

Leading Edge Issues in Operational Risk Measurement

Leveraging Scenario Analysis in Operational Risk Management

Federal Reserve Bank of New York

May 29 - 30, 2003



Leveraging Scenario Analysis in Operational Risk Management

Agenda

- Objectives and Context of Risk-based Economic Capital Model
- Model Overview
- Generating Scenarios
- Adjustments and Incentives
- Validation
- Strengths and Weaknesses of Scenario Analysis
- Conclusions / Q & A

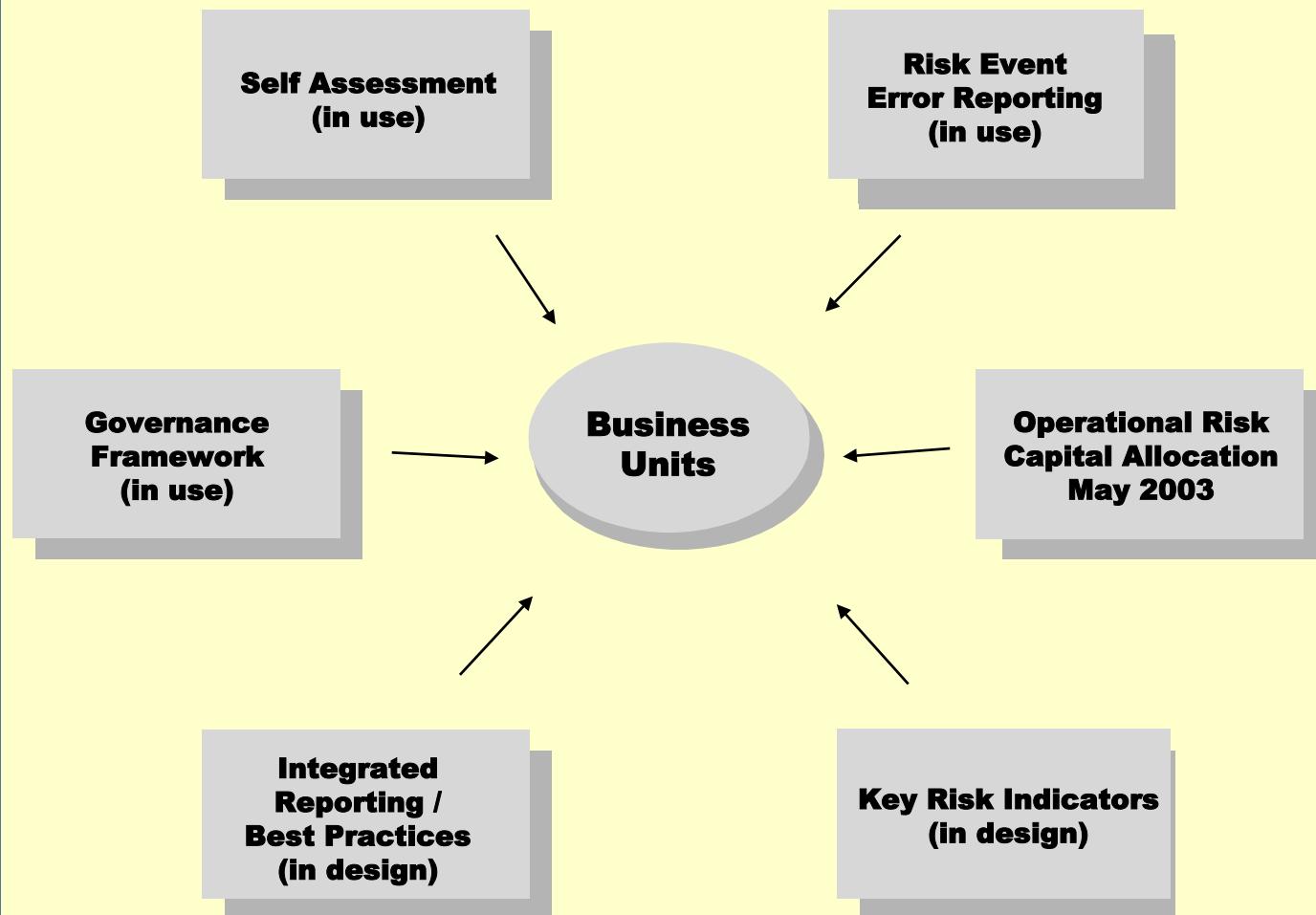
A risk-based model is being implemented at JPMorgan Chase

The objectives of the new model are:

- 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

Capital is one pillar in our integrated risk management framework

Operational Risk Framework



The framework is:

- business-oriented
- risk-specific
- firm-wide

Operational risk system:

