Annex 2

Single Factor Stress Tests to be carried out by banks

The stress testing framework and methodology in each bank should be tailored to suit the size, complexity, risk philosophy, risk perceptions and skills in each bank. However, banks have to necessarily apply the shocks indicated in this annex to their portfolios. These shocks are based on one or more of the following: (i) the aggregate experience of Indian banks since 2007 (ii) Stress tests carried out by IMF to assess Financial System Stability (iii) BCBS guidelines (iv) International best practices. The shocks have been simplified here considering the differences in types of banks in India, their business models and sophistication levels. Most of the shocks are indicated in three levels of severity - Baseline, Medium and Severe.

2. Banks may also endeavour to assess their resilience to the possibility of more than one shock materialising simultaneously. Banks which have already realised shocks more severe than the ones indicated here should have them built into their stress testing framework as baseline shocks and apply more stringent shocks to make the stress testing exercise meaningful. Banks with advanced capabilities may adopt more sophisticated methodologies for stress testing.

3. Sensitivity Analysis - Shocks

3.1 Credit Risk

The stress test for credit risk aims to assess the impact of macro-economic cycles as well as bank specific factors on bank’s financial performance – be it capital adequacy or profitability. In an economic downturn, the major risk factors facing the banks are the credit downgrades of the counterparties, deterioration in the asset quality and erosion in the collateral value. On the other hand, in an economic upturn, there is likely to be a sense of exuberance on the backup of under-pricing of risk, leading to excessive credit growth in select sensitive sectors. To address this excessive sectoral credit growth, provisioning and/or risk weights on the exposure to these select sensitive sectors may be increased and
banks should be in a position to factor in such a rise during the economic upturn. Against this backdrop, banks may at the minimum carry out the following stress tests on their credit portfolio.

**Shock 1:** Increase in NPAs - Credit quality generally tends to deteriorate during economic downturn as debtors begin to experience cash flow problems which in turn affect smooth servicing of debt leading to a possible deterioration in asset quality.

Net NPA increase by 50 *(Baseline)*, 100 *(Medium)*, and 150 *(Severe)* percent, and simultaneous increase in provisioning to 1 percent for standard loans; 30 percent – for substandard loans; and 100 percent for doubtful loans over one-year period.

**Shock 2:** Increase in NPA in Top Five Industries – Some industries are more affected by economic downturn and experience problems in servicing of debt.

Additional 3 *(Baseline)* and 5 *(Medium)* percentage points increase in Net NPAs in top five industries.

**Shock 3:** Increase in NPA in Specific Sectors – Some sectors undergo stress due to idiosyncratic factors.

Additional 3 *(Baseline)* and 5 *(Medium)* percentage points increase in Net NPAs in specific sectors: Agriculture, Power, Real Estate, Telecom and Roads.

**Shock 4:** Slippage of Restructured Standard Assets – Assets which have undergone stress and are restructured are more prone to deterioration in asset quality.

Additional slippages in restructured standard assets – 20 per cent *(Baseline)*, 30 per cent *(Medium)* and 40 per cent *(Severe)* of restructured standard assets.
**Shock 5:** Depletion in collateral
Depletion in collateral value by 10 per cent (**Baseline**), 15 per cent (**Medium**), 20 per cent (**Severe**)

**Shock 6:** Downgrade in counter-party rating - In a down turn, bank's counterparties may suffer credit downgrade awarded by an external CRA or internally.

Uniform downgrade of borrowers by one notch across all rating grades – 5 per cent (**Baseline**), 10 per cent (**Medium**), 20 per cent (**Severe**) of all borrowers.

**Shock 7:** Concentration Risk – Individual borrowers
Default by largest single borrowers – Default by top one (**Baseline**), top two (**Medium**), top three (**Severe**) borrower

**Shock 8:** Concentration Risk – Group
Default by largest group borrower – Default by top three company-member of the group (**Baseline**), top five company-members of the group (**Medium**), all company-members of the group (**Severe**)

**Shock 9:** Concentration Risk – Industries/Sectors
Default in all exposures to largest industries/sectors – Default by topmost industry/ sector (**Baseline**), top three industries/sectors (**Medium**), top five industries/sectors (**Severe**).

