STRESS TESTING 101 FOR BANKS

HELPING BANKS AND FINANCIAL INSTITUTIONS IN INDIA MANAGE RISK THROUGH IMPROVED STRESS TESTING PRACTICES
The global financial meltdown in 2008 was believed to be a direct result of sub-optimal stress testing in banks. Lessons learnt, regulators across the world have tightened the surveillance framework around it.

While most countries have come out with stringent rules for stress testing, India is still lagging.

This whitepaper highlights the best practices Indian banks can adopt to strengthen their risk management systems.
Stress testing to power risk management systems in banks

The 2007–08 global financial crisis was a turning point for banks and financial institutions across the world as it put the spotlight on the need for more stringent stress testing practices. Prior to this, stress testing was part of the Internal Capital Adequacy Assessment Program (ICAAP) under the Basel norms. Its scope was limited to supporting policy decisions and was being carried out to merely tick the regulatory exercises checklist. However, the macro scenario was far more severe in many respects than assumed by banks. Weak stress testing practices further impaired the resilience of banks and financial institutions. This led many banks and supervisory authorities across the world to question whether the existing stress testing practices were sufficient and robust to cope with rapidly changing circumstances. Against this backdrop, the Basel Committee on Banking Supervision (BCBS) issued the Principles for Sound Stress Testing Practices and Supervision in May 2009. This further led regulators to drive investments, develop and implement stronger stress-testing frameworks globally.

Today, stress testing has emerged as a common tool for financial supervision and regulation with many countries undertaking related reforms. The International Financial Reporting Standard (IFRS) 9 has prescribed stress testing for banks and financial institutions as an exercise to determine the volatility in the expected credit loss in baseline and adverse scenarios such as significant deceleration in GDP growth or sharp increase in unemployment rates. The Basel Committee on Banking Supervision (BCBS) is finalising a new set of guidelines to replace the stress testing principles set in 2009.

**Most countries have upped their game, India not so much**

In the United States (US), the Federal Reserve Board (FRB) conducts annual reviews of its stress testing processes and scenarios and shares updated guidelines with banks. Both large and small financial institutions are required to report the results to the FRB’s Comprehensive Capital Analysis and Review (CCAR) and Dodd-Frank Act Stress Testing (DFAST) respectively. In Europe, similar guidelines were issued in 2017 by the European Banking Authority (EBA) that covers nearly 70 percent of the European Union banking sector.

In India, the Reserve Bank of India (RBI) emphasised on stress testing as a risk management tool in its Annual Policy Statement 2006–07 and issued formal guidelines in June 2007. After the global financial crisis of 2007–08 and the global outrage on the inefficiency of the existing stress testing practices, RBI also updated its guidelines in 2013 based on Basel Committee Principles of May 2009. Banks and financial institutions in the country mainly follow the traditional “top-down” approach to implement these norms. The approach is simple, requires minimal technology infrastructure and is quick to compute. However, the model does not adequately assess risks or enable revenue forecasting. As a result, Indian banks are today weighed down by a high number of non-performing assets (NPAs).

Globally, banks and financial institutions are trying to close the gap by augmenting the results from the top-down approach with a bottom-up approach, and Indian banks should also be doing that.
Stretching the boundaries: How much risk is good risk?

What is stress testing?
Stress tests are designed to understand whether a bank has enough capital to survive plausible adverse economic conditions. These tests are meant to measure the institution’s ability to maintain enough buffer to stay afloat under extreme scenarios.

Risk capacity vs. risk exposure
The simple objective of stress testing is to keep institutions as a going concern even during severe economic distress. Institutions should balance risk capacity with risk exposure under economic and regulatory constraints. They must maintain a minimum capital ratio (currently, 8 percent), solvency, earnings, minimum leverage ratio (currently, 3 percent, Basel III) and liquidity.

