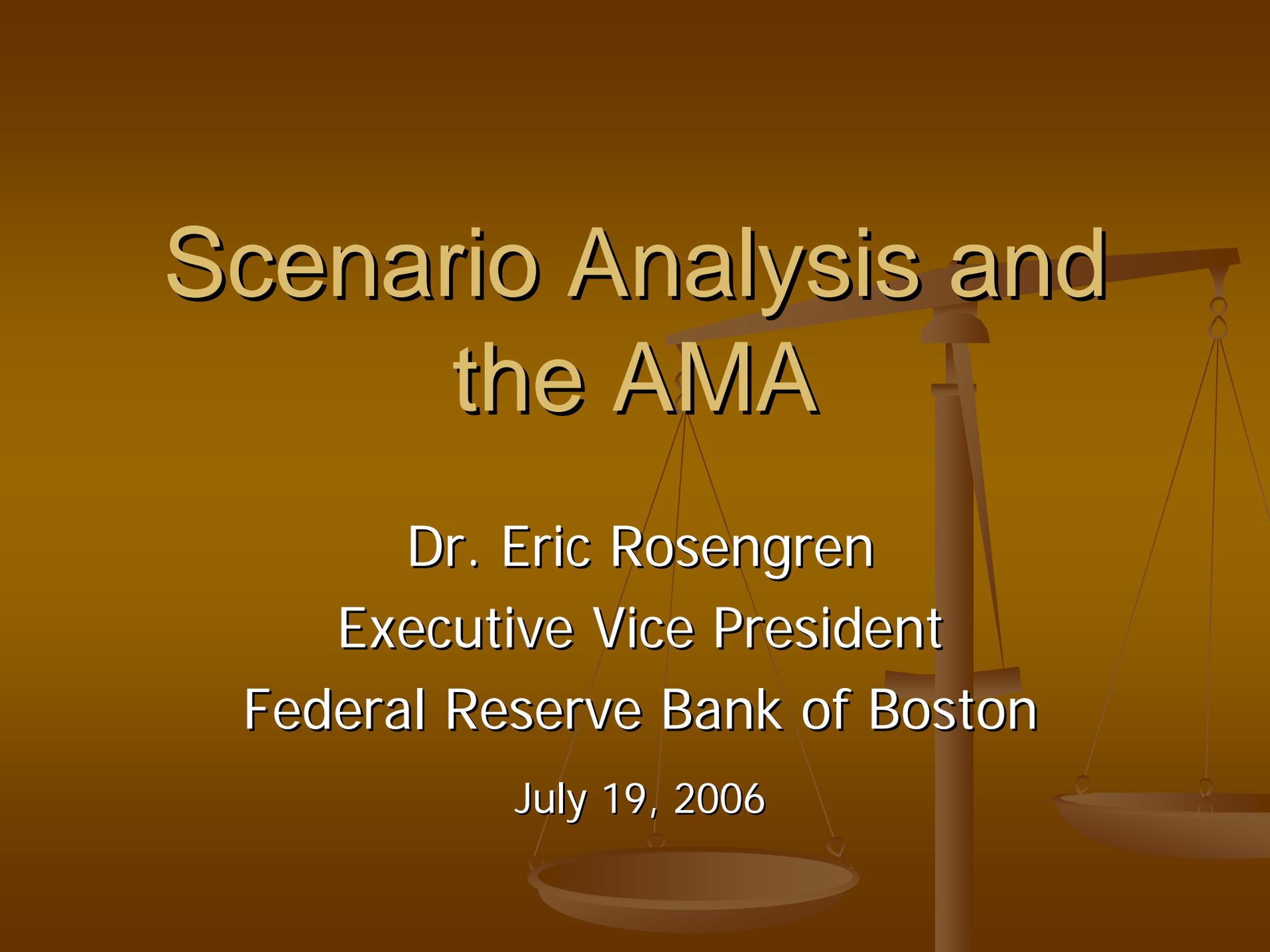


Scenario Analysis and the AMA

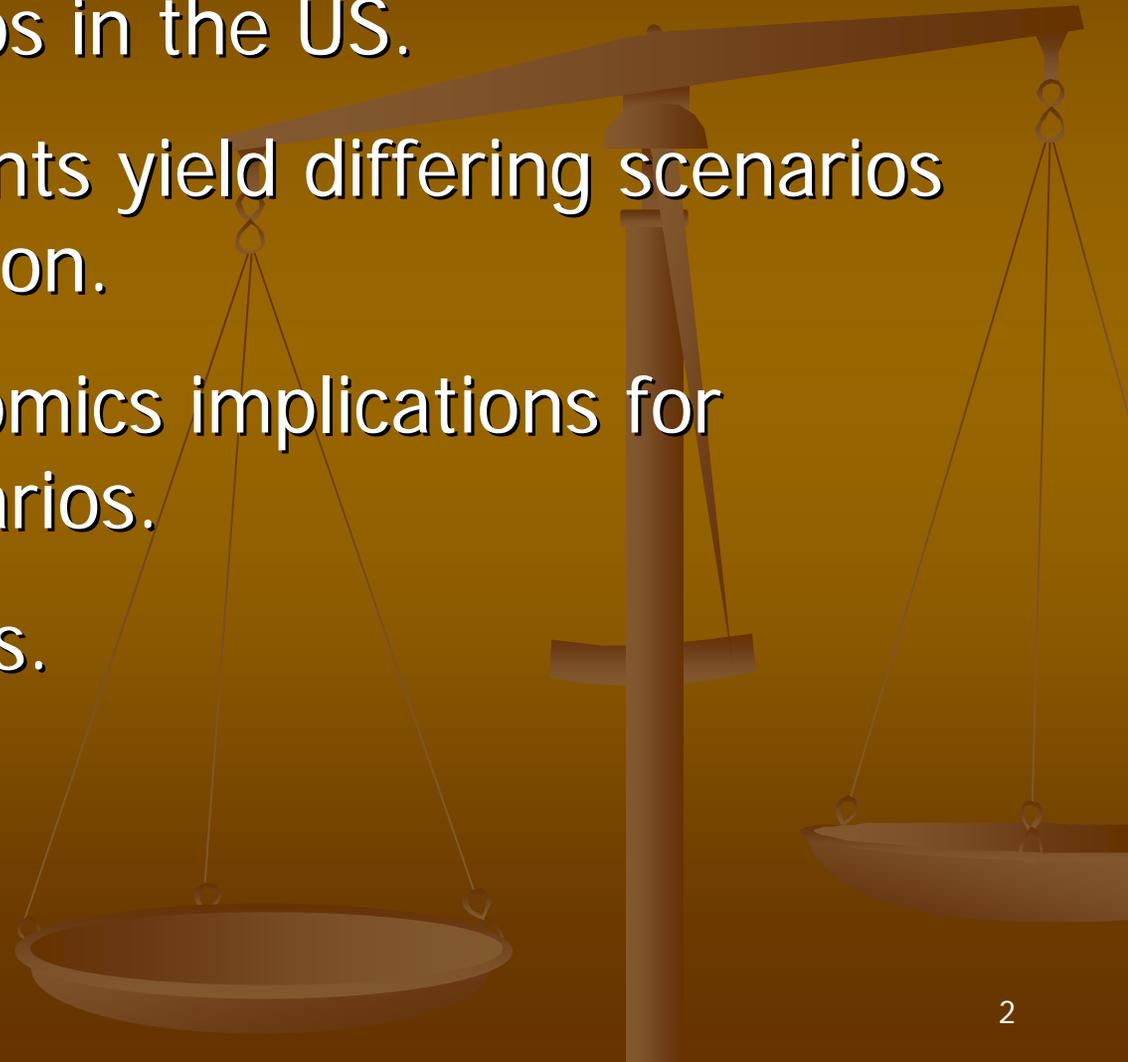


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Overview

- Uses for scenarios in the US.
- Differing tail events yield differing scenarios by bank and region.
- Behavioral economics implications for structuring scenarios.
- Future challenges.



