, but not limited to these

**3. Internal Controls** To ensure the capital planning process is working as designed, a firm has to establish an internal control framework which supports the entire process. Specifically, an adequate internal control framework needs to have i) policies and procedures supporting consistent and repeatable processes, ii) validation of estimation methods for suitability, iii) reliable data and information systems, and iv) an internal audit function which independently assesses the efficacy of the capital planning process. This helps to detect potential errors which could make the capital plan unreliable.

**4. Capital Policy** The principles and guidelines used for capital planning need to be described in a written capital policy. This document should cover the firm's risk appetite, post-stress capital goals and targeted capital levels, as well as organizational structure, business strategy and governance structure. A firm's post-stress capital goals should be aligned with the firm's risk profile and risk appetite, including capital limits supported by forward-looking analysis of the firm's risks. The capital policy also needs to define the actions the firm will take to mitigate potential breaches of capital targets or post-stress capital goals, allowing the firm's senior management and board of directors to proactively address capital shortfalls.

**5. Scenario Design** To be able to test the potential range of outcomes a firm could face under stress, a firm has to rely on its capabilities to design stress scenarios which are sufficiently severe and also capture firm specific vulnerabilities. A scenario should include a narrative of the hypothetical economic situation, as well as projections of the relevant economic variables under these conditions. Firm specific scenarios should additionally be linked with the firm's risk identification process so that the scenario appropriately covers the unique risks arising from a portfolio material to the firm's business.

**6. Projection Methodologies** Capital planning on a forward-looking basis critically relies on the availability of reliable methods to forecast losses, revenues and expenses over the full planning horizon, under both expected and stressed economic conditions. Firms should therefore use sound methods which relate macroeconomic and other risk factors to its projections. For this purpose, a firm needs to be able to identify the key drivers of its losses, revenues and expenses, and it needs to be capable to estimate the respective sensitivities quantitatively. Further, models need to be sensitive to firm's risk characteristics and scenario conditions and the underlying assumptions need to be well-supported.

#### **3.1.4 Overall assessment of Capital Plan Submissions**

When making the overall assessment of a firm's capital plan submission, the Federal Reserve takes into account the findings of both the quantitative and the qualitative assessments and ultimately decides whether to object or not to object a firm's capital plan.<sup>7</sup> If a capital plan is rejected, a firm is not allowed to make any capital distributions unless explicitly permitted by the Federal Reserve.

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<sup>7</sup>The Federal Reserve's decision to object or not to object is carried out annually. The decision only applies to the next four quarters

In March 2019 the Federal Reserve decided to limit for the 2019 CCAR cycle the use of objections for qualitative grounds to those five firms which became only recently subject to CCAR and which continue to exhibit material deficiencies in capital planning (Barclays US LLC; Credit Suisse Holdings (USA), Inc; DB USA Corporation; TD Group Holdings LLC; UBS Americas Holding LLC).

The Federal Reserve can also issue a so-called conditional non-objection to a firm's capital plan, which requires a firm to address the weaknesses in its capital adequacy process within a given deadline. A conditional non-objection was granted to Credit Suisse Holdings (USA), Inc in July 2019, as the Federal Reserve identified weaknesses in the assumptions used by the firm to project stressed trading losses. Credit Suisse Holdings (USA), Inc is required to address the noted weaknesses by October 27, 2019.

Sources:

Dodd-Frank Act Stress Test 2019: Supervisory Stress Test Results, Board of Governors of the Federal Reserve System, June 2019, available on [www.federalreserve.gov/supervisionreg/dfa-stress-tests.htm](http://www.federalreserve.gov/supervisionreg/dfa-stress-tests.htm)

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## **3.2 European Union**

### **3.2.1 Scope of EU-wide stress test**

Within the European Union, the European Banking Authority (EBA) is mandated to initiate and coordinate the EU-wide stress test, in cooperation with the European Systemic Risk Board (ESRB), the European Central Bank (ECB) and the European Commission (EC). The EBA was established in 2011 as part of the European System of Financial Supervision (ESFS).<sup>8</sup> Its main task is to provide a single set of harmonized prudential rules for financial institutions with the EU (European Single Rulebook in banking), and it is also mandated to assess risks and vulnerabilities in the EU banking sector. While the national supervisory authorities in the 28 EU member states remain generally in charge for the supervision of individual financial institutions, the ESFS has to ensure the efficient functioning of the single market through a supervisory framework

