

# STRESS TESTING METHODOLOGY BRIEF COMPARISON ACROSS REGULATORS



**Reserve Bank of India (RBI)**



**Federal Reserve (FED)**



**Bank of England (BOE)**



**European Banking Authority (EBA) - European Systemic Risk Board (ESRB)<sup>1</sup>**

## NUMBER OF ENTITIES CONSIDERED

<p>While most of the financial institutions like Scheduled Commercial Banks (SCBs), Non Banking Financial Companies (NBFCs) and Scheduled Urban Co-operative banks were considered, the main stress tests are performed on a select list of 60 SCBs comprising 99% of the banking sector assets. The Scheduled Urban Co-operative banks and NBFCs were subjected to only credit risk based stress tests.</p>	<p>Stress tests were performed on 33 Bank Holding Companies (BHC). The BHCs are included in the stress tests if their total consolidated assets are equal to or greater than \$50Bn. In addition, 6 BHCs among them were subjected to a global market shock to their trading portfolios and 8 BHCs to their largest counterparty default in derivatives and securities financing transactions.</p>	<p>The stress test covered 7 major UK banks and building societies (hereafter referred to as 'banks'), accounting for around 80% of Prudential Regulation Authority (PRA)<sup>2</sup> -regulated banks' lending to the UK real economy.</p>	<p>Of the 51 banks subject to the EBA led stress test, 37 covered 70% of banking assets in the euro area. Separately, the ECB conducted a parallel stress test of an additional 56 banks under its direct supervision, using the same methodology. This is an internal supervisory exercise conducted by the ECB and the results are not published. However, if a bank chooses to publish its own results it can do so.</p>
--	--	---	---

## SCENARIOS FOR STRESS TESTING

<p>Metrics based stress tests with varying number of scenarios based on the risk being tested. For instance, for credit risk, econometric models were developed which modelled Slippage Ratio as a function of macro-economic variables like Gross Value Added (GVA), Weighted Average Lending Rate (WALR), CPI inflation, Exports to GDP ratio and so on. The independent variables were then increased/ decreased in multiples of their historical standard deviations to create scenarios of various severities.</p> <p>(See: RBI, FSR, Page no.37; Chart 2.6)</p> <p>For liquidity risk, scenarios containing sudden and unexpected withdrawals of deposits and increased utilisation of credit lines, of varying proportions, were used to assess the ability of banks to withstand these liquidity shocks. These scenarios have varied over the years.</p> <p>(See: RBI, FSR, Page no. 45; Chart 2.17)</p>	<p>Scenario based stress tests comprising of 3 scenarios - Baseline, Adverse and Severely Adverse. The supervisory scenarios included trajectories for 28 variables. Depending on whether the scenario was adverse or severely adverse, the trajectory changed correspondingly. For instance, the unemployment rate reaches a peak of 10% in the severely adverse scenario whereas in the adverse scenario it rises to 7.5%. Econometric models are developed relating these macro-economic variables to Probability of Default (PD), which in turn, are used to calculate losses and consequently the erosion in capital.</p> <p>(See: US, Stress Test 2016, Page Nos. 13 and 14; Figures 3, 4 and 5)</p>	<p>Scenario based Stress test based on 2 scenarios - Baseline and Adverse. The adverse scenario is constructed based on the risk assessment of the Financial Policy Committee (FPC)<sup>3</sup> and PRA. For instance, it is assumed that the credit spreads on US investment grade corporate bonds rise from 170 bps to 500 bps at the peak of the stress. These risks then feed into the BOE's projection of losses and consequently of bank capital.</p> <p>(See: UK, Stress Test, Page no. 8; Chart A)</p>	<p>The exercise analyses how a bank's capital position develops over a period of three years, under both a Baseline and an Adverse stress scenario.</p> <p>(See: Adverse Macro-financial scenario for the EBA 2016 EU-wide bank stress testing exercise, Page 2, Table-1)</p>
--	--	--	---