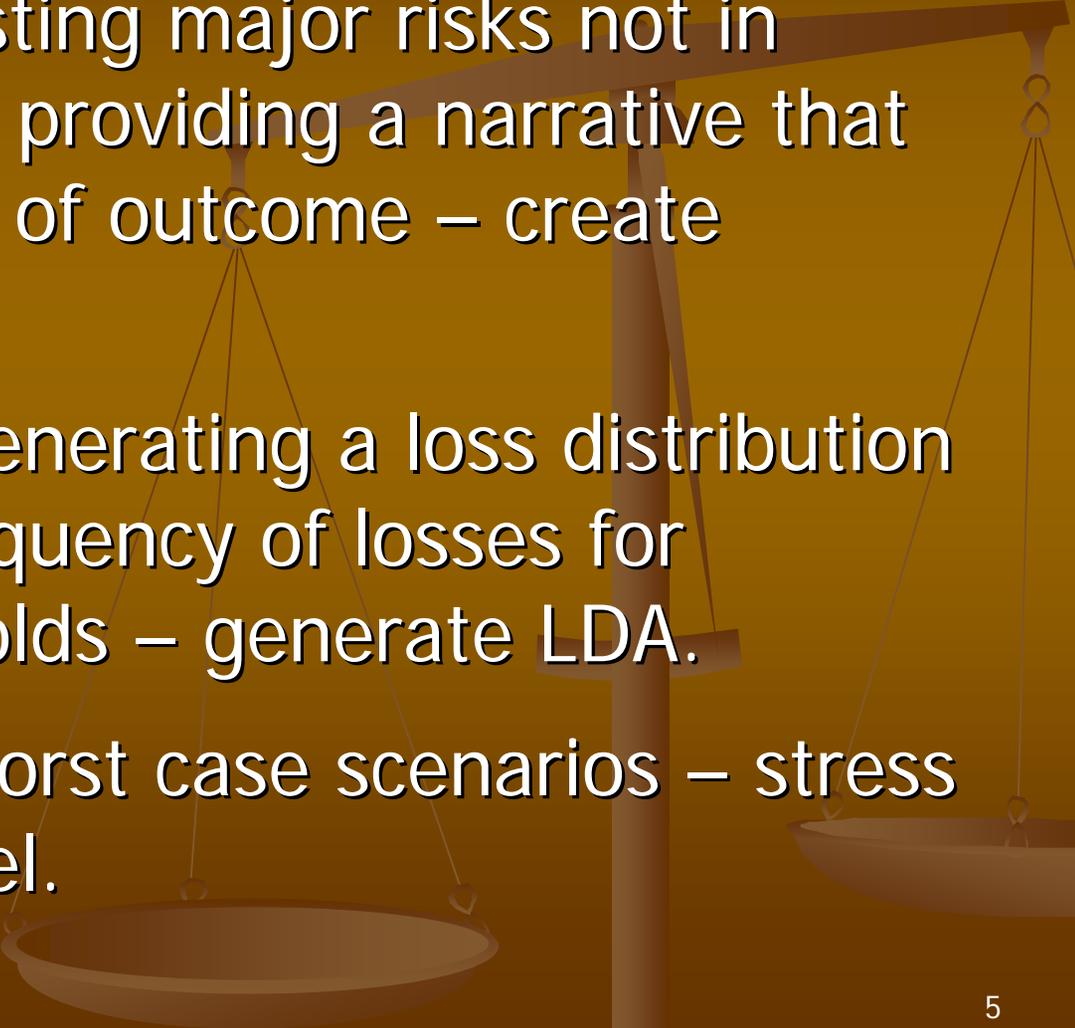
For What Purpose is Scenario Analysis Being Used?

- Stress test
 - Potential future losses not yet experienced – Avian Flu
 - External losses – What would the severity of loss be at our bank?
- Synthetic Losses – Fill in where there is insufficient internal data
- Generate Severity Function
 - Relies on business line expertise
 - Structured interviews of business lines

Typical Scenario Format

- Scenario workshops usually bring managers together to have a structured scenario discussion.
- Scenario construction often uses outside consultants.
- ERM/central op risk/audit often facilitate and cross-check results.
- Workshops often include discussion of internal losses and to varying degrees external losses.
- Risk-management as well as improvement in capital calculation are cited as advantages.

Purpose of Scenarios Varies



- Some focus on listing major risks not in internal data and providing a narrative that captures severity of outcome – create synthetic losses.
- Some focus on generating a loss distribution by asking the frequency of losses for particular thresholds – generate LDA.
- Some focus on worst case scenarios – stress test current model.

External Data and Scenarios

- Scenarios and external data are often used to capture tail events not in internal data.
- Institutions vary on how applicable they view external data for their particular circumstances.
- Reason to believe scenarios may vary greatly by geographic region – external data shows distinctive patterns of tail losses.

