



ENTERPRISE RISK
MANAGEMENT SYMPOSIUM

somewhat
different

Economic Capital Modeling

Proxy Model Implementation Experience

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ERM Symposium Proxy Model

Agenda