## METHODOLOGY/ ANALYTICAL FRAMEWORK

<p>The resilience of the banks was measured by two approaches:-</p> <ol style="list-style-type: none"> <li>Performance on the functional aspects - Soundness, Profitability, Efficiency, Asset-Quality and Liquidity (measured by the banking stability indicator);</li> <li>Scenario and sensitivity based stress tests. Econometric models were developed to gauge the impact of macro-economic variables on (Gross Non-Performing Advances) GNPA in the system. These relationships formed the basis for the scenario based stress tests.</li> </ol>	<p>Different categories of models were developed to project balance sheet items such as Pre Provisioning Non Performing Revenue (PPNR), Net Income, Loan Losses, and Risk Weighted Assets (RWAs). These models formed the basis for measuring the bank's resilience in the 2 stress scenarios.</p> <p>A majority of the models developed were by FED, though some models were developed by third parties as well. An internal model validation team of the FED, independent from the model development team, reviewed the models with a focus on design, estimation and implementation of the models</p>	<p>BOE uses an Annual Cyclical Scenario (ACS)<sup>4</sup> framework where the stress scenario is designed based on the macroeconomic risk assessment done by the FPC and the PRA Board. This stress scenario is of a five year duration, lasting till end of 2020. The values of the relevant macro-economic variables are then calibrated according to the Board's risk assessment. The bank then estimates the capital ratios of the participating institutions under the stress scenario.</p>	<p>Stress tests are solvency exercises to check if the banks remain solvent [based on CET1 (Common Equity Tier 1) ratio] after incurring losses connected to a change in economic conditions. The adverse scenario reflects the four systemic risks that were considered by the ESRB to constitute the most material threats to the stability of the EU banking sector:</p> <ol style="list-style-type: none"> <li>an abrupt rise in currently low global bond yields, amplified by low secondary market liquidity;</li> <li>weak profitability prospects for banks in a low nominal growth environment amid incomplete balance sheet adjustments;</li> <li>rising debt sustainability concerns in the public and non-financial private sectors amid low nominal growth;</li> <li>prospective stress in a rapidly growing shadow banking sector, amplified by spill over and liquidity risk.</li> </ol> <p>The stress test is not a pass/fail exercise. No hurdle rates or capital thresholds are defined for the purpose of the exercise. However, the findings of the stress test will be part of the ongoing supervisory dialogue. One benchmark therefore will be a bank's post-adverse scenario result in relation to its existing capital ratio. The result is further adjusted up or down, taking into account other factors including the specific risk profile of the individual institution and its sensitivity towards the stress scenarios; consequences of the static balance sheet assumption of the stress tests and measures taken by the bank to mitigate risk activities, such as relevant asset sales. Consequently, the stress test results will feed into Pillar 2 guidance in the Supervisory Review and Evaluation Process (SREP)</p>
---	--	--	--

## RISK COMPONENTS CONSIDERED

Credit Risk, Interest Rate risk, Limited form of Liquidity Risk and Limited form of Contagion Risk	Credit Risk, Operational Risk, Market Risk and Indirect Liquidity Risk	Credit Risk, Operational Risk, Market Risk and Indirect Liquidity risk	Credit Risk, Operations and Conduct risk, Market Risk
--	--	--	---

## TIME HORIZON OF STRESS TEST

1 year	Atleast 2 years	5 years	3 years
--------	-----------------	---------	---------

## WHETHER METHODOLOGY INCORPORATES MANAGEMENT ACTIONS OF PARTICIPATING BANKS

Not taken into account	To the extent that these actions were decided upon before the start of the stress test. For instance, mergers, change of business plans, and so on are incorporated in the stress scenarios.	Management actions as response to the evolving stress scenario, both strategic (change in product mix/business plans) and non-strategic (withholding and ploughing back of dividends) are taken into account. While not explicitly mentioned, these actions of the banks seem to form a part of a collaborative exercise between the BOE and the participating banks.	ECB will use the stress test as crucial input for the overall SREP for every year. In this context, it will also be used as one input factor for estimating the supervisory capital demand for banks.
------------------------	--	---	---