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<sup>8</sup>The ESFS is comprised of the three European supervisory authorities European Banking Authority (EBA), the European Securities and Markets Authority (ESMA) and the European Insurance and Occupational Pensions authority (EIOPA), together with the European Systemic Risk Board (ESRB), the European Central Bank (ECB) and the Member States' competent supervisory authorities

that can be consistently applied in all member states. For large banks in the euro area (so called significant banks under the Single Supervisory Mechanism), supervision is performed by the ECB directly. A bank is considered significant if i) the size of its total assets exceeds EUR 30 billion, ii) if it is economically important for a specific country or the EU overall, iii) if it holds material cross-border assets/liabilities or iv) if it has requested or received direct public financial assistance from the European Stability Mechanism or the European Financial Stability Facility. Currently, the ECB directly supervises 114 significant banks, which hold more than 80 percent of banking assets in the euro area. Less significant banks are supervised indirectly by their national supervisory authorities, but under the oversight of the ECB.

The EU-wide stress test aims to compare and assess the resilience of EU banks and the EU banking system in a consistent way. It is designed to inform the Supervisory Review and Evaluation Process (SREP), which is used by the joint supervisory teams from the ECB and the national supervisors to assess and measure the risks of each bank based on a harmonized method across member states. SREP examines a bank's risk profile in the four areas business model, governance and risk, capital and liquidity. SREP was first carried out for the largest banking groups in the euro area in 2015. Since 2018, the scope of SREP is gradually extended to less significant institutions with the aim of covering all less significant institutions by 2020.

Generally, banks are included in the EU-wide stress test if they have consolidated assets of EUR 30 billion or more. However, national supervisory authorities can request to include additional institutions in their jurisdiction at their own discretion. The 2018 EU-wide stress test involved 48 banks from 15 EU and EEA countries, covering broadly 70% of total EU banking sector assets. From those banks, 33 are under directly supervision of the ECB. A list of the banks subject to the EU-wide stress test is provided in Appendix B.

The EU stress test is run at the highest level of consolidation. This means that banking groups located in the EU are normally tested in their entirety. The scope of consolidation follows the perimeter of the banking group as defined by the Capital Requirements Directive (CRD) and Capital Requirements Regulation (CRR). Insurance activities are therefore typically excluded from both the balance sheet and the P&L.

### **3.2.2 Approach**

For the EU-wide stress test, banks have to project their capital ratios over a three-year period. The macroeconomic scenario for the baseline projections is prescribed by the ECB. The adverse macroeconomic scenario and the risk type specific shocks related to it are determined by the ESRB and the ECB in close cooperation with the EBA, as well as with national supervisory authorities and central banks. Starting point for all projections is typically the last calendar year. For the 2018 EU-wide stress test, the banks were required to consider the impact from the introduction of IFRS 9 in the starting point, as well as in the forward-looking projections. Capital is computed under the definitions

of CRR/CRD, with transitional arrangements applied as valid for every year. Results are reported for the CET1 ratio, the Tier 1 ratio and the leverage ratio at the end of each year. There are no explicit minimum post-stress capital ratios or thresholds which need to be met, but the supervisory authorities will use the stress test results as input into SREP. Thus, the EU-wide stress test has potential capital implications for individual banks through Pillar 2 requirements.

The EU-wide stress test is a constrained bottom-up stress test. This means that the banks are required to project the impact of the defined scenarios using their own models, but subject to strict constraints and thorough review by supervisors. For instance, banks are explicitly instructed to conduct the stress test under the assumption of a static balance sheet, i.e., assuming that assets and liabilities which mature within the three year projection horizon are replaced with similar financial instruments in terms of type, currency, credit quality and original maturity as at the starting point.<sup>9</sup> Planned capital measures or divestments must not be included in the banks' projections. There are no exemptions allowed from the static balance sheet assumption, not even for those institutions subject to mandatory restructuring plans agreed with the European Commission.<sup>10</sup> Moreover, banks are required to apply a common simplified tax rate of 30 percent in their forward-looking P&L projections, irrespective of their effective tax rate. Lastly, planned dividend payments under the stress scenario are subject to a Maximum Distributable Amount (MDA) restriction if they are in breach with combined buffer requirements. Thus, banks may have to reduce or cancel planned capital distributions under stress.

