# Capital Allocation for Operational Risk

## Implementation Challenges for Bank Supervisors

Eric Rosengren

Senior Vice President

Federal Reserve Bank of Boston

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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
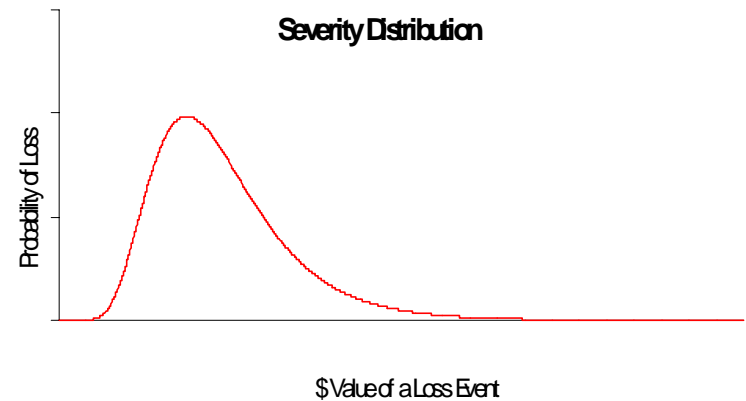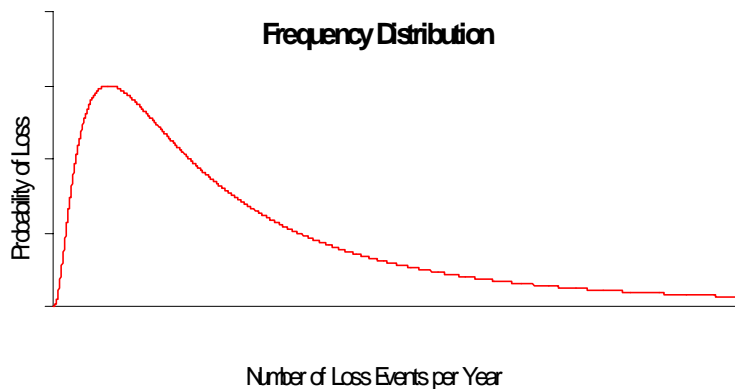    - with data, loss distributions can be calculated relatively easily

# 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.
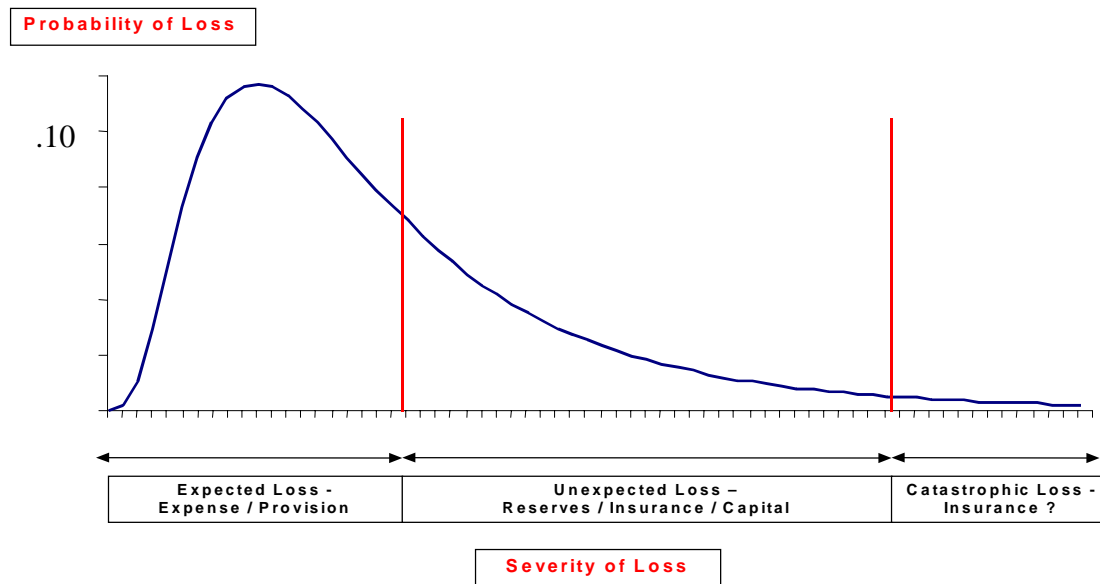
# Overview of Quantification Techniques