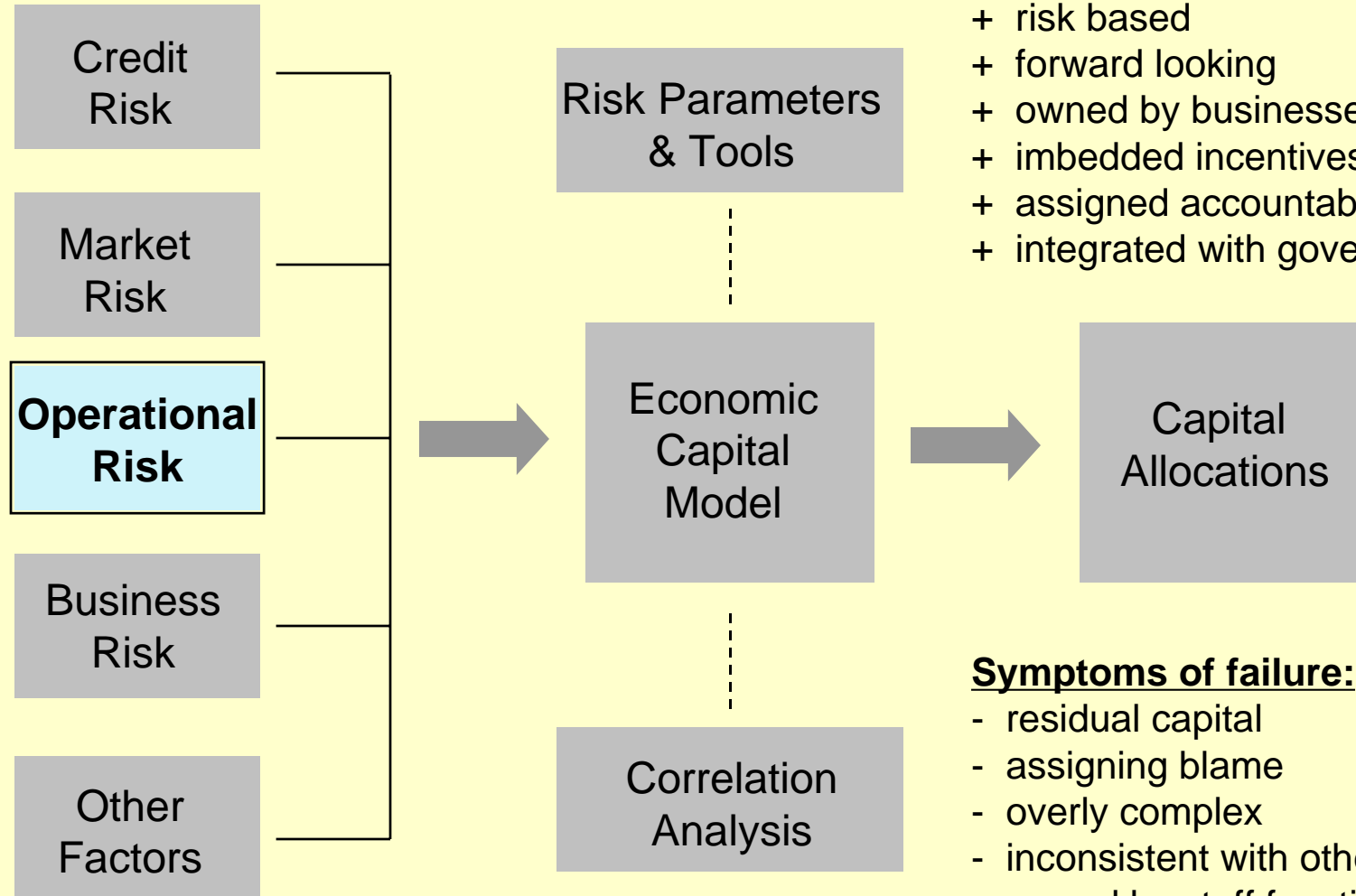
- owned by businesses
- consistent, firm-wide roll out
- validated by GAD
- compatible with Credit / Market risk tools

Implementation:

- project teams for each initiative
- GAD sign off required for key elements
- redundancies eliminated