In terms of risk coverage, the EU-wide stress test includes stress-estimates for credit risk, market risk as well as operational risk including conduct risk. The calculation of the risk exposure amounts (REA) for these risk types follows detailed guidance, including constraints which make the estimates more conservative.<sup>11</sup> Credit risk is modelled based on stressed point-in-time PD and LGD and additionally considers grade migration under IFRS 9 (e.g. change to lifetime ECL for positions entering stage 2). Market risk requires a revaluation of positions held with a trading intent, including related hedges and impact on credit valuation adjustment (CVA). The revaluation occurs by applying a set of instantaneous stressed market risk factors, i.e., market risk only takes into account the initial shock at the beginning of a crisis. Banks are allowed to consider client revenues from items held with a trading intent (e.g. retained portion of bid/ask spread or mark-up) if they are able to provide historical evidence for the sustainability of these incomes under stress.<sup>12</sup> Additionally, banks have to

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<sup>9</sup>The static balance sheet assumption also means that banks are neither allowed to assume capital measures nor workout or cure of assets. Moreover, the banks have to assume the same business mix and models throughout the entire time horizon. The revenue and cost assumptions have to be consistent with these assumptions and should also be in line with the constraint of zero growth.

<sup>10</sup>Such items shall though be reported 'below the line' on a separate template

<sup>11</sup>Constraints are often in the form of floors or caps, for example REA for credit risk floored at 2017 value, NII cannot increase under adverse scenario, et cetera.

<sup>12</sup>For the adverse scenario, client revenues have to be capped at the larger of 75% of client revenues and 75% of baseline net trading income

include estimates for credit counterparty risk (CCR), assuming that from the 10 largest counterparties the two most vulnerable ones default. Estimates for conduct risk and other operational risks are based on banks' own estimates, using advanced measurement approach (AMA) or calculation as a function of gross earnings in case no historical data is available. In addition to the loss projections given by the REA, the banks have to provide estimates for stressed net interest income (NII), stressed non-interest income and stressed expenses.

Sources:

'About us' on [www.eba.europa.eu](http://www.eba.europa.eu), European Banking Authority, retrieved in September 2019 from <https://eba.europa.eu/about-us;jsessionid=36F14F716728AFBD1DC96A5E6EE07C58>

'EU-wide stress testing 2018' on [www.eba.europa.eu](http://www.eba.europa.eu), European Banking Authority, retrieved in September 2019 from <https://eba.europa.eu/risk-analysis-and-data/eu-wide-stress-testing/2018>

### **3.3 United Kingdom**

#### **3.3.1 Scope of UK stress test**

The stress testing framework for the UK banking system was established by the Bank of England (BoE) in 2013. The first annual stress test was implemented in 2016 and is known as 'annual cyclical scenario'. The main purpose of this stress test is to provide a forward-looking, quantitative assessment of the capital adequacy of the UK banking system, both for individual banks as well as the system overall.

Since its inception, the UK stress test covers the same seven participating banks and building societies, namely Barclays, HSBC, Lloyds Banking Group, Nationwide, Royal Bank of Scotland, Santander UK and Standard Chartered. Although there are no published formal criteria for the inclusion into the UK stress test, the sample appears quite evident as all of the participating institutions have total balance sheet assets of several hundred billion pounds or more, while the next following institutions are with total balance sheet assets below GBP 50 billion much less significant. The seven banks subject to the UK stress test account for around 80 percent of PRA-regulated lending volumes.

The UK stress test is run at the highest level of UK consolidation. The scope of consolidation follows the perimeter of the banking group as defined by CRR/CRD IV, which includes investment banks. Insurance activities are excluded, but banks are expected to assess the impact of the scenario on their dividend income from insurance activities, as well as the related significant investments, minority interest, capital deductions and risk-weightings.

### 3.3.2 Approach

The annual cyclical scenario in the UK stress test runs over a five-year period. Starting point is the 31 December of the previous calendar year. The banks project their capital positions at each year end under a baseline and a stress scenario. For both scenarios a set of key macroeconomic and financial variables is provided by the BoE. The banks need to further expand this set of variables by using own robust statistical techniques.