Stress tests also help assess new capital plans and their risk exposure. For example, in the US, several dividend pay-outs and share repurchases were rejected because they failed the stress tests and their capital levels were found to be inadequate under stressful scenarios. Although there is no standard on the actual capital a bank must hold to cover the risk, the buffer should never be negative even in adverse scenarios (see figure 1).

Why should banks adopt stress testing?
To begin with, stress testing incentivises banks to implement robust risk mitigation and management practices. It also creates transparency in the banking system through better data collection and publication.

Banks and financial institutions have also realised the potential of the analyses from stress tests to feed business intelligence. The focus has now shifted to formulate capital and performance management strategies, capture efficiency and return on investment. Simply put, stress testing is no longer viewed as a mere regulatory exercise but a strategic and profitable function.

Stress testing can be used to strengthen the following functions (see figure 2):

**RISK APPETITE (RA)**
- Identify growth strategies and corporate RA that could impact the availability and deployment of capital
- Create business plans linked to capital strategies, including capital allocation, risk-adjusted performance and incentives
- Undertake dynamic monitoring and recalibration of RA targets and thresholds

**BALANCE SHEET MANAGEMENT**
- Dynamically manage balance sheet composition to improve risk weighted asset (RWA) and build resilience to external shocks
- Determine “strategic buffer” capital levels accounting for cyclicality
- Identify enhanced asset-liability management (ALM) capabilities linked to stress scenarios

**CAPITAL MANAGEMENT**
- Improve the sources vs. use of funds and capital targets formulation
- Refine capital distribution plans (dividends, repurchases)
- Identify capital contingency plans, Key Risk Indicators and triggers

**RISK MANAGEMENT**
- Identify and assess all material risks
- Ensure risk management policies and procedures are linked to capital adequacy levels (e.g. limits)
- Identify stress scenarios that impact liquidity, capital access and funding requirements
According to World Bank data, India is lagging behind major economies, with a high number of non-performing assets (NPAs). Between 2012 and 2016, non-performing assets almost tripled in Indian banks whereas in other countries, they either declined substantially or increased marginally (see figure 3).

As per the RBI, only six state-owned banks had more than three percent gross NPA (GNPA) among all public-sector banks in March 2012. Public sector banks cover more than 70 percent of the Indian banking sector. The Central Bank of India had the highest GNPA at 4.8 percent. However, as per CARE Ratings, by June 2017, the GNPA of most banks shot up to double digits. IDBI Bank rose to 24.11 percent and Indian Overseas Bank touched 23.6 percent. Such elevated levels of debt threaten the very existence of the financial institutions, further leading to economic slow-down.

Figure 3: World Bank data on banks non-performing loans to total gross loans

<table>
<thead>
<tr>
<th>Country</th>
<th>2012</th>
<th>2016</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
<td>3.37</td>
<td>9.19</td>
<td>5.81</td>
</tr>
<tr>
<td>US</td>
<td>3.32</td>
<td>1.32</td>
<td>-2.00</td>
</tr>
<tr>
<td>UK</td>
<td>2.86</td>
<td>1.69</td>
<td>-1.17</td>
</tr>
<tr>
<td>China</td>
<td>3.59</td>
<td>0.94</td>
<td>-2.65</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>0.60</td>
<td>0.85</td>
<td>0.25</td>
</tr>
<tr>
<td>Japan</td>
<td>2.43</td>
<td>1.40</td>
<td>-1.03</td>
</tr>
<tr>
<td>Germany</td>
<td>0.95</td>
<td>1.75</td>
<td>0.79</td>
</tr>
</tbody>
</table>

* Banks non-performing loans to total gross loans in %

Sources:
Setting the right framework

CORE AREAS OF STRESS TESTING

Stress testing frameworks should have the scalability to do complex sensitivity and scenario analyses including co-relations between various risk drivers.

The core of the stress testing exercises covers many stages including (see figure 4):

- Identifying the portfolio risk drivers such as PD, loss given default (LGD), exposure at default (EAD)
- Maintaining good reference data system (RDS)
- Storing different stress testing models for different aspects such as securitised or non-securitised assets, traded instruments
- Calculating various risk metrics such as RWAs and pre-provision net revenue (PPNR), expected credit loss (ECL), etc.