The model is compatible with the firm's overall capital framework

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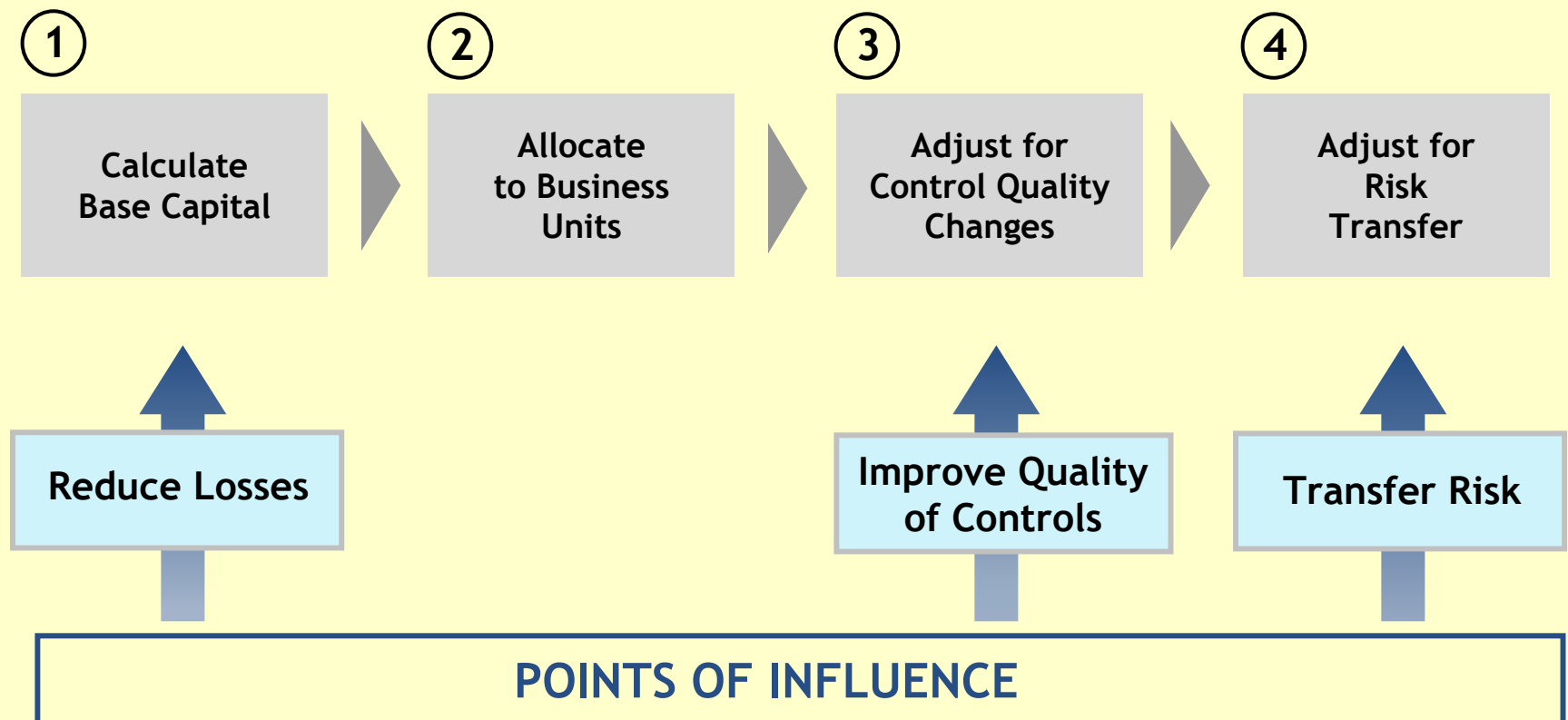
Success drivers:

- + risk based
- + forward looking
- + owned by businesses
- + imbedded incentives
- + assigned accountability
- + integrated with governance

Symptoms of failure:

- residual capital
- assigning blame
- overly complex
- inconsistent with other risks
- owned by staff function
- regulatory focus only

Capital is driven by actual and estimated losses, and by the quality of controls environment



Businesses can influence capital by:

- *Reducing losses*
- *Improving the quality of controls*
- *Transferring financial risk*

Step 1:

Calculate
Capital

Allocate
to Business
Units

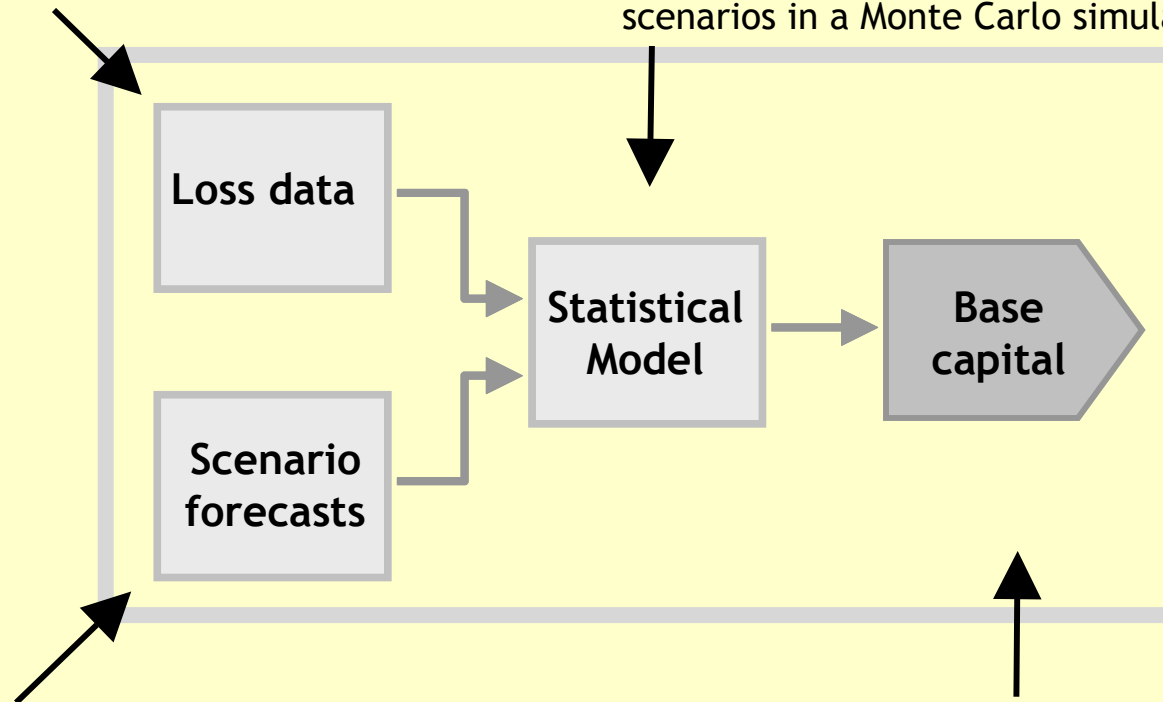
Adjust for
Control Quality
Changes

Adjust for
Risk
Transfer

We firstly calculate a “base capital” number by combining loss data and scenario forecasts of loss

① Losses > \$20,000 from 1/1/2002 to the current period

③ The statistical engine combines frequency and severity distributions derived separately from the data and scenarios in a Monte Carlo simulator



② Future loss scenario forecasts, including stress events, by line of business and risk category

④ The base capital number represents the unexpected loss portion of the total Operational Value-at-Risk

Step 1:

Calculate
Capital

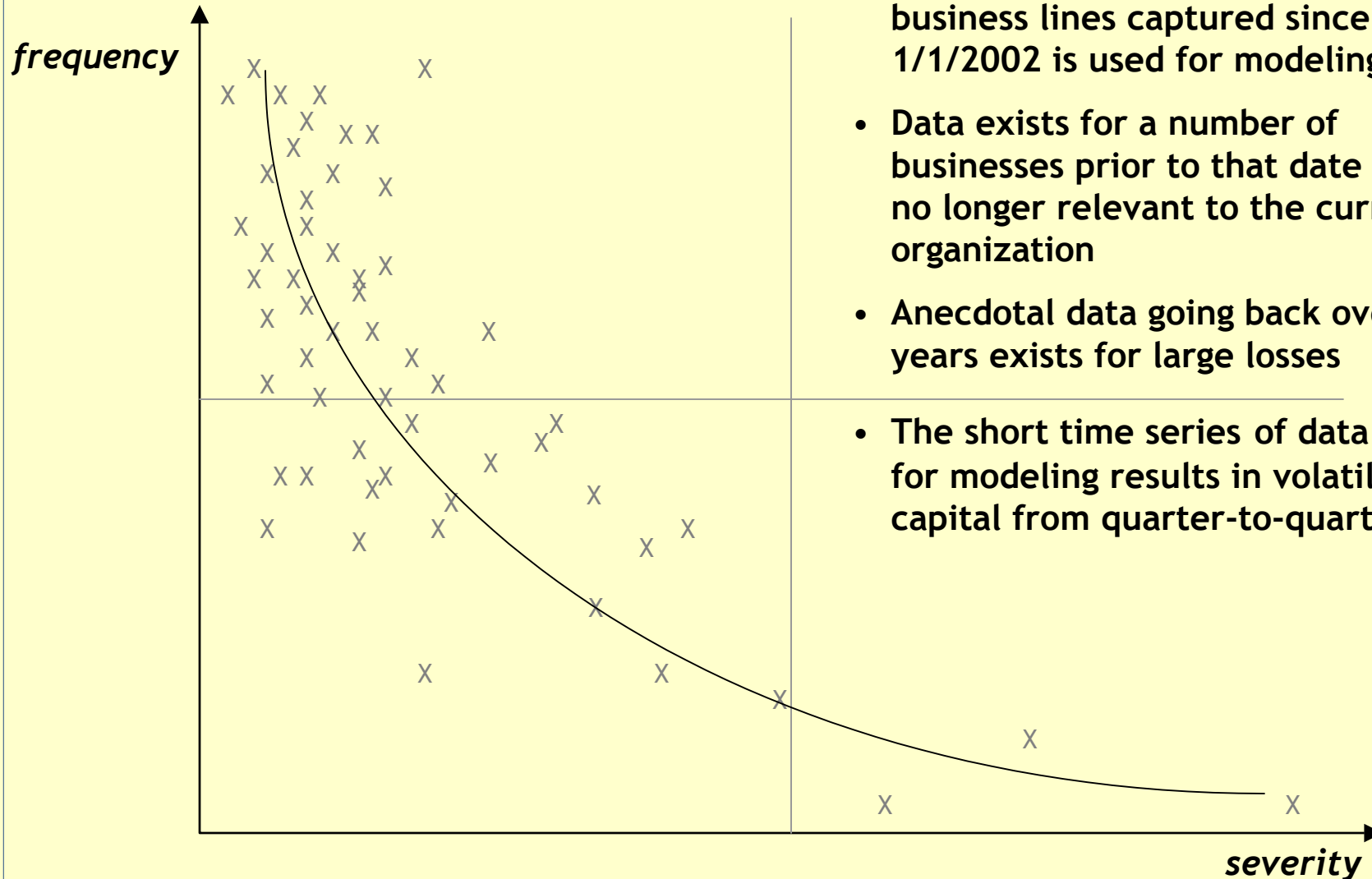
Allocate
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We have a limited time series of complete, quality data