Banks have to forecast losses, income and expenses, as well as impacts on risk-weighted assets and other capital elements. The banks use their own models, but the BoE provides specific guidelines on the modelling assumptions. As opposed to stress tests in other jurisdictions, the instructions given by the BoE put less emphasis on a uniform modelling approach across firms. Rather than forcing comparability of results across firms, the BoE seems to be driven by a desire to make the stress test for each institution as realistic and meaningful as possible, also aligned with the banks' own business plans. Since inception, the UK stress test is performed on the assumption of a dynamic balance sheet and banks' submissions should reflect their own business plans, including any planned costs and business changes (adjusted appropriately to scenario conditions). Notably, the BoE provides variable paths for selected lending volumes which the banks need to consider, together with their expectation of their future market share. To the extent included in their business plan, banks can incorporate planned balance sheet size reductions in their baseline and stress projections. Similarly, banks should reflect the expected effects of future regulatory, legal or accounting changes in their projections if they did so in their business plan, even if requirements or implementation details have not yet been finalized.

Related to IFRS 9 provisioning, banks should follow two key methodological principles. On the one hand, banks should assume 'perfect foresight' in their provision calculations, i.e., banks should assume they are able to accurately predict the five years of economic and financial market data from day one (no uncertainty in ECL calculations). On the other hand, they should apply a single scenario, i.e., banks should assign a 100 percent probability weight to the given baseline and stress scenario, respectively. For the necessary extension of the scenarios beyond the five-year horizon, banks shall assume a linear return to the outer year variable projections provided by the BoE.

For the UK stress test, banks are explicitly asked to evaluate what mitigation actions they could implement in response to stress. For this purpose, the BoE distinguishes between strategic management actions and business-as-usual management actions. Strategic management actions are defined as extraordinary actions taken in response to the stress scenario (e.g. asset disposals, strategic costs cuts). Such actions typically require board approval and therefore take some time to be implemented. Banks should therefore not include strategic management actions in their stress projections. Instead, these should be set out separately and banks should provide their capital ratios in each year of stress pre- and post-strategic management actions. Also, the BoE expects strategic management actions to have a material benefit to the bank's capital

position, to be part of the bank's recovery plan, and to be executable under stress and with no material impediments. By contrast, business-as-usual management actions represent actions that banks could and would take as a natural response to weakening economic conditions. The banks have to submit a detailed description of all material business-as-usual actions alongside their stress projections.

Assumed dividend payments under the stress scenario should be in line with a bank's publicly disclosed payout ratio range.<sup>13</sup> Further reductions in dividend payments are possible but shall be reported separately as strategic management actions. Banks should also consider the impact on the issuance, redemption, amortization and maturity of their regulatory capital instruments (Additional Tier 1, Tier 2, MREL) under the stress scenario. The impact from contingent capital instruments being triggered for conversion should, however, not be included in the projections. Instead, banks shall show the impact of a conversion as part of the management actions template, regardless of whether a trigger event is expected to occur based on the scenario projections or not.

In the UK stress test, banks need to pass firm specific post-stress hurdle rates for risk-weighted CET1 ratio and Tier 1 leverage ratio at the lowest point. These minimum post-stress ratios are set by the BoE in a separate hurdle rate framework which still further evolves. For the 2018 stress test, the bank individual hurdle rates were set between 6.7% and 8.5% for risk-weighted post-stress CET1 ratio and between 3.26% and 3.79% for post-stress Tier 1 leverage ratio, respectively. These hurdle rates are applied on post-stress ratios before the conversion of contingent capital instruments and under transitional IFRS 9 arrangements. The hurdle rates reflect the bank's minimum capital requirement (4.5% risk-weighted CET1 ratio, 3.25% Tier 1 leverage ratio) plus their individual G-SIB/D-SIB buffers and Pillar 2A requirements, less an adjustment related to the impact of IFRS 9.<sup>14</sup> From a methodological viewpoint, this approach implies that stress has to be absorbed by the capital conversation buffer, the countercyclical buffer, the Pillar 2B capital and the banks' own buffers, while the G-SIB/D-SIB buffers and Pillar 2A capital requirements have to be maintained even under adverse economic conditions.

Sources:

Stress testing the UK banking system: key elements of the 2019 annual cyclical scenario, Bank of England, March 2019, available on <https://www.bankofengland.co.uk/news/2019/march/key-elements-of-the-2019-stress-test>

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<sup>13</sup>If no payout ratio range is available, dividends should be fixed at the levels projected in the baseline scenario.

<sup>14</sup>The BoE justifies the hurdle rates adjustment for IFRS 9 by the fact that credit provisions reduce the capital impact of the credit losses at the time they arise, i.e., IFRS 9 credit provisions just reflect the accelerated capital impact of credit losses under stress. Thus, not adjusting hurdle rates for the impact of IFRS 9 would unintentionally raise the amount of capital banks have to hold in order to absorb stress.