3.2 Market Risk
The prime objective is to study the impact of stress test on Profit and Loss account.

A. **Foreign Exchange Risk**
Forex risk arises from exchange rate changes adversely impacting the local currency denominated bank's assets and liabilities. The Stress Test evaluates the impact of exchange rate variations on the bank’s net open position and also on bank’s profitability.
**Shock 1:** Depreciation of Indian rupee

- **Baseline:** 15 per cent depreciation in 30 days
- **Medium:** 20 per cent depreciation in 30 days
- **Severe:** 25 per cent depreciation in 30 days

**Shock 2:** Appreciation of Indian rupee

- **Baseline:** 15 per cent appreciation in 30 days
- **Medium:** 20 per cent appreciation in 30 days
- **Severe:** 25 per cent appreciation in 30 days

**Reverse Stress Testing**

How much depreciation would be necessary for Tier I capital to move down to 3 per cent over 60 days?

**B. Interest Rate Risk**

Interest rate risk is the risk where changes in market interest rates might adversely affect a bank's financial condition. The immediate impact of changes in interest rates is on bank's earnings through changes in its Net Interest Income (NII). A long-term impact of changes in interest rates is on bank's Market Value of Equity (MVE) or Net worth through changes in the economic value of its, liabilities and off-balance sheet positions. The interest rate risk, when viewed from these two perspectives, is known as 'earnings perspective' and 'economic value' perspective, respectively.

Banks should conduct sensitivity analysis using methods that reflect their specific interest rate risk characteristics using gap analyses or simulation techniques. Banks should at a minimum assess their resilience using the baseline factors given below:
Interest rate risk for both trading and banking book

**Shock 1:** Parallel upward/downward shift of IND yield curve in bps  
*Baseline* 250; *Medium:* 300; *Severe:* 400

**Shock 2:** Steepening of IND yield curve  
100 bps linearly spread between 15-day and over 25-year maturities

**Shock 3:** An Inversion of the yield curve  
One-year rates up 250 bps and 10-year rates down 100 bps

C. **Equity Price Risk**

**Shock:** Decline in equity prices across the board  
*Baseline:* 40 per cent; *Medium:* 50 per cent; *Severe:* 60 per cent

3.3 **Liquidity Risk**

Whether a bank can be regarded as having sufficient liquidity depends to a great extent on its ability to meet obligations under a funding crisis. Therefore, in addition to conducting cash-flow projections to monitor net funding requirements under normal business conditions, banks should perform stress tests regularly by conducting projections based on “what if” scenarios on their liquidity positions to

- identify sources of potential liquidity strain;
- ensure that current liquidity risk exposures remain in accordance with the established liquidity risk tolerance; and
- analyse any possible impact of future liquidity stresses on their cash flows, liquidity position, profitability and solvency.

**Institution-specific crisis scenarios**

An institution-specific crisis scenario should cover situations that could arise from a bank experiencing either real or perceived problems which affect public confidence in the bank and its firm-wide or group-wide operations. It should represent the bank’s view of the behaviour of its cash flows in a severe crisis. A
key assumption is that many of the bank’s liabilities cannot be rolled over or replaced, resulting in the need to utilise its liquidity cushion.

For retail banks, this scenario will likely entail an acute deposit run. Such a scenario would typically include the following characteristics:

- significant daily run-off rates for deposits, with increasing requests from customers to redeem their time deposits before maturity;
- interbank deposits repaid at maturity;
- no new unsecured or secured funding obtainable from the market; and
- forced sale of marketable securities at discounted prices.

