

Operational Risk Modeling at U.S. Bank

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Model Approach

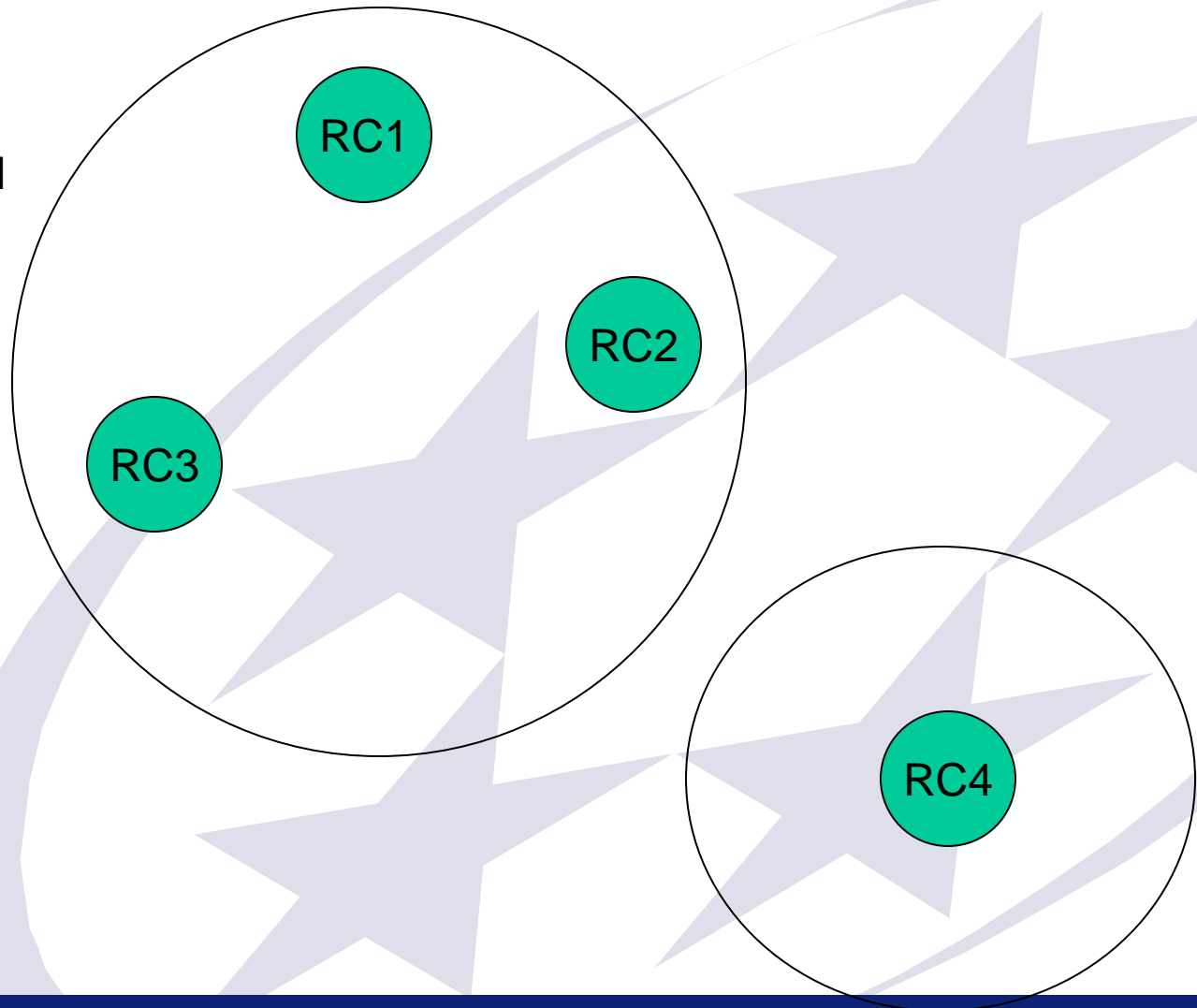
- Loss Distribution Approach
- Data
 - Internal data
 - Consortium data (ABA, ORX)
- Group internal data into units of measure based upon similarities
- Combine relevant external data
- Distributional form selected based upon goodness of fit, influenced by scenario consistency
 - Frequency from internal data
 - Severity is a combination of internal and external data influenced by scenarios