National Differences – Same External Data Source

US losses

1. CorpF CPBP
2. RetBro CPBP
3. RetBro CPBP
4. CorpF CPBP
5. RetailB CPBP
6. CorpF CPBP
7. CorpF CPBP
8. RetBro CPBP

Japan losses

1. ComB EF
2. RetBro IF
3. RetailB IF
4. ComB EF
5. RetailB IF
6. Trading IF
7. RetBro CPBP
8. RetBro CPBP

EU – Between Extremes

EU losses

1. Asset IF
2. RetailB CPBP
3. ComB CPBP
4. ComB CPBP
5. ComB EF
6. RetailB CPBP
7. RetailB EDPM
8. Asset IF

- Top 8 US losses, at time of incidence, are all \$1.7 billion or above.
- Top 8 Japanese losses, at time of incidence, are all below \$1 billion.
- Of top 8 EU losses, at time of incidence, half are above \$1 billion and half are below \$1 billion.

US Observations

- Largest losses are more severe than EU and Japan.
- These losses generally are in clients products and business practices, which captures lawsuits.
- Legal actions tend to be in corporate finance – tied to activity with clients and retail activities – and result from class action lawsuits.

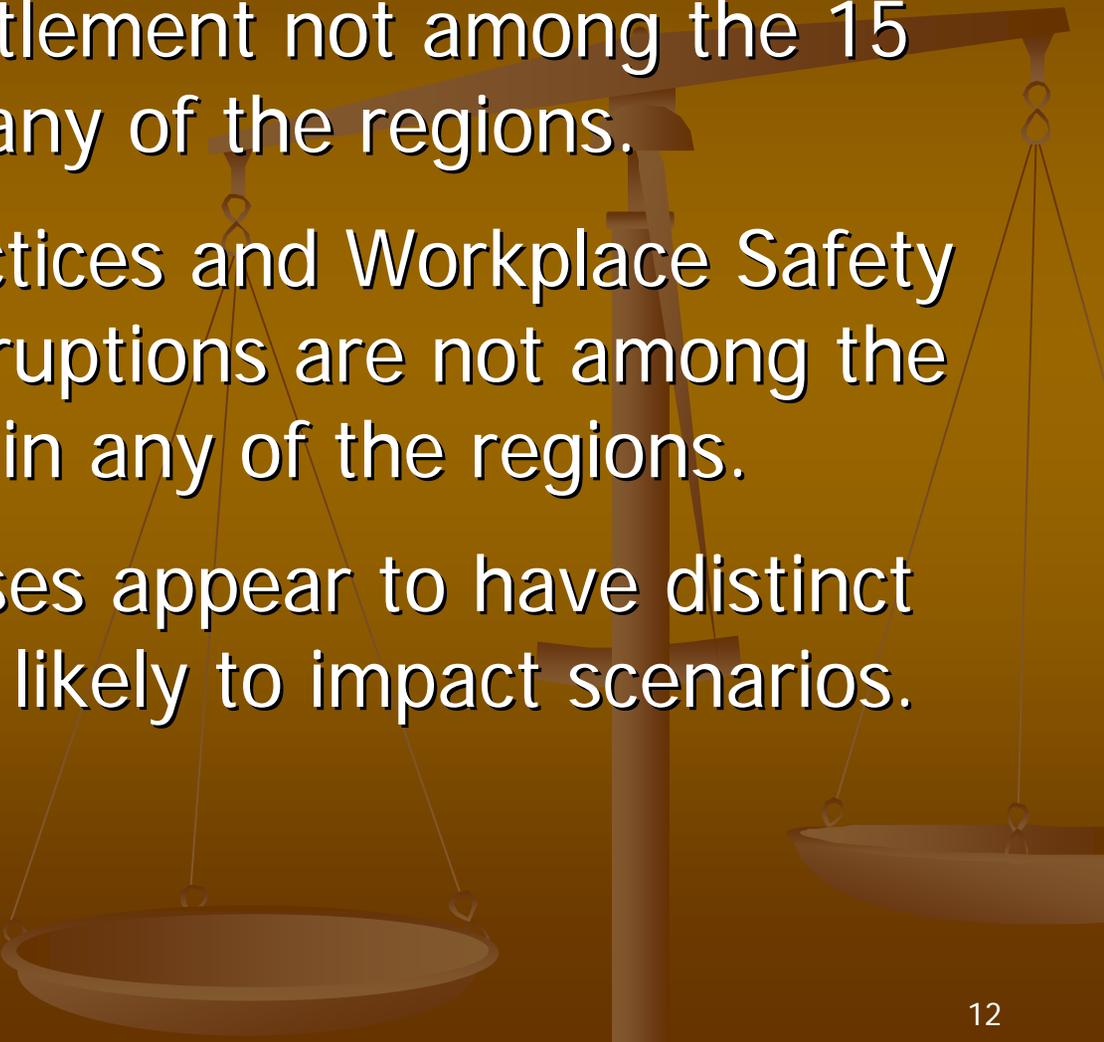
US Observations Continued...