Foreign banks (including branches and subsidiaries of foreign banking groups) should, in particular, assess the effects of a group-wide crisis scenario on their liquidity positions. This scenario assumes that an institution-specific stress event is affecting the global operations of the banking group (i.e. with problems spilling over the whole banking group). In a group-wide crisis, a default position would be that no intragroup or head office funding support can be assumed to be available.

There are other institution-specific scenarios that are less severe in the short term but may subject a bank to longer-term liquidity pressures. These scenarios may be triggered by possible changes in the market and public perceptions of a bank that affect its access to funds or cause a gradual drain on its liquidity. Banks are encouraged to take account of different scenarios applicable to their own circumstances as part of the ongoing liquidity risk management process.

**General market crisis scenarios**

A general market crisis scenario is one where liquidity at a large number of financial institutions in one or more markets is affected. Characteristics of this scenario may include –
• a market-wide liquidity squeeze, with severe contraction in the availability of secured and unsecured funding sources, and a simultaneous drying up of market liquidity in some previously highly liquid markets;
• counterparty defaults;
• substantial discounts needed to sell or repo assets and wide differences in funding access among banks due to the occurrence of a severe tiering of their perceived credit quality (i.e. flight to quality);
• restrictions on currency convertibility; and
• severe operational or settlement disruptions affecting one or more payment or settlement systems.

Banks should be aware that the cash-flow patterns of certain assets and liabilities may behave quite differently in the case of a general market crisis scenario as compared with the institution-specific crisis scenario. For example, a bank may have less control over the level and timing of future cash flows from the sale of marketable debt securities under a general market crisis scenario. This could be due to the fact that only very few market participants would be willing or would have sufficient liquidity to purchase securities. Hence, banks should assign appropriate discount factors to such assets to reflect the price risk associated with different stress scenarios. Moreover, the impact of a general market crisis on individual banks may differ. For example, a bank with a strong market reputation may benefit from a flight to quality as depositors seek a safe haven for their funds.

**Combined scenarios**

Banks are expected to incorporate a third type of scenario into their stress tests which bears the characteristics of both an institution-specific crisis and a general market crisis. Although this combined scenario may reflect a set of very adverse circumstances that could plausibly happen to any bank in terms of liquidity impact, it will generally be inappropriate for banks to adopt an “additive approach” in designing the scenario, viz., simply by summing up the underlying assumptions and estimated impacts of an institution-specific scenario and a general market
risk scenario. Banks should consider making appropriate adjustments under the combined scenario to modulate the severity of assumptions used commonly for the institution-specific and the general market crisis scenarios, having regard to how the various stress circumstances may interact in the scenario.

The following are some relevant factors that could be considered:

• As a greater number of financial institutions in the market will be affected by the crisis, this may change the way in which some institution-specific stress elements are to be structured. For example, instead of a quick but severe bank run, there may be a less acute, but more persistent and protracted run-off of customer deposits.

• Even lower realisable values of assets may result as the bank concerned seeks to sell or repo large quantities of assets when the relevant asset markets become less liquid and market participants are generally in need of liquidity.

**Minimum stress period**

The ability of a bank to honour its immediate commitments at least for the initial period when the stress is likely to be most acute is crucial for its later survival. As such, it is expected that a bank should have sufficient funds (including those that can be generated from its available liquid assets and other funding sources) to cover its liquidity needs and to enable it to continue its business for a certain minimum stress period under each of the crisis scenarios, without resorting to emergency liquidity assistance from the RBI. A bank should assume the minimum stress period for an institution-specific crisis scenario to last for no less than five business days, and that for a general market crisis scenario and a combined scenario, no less than one calendar month. Banks should adopt longer minimum stress periods if their liquidity risk profile warrants this.
## Liquidity risk stress test