## PRIMARY VARIABLES / METRICS ESTIMATED

<ol style="list-style-type: none"> <li>Capital to Risk-Weighted Assets Ratio (CRAR)</li> <li>GNPA</li> <li>Expected Losses</li> <li>Unexpected Losses</li> <li>Expected Shortfall</li> </ol>	<ol style="list-style-type: none"> <li>CET1 Ratio</li> <li>Tier 1 Ratio</li> <li>Tier 1 Leverage Ratio</li> <li>Pre Provision Net Revenue</li> <li>Provisions and Losses</li> </ol>	<ol style="list-style-type: none"> <li>CET1 Ratio</li> <li>Tier 1 Leverage Ratio</li> </ol>	<ol style="list-style-type: none"> <li>CET1 Ratio</li> <li>Non-Performing Loan (NPLs)</li> <li>Net Interest Income (NII)</li> <li>Impairments on Financial assets</li> <li>income from market risk activities</li> </ol>
--	---	---	--

## DISCLOSURE OF RESULTS OF STRESS TESTS

<p>Results were presented at an aggregate level - either by type of institution (SCB, NBFC, Cooperative Bank) and at the bank group level (Public Sector, Private Sector, Foreign Bank). Results for individual banks are not disclosed publicly.</p> <p>(See: RBI, FSR, Page no. 41; Chart 2.12)</p>	<p>Results were presented at the individual bank level and publically disclosed, with the losses being further disaggregated by product type.</p> <p>(See: US, Stress Test, Page No. 43, Table 8)</p>	<p>Results were presented at the individual bank level and publically disclosed, with the impairments to the ratios being disaggregated by risk factor.</p> <p>(See: UK, Stress Test, Page no. 12; Table 3)</p>	<p>Results were presented at individual Bank (51 banks that are being covered) level and publically disclosed, with the impairment to the ratios for both baseline and adverse scenarios.</p> <p>(See: 2016 EU-wide Stress Test, Page no.2, Disclosure of summary of bank level stress test results for sample bank (Erste Group Bank AG))</p>
---	---	---	--

All data for the above comparison was taken from the following references:-

- Reserve Bank of India's Financial Stability Report December 2016 - <https://rbi.org.in/Scripts/PublicationReportDetails.aspx?UrlPage=&ID=865>
- United States' Federal Reserve's Guidelines on Stress Testing - <https://www.gpo.gov/fdsys/pkg/FR-2013-11-29/pdf/2013-27009.pdf>
- United States' Federal Reserve's Supervisory Stress Test Methodology and Results June 2016 - <https://www.federalreserve.gov/newsevents/press/bcreg/bcreg20160623a1.pdf>
- Stress Testing the UK Banking System – 2016 results - <http://www.bankofengland.co.uk/financialstability/Documents/fpc/results301116.pdf>
- Stress Testing the UK Banking System – key elements of the 2016 stress test - <http://www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/keyelements.pdf>
- 2016 EU-Wide Stress Test – Methodological note - <https://www.eba.europa.eu/documents/10180/1259315/2016+EU-wide+stress+test-Methodological+note.pdf>

1. There are 2 major institutions which are responsible for conducting stress tests in the EU. The European Central Bank (ECB) is the primary institution responsible for administering monetary policy. The European Banking Authority is the regulatory and supervisory body with the primary function of increasing transparency in the EU-banking sector and stability of the individual institutions.

2. The Prudential Regulation Authority (PRA) was created as a part of the Bank of England in 2012 and is responsible for the prudential regulation and supervision of around 1,700 banks, building societies, credit unions, insurers and major investment firms

3. The Financial Policy Committee(FPC) is charged with a primary objective of identifying, monitoring and taking action to remove or reduce systemic risks with a view to protecting and enhancing the resilience of the UK financial system

4. Stress Testing the UK Banking System - key elements of the 2016 stress test - <http://www.bankofengland.co.uk/financialstability/Documents/stresstesting/2016/keyelements.pdf>