Figure 4: Core structure of stress-testing exercises

<table>
<thead>
<tr>
<th>Scenario planning</th>
<th>Portfolio risk drivers</th>
<th>RDS, shocks, stress models</th>
<th>Stress calculation</th>
<th>Results and Aggregation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples</td>
<td>Credit</td>
<td>Market</td>
<td>Stress</td>
<td>Results and</td>
</tr>
<tr>
<td>• Euro crisis</td>
<td>• PD</td>
<td>• Spread</td>
<td>• Credit risk</td>
<td>Aggregation</td>
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<tr>
<td>• Recession</td>
<td>• LGD</td>
<td>• FX</td>
<td>• Market risk</td>
<td>• PPNR impacts</td>
</tr>
<tr>
<td>• Depression</td>
<td>• EAD</td>
<td>• EQ</td>
<td>• Issuer risk</td>
<td>• (Net interest and</td>
</tr>
<tr>
<td>• China hard</td>
<td>• Product Taxonomy</td>
<td>• Shock values like Fx</td>
<td>• Investment risk</td>
<td>net non-interest</td>
</tr>
<tr>
<td>landing</td>
<td>• Industry code</td>
<td>rate movement, GDP</td>
<td>• Liquidity risk</td>
<td>income)</td>
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<tr>
<td>• Middle East</td>
<td>• Scenario-Risk</td>
<td>growth rate etc.</td>
<td>• Operational risk</td>
<td>• Expected credit</td>
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<tr>
<td>crisis</td>
<td>driver mapping</td>
<td></td>
<td>• Country risk</td>
<td>losses</td>
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<td></td>
<td></td>
<td></td>
<td>• Business risk</td>
<td>• Provisioning</td>
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<td>• P&amp;L impacts</td>
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<td>• Capital ratios</td>
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<td>calculations</td>
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<td>• RWA impacts</td>
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The robustness of stress testing systems depends on the efficiency and suitability of various models it employs as part of its earnings forecasting and on the scalability of reference data services it can provide. A good stress testing framework can integrate all these aspects quickly and effectively to fulfil the overall objectives of risk management in banks.

DATA QUALITY

Banks must address data quality issues to reap benefits from their stress testing framework. Transactions like trades and loans flow through various systems before reaching risk management applications. Manual interventions at multiple levels and lack of proper reconciliations among different reporting systems lead to data discrepancies. Analyses based on poor quality data are not useful. There have been instances where institutions have reported different numbers to different regulators with little or no effort put in to reconcile the data.

Regulators around the world had been raising concerns about quality of data being used for stress testing. For example, the US Federal Reserve has disapproved using different accounting standards at different places. Basel committee came up with BCBS 239 principles for effective risk data aggregation and reporting to address data quality issues. Similarly, the RBI has instructed banks to address data quality issues in its stress testing guidelines and various committee reports such as Deepak Mohanty Committee on Data and Information Management (2014) and IT vision document (2011-17). However, given the lack of a prescribed standard, banks in India have been slow to tackle the issue of data quality.

8. https://www.bis.org/publ/bcbs239.pdf
## APPROACHES FOR STRESS TESTING

There are two general approaches for conducting stress tests.

### What is a top-down approach?
The top-down approach evaluates the impact of shocks to macroeconomic variables on a bank's balance sheet or income statement categories. It helps figure out whether the bank has enough capital to survive stressful conditions. For example, it stresses the net NPA level and studies its impact on the bank's capital levels.

### What is a bottom-up approach?
The bottom-up approach evaluates the impact of shocks to macroeconomic variables on the bank but at the most granular level data. This considers shocks at individual customer levels, their credit ratings, instruments of investments such as equity, debt, etc. The results are then aggregated to give a firm-wide view of the impact on the bank's capital levels.