### A. Outflows

<table>
<thead>
<tr>
<th>1. Partial loss of retail deposits(^1)</th>
<th>Run-off factor</th>
<th>Baseline</th>
<th>Medium</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable(^2)</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Unstable(^3)</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Partial loss of wholesale deposits(^4)</th>
<th>Run-off factor</th>
<th>Baseline</th>
<th>Medium</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Unstable</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Partial loss of secured short term financing like Repo and CBLO</th>
<th>Run-off factor</th>
<th>Baseline</th>
<th>Medium</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-financial corporate bonds with any counterparty</td>
<td>15%</td>
<td>30%</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>Non- Level 1 asset(^5) or non-Level 2A asset(^6) with domestic sovereigns, multilateral development banks or domestic PSEs as a counterparty.</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Securitised instrument including RMBS</td>
<td>25%</td>
<td>50%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Other level 2B asset(^7)</td>
<td>50%</td>
<td>75%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>All other assets</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Market valuation changes on derivative transaction including change in collateral value posted for derivative transactions</th>
<th>Run-off factor</th>
<th>Baseline</th>
<th>Medium</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Look back approach(^8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Unscheduled draws on committed but unused credit and liquidity facilities</th>
<th>Run-off factor</th>
<th>Baseline</th>
<th>Medium</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail and small(^9) business customers</td>
<td>5%</td>
<td>10%</td>
<td>20%</td>
<td></td>
</tr>
<tr>
<td>Credit facility to non-financial corporates, PSEs, and MDBs.</td>
<td>10%</td>
<td>20%</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Credit facilities to banks subject to prudential supervision</td>
<td>40%</td>
<td>70%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Credit facilities to other financial institutions</td>
<td>40%</td>
<td>80%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Liquidity facilities to other financial institutions</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Liquidity facility to non-financial corporates, PSEs and MDBs.</td>
<td>30%</td>
<td>60%</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Credit and liquidity facilities to other legal entities</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>
B. **Inflows**

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Haircut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities held under HFT</td>
<td>Baseline</td>
</tr>
<tr>
<td>1. Corporate bond with rating AA- or higher</td>
<td>15%</td>
</tr>
<tr>
<td>2. Corporate bond with rating between A+ and BBB-</td>
<td>50%</td>
</tr>
<tr>
<td>3. Securitised instruments including RMBS</td>
<td>25%</td>
</tr>
<tr>
<td>4. Equity shares</td>
<td>50%</td>
</tr>
<tr>
<td>5. Securities/loans maturing within 30 days and held under AFS and HTM category.</td>
<td>As above</td>
</tr>
</tbody>
</table>

1. Retail deposits are defined as deposits placed with a bank by a natural person.
2. Stable deposits are insured deposits in transactional accounts (eg. Accounts where salaries are automatically credited/deposits are in accounts where salaries are paid out from) or relationship based accounts (eg. The deposit customer has another relationship with the bank say a loan).
3. All deposits other than stable deposits are unstable deposits.
4. Unsecured wholesale funding is defined as funding/deposits from non-natural persons i.e. legal entities including sole proprietorship and partnerships.
5. Level 1 asset include cash, Government securities and a portion (to be notified separately) of SLR deposits.
6. Level 2A assets includes marketable non-financial sector corporate bonds rated AA- or better and marketable securities assigned 20% risk weight under Basel II standardised approach.
7. Level 2B assets includes securitised instrument including RMBS, corporate bond rated between A+ and BBB-, equity shares and commercial paper.
8. Cash outflows arising out of margin and collateral requirements in the derivative exposures may be quite significant. Banks should identify the risk factors impacting the valuation of derivatives contracts in their portfolio (like interest rates, forex rates, volatilities, etc.) and generate the movements in these risk factors based on past distribution of movement of these risk factors. For base line scenario movements in the risk factors projections could be at 95% confidence interval, for medium scenarios movements in the risk factors projections could be based on 99% confidence interval and for severe scenarios, projections should be based on 99.9% confidence interval. Collateral/Margin requirements based on these scenarios should then be calculated.
9. Small business is one where the total average annual turnover is less than Rs.50 crore as defined in RBI Master Circular on New Capital Adequacy Framework (NCAF).