- Modeling business line activity in the US for the tail of the distribution will be dominated by modeling legal liabilities.
- Many of the high severity losses are recent.

Japanese Observations

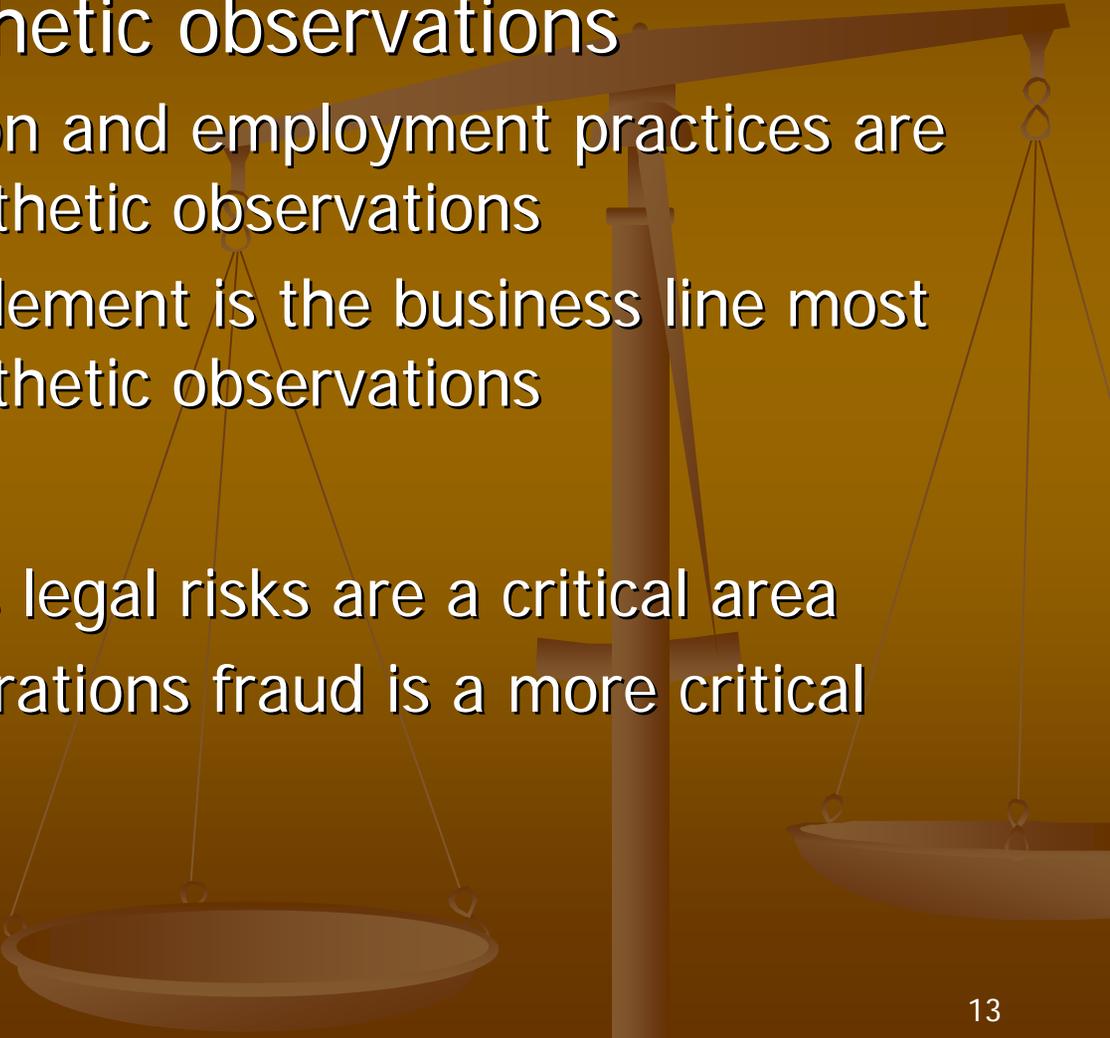
- Internal and external fraud are the main sources of tail events.
- Few lawsuits – clients, products and business practices tends to be from tax disputes.
- Commercial banking accounts for many of the high severity losses, corporate finance is far less prevalent, in part, because of fewer lawsuits.