### SOME OF THE KEY DIFFERENCES BETWEEN THE TWO APPROACHES ARE AS FOLLOWS:

<table>
<thead>
<tr>
<th>TOP-DOWN APPROACH</th>
<th>BOTTOM-UP APPROACH</th>
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<tbody>
<tr>
<td>It is less dependent on complex models and therefore, quicker to implement. It ignores the heterogeneous nature of portfolios. For example, while applying shock to the industry with maximum exposure, it ignores borrowers with interests in multiple industries.</td>
<td>It depends a lot on revenue and expense forecasting models, and collateral valuation models. It fully takes care of the heterogeneous nature of portfolios and co-relation risk among portfolios. Therefore, this approach is time consuming.</td>
</tr>
<tr>
<td>It is more predictable and produces stable results.</td>
<td>It may give varied results when underlying economic conditions change, even though the balance sheet composition may remain the same.</td>
</tr>
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<td>It assumes a static balance sheet and applies shock on it.</td>
<td>It considers the dynamic nature of the balance sheet and can apply the shock values on it.</td>
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<td>It is useful in benchmarking peers.</td>
<td>It makes it difficult to benchmark peers, as the idiosyncratic risk is not separated from the systemic risk, and the underlying models and assumptions may vary from bank to bank.</td>
</tr>
<tr>
<td>It does not correctly account for exposures created by off-balance sheet instruments. It is a single-aggregated model of the balance sheet.</td>
<td>It captures the exposures created by off-balance sheet instruments in a reasonable manner through various forecasting models. For example, expected liabilities can be integrated into the balance sheet from off-balance sheet instruments such as letters of credit and bank guarantees.</td>
</tr>
<tr>
<td>It gives an imprecise modelling of linkages between changes in economic conditions and risk factors. For example, it assumes that counterparties' ratings are downgraded by only one notch in stress conditions. This may not hold true and there could be a significant jump in counterparty credit risk, as seen in the financial crisis of 2008.</td>
<td>It adopts realistic modelling of linkages between changes in economic conditions and risk factors.</td>
</tr>
<tr>
<td>It doesn't capture the idiosyncratic risk of the bank.</td>
<td>It captures the idiosyncratic risk of the bank. For example, a bank focusing on wholesale banking can follow different models from those that a bank focused on retail banking is following.</td>
</tr>
<tr>
<td>It requires minimal monitoring and intervention.</td>
<td>It requires continuous validation of models and underlying assumptions. For example, while adopting autoregressive models, correlation among portfolios tend to be higher during stress periods than in normal periods.</td>
</tr>
</tbody>
</table>
Limitations
Historically, top-down approaches to stress testing have led to an inadequate assessment of business risks and forecasting future revenues. This approach doesn’t capture concentration and correlation risks adequately or assumes zero or constant correlation among portfolios. But, it is observed that during stress periods the correlation tends to increase substantially due to which even a slight downturn can lead to a significant increase in NPAs or illiquid assets, eventually leading to losses. These losses sometimes far exceed the risk-bearing capacity of the institution.

On the other hand, the bottom-up approach is technology intensive. Imagine stress tests or calculations based on data of millions of customers with multiple facilities, making secure and non-secure transactions with diverse types of collaterals and in multiple currencies. On top of these, the calculations involve complex statistical models instead of a simple arithmetic. Therefore, banks need robust and scalable infrastructure to implement the model.

Top-down or bottom-up? Why not both?
ADOPTING A MIXED APPROACH

Given the limitations, a combination approach is recommended to assess the vulnerabilities of financial institutions along with addressing data quality issues (see figure 5).

Figure 5: A combination approach for stress testing

It’s also important to study and compare the results from both the models. The results can be used to assess the areas of concentration and realign priorities or decide on the capital plans like raising additional capital, share repurchases, dividend pay-out, etc. The results could vary due to technical reasons and it’s necessary to understand them and take appropriate steps such as recalibration of models and correcting underlying assumptions to reflect more realistic scenarios.
Staying ahead of the game

Today, Indian banks and financial institutions are weighed down by a large number of NPAs, primarily due to sub-optimal stress testing practices that follow only the top-down approach. This has given rise to inadequate analyses leading to a significant jump in NPAs in the last few years. While global peers have tightened the stress testing surveillance and continuously worked on improving the processes, Indian banks are yet to adopt a holistic approach. Using a combination of the top-down and bottom-up approaches will go a long way in strengthening the financial systems.

