

BANK OF JAPAN

Operational Risk Scenario Analysis Workshop

Evolving the Scenario Analysis Process at JPMorgan Chase

Robin L. Phillips



July 19, 2006

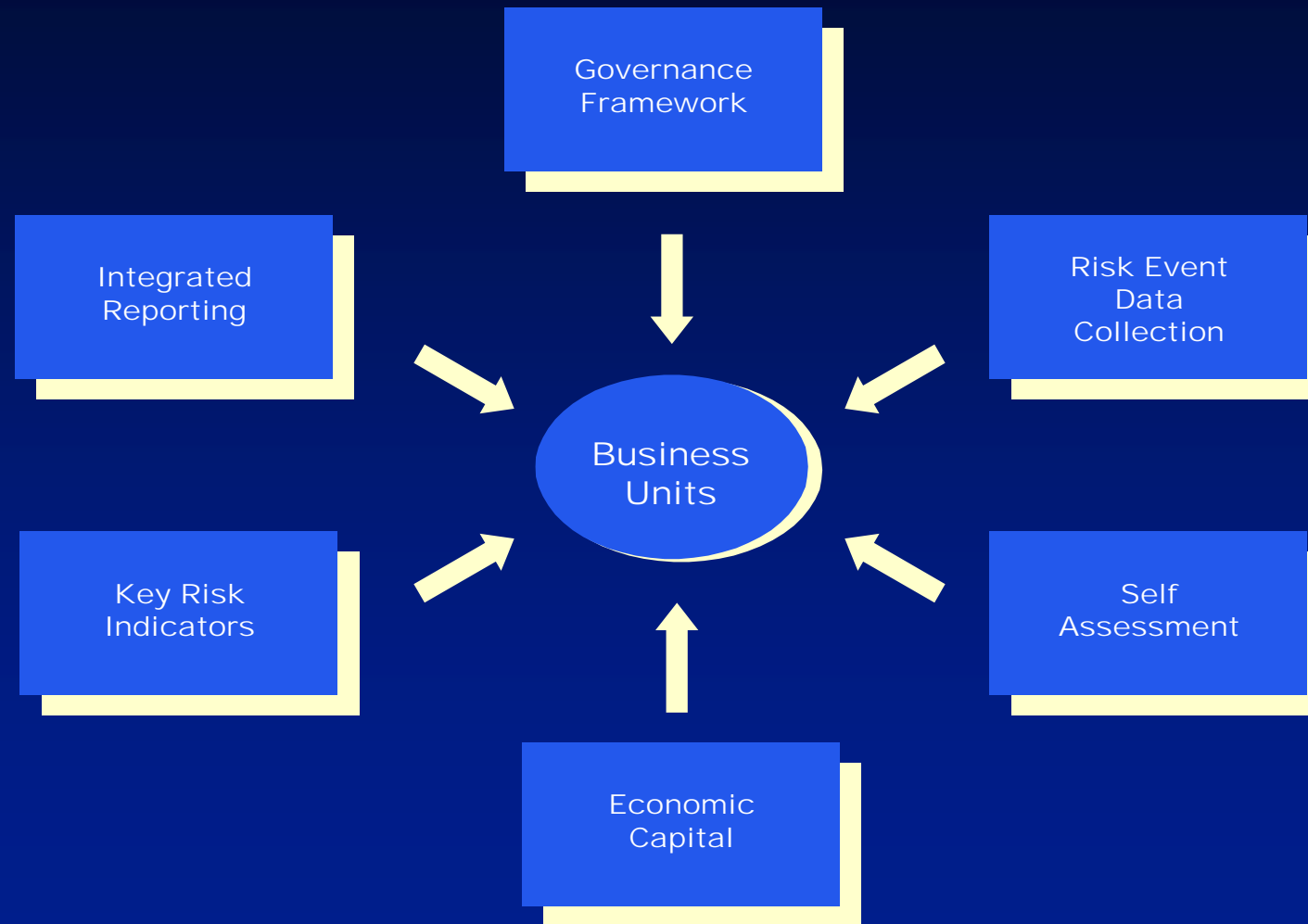
Leveraging Scenario Analysis in Operational Risk Management