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

**Frequency Distribution**

Probability of Loss

Number of Loss Events per Year

**Severity Distribution**

Probability of Loss

$ Value of a Loss Event

# Overview of Quantification Techniques

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

**Probability of Loss**

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| Expected Loss - Expense / Provision | Unexpected Loss – Reserves / Insurance / Capital | Catastrophic Loss - Insurance ? |
|---|---|---|

**Severity of Loss**

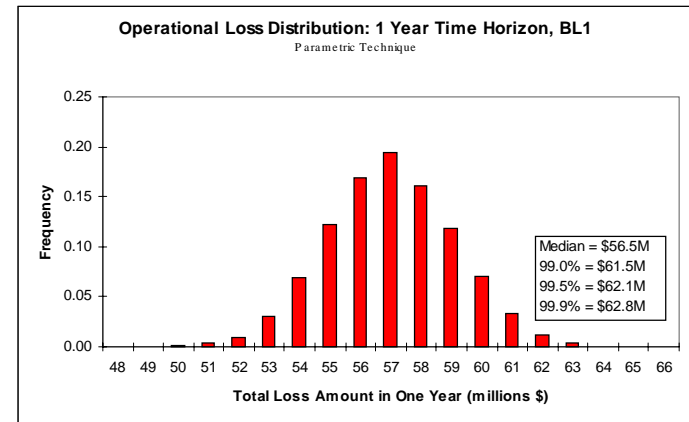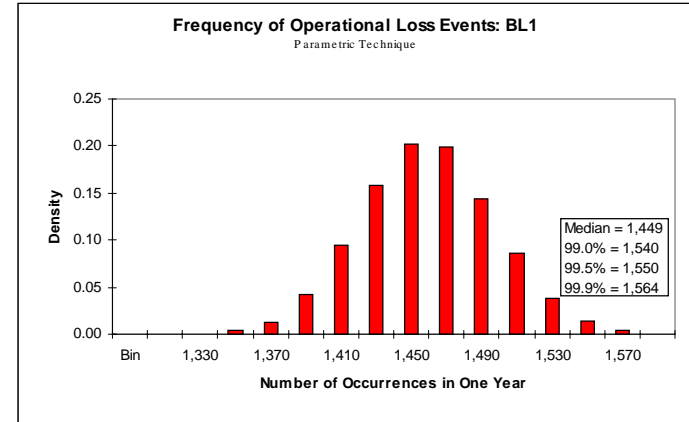# Quantification: Distributional Assumptions

- 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
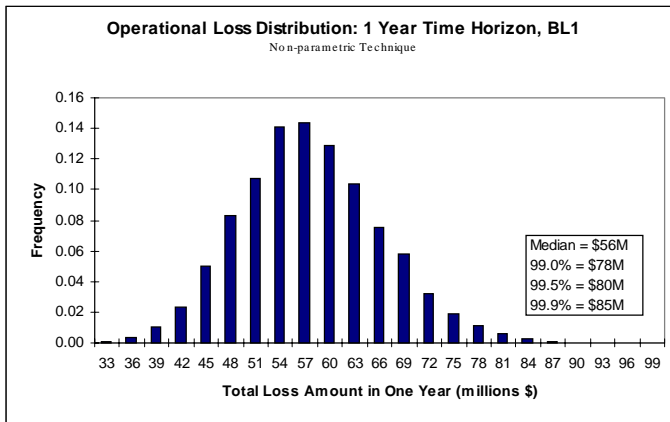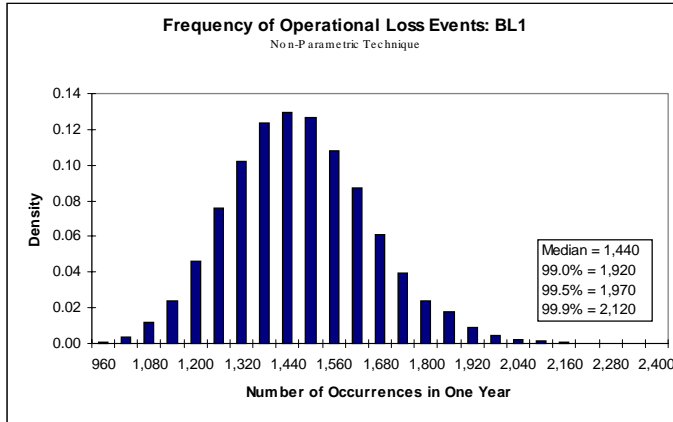
# Quantification: Scaling of Data

- 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

(Density vs. Number of Occurrences in One Year)

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

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

(Frequency vs. Total Loss Amount in One Year (millions $))