To successfully implement the mixed approach, banks and financial institutions must address the following issues:

1. **Cultural Inertia**
   - While most global counterparts are realising the business potential of stress test analysis, there is still a cultural inertia among financial institutions in India in adopting risk management and stress testing practices as an integral part of their business. Bankers still consider it as an overhead function and a regulatory compulsion. But given the last global financial crisis and the high NPAs in the Indian banking sector, it is time to adopt stress testing to aid regular business decisions. The areas include product pricing, strengthening vulnerable areas, maintaining ample liquidity and capital allocation among business lines.

2. **Data Quality**
   - Sourcing superior quality data from a host of systems such as reconciliation applications, core banking applications and trading systems is a challenge. BCBS 239 compliance requires high number of resources for implementation as even good stress testing models will fail to produce reliable results if the data inputs are bad.

3. **Standardisation of Industry and Sector Classification**
   - Currently, when applying stress tests, every bank follows its own convention of industry clustering. Although there is no India-based empirical study on the impact of different approaches to clustering, this can substantially influence the stress testing results. Therefore, it’s in the best interest of the institution and the financial system to standardise reference data and use global standards such as the Global Industry Code (GIC) or the Industry Classification Benchmark (ICB) for stress testing purposes.
How Accenture can help

Accenture is a proven partner in implementing stress testing frameworks and BCBS 239 guidelines across the globe.

**People**

Accenture Financial Risk and Service (AFRS) is a Communities of Practice (CoP) of subject matter experts (SMEs) and industry experts in the stress testing domain.

We follow a collaborative design-thinking approach to remove process redundancies and bring in operational efficiency.

We have committed professionals can help banks across multiple geographies in implementing stress testing framework and BCBS 239.

We can develop and customise the risk analytics to come up with a target operating model, that will be suitable to you.

We can help banks develop Key Performance Indicators (KPIs) and training decks to help them easily integrate new processes.

We can help deploy various assets and accelerators, pre-configured solutions to reduce time and cost to market.

We have expertise in advanced technologies such as big data analytics that can handle the high computation requirement.

We can conduct maturity-level assessments, gap-analyses, requirement elicitation, data modelling and business process modelling (BPM).

We can help leverage new age technologies to address regulatory challenges and make stress testing exercises a part of day-to-day business functions.

People

**Process**

**Technology**

**Enablement and Support**

**Delivery Experience**

**Domain Expertise**

**Offerings**

**Governance**

Efficient Governance

- Turn stress tests requests into routine reporting by automating the stress testing processes.
- Coordinate across LOBs, Risk and Finance functions.
- Use stress testing as a business planning and decision making tool.

Risk Analytics

- Use the Risk Appetite Framework and business planning to drive consistent Analytics into Balance Sheet metrics.
- Use Data Dictionary infrastructure to create a layer for the centralised management of metadata (metadata glossary operational, technical and business) to drive stress testing execution.

Operations Efficiency

- Apply lean Six Sigma lens on the current stress testing function to identify cost reduction and efficiency opportunities.
- Create a “Utility Model” for the stress testing functions with optimised distribution of centralised and distributed functions.
- Make the abstraction layer with the semantic mapping of all stress testing data available to all stakeholders for their decision making.

Reliable Infrastructure

- Align to strategic Data Architecture: Granular Data Pools–big data and DW applications which can be easily adapted to evolving stress testing needs.
- Implement self-service reporting to reduce costs and leverage insight for business controls and planning.
About Accenture

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialised skills across more than 40 industries and all business functions—underpinned by the world's largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With more than 449,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

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