Unit of Measure

- Statistically compared bank's risk cells to each other
- Combined cells with similar severity distributional characteristics
- Reviewed combinations to make certain that statistics didn't combine risk cells that happened by chance to have similar distributions

Unit of Measure

Cells are combined one at a time based upon similarity and distance

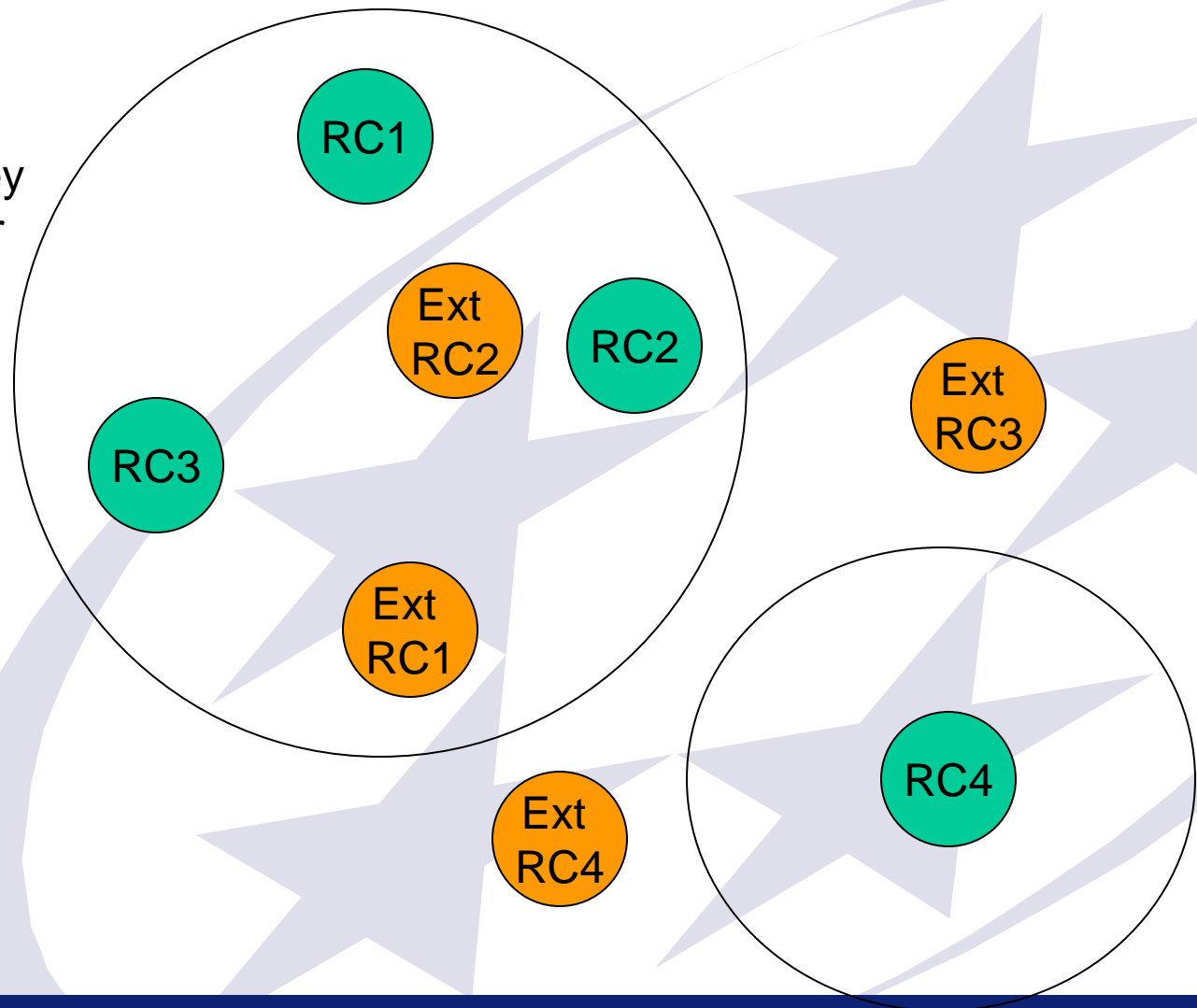


Combinations

- Examined external data cells for combination with internal units of measure using KS and AD tests
- Utilized distance approach to join similar cells
- Consideration is given to whether this approach excludes data which should be included
- Since external data is from a broader group, it may contain distributional information not evident in our internal data