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- Complete, quality data across all business lines captured since 1/1/2002 is used for modeling
- Data exists for a number of businesses prior to that date but is no longer relevant to the current organization
- Anecdotal data going back over 10 years exists for large losses
- The short time series of data used for modeling results in volatile capital from quarter-to-quarter

To supplement the loss data we considered alternatives

<u>Alternative</u>	<u>pro</u>	<u>con</u>
<ul style="list-style-type: none">• 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
<ul style="list-style-type: none">• Use internal, anecdotal data to supplement the data set	<ul style="list-style-type: none">• Factual• Relevant, qualitatively	<ul style="list-style-type: none">• Statistically incomplete
<ul style="list-style-type: none">• 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

Step 1:

Calculate
Capital

Allocate
to Business
Units

Adjust for
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Transfer

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

① Typical teams consisted of:

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

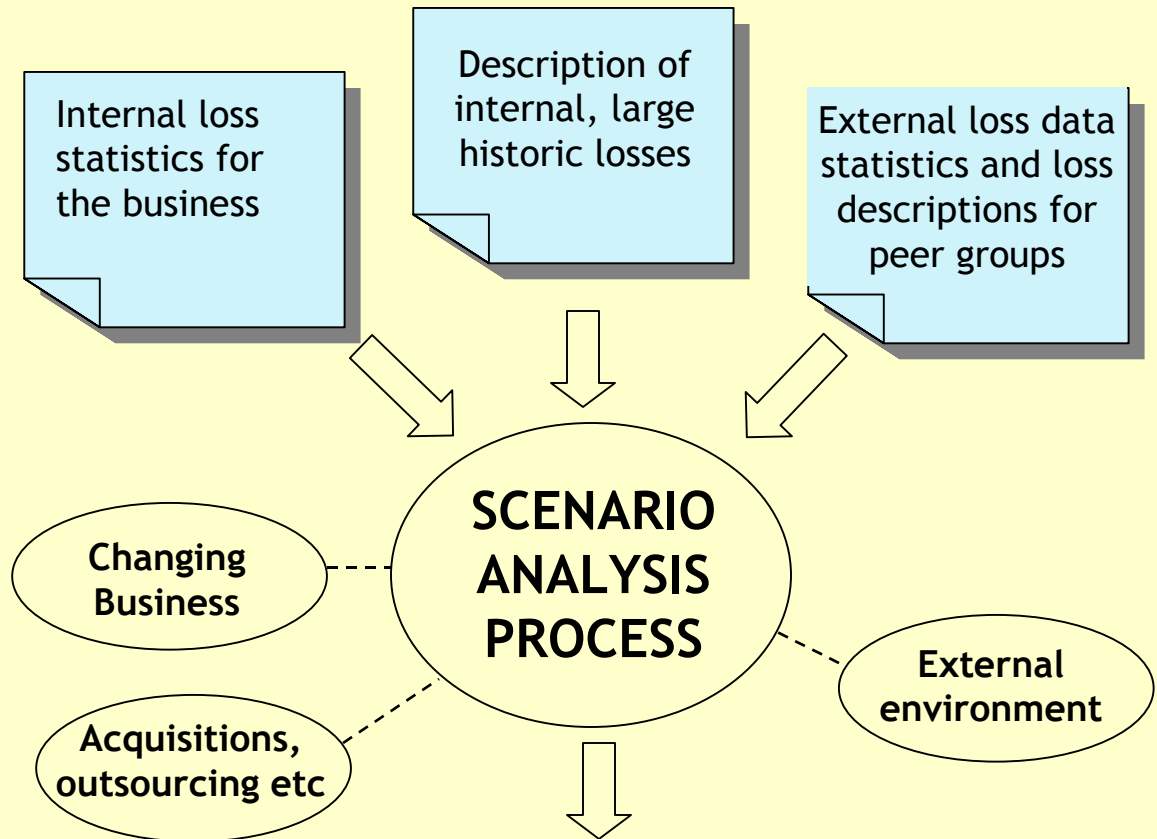
Other specialists included:

- 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 will be updated annually and when material changes to the business occur



The screenshot shows a spreadsheet titled "Operational Risk Model Project Scenario Analysis". It contains multiple columns and rows of data, including headers for "Scenario", "Loss", "Cost", "Impact", "Frequency", "Severity", and "Risk". The data is organized into several sections, with some cells highlighted in blue and others in grey.