Financial Stability Report, Issue No. 44, Bank of England, November 2018, available on <https://www.bankofengland.co.uk/stress-testing/2018/stress-testing-the-uk-banking-system-2018-results>

## 3.4 Switzerland

### 3.4.1 Scope of FINMA Loss-Potential Analysis

For Switzerland, the amount of publicly available information on stress testing is only scarce. The Financial Markets Supervisory Authority (FINMA) explicitly mentions stress tests as 'a supervisory instrument that FINMA applies to a selection of prudentially supervised institutions', but without giving much further details. The following description of FINMA's Loss-Potential Analysis (LPA) mainly relies on information as available from the BIS paper 'Stress-testing banks - a comparative analysis', and particularly the associated online appendix. The description is also consistent with my own practical experience with the LPA stress test.

The LPA stress test is an instrument of FINMA's supervisory review and assessment process. Its objective is to challenge the banks' internal capital adequacy assessments, as well as the risk management and capital planning capabilities of individual banks. LPA is a scenario-based bottom-up stress test which relies on bank data and bank-internal models. Currently, only the two Swiss G-SIBs UBS and Credit Suisse are subject to the LPA stress test.<sup>15</sup> Results are not disclosed publically, but discussed between FINMA and the participating banks.

### 3.4.2 Approach

For the LPA stress test, the two large Swiss banks have to evaluate two different stress scenarios. One scenario is held largely constant to monitor the evolution of a bank's risk profile over time. By contrast, the other scenario aims mainly to explore new vulnerabilities. The results under both scenarios are part of a systematic benchmarking process across the two banks and compared with the most relevant bank internal scenarios and economic capital metrics. While LPA is used to assess the adequacy of capital buffers, FINMA does not explicitly define minimum thresholds or targets for post-stress capital ratios.

LPA builds on the banks' internal risk infrastructure and stress testing methodologies. As a general principle, banks should not assume balance sheet shrinkage under stress. However, the evolution of portfolio characteristics over the scenario horizon (e.g. volume of assets under management, impact on Lombard lending portfolios) is taken into account. Thus, the LPA stress test is neither based on strictly static nor fully dynamic balance sheet assumptions, but conservatively considers the material impacts which are likely to arise under a given stress scenario. When FINMA is not convinced by the banks' modelling approaches or the results in certain areas, FINMA raises its concerns and expectations.

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<sup>15</sup>According to FINMA, further stress tests have been carried out regularly at medium-sized and smaller institutions

In addition, FINMA typically applies specific add-ons to results computed by banks when not being satisfied. These add-ons are maintained until the banks have sufficiently enhanced their approaches or results.

Sources:

Stress tests: a key tool of banking supervision, Fact Sheet, Swiss Financial Market Supervisory Authority FINMA, January 2016, available on <https://www.finma.ch/en/supervision/banks-and-securities-dealers/supervisory-instruments/stress-tests/>

Stress-testing banks - a comparative analysis, FSI Insights on policy implementation No 12, Financial Stability Institute, November 2018, available on <https://www.bis.org/fsi/publ/insights12.htm>

Online appendix to: Stress-testing banks - a comparative analysis, FSI Insights on policy implementation No 12, Financial Stability Institute, November 2018, available on [https://www.bis.org/fsi/publ/insights12\\_appendix.pdf](https://www.bis.org/fsi/publ/insights12_appendix.pdf)

## **3.5 Japan**

### **3.5.1 Scope of JFSA stress test**

Japan undergoes its banking system two different stress tests. A micro-prudential stress test conducted by the Japanese Financial Services Authority (JFSA) and a macro-prudential stress test performed by the Bank of Japan (BoJ). Given the focus of this paper on supervisory stress tests for capital adequacy purposes, the following only discusses the JFSA stress test. In the absence of detailed information on the JFSA homepage, the following section is based on a compilation of information available from other sources, namely a JFSA document describing their new supervisory approach and the online appendix of the BIS paper 'Stress-testing banks - a comparative analysis'.