Combining Data

External data are combined when they demonstrate similar risk characteristics



Data Combination Analysis

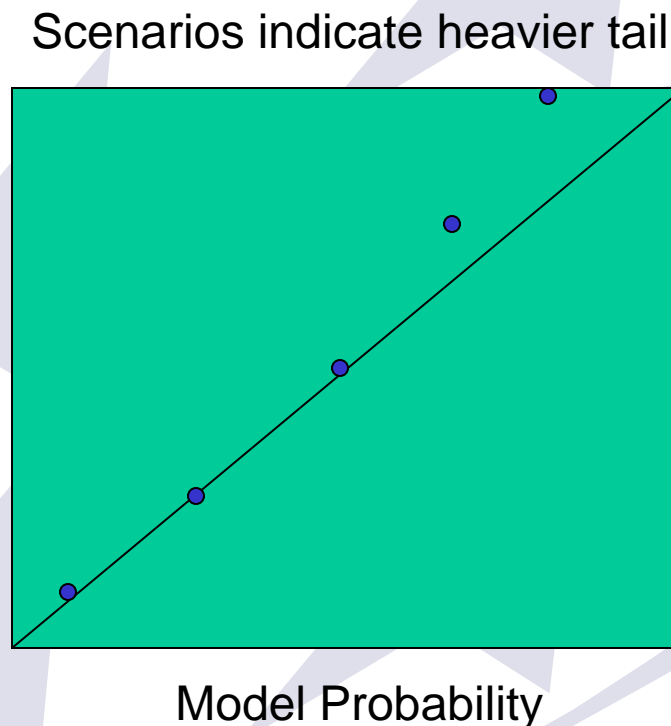
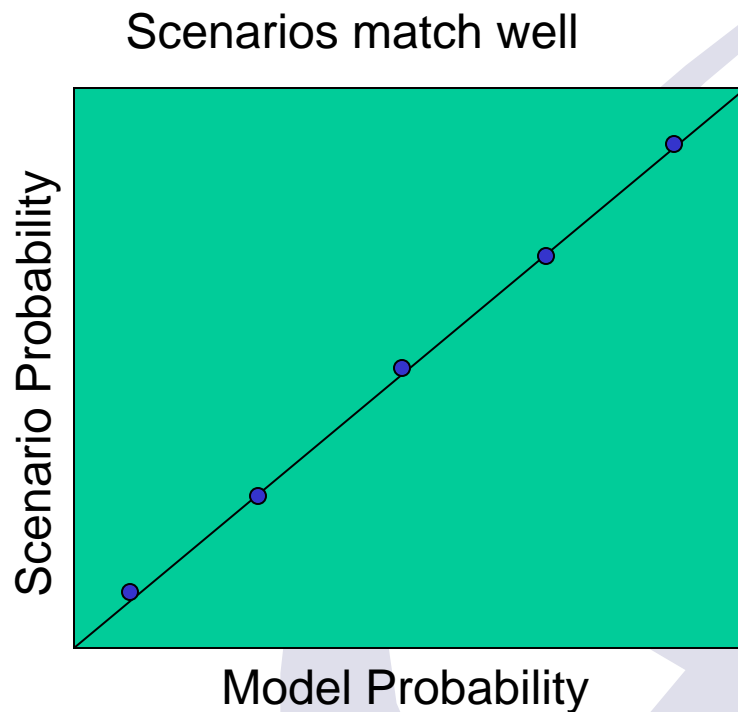
- The analysis of units of measure provides useful information about that characteristics of the data
- Comparing the combinations to management expectations promotes discussion of risk
 - Are similar businesses grouped together?
 - Are differences understood?
 - Leads to discussions about risk management practices and control environments

Integration of Scenarios with the Model

- Selection of distributions
- Often several models provide statistically acceptable fits to the units of measure
 - Combination of goodness of fit
 - Tail fit
- Integration of scenario analysis can provide framework for determining best distribution
 - Consistency of distributional form with scenarios

Scenarios and the LDA

- When selecting distributions we compare scenario distributional characteristic to a range of distributional forms
- This can help inform the distribution selection process by comparing management expectations to analytical forms



Stability of the Model

- A good model should exhibit stable attributes
 - Units of measure
 - Choice of severity Distributions
 - Parameters of severity distributions
- Desire risk sensitivity, but not data sensitivity
 - Models fit to random subsets of the data should be consistent with models fit to the entire dataset
 - Time sensitivity
 - Large loss sensitivity