Measurement of Operational Risk
Approaches to Measure Operational Risk

• Spectrum of approaches
  – Basic indicator - based on a single indicator
  – Standardized approach - divides banks’ activities into a number of standardized industry business lines
  – Advanced measurement approach
  – Loss distribution approach

• Basic Indicator
  – 30% of gross income
Proposed Operational Risk Capital Requirements

Reduced from 20% to 12% of a Bank’s Total Regulatory Capital Requirement (November, 2001)

Based on a Bank’s choice:

(a) **Basic Indicator Approach** which levies a single operational risk charge for the entire bank

or

(b) **Standardized Approach** which divides a bank’s different lines of business, each with its own operational risk charge

or

(c) **Advanced Management Approach** which uses the bank’s own internal models of operational risk measurement to assess a capital requirement
Basel I

- Two minimum standards
  - Asset to capital multiple
  - Risk based capital ratio

- Scope is limited
  - Portfolio effects missing: a well diversified portfolio is much less likely to suffer massive losses
  - Netting is absent

- No market or operational risk
Basel I

- Calculate risk weighted assets for on-balance sheet items.
- Assets are classified into categories.
- Risk-capital weights are given for each category of assets.
- Asset value is multiplied by weights.
- Off-balance sheet items are expressed as credit equivalents.
Minimum Capital Requirement Pillar One

- Credit Risk
  - Standardized
  - Internal Ratings
  - Credit Risk Models
  - Credit Mitigation

- Market Risk
  - Trading Book
  - Banking Book

- Other Risk
  - Operational
  - Others
Regulatory Approach

Risk Based/less Regulatory Capital:

Basic Indicator
- Bank
- Rate
- Base

Standardized
- Bank
- Risk
- Business Line 1
  - Expected Loss 1
- Business Line 2
  - Expected Loss 2
- Business Line 3
  - Expected Loss 3
- ... (n)

Internal Measurement Approach
- Bank
  - Risk Type 1
  - Rate
  - Expected Loss 1
- Risk Type 2
  - Rate
  - Expected Loss 2
- ... (K)

Loss Distribution
- Expected Loss
- Severe Unexpected Loss
- Catastrophic Unexpected Loss
- Loss

Rate of progression between stages based on necessity and capability
Operational Risk Measurement

• Step1: Input assessment of all significant operational risk
  – Audit reports
  – Regulatory reports
  – Management reports

• Step2: Risk assessment framework
  – Risk categories (internal dependencies: people, process, technology and external dependencies)
  – Connectivity and interdependence
  – Change, complexity, complacency
  – Net likelihood assessment
  – Severity assessment
  – Combining likelihood and severity into an overall risk assessment
  – Defining cause and effect
  – Sample risk assessment report
Operational Risk Measurement

• Step3: Review and validation

• Step4: output
Operational Risk - Basic Indicator Approach

• Capital requirement = $\alpha\%$ of gross income

• Gross income = Net interest income + Net non-interest income

Note: $\alpha$ supplied by BIS (currently $\alpha = 30\%$)
Example

• Bank’s Gross Income = Rs.395,479,059

• Capital charge for operational risk

• 30% of Gross Income = Rs.118,643,717

or

• 15% of Gross Income = Rs.59,321,858
<table>
<thead>
<tr>
<th>Bank ($ Million)</th>
<th>BIS (.3)</th>
<th>RBI (.15)</th>
<th>Capital</th>
<th>Deficiency / Surplus</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Bank of India</td>
<td>38.9</td>
<td>19.4</td>
<td>1.16</td>
<td>-1574.13</td>
</tr>
<tr>
<td>Punjab National Bank</td>
<td>11.5</td>
<td>5.72</td>
<td>0.7</td>
<td>-717.14</td>
</tr>
<tr>
<td>ICICI Bank Ltd.</td>
<td>11.3</td>
<td>5.62</td>
<td>2.76</td>
<td>-103.62</td>
</tr>
<tr>
<td>Bank of Baroda</td>
<td>2.96</td>
<td>1.48</td>
<td>0.81</td>
<td>-82.71</td>
</tr>
<tr>
<td>Canara Bank</td>
<td>3.28</td>
<td>1.64</td>
<td>0.91</td>
<td>-80.21</td>
</tr>
<tr>
<td>Corporation Bank</td>
<td>1.1</td>
<td>0.55</td>
<td>0.31</td>
<td>-77.41</td>
</tr>
<tr>
<td>Oriental Bank of Commerce</td>
<td>1.42</td>
<td>0.71</td>
<td>0.55</td>
<td>-29.09</td>
</tr>
<tr>
<td>HDFC Bank Ltd.</td>
<td>1.79</td>
<td>0.89</td>
<td>0.69</td>
<td>-28.98</td>
</tr>
<tr>
<td>Bank of India</td>
<td>2.48</td>
<td>1.24</td>
<td>1.08</td>
<td>-14.81</td>
</tr>
<tr>
<td>Syndicate Bank</td>
<td>1.55</td>
<td>0.77</td>
<td>1.15</td>
<td>33.04</td>
</tr>
<tr>
<td>UTI Bank</td>
<td>0.9</td>
<td>0.45</td>
<td>0.61</td>
<td>26.22</td>
</tr>
<tr>
<td>Union Bank</td>
<td>1.87</td>
<td>0.93</td>
<td>1.12</td>
<td>16.96</td>
</tr>
</tbody>
</table>
Operational Risk - Standardized Approach