Agenda

- Objectives and Context of Risk-based Economic Capital Model
- Reasons for Pursuing a Scenario Analysis Process
- Original Process and Conclusions
- Updating the Approach
- Strengths and Weaknesses of Scenario Analysis
- Conclusions

Capital is one component of our integrated risk framework

Operational Risk Management Framework



A risk-based capital model has been in place at JPMC since 2003

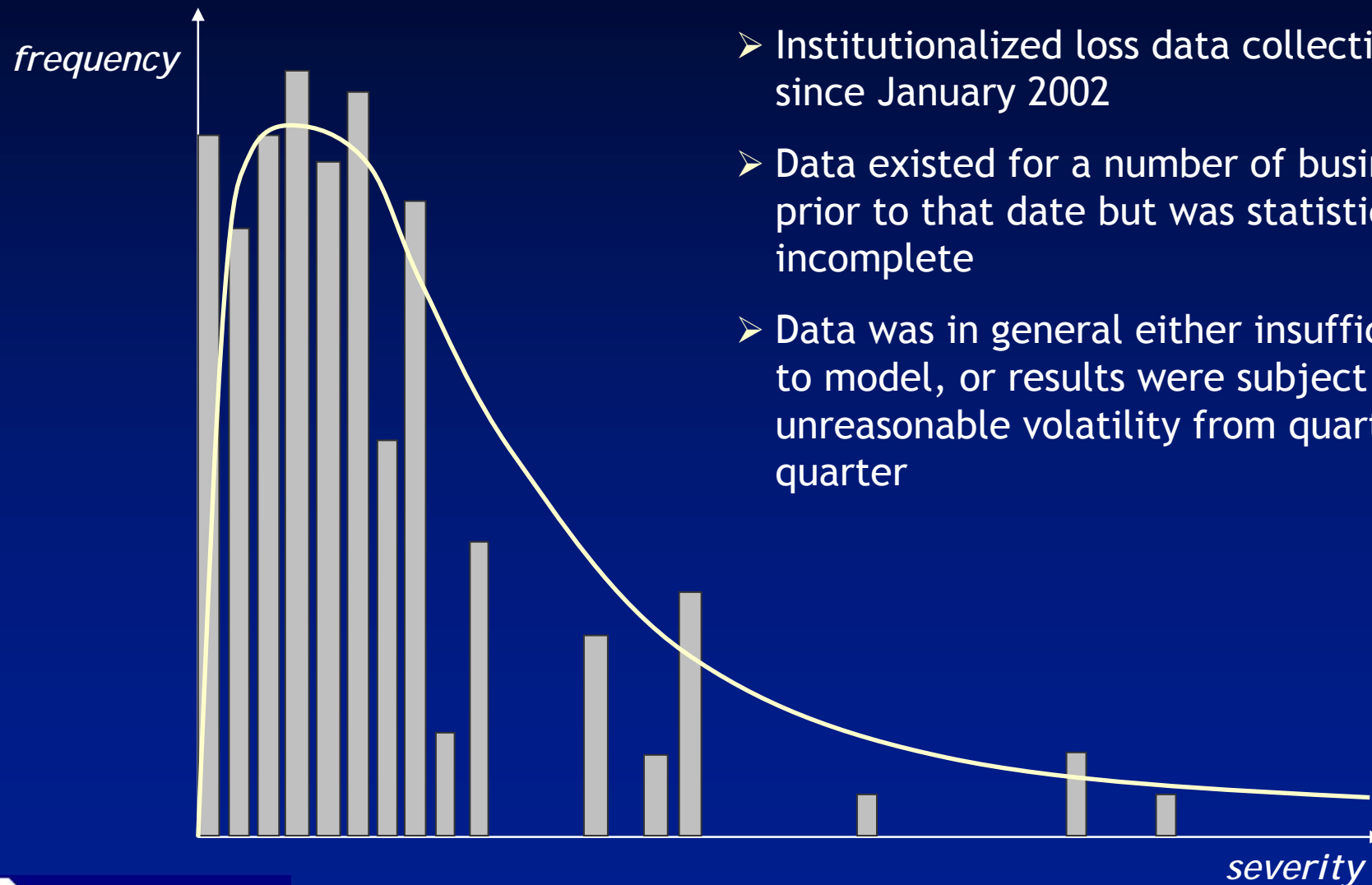
Objectives:

- Risk-based calculation and measurement of operational risk
- Incentives for good risk management behavior
- Directionally correct, repeatable and progressive
- Compatible with credit, market and business risk capital
- Consistent with Basel II regulatory proposals

The model is based on a Loss Distribution Approach

- Statistical model, founded on fact (loss data)
- Repeatable and progressive, as additional data becomes available
- Similar to other risk models
- Consistent with much of industry thinking

In 2003 we had a very limited time series of quality data



- Institutionalized loss data collection since January 2002
- Data existed for a number of businesses prior to that date but was statistically incomplete
- Data was in general either insufficient to model, or results were subject to unreasonable volatility from quarter-to-quarter

To supplement the loss data we considered alternatives

<u>Alternative</u>	<u>Strength</u>	<u>Weakness</u>
1. Use external loss data from a commercially available database	<ul style="list-style-type: none">• Factual• Objective	<ul style="list-style-type: none">• Collection bias• Relevance
2. Use internal, anecdotal data to supplement the data set	<ul style="list-style-type: none">• Factual• Relevant	<ul style="list-style-type: none">• Statistically incomplete
3. Generate loss scenarios based on business judgment	<ul style="list-style-type: none">• Relevant• Most accurate, in absence of good data	<ul style="list-style-type: none">• Subjective• Open to “gaming”

None of the alternatives individually was appealing, therefore we chose to combine them into a single scenario analysis process

We assembled teams of experts in the 20 major businesses ...

① Typical teams consisted of:

- Business managers
- Operations managers
- Risk managers
- CFOs
- Legal
- Internal audit

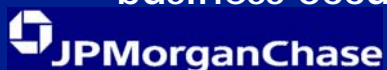
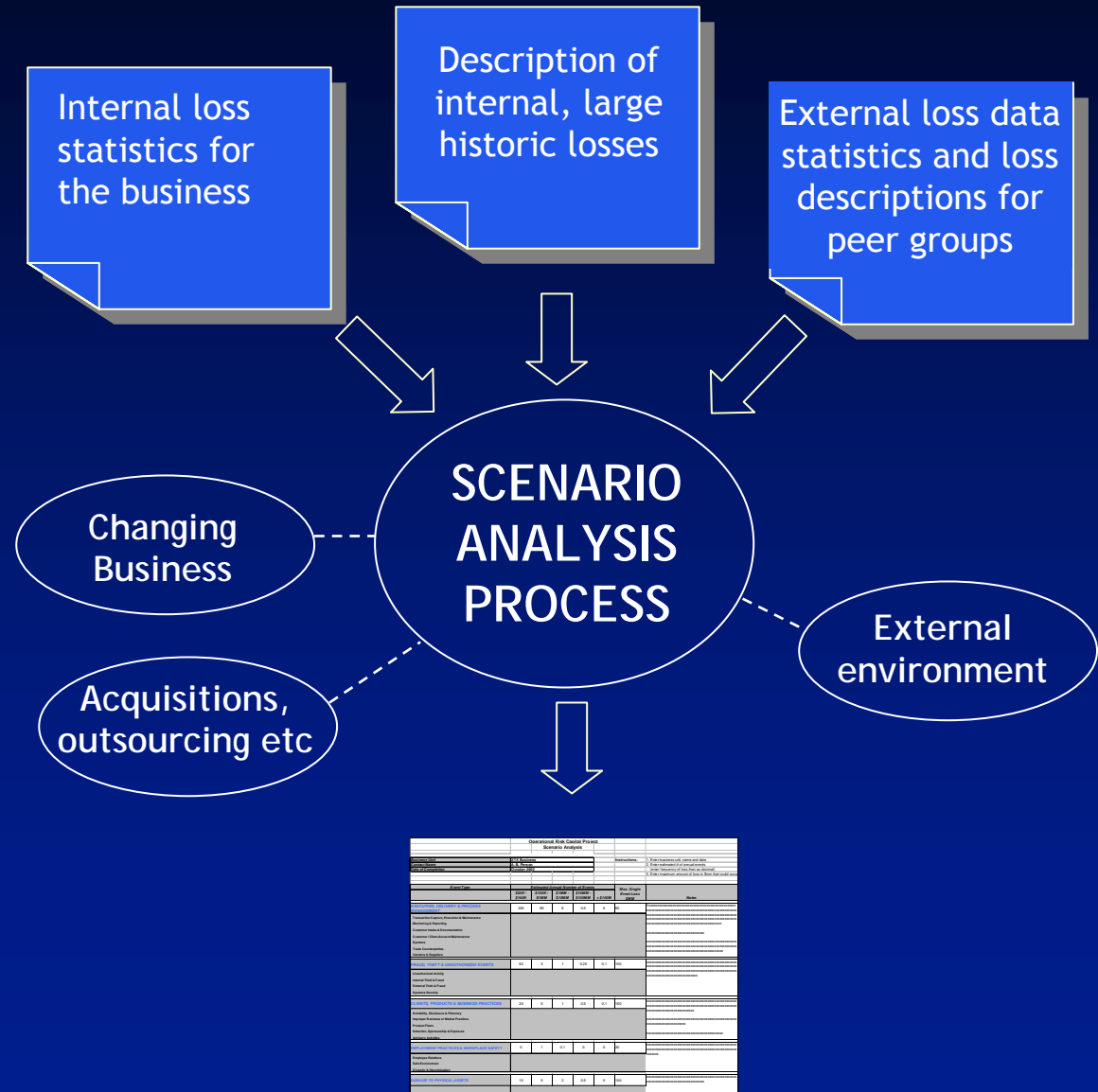
Other specialists included:

- Compliance
- Technology
- Information security

② More than one meeting was normally held to develop and review the scenarios

③ Scenario data and modeled results were compared across businesses

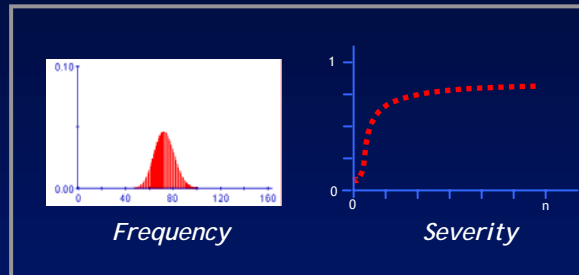
④ Scenarios updated when material changes to the business occur



We combined distributions from both loss data and scenarios to generate a capital number

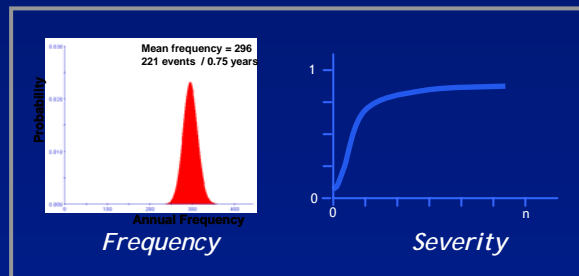
DATA

- Factual
- Incomplete



SCENARIOS

- Subjective
- "Complete"



- Below a \$1mm threshold we modeled only actual loss data
- Above \$1mm we weighted the scenarios 80% and the data 20%

Conclusions from the exercise

Positives:

- Scenario process became more valuable than just a data collection exercise
- Participants found exercise forward-looking and very informative
- Stabilizes volatility of loss-based capital calibration

Negatives:

- Process is inherently subjective
- May not capture impact of multi-dimensional loss events
- Difficult to relate to high confidence intervals (99%+)
- Linkage to capital can lead to “gaming”

We are currently making our first update to the capital model

For our “update round” of scenarios we are making some changes to strengthen the process and provide more business relevance

Objectives:

- Bring more data and analysis into the exercise
- Learn from our own, and others’, experiences
- Capture more forward-looking business information and metrics

There is considerably more data available to us now

2003:

- One year of internal loss data
- Collection of peer group losses from First and OpVar databases

2006:

- Four+ years of internal loss data - frequency and severity analysis possible
- Peer group losses from First database - additional losses
- ORX data now available - severity distribution analysis and large losses relevant
- Other sources of industry data - enrich analysis, e.g. industry fraud statistics
- Web searches provide additional information