General Observations



- Payment and Settlement not among the 15 largest losses in any of the regions.
- Employment Practices and Workplace Safety and Business Disruptions are not among the 15 largest losses in any of the regions.
- High severity losses appear to have distinct regional patterns likely to impact scenarios.

Implications for Scenarios



- For creating synthetic observations
 - Business disruption and employment practices are likely to need synthetic observations
 - Payment and settlement is the business line most likely to need synthetic observations
- For tail events
 - For US operations legal risks are a critical area
 - For Japanese operations fraud is a more critical area

Things to Consider in Scenarios – Behavioral Economics Lessons

- Tversky and Kahneman have written extensively about the psychology of choice.
- In their Science article (1981) they illustrate that answers to decision problems vary by how the question is asked and the frame of reference of the respondent – I will be using examples from this paper.
- Behavioral theories are relevant to establishing good scenario analysis.

Framing Questions

- Problem – A disease may break out that is expected to kill 600 people
 - Program A – 200 people saved (72%)
 - Program B – 1/3 probability that all 600 are saved and 2/3 probability no one is saved (28%)
 - Program C – 400 people die (22%)
 - Program D – 1/3 probability that nobody will die and 2/3 probability that 600 people will die (78%)

Similar Questions – Different Results

- All programs have the same expected value – First two are lives saved while second two are lives lost.
- Program A – choices with gains are viewed as risk averse – most prefer 200 saved than the 1/3 chance of saving 600.
- Program D – choices in losses are viewed as risk taking – prefer 1/3 chance that no one dies to the certain death of 400.

Application to Scenarios

- How questions are framed potentially impacts the results
- Discussing risk mitigation – the results may be sensitive to whether they are framed as gains or losses
 - Avian flu – scenarios and risk mitigation – framed in survival or deaths?
 - Would answers have changed if framed in increasing profits rather than decreasing losses?