• Banks’ activities are divided into standardized business lines.

• Within each business line:
  – specific indicator reflecting size of activity in that area
  – Capital charge$_i = \beta_i \times$ exposure indicator$_i$

• Overall capital charge = sum of requirements for each business line
### Operational Risk - Standardized Approach

<table>
<thead>
<tr>
<th>Business Line</th>
<th>Exposure Indicator</th>
<th>Capital Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Finance</td>
<td>Gross Income</td>
<td>$\beta_1$</td>
</tr>
<tr>
<td>Investment trades</td>
<td>Gross Income (VaR)</td>
<td>$\beta_2$</td>
</tr>
<tr>
<td>Retail Banking</td>
<td>Annual Average Assets</td>
<td>$\beta_3$</td>
</tr>
<tr>
<td>Commercial Banking</td>
<td>Annual Average Assets</td>
<td>$\beta_4$</td>
</tr>
<tr>
<td>Fee Based Service</td>
<td>Gross Income</td>
<td>$\beta_5$</td>
</tr>
<tr>
<td>Asset Management</td>
<td>Funds under Management</td>
<td>$\beta_6$</td>
</tr>
</tbody>
</table>

Note: Definition of exposure indicator and $\beta_i$ given by Bank for International Settlements
Advanced Management Approach

• Qualitative standards – organizational requirements to create an independent operational risk function

• Quantitative standards – collection of operational loss data and the development of operational risk measurement models.
  – capturing potentially severe tail loss events with a 99.99 percentile confidence interval
  – Track internal loss data based on a minimum five-year observation period
  – Use relevant external data
  – Use scenario analysis (expert opinion along with external data to evaluate its exposure to high-severity events)
Qualitative Risk Measure

• Critical assessment method
  – Questionnaire format and interviews with bank managers to identify operational risk events.
Key Risk Indicators approach

• Identifying indicators to measure the scope of business loss and the risk involved.

• Example: portfolio size, volume of transactions traded, volume of deals routed through payment and settlement systems.

• Key risk indicators is more a predictive model than a cause-and-event approach.
Loss Distribution Approach (LDA)

- Identifying the distribution of historical loss events.
- Quantitative measures such as expected loss and operational value at risk.
Scenario Generation Approach

• Loss Scenario Modeling.
• Simulation models for loss scenarios based on the events and loss captured.
## Risk Identification Matrix

### Effect

<table>
<thead>
<tr>
<th>Causes</th>
<th>Direct Effect</th>
<th>Indirect Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loss from Counter party</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loss from External Factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other Losses</td>
<td>Operational Loss</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Increase Expenses</td>
</tr>
<tr>
<td>Uncertain Information on Counter Party</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncertain Information on Market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Causes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failed processes, People, Systems, external events</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Capital Requirements for Operational Risk Management

1. Regulation of Risk → Loss Distribution → Adjust for data points → Adjustment for Changes → Initial operating Risk Capital
2. Allocation of Capital → Initial Capital → Adjustment for Business Complexity → Adjustment for Performance measures → Adjusted operating risk capital
3. Bank Specific Adjustment → Adjusted Capital → Correction Analysis → Risk Mitigation reductions → Net or Risk Economic Capital
Operational Risk Management Triangle

- Day to day Business Operations
- Performance Measurement
- Risk Assessment
- Financial Implication

Operational Risk Management
Daily Business Operations

• Client level
• Advisory role
• Risk mitigation measure
• Execution of measures
Risk Assessment

- Self assessment
- Duration of risk
- Errors in assessment
- Cost due to assessment
- Analysis of risk
Financial Implication

- Loss from operations
- Capital requirement
- Value additions to the bank
Performance Measurement

• Control of operational risk

• Optimization of investment

• Identification of best practices

• Benchmarking