In a more recent paper, the JFSA provides an overview over their new supervisory approaches. In essence, the JFSA wants to move away from its rigorous, check-list based loan-by-loan review process and replace it with a more dynamic supervisory review approach. The JFSA regards stress tests as an important forward-looking instrument which can help to identify situations of increased likelihood that a bank may breach its minimum capital requirements in the future. This could for example arise if a firm is exposed to excessive amounts of risks not captured by existing capital adequacy standards, if a firm's business model and profitability is no longer sustainable in the future, or if a firm's governance and corporate culture is not strong enough to prohibit imprudent risk taking. The JFSA also emphasizes that factors which affect the volatility in firms' earnings are not necessary parameters in the calculation of the regulatory capital adequacy, but should nonetheless be considered when assessing a firm's risk profile

The JFSA stress-test covers three G-SIB and four D-SIB, covering around 70 percent of total banking sector assets. These banks are likely Mitsubishi UFJ, Mizuho, Sumitomo Mitsui (G-SIB) as well as Daiwa Securities, Nomura Holdings, Norinchukin Bank and Sumitomo Mitsui Trust Holdings (D-SIBs).<sup>16</sup>

### 3.5.2 Approach

The JFSA stress-test is a bottom-up solvency stress test which relies on the bank's own risk management and stress testing capabilities. Banks are responsible for continuously developing and updating models, and the JFSA reviews and challenges these methodologies regularly. The requirements stated by the JFSA concentrate on a number of high-level principles. For instance, banks are supposed to develop and run stress scenarios which take into account firm specific vulnerabilities, i.e., the stress test performed by an individual firm needs to be designed and tailored to its own circumstances and risk profile. This approach aims to identify vulnerabilities which may not have revealed by ordinary capital adequacy analysis.

While the JFSA does not define a common stress scenario, banks are expected to incorporate certain risks communicated by the JFSA into their own scenarios. The JFSA does not favour the use of hurdle rates, as they see a risk that common stress scenarios specified by a regulator as 'pass-or-fail' tests may result in unintended distortions in banks' portfolio allocation or may create false sense of complacency. Despite this, the JFSA will further explore the potential use of a supervisory stress test based on a common scenario across banks, as they see some benefits of 'universal stress tests', for instance in terms of comparability of modelling approaches.

Assumptions related to banks' balance sheet, income and expenses under stress need to be made by the banks individually, based on their specific risk profiles. While the JFSA seems to be fairly open with respect to the stress testing methodologies and assumptions applied by the banks, the assumptions are challenged and analysed by the JFSA horizontally across firms.

The banks have to run their stress scenarios over a three-year time horizon. The key variable of interest is the CET1 ratio, but banks have additionally to provide the variables used as inputs for the calculation of the post-stress CET1 ratios, as well as other relevant metrics considered on a case-by-case basis. Results are not publically disclosed, but firm individual results are shared between banks and the JFSA. The results of the JFSA-stress test do not mechanically trigger any policy decisions versus specific banks. Instead, the JFSA aims to increase banks' awareness and preparedness towards potential risks. The JFSA use the stress-testing results mainly as a benchmark for their dialogue with banks, with a view to enhance business and risk management of individual institutions.

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<sup>16</sup>This follows from the fact that these firms qualify as G-SIB and D-SIB, respectively

Sources:

JFSA's supervisory approaches - Replacing checklists with engagement, Financial Services Agency, June 2018, available on  
[https://www.fsa.go.jp/en/wp/supervisory\\_approaches.pdf](https://www.fsa.go.jp/en/wp/supervisory_approaches.pdf)

Online appendix to: Stress-testing banks - a comparative analysis, FSI Insights on policy implementation No 12, Financial Stability Institute, November 2018, available on  
[https://www.bis.org/fsi/publ/insights12\\_appendix.pdf](https://www.bis.org/fsi/publ/insights12_appendix.pdf)

Assessment of Basel III G-SIB framework and review of D-SIB frameworks - Japan, Regulatory Consistency Assessment Programme (RCAP), Basel Committee on Banking Supervision, June 2016, available on  
<https://www.bis.org/bcbs/publ/d371.pdf>

Peer review of Japan, Review Report, Financial Stability Board, December 2016, available on  
<https://www.fsb.org/wp-content/uploads/Japan-peer-review-report.pdf>

