



Insurance & Actuarial
Advisory Services

ERM Symposium

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 **ERNST & YOUNG**

Quality In Everything We Do

ERM Tools & Techniques

2007 ERM Symposium ERM Essentials Workshop

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What are we trying to measure?

- Risk

- Across the enterprise, products and businesses

- Across all risk types

- Caveats

- Recognition that legal entity risk measurement is important

What risks?

- o Interest rate
- o Equity
- o Credit
- o Catastrophe
- o Mortality
- o Morbidity
- o Underwriting
- o Operational
- o

What do we need to capture?

- (Reasonably) accurate assessment of the enterprise's risk exposure (distribution)
 - Inherent risk
 - Correlation across risks and businesses
 - Tail
 - Main distribution

In an ideal world we'd have.....

- A simulation model that reflects:
 - Our business including its unique characteristics
 - All of the inherent risks as manifested in asset and product liability outcomes
 - The capital markets
 - All of our business related risks (i.e. operational risks)
 - Outcomes across a universe of possible scenarios
 - The inherent correlation of risks in good times and in bad

Aggregation/Diversification

- Getting it right is an important consideration in addressing the tools and techniques agenda
- The mega-model although ideal is impractical
 - Too complex
 - Technology and hardware limitations
 - Impractical control environment
 - Etc.

In the absence of the “mega-model” how do we get there?

- This is the MOST IMPORTANT question that needs to be answered !!!!!!!
- Implications of not thinking it through.....
 - Having to re-engineer the entire process
 - Credibility of results – internally & externally
 - Complex and inefficient processes
 - Complex and ineffective control environment
 - Difficult model validation process

In the absence of the “mega-model” how do we get there?

- Design the end-state goals before building the tools and techniques to support the risk measurement process
 - What are the various uses and what are the requirements of each?
 - Risk measurement & management
 - Economic capital
 - Capital management
 - Valuation
 - Strategic decision making
 - Performance measurement

In the absence of the “mega-model” how do we get there?

- Recognize that there should be a balance between model framework complexity and:
 - Assumption uncertainty
 - Risk measurement methodology uncertainty
 - Correlation

Addressing aggregation/diversification

- Three common approaches:
 - Common scenarios
 - Correlation matrices
 - Copulas

Diversification through common scenarios

(why correlation & copulas have limited appeal)

■ Primary Attributes

- Permits scenario specific correlation across products and risks
- Inherently adjusts for shifts in risk relationship
- Permits adjustment for cash flow effects
- Allows for calibration of correlations to different parts of the distribution

What techniques?

- Integrated scenarios & product models
 - Interest rate, equity, credit, mortality/morbidity
 - Additive scenarios across products
 - Scenario generation process can adjust risk correlation dynamics
 - Cash flow effects captured
 - Ops risk integration?

What techniques?

- Other approaches
 - Representative model points
 - Replicating portfolios both assets & liabilities
 - Approximation techniques
 - Scenario selection

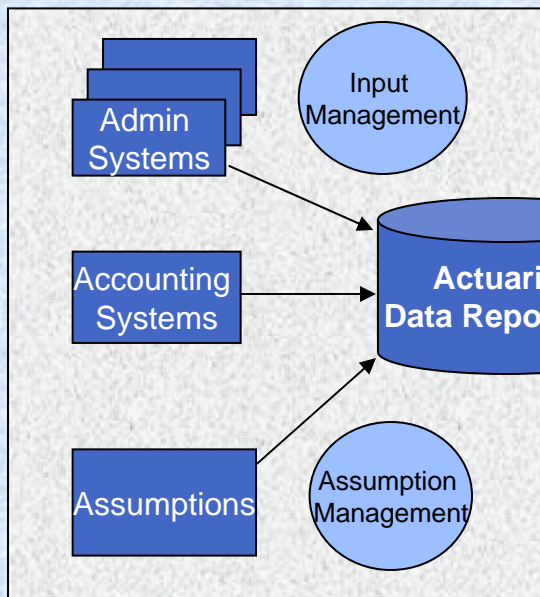
Building the infrastructure

- In designing the tools and techniques we should recognize that:
 - Complex models are difficult to build, maintain and validate
 - Therefore design the process so that it:
 - Anticipates the techniques that are going to be used
 - Allows for efficiency in building and maintaining the models
 - Supports a robust control environment
 - Meets timing requirements
 - Leverages technology

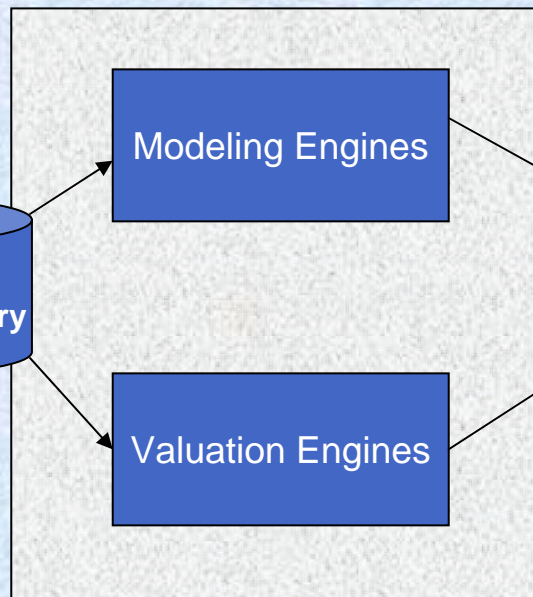
Actuarial Transformation™

Technology Supported Actuarial Environment

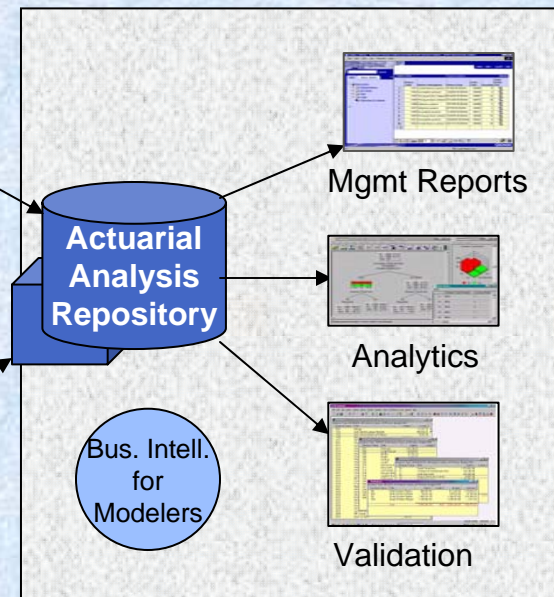
Data Integration and Improvement



High Performance Computing



Advanced Decision Support



Automated and Controlled Environment

Tools & Techniques

- Implementing the right framework requires:
 - Understanding
 - Ingenuity
 - Revolution
 - Credibility

Questions?