Capital Allocation for Operational Risk
Implementation Challenges for Bank Supervisors

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Goals of Bank Supervisors

• Allocate capital according to a risk-focused approach to the quantification of operational risk

• Provide incentives for banks to measure and manage operational risks
  – Promote sound internal policies / controls / procedures
  – Motivate investment in operational risk infrastructure to reduce operational risk

• Ensure appropriate consideration of stress testing / systemic risk
  – Consideration of systemic implications of operational risk decisions made by individual firms
Role for OpRisk Quantification

• Enables measurement of capital based on historical experience of firm
  – Most accurate measure of idiosyncratic risk of individual firms
  – Rewards firms that can reduce operational risk

• Improves bank decision making
  – Provides framework for explicitly measuring gains from reducing risk

• Provides a mechanism for better understanding “tail events,” those that may be outside a bank’s historical experience

• Provides method for measuring the effect of risk mitigation tools
FRB Boston Operational Loss Data Initiative

• Several institutions, of varying size and product mixes, provided us with operational loss data

• Data is considered strictly confidential
  – Bank-specific information is used solely for supervisory purposes

• We have detailed discussions with banks regarding data collection issues and quantification methods

• General observations about quantification methods:
  – AMA methods are within the reach of most large institutions
    • main cost is data collection
    • with data, loss distributions can be calculated relatively easily
Data Discussion

• To maintain the confidentiality of bank-specific data, all empirical examples provided in this presentation are based on a “constructed” database, not actual bank-level data. The database was constructed in a manner so that it would be impossible to uncover bank-specific information, but still provide empirical results that mirror our general findings from actual data.

• The constructed database:
  – omitted several banks that supplied us with data
  – combined business lines from several banks
  – contains no bank in its entirety
  – transformed data that was used

• Thus, the axes on each of the graphs in this presentation are not relevant and not reflective of any bank.
Overview of Quantification Techniques

Generally, the estimation of operational loss distribution involve 3 steps:
1. Estimating a frequency distribution
2. Estimating a severity distribution
3. Running a statistical simulation to produce a loss distribution
Overview of Quantification Techniques

- The estimated operational loss distribution would take the form of something similar to:

  **Severity of Loss**
  
  **Probability of Loss**

  - Expected Loss - Expense / Provision
  - Unexpected Loss - Reserves / Insurance / Capital
  - Catastrophic Loss - Insurance?
Quantification: Distributional Assumptions

• Selection of distributional assumptions are important
  
  – Parametric vs. Non-Parametric
  
  – Appropriate distributional assumption likely differs
    • by business lines
    • by institution

• Supervisors must be concerned about incentives banks have to choose a specific methodology
Distributional Assumptions Matter

Non-Parametric

Frequency of Operational Loss Events: BL1

No Parametric Technique

Parameteric Technique

Frequency of Operational Loss Events: BL1

Median = 1,440
99.0% = 1,920
99.5% = 1,970
99.9% = 2,120

Number of Occurrences in One Year

Median = 1,449
99.0% = 1,540
99.5% = 1,550
99.9% = 1,564

Operational Loss Distribution: 1 Year Time Horizon, BL1

No Parametric Technique

Median = $56M
99.0% = $78M
99.5% = $80M
99.9% = $85M

Operational Loss Distribution: 1 Year Time Horizon, BL1

Median = $56.5M
99.0% = $61.5M
99.5% = $62.1M
99.9% = $62.8M
Quantification: Scaling of Data

• Why scale data?
  – Level and mix of business activity changed so that historic data are not reflective of current loss rates
    • impact on frequency distribution - more/less frequent events
    • impact on severity distribution - exposure increases/decreases
  – Thus, blindly using historical operational loss data can be misleading

• Conceptually, scaling is straightforward

• In practice, implementing is quite difficult
  – What variable / methodology should be used to scale?
  – The return of the exposure indicator?
Scaling Matters

Non-Parametric, No Scaling of Data

Frequency of Operational Loss Events: BL1
Non-Parametric Technique

Median = 1,440
99.0% = 1,920
99.5% = 1,970
99.9% = 2,120

Operational Loss Distribution: 1 Year Time Horizon, BL1
Non-Parametric Technique

Median = $56M
99.0% = $78M
99.5% = $80M
99.9% = $85M

Non-Parametric, Scaling of Frequency Data

Frequency of Operational Loss Events: BL1
Scaled Frequency Data
Non-Parametric Technique

Median = 1,673
99.0% = 2,224
99.5% = 2,280
99.9% = 2,431

Operational Loss Distribution: 1 Year Time Horizon, BL1
Scaled Frequency Data
Non-Parametric Technique

Median = $65M
99.0% = $90M
99.5% = $93M
99.9% = $100M
Scaling Matters

**Impact of Scaling**

- Required capital at the 99.9% confidence level, no scaling of data: = 85M

- If scale frequency data: = 100M (18% increase)

- If scale both frequency and severity data: = 111M (30% increase)
Implementation Details are Important

Sensitivity of Loss Distribution to Modeling Assumptions
Note: Same Underlying Data

99.9% Confidence:
- Par, No Scaling: 63M
- NonPar, No Scaling: 85M
- NonPar, Scaling Freq: 100M
- NonPar, Scaling Freq/Sev: 111M

Total Loss Amount in One Year (millions $)
Density

Par, No Scaling
NonPar, No Scaling
NonPar, Scaled Freq
NonPar, Scaled Freq/Sev
Quantification: How to Handle “Tail Events”

- How does a bank with no experience with high-severity events incorporate the possibility that such an event could occur at their institution?
  - External data?
  - Scenario analysis?

- How does a bank that experienced a high-severity event deal with that event in their quantification analysis?
  - Loss distributions are sensitive to the inclusion of extreme events
  - How long should the bank retain the extreme event in their database?
  - If problem is corrected / controls enhanced, should event remain in database?
Quantification: Risk Mitigation Techniques

- Insurance: outstanding issues regarding conversion of operational risk to credit / legal risk

- Insurance as capital offset:
  - Using information about deductibles/limits, “event policies” can be thought of as altering the severity distribution

- Incorporating this mitigation technique into the quantification analysis can significantly affect the tail of the operational loss distribution

- Quantification techniques discussed above provide firms with the framework to determine appropriate insurance coverage
Benefits of Quantifying OpRisk

• Allows banks to identify operational loss outcomes that they have exposure to, but have yet to experience.
  – example: bad cluster of high frequency, low impact events

• Provides a framework for modeling extreme events.
  – “Scenario Analyses” of low frequency, high impact events
  – example: business interruption

• Large potential payoff to banks:
  – Help incorporate the quantification of “risk reduction” into the decision making process of whether to make a particular technological investment or not.
  – Banks that measure and manage operational risk can significantly reduce costs
  – Banks that measure and manage operational risk are likely to be less susceptible to systemic problems
Significant Challenges for Bank Supervisors

• What modeling assumptions are reasonable?

• Many different types of models will be employed by banks
  – models idiosyncratic to firm
  – models idiosyncratic to business line
  – models idiosyncratic to controls

• Attaining flexible firm-specific modeling and consistency of treatment across organizations will be difficult

• Supervisory staff will need to understand modeling issues as well as the nature of operational risk for different business lines.