## 4 Conclusions

The discussion of the different stress testing approaches in this paper highlights an uneven implementation of supervisory stress tests across jurisdictions. This makes a comparison of stress test results very tricky. Differences can occur for a variety of reasons. First, stress scenarios are evaluated over different time horizons. In tendency, stress tests which extend over longer time periods will result in lower post-stress capital ratios than stress tests with a shorter scenario horizon. Second, stress test results depend heavily on the nature and severity of the chosen scenario. Third, stress tests are conducted differently on a technical level. While some supervisors use their own models to consistently evaluate a scenario for all banks in their jurisdiction, other supervisors try to achieve this consistency by providing banks more or less specific modelling guidance, or only define some high-level principles and leave the technical implementation entirely to the banks. Fourth, the stress tests also vary largely with respect to assumptions, ranging from different treatment of dividends and other capital distributions to different balance sheet assumptions (static vs. dynamic), as well as permissible mitigation actions under the stress scenario. Fifth, the stress test results have very different consequences for banks. While in some jurisdictions banks need to pass mandatory post-stress hurdle rates, other jurisdictions prefer to utilize stress test results only indirectly as part of their supervisory review process. In addition, supervisors have also different preferences on whether to disclose stress test results to the public or not.

Given the surprisingly large variation in stress testing methodologies across jurisdictions, a harmonization of approaches appears very difficult if not impossible to achieve in the short- to mid-term. This means that large international banking groups need to implement different stress testing methodologies within

their firm. This creates significant inefficiencies and unnecessary cost burdens and also makes internal comparisons of stress testing results difficult. It must be feared that overlaps and different stress test outcomes will equally confuse supervisors and bank managements, for instance if the home regulator looks at a business from a consolidated viewpoint and using its own stress testing framework, while a local host regulator may look at the same business booked in a local legal entity and being tested under a different stress testing regime. A certain harmonization of approaches would therefore be helpful.

Although some of the above-mentioned differences in approaches will likely persist, it would already be good progress if supervisors could agree on some methodological principles which go beyond the very general stress testing principles issued by the Bank for International Settlements (BIS) in October 2018. For example, it would be desirable to have common rules for the treatment of capital distributions, balance sheet assumptions and mitigation actions. Further alignment could also result from agreeing on a uniform time horizon over which the scenarios have to be evaluated. Lastly, supervisory should find a common view of what appropriate post-stress minimum thresholds banks should maintain under a severe stress scenario. This would require a clarification to what extent capital buffers can be used to absorb stress losses. For G-SIBs and D-SIBs, it needs additionally to be defined whether the systemic risk buffers are to be maintained under stress or not.

Notwithstanding the lack of alignment in stress testing approaches internationally, stress tests are expected to remain of increasing importance in banking supervision. While currently mainly used as a complementary instrument to assess the capital adequacy of large international banks, stress tests may be utilized more broadly in future. It is not unlikely that stress tests will become a necessity for all D-SIBs and larger banks in jurisdictions with a significant banking sector. These banks are therefore well advised to start investing into their stress testing capabilities.

# Appendices

## A Banks subject to DFAST/CCAR

| Firm                                    | Subject to DFAST in 2019? |
|---|---------------------------|
| Ally Financial Inc.                     | No                        |
| American Express Company                | No                        |
| Bank of America Corporation             | yes                       |
| The Bank of New York Mellon Corporation | yes                       |
| Barclays US LLC                         | yes                       |
| BB&T Corporation                        | No                        |
| BBVA Compass Bancshares, Inc.           | No                        |
| BMO Financial Corp                      | No                        |
| BNP Paribas USA, Inc                    | No                        |
| Capital One Financial Corporation       | yes                       |
| Citigroup Inc                           | yes                       |
| Citizens Financial Group, Inc.          | No                        |
| Credit Suisse Holdings (USA), Inc       | yes                       |
| DB USA Corporation                      | yes                       |
| Discover Financial Services             | No                        |
| Fifth Third Bancorp                     | No                        |
| The Goldman Sachs Group, Inc            | yes                       |
| HSBC North America Holdings Inc.        | yes                       |
| Huntington Bancshares Incorporated      | No                        |
| JPMorgan Chase & Co                     | yes                       |
| KeyCorp                                 | No                        |
| Morgan Stanley                          | yes                       |
| Northern Trust Corporation              | yes                       |
| M&T Bank Corporation                    | No                        |
| MUFG Americas Holdings Corporation      | No                        |
| The PNC Financial Services Group        | yes                       |
| RBC US Group Holdings LLC               | No                        |
| Regions Financial Corporation           | No                        |
| Santander Holdings USA, Inc.            | No                        |
| State Street Corporation                | yes                       |
| SunTrust Banks, Inc                     | No                        |
| TD Group US Holdings LLC                | yes                       |
| UBS Americas Holdings LLC               | yes                       |
| U.S. Bancorp                            | yes                       |
| Wells Fargo & Company                   | yes                       |