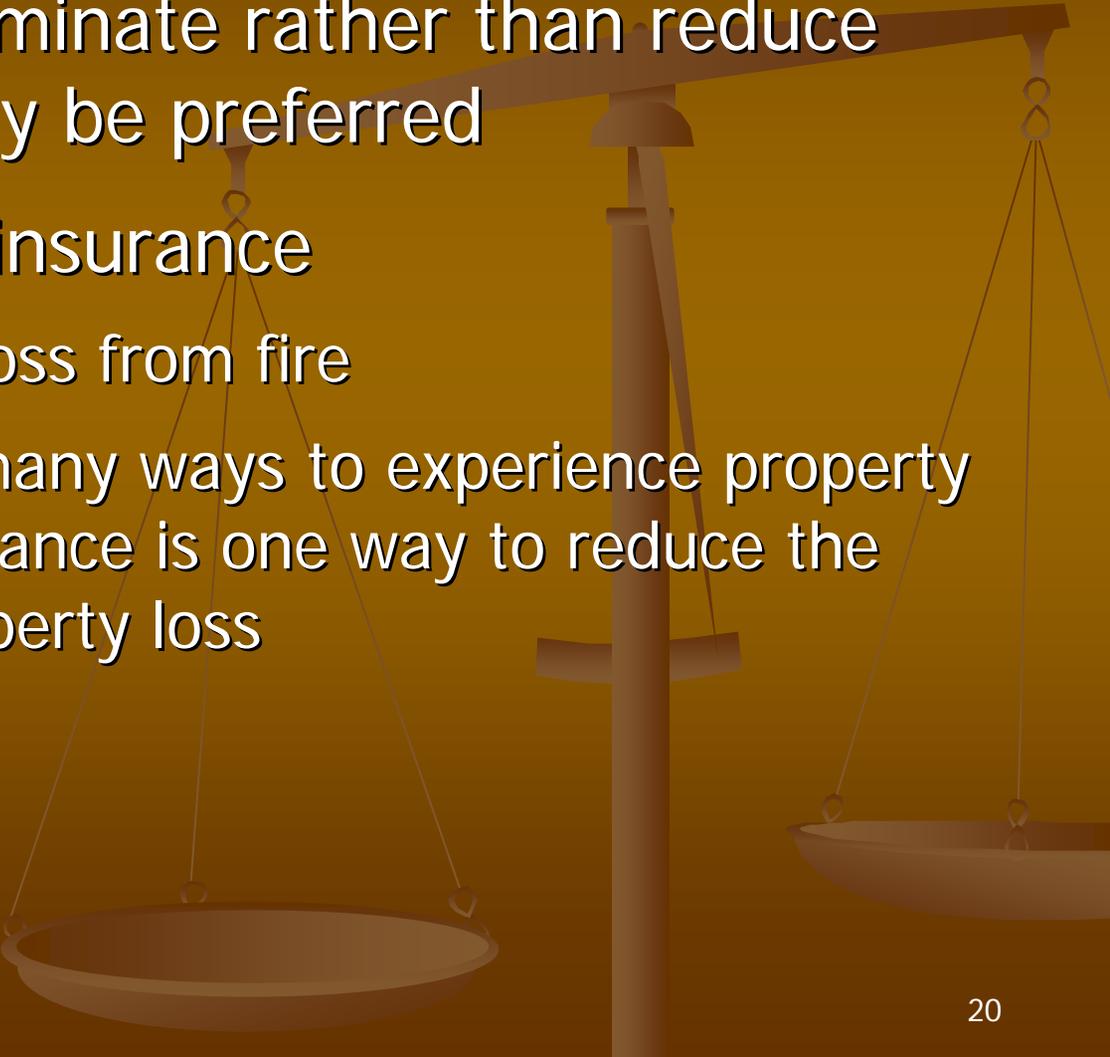
Sequencing of Decisions Can Impact Results

- Consider a two-stage game where the choice of the second stage of the game must be decided before the game starts
 - First stage – 75% no second stage, 25% move on to second stage
 - Second stage
 - Choose a sure win of \$30 (74%)
 - 80% chance to win \$45 (26%)
- Or
 - 25% chance to win \$30 (42%)
 - 20% chance to win \$45 (58%)

Sequencing Alters Response

- Sequencing did not alter results, but the responses are quite different. Despite identical outcomes and probabilities preferences change.
- Preference for certain over uncertain outcomes varies.
- Conditioning questions that appear to provide a more certain outcome will tend to be preferred.

Application in Risk Management



- Questions that eliminate rather than reduce bad outcomes may be preferred
- Example 1 – Fire insurance
 - Eliminate risk of loss from fire
 - Fires are one of many ways to experience property loss and fire insurance is one way to reduce the probability of property loss

Applications Continued...

- Example 2
 - Teller stealing is eliminated by cameras
 - Many ways to reduce employee theft and installing cameras can reduce one source of common theft by employees
- Scenarios framed as conditional outcomes may generate different results.
- Scenarios framed as certain losses may be viewed differently than reduction in frequency of losses

Frame of Reference Matters

- Long-shots are chosen more frequently in the last race of the day
- You are going to see a play that costs \$10
 - You lose \$10 do you still see the play?
 - Yes (88%)
 - No (12%)
 - You lose the \$10 ticket and need to buy another, do you still see the play?
 - Yes (46%)
 - No (54%)