## 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

(Density vs. Number of Occurrences in One Year)

**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

(Frequency vs. Total Loss Amount in One Year (millions $))

# Scaling Matters

## Non-Parametric, Scaling of Frequency and Severity Data

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

Density vs. Number of Occurrences in One Year

| 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 and Severity Data**
Non-parametric Technique

Frequency vs. Total Loss Amount in One Year (millions $)

| Median = $72M |
| 99.0% = $100M |
| 99.5% = $103M |
| 99.9% = $111M |

## 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
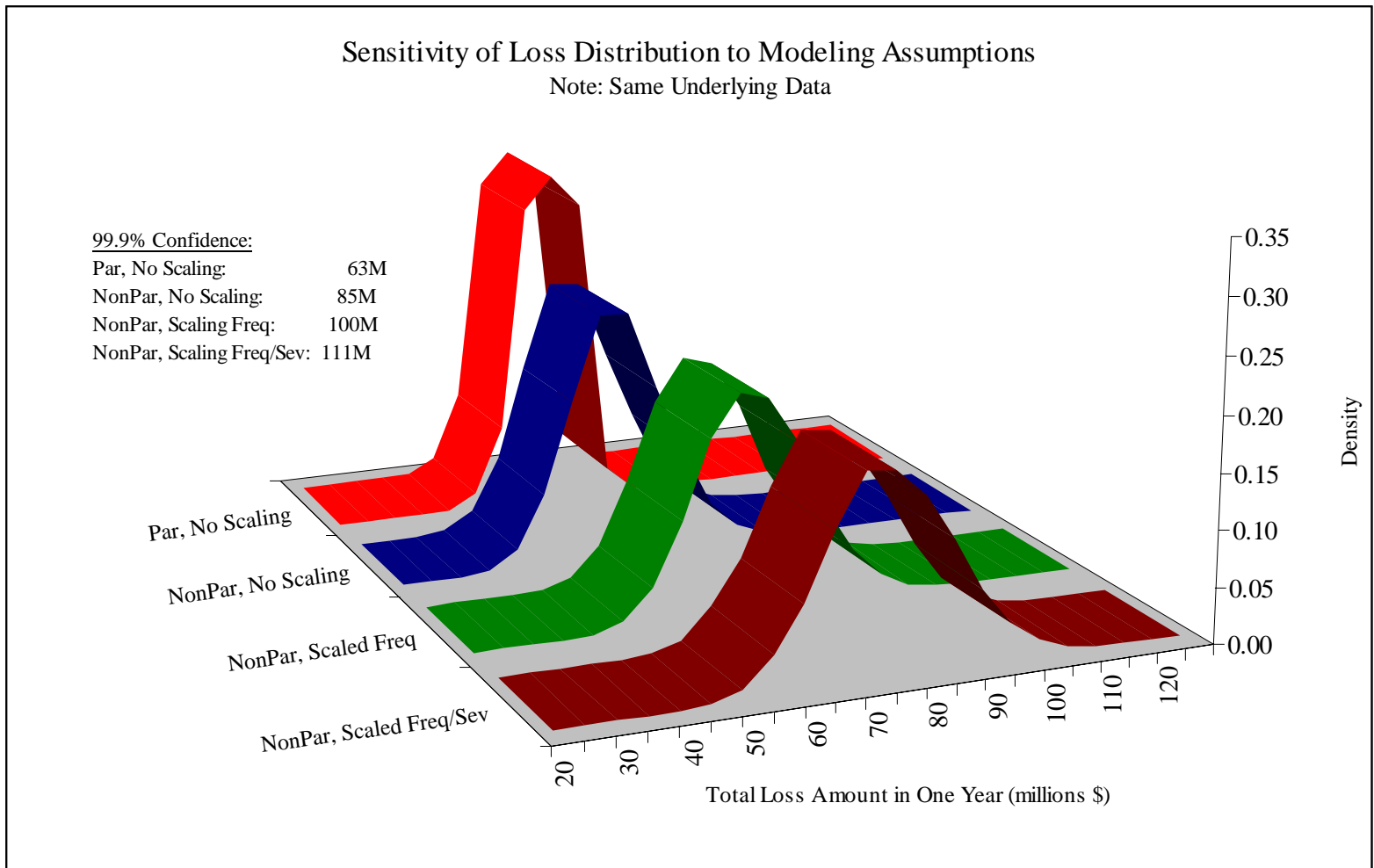
# Quantification: How to Handle "Tail Events"

- 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.