## B Banks subject to EU-wide stress test

| <b>Firm</b>                                     | <b>Country</b> |
|---|----------------|
| ABN AMRO Group N.V.                             | Netherlands    |
| Allied Irish Banks Group plc                    | Ireland        |
| Banco Bilbao Vizcaya Argentaria S.A.            | Spain          |
| Banco BPM S.p.A.                                | Italy          |
| Banco de Sabadell S.A.                          | Spain          |
| Banco Santander S.A.                            | Spain          |
| Bank of Ireland Group plc                       | Ireland        |
| Bank Polska Kasa Opieki SA                      | Poland         |
| Barclays Plc                                    | United Kingdom |
| Bayerische Landesbank                           | Germany        |
| Belfius Banque SA                               | Belgium        |
| BNP Paribas                                     | France         |
| CaixaBank, S.A.                                 | Spain          |
| Commerzbank AG                                  | Germany        |
| Coöperatieve Rabobank U.A.                      | Netherlands    |
| Danske Bank                                     | Denmark        |
| Deutsche Bank AG                                | Germany        |
| DNB Bank Group                                  | Norway         |
| DZ BANK AG Deutsche Zentral-Genossenschaftsbank | Germany        |
| Erste Group Bank AG                             | Austria        |
| Group Crédit Mutuel                             | France         |
| Groupe BPCE                                     | France         |
| Groupe Crédit Agricole                          | France         |
| HSBC Holdings Plc                               | United Kingdom |
| ING Groep N.V.                                  | Netherlands    |
| Intesa Sanpaolo S.p.A.                          | Italy          |
| Jyske Bank                                      | Denmark        |
| KBC Group NV                                    | Belgium        |
| La Banque Postale                               | France         |
| Landesbank Baden-Württemberg                    | Germany        |
| Landesbank Hessen-Thüringen Girozentrale AdöR   | Germany        |
| Lloyds Banking Group Plc                        | United Kingdom |
| N.V. Bank Nederlandse Gemeenten                 | Netherlands    |
| Norddeutsche Landesbank - Girozentrale -        | Germany        |
| Nordea Bank - group                             | Sweden         |
| NRW.BANK  | Germany        |
| Nykredit Realkredit                             | Denmark        |
| OP Financial Group                              | Finland        |
| OTP Bank Nyrt.                                  | Hungary        |
| Powszechna Kasa Oszczednosci Bank Polski SA     | Poland         |
| Raiffeisen Bank International AG                | Austria        |
| Skandinaviska Enskilda Banken - group           | Sweden         |
| Société Générale S.A.                           | France         |
| Svenska Handelsbanken - group                   | Sweden         |
| Swedbank - group                                | Sweden         |
| The Royal Bank of Scotland Group Plc            | United Kingdom |
| UniCredit S.p.A.                                | Italy          |
| Unione di Banche Italiane Società Per Azioni    | Italy          |

## C Banks subject to UK stress test

| <b>Firm</b>                          | <b>subject to EU stress test?</b> |
|--------------------------------------|-----------------------------------|
| Barclays Plc                         | Yes                               |
| HSBC Holdings Plc                    | Yes                               |
| Lloyds Banking Group Plc             | Yes                               |
| Nationwide                           | No                                |
| The Royal Bank of Scotland Group Plc | Yes                               |
| Santander UK Group Holdings plc      | No                                |
| Standard Chartered                   | No                                |

## D Banks subject to FINMA LPA stress test

| <b>Firm</b>   | <b>Type</b> |
|---------------|-------------|
| Credit Suisse | G-SIB       |
| UBS           | G-SIB       |

## E Banks subject to JFSA stress test

| <b>Firm</b>                    | <b>Type</b> |
|--------------------------------|-------------|
| Daiwa Securities               | D-SIB       |
| Mitsubishi UFJ                 | G-SIB       |
| Mizuho                         | G-SIB       |
| Nomura Holdings                | D-SIB       |
| Norinchukin Bank               | D-SIB       |
| Sumitomo Mitsui                | G-SIB       |
| Sumitomo Mitsui Trust Holdings | D-SIB       |