Step 1:

Calculate
Capital

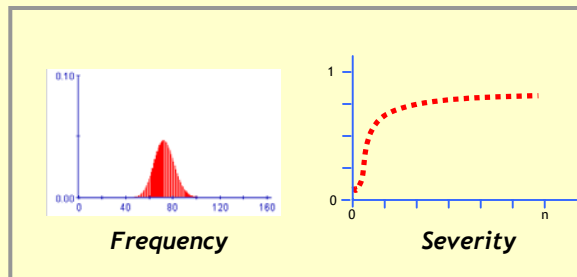
Allocate
to Business
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Adjust for
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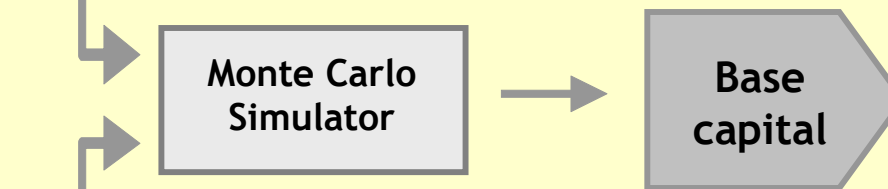
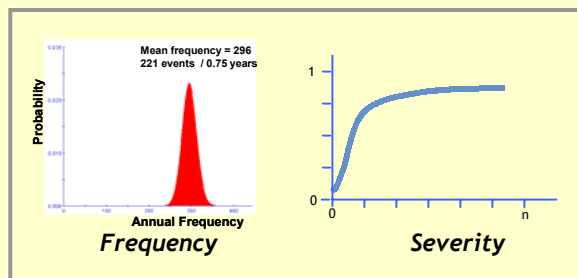
Adjust for
Risk
Transfer

Distributions from both loss data and scenarios are combined to generate the base capital

DATA



SCENARIOS



- Confidence in data below \$1mm is high - and is weighted 100% in the simulator
- Above \$1mm confidence is higher in the scenarios - these are weighted 80% vs data 20%
- As we collect more data the weighting will change away from scenarios towards data, and the \$1mm level will be raised
- In 5 years we anticipate using data 100% except above a determined threshold, above which we will continue to combine scenarios and data

Step 2:

Calculate Capital

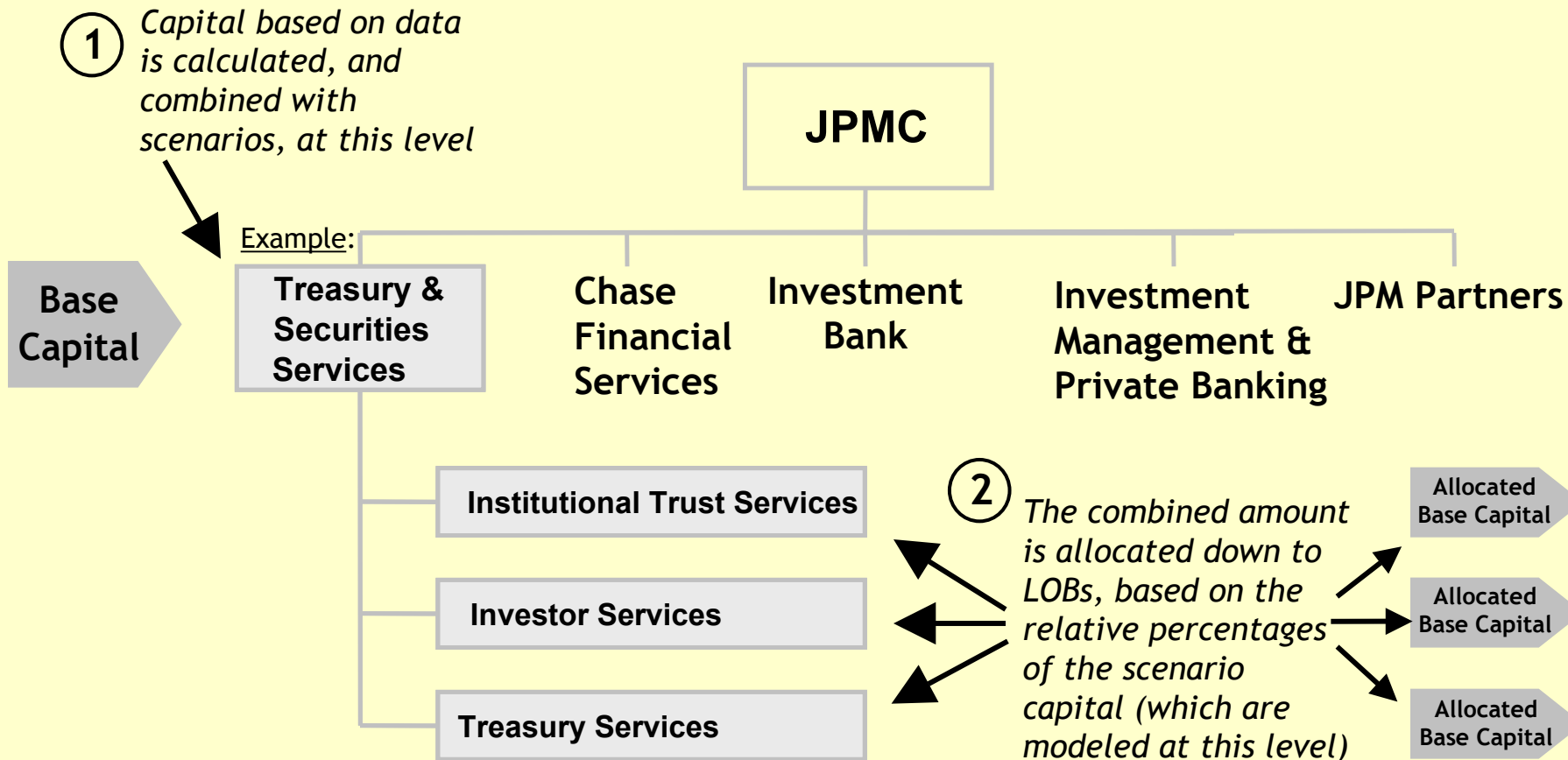
Allocate to Business Units

Adjust for Control Quality Changes

Adjust for Risk Transfer

Capital is calculated for each of the five business enterprises, then allocated to each major business line

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Step 3:

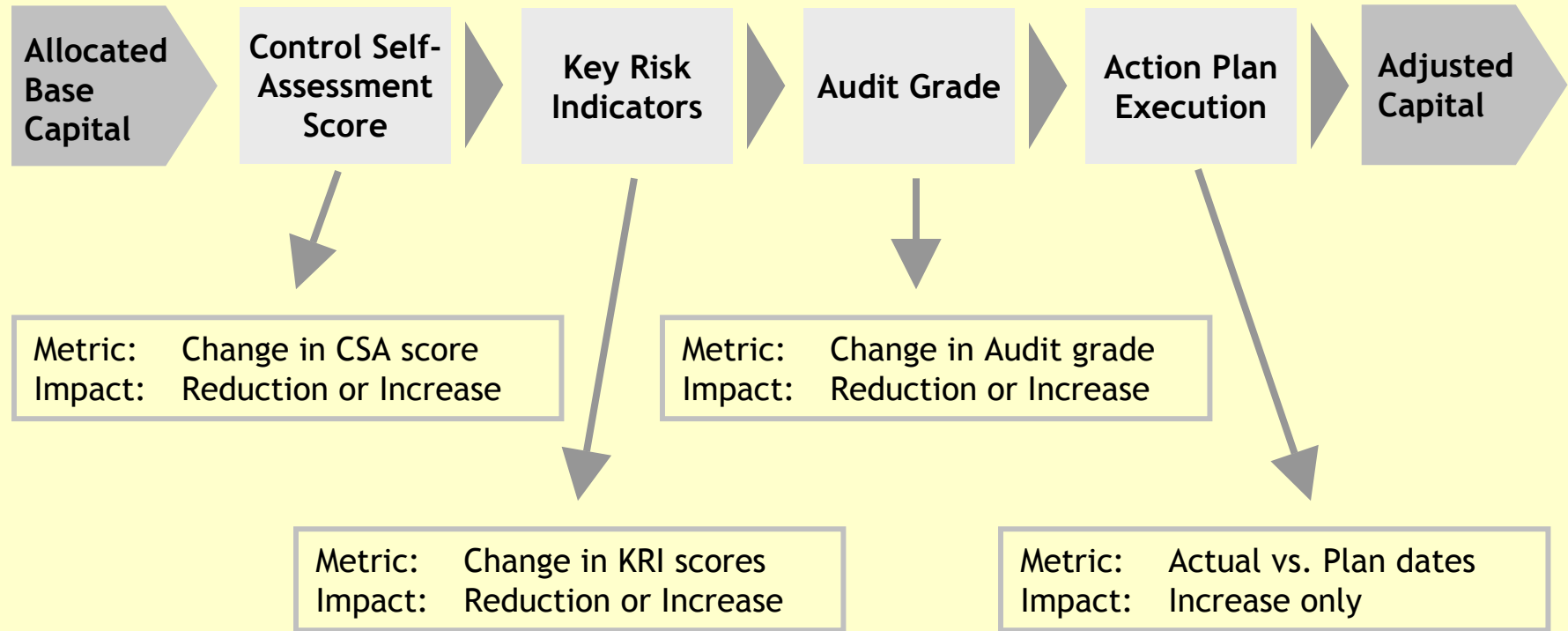
Calculate Capital

Allocate to Business Units

Adjust for Control Quality Changes

Adjust for Risk Transfer

The base capital is adjusted for each line of business to reflect changes in the quality of the control environment