Increased data enhances the objectivity of the modeling process

- We examine internal data for “Level 2 Businesses” and “Level 1 Event Types”
 - over 50 “units of analysis” (more granularity vs. 2003)
 - Frequency and severity distribution fitting
 - Time series analysis (new analysis)
 - Large loss examination
- Similar analysis is performed on ORX data to provide statistical benchmarks
- Industry “Large Loss” experience is examined and documented using the FIRST database to provide loss event benchmarks

The analysis yields mixed results

- For some “units of analysis”, internal loss data and traditional frequency/severity fitting analysis is beginning to provide reasonable representation of the unit’s risk profile
- For others units, 4+ years of internal loss data continues to provide poor representation of the unit’s risk profile

Scenario analysis is as important in 2006 as it was in 2003

Scenario focus has moved away from forecasting the complete distribution, to exploring only the tail

In 2003 we asked experts to forecast the complete loss distribution in terms of frequency and severity.

This time we are asking the experts to describe their key risks and exposures in terms of every day business metrics.

We ask the business experts:

1. Identify key risks - “What keeps you awake at night?”
2. Describe a scenario for each risk
3. Quantify the exposure for each scenario
4. What are the key drivers?

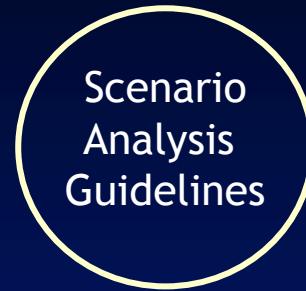
Inputs and Outputs - concentrated on the key risks

INTERNAL DATA

- Internal loss data statistical profile
- Large loss descriptions

EXTERNAL DATA

- Internal loss data statistical profile
- Peer group large loss descriptions
- ORX data profile
- Industry data
- Web search results



1. Identify key risks
2. Describe scenarios
3. Quantify exposures
4. Identify drivers

BUSINESS PRACTICE RISK

FRAUD RISK

EXECUTION RISK (example)

1. Risk
Inability to handle peak demand
2. Scenario
When interest rates are falling there is a rapid increase in refinancing applications. We make rate commitments
3. Exposure
Assume applications from 10% of portfolio in one month, and an adverse rate movement
4. Drivers
interest rate changes, average loan size, number of loan applications


How the output will be used

Three alternatives are being considered:

- Utilize the existing model, replacing the previous forecasts with the updated maximum loss
 - *Simple, but limited benefit*

- Generate a single severity distribution that combines the observed loss data with the forecast maximum, replacing the two separate distributions in use today
 - *Removes subjectivity behind the method of combining distributions*
 - *Subjectivity is transferred to the choice of distribution assumptions, and/or the choice of proxies*

- Evolve the model to calculate capital based on the underlying business metrics and exposures
 - *Promising "R&D" activity: adds business value, but expensive to develop*



Increasing Value and Relevance
—
Increasing Complexity

Validation – Review Points

- **Characteristics of the severity distribution:**
 - *Reasonableness in absolute terms*
 - *Comparability across event types (e.g. execution vs. fraud)*
 - *Comparability across businesses*
 - *Comparability to observed internal losses*
 - *Comparability to external losses*

- **Capital estimates from the model:**
 - *Reasonableness in absolute terms*
 - *Comparability to other businesses*
 - *Comparison to revenues*
 - *Comparison to other risk classes (especially credit and market risk)*
 - *Comparison to available disclosures or other external benchmarks, including ORX*

Validation - Governance Process

- Corporate risk staff review
 - *Corporate Operational Risk, Quantitative Research, Audit*

- Review within a business
 - *Peer review, by ORMs and scenario participants*
 - *Business CFO and Controller*
 - *Business management approval*

- Firmwide, cross-business review (focus on results)
 - *Head of Operational Risk, CRO, CFO*
 - *Corporate management approval*
 - *Operational Risk Committee, Executive Committee*
 - *Board of Directors*
 - *Audit Committee, Risk Policy Committee*

Conclusions

Scenario Analysis:

- A value-added exercise; improves our understanding of risk
- Continues to be a key component of our overall risk measurement framework
- Business engagement is in proportion to perceived value of scenario process and economic capital calculation
- Value can be fully leveraged when integrating scenarios with other elements of the risk framework
- Shortcomings do exist but these will diminish, not increase, over time

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