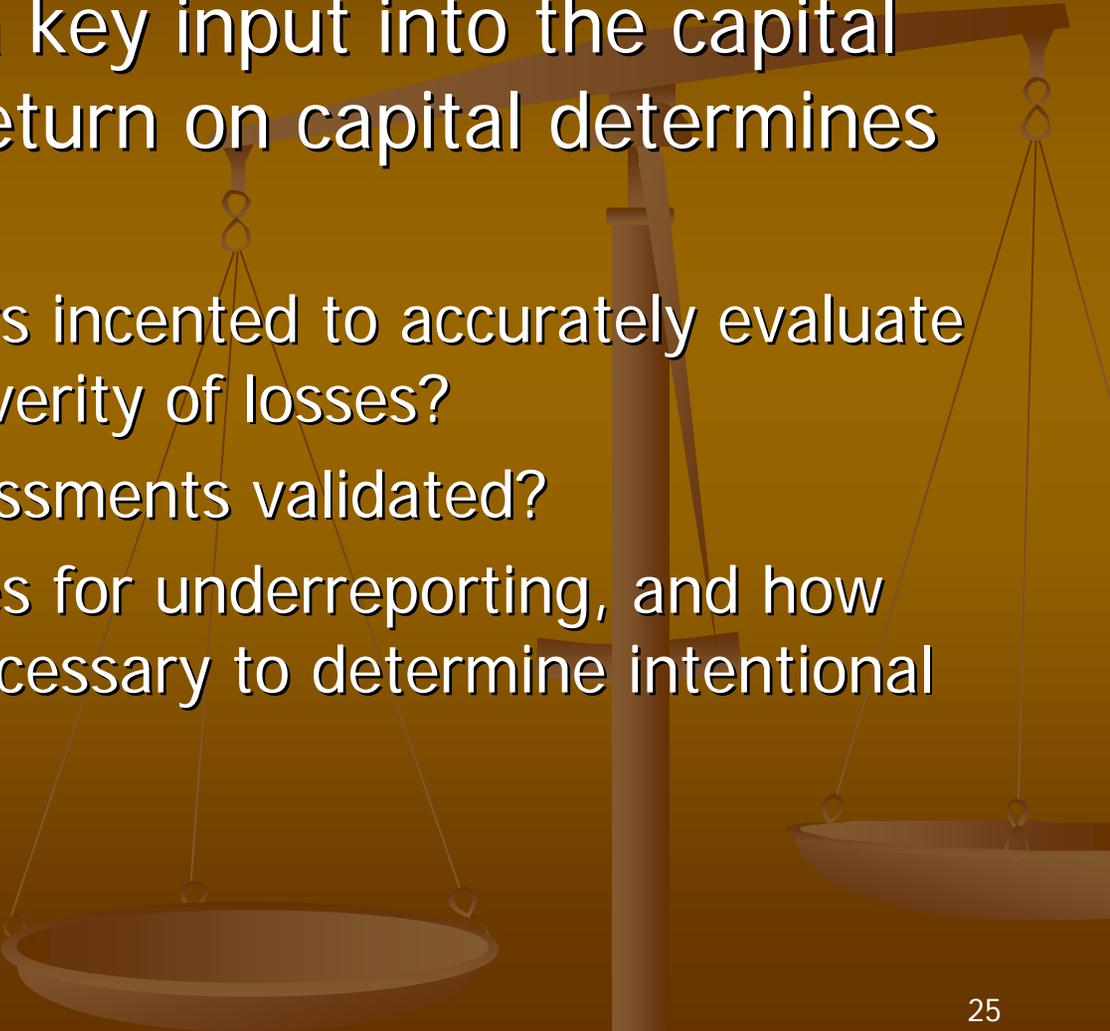
Frame of Reference and Scenarios

- Discussion of scenarios – All of the largest losses (at a particular bank that will remain unnamed) through self assessments are from internal and external fraud
 - Would the answer change if
 - The bank just had a \$100 million loss in clients products and business practices
 - The team had been told that 16 of the largest 20 largest losses in the LDCE (all in excess of \$100 million) had been from clients products and business practices

Frame of Reference Continued...

- How to evaluate external versus internal losses
 - Some banks assume external losses could not occur at their bank
 - Some banks assume all external losses could occur at their bank
- How should scenarios view external versus internal losses?
- Do managers that have experienced large losses view the probability differently?

Incentives Matter



- If scenarios are a key input into the capital calculation and return on capital determines bonuses
 - How are managers incented to accurately evaluate frequency and severity of losses?
 - How are self assessments validated?
 - Are there penalties for underreporting, and how much data are necessary to determine intentional underreporting?

Challenges for Supervisors

- How to validate scenario based models?
 - Are the capital numbers consistent with peers that have similar risk exposure?
 - Are the internal loss experiences consistent with the estimate of operational risk exposure?
 - Does the process provide a way to determine the level and change in operational risk at the bank, and can it be explained to investors, the board, senior management, and business line managers?