Audit provides the checks and balances to validate the integrity of the adjustment metrics

Step 4:

Calculate
Capital

Allocate
to Business
Units

Adjust for
Control Quality
Changes

Adjust for
Risk
Transfer

Risk transfer will be incorporated in a future version of the model

A follow-on project will address financial risk transfer:

- Examine current insurance coverage
- Determine types of insurance and other risk transfer products that are relevant for future use
- Develop mechanism for incorporation of risk transfer products into the mechanics of the model
- Model the capital impact vs. cost and risk of transfer
- Incorporate cost/risk-effective products as appropriate

Validation of the Model will Take a Number of Forms

The availability of comparable benchmarks today is limited. Our validation is based, for now, on a series of reasonability checks.

■ Internal data

- Comparison of scenario forecasts vs. loss data
- Trends in losses vs. trends in control quality metrics

■ Internal comparisons and “reasonability” tests

- Comparison of capital levels by line of business
- Ratio of actual losses to capital
- Ratio of theoretical mean-to-VaR
- Ratio of op risk capital vs. total economic capital

■ External data (starting later this year)

- Comparison of scenarios to external loss events
- Benchmarking losses vs. ORX data consortium members

Specific validation of scenario data

The importance of scenarios in the model demands particular scrutiny of forecasts vs. experience over time

- Absolute frequency of losses

Q: Do the scenario frequency projections match our internal annualized loss experience, particularly at the tail?

A: Over \$1mm the scenario frequency is greater than the actual loss experience

- Distribution of losses (shape of the loss curve)

Q: Does the distribution of losses in the scenarios match the actual loss experience?

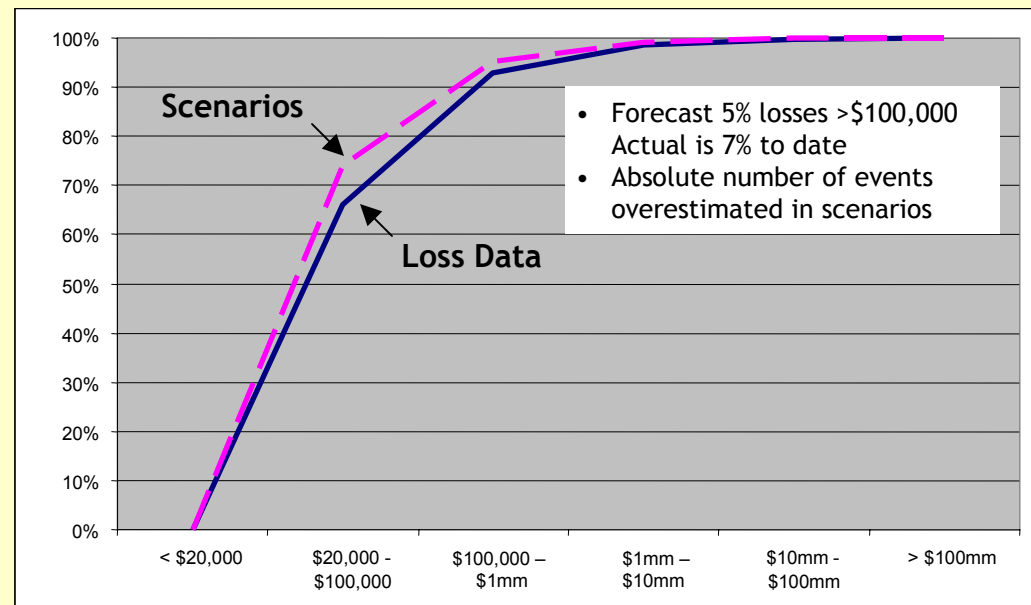
A: The data curve has a “heavier” profile, driven by 4th quarter losses in 2002

- Maximum Loss

Q: How do maximum loss data, internal or external, influence scenario model inputs?

A: Loss experience should very strongly guide, but not dictate, model inputs

Loss Distribution Curve - Actual results vs. forecast



Starting this year we will use ORX data in each of these tests (in addition to additional benchmarks for risk management purposes)

We also continue to utilize an external database subscription to validate the maximum loss

Strengths and weaknesses of the scenario process

Positives:

- Scenario process became more valuable than just data collection
- Participants found exercise forward looking and very informative
- Integrates into self assessment effort, risk weightings and loss data analysis
- Stabilizes volatility of loss-based capital calibration

Negatives:

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

Conclusions

Scenario Analysis:

- A value-added exercise; improves our understanding of risk
- Scenario analysis is but one component of overall risk measurement framework
- Value is fully leveraged by integrating process with other elements
- Shortcomings do exist but these will diminish, not increase, over time

General:

- Strongly encouraged by the advances in operational risk measurement
- Confident industry efforts are directionally correct
- Financial benefits will far exceed costs and effort
- JPMC strongly supportive of CP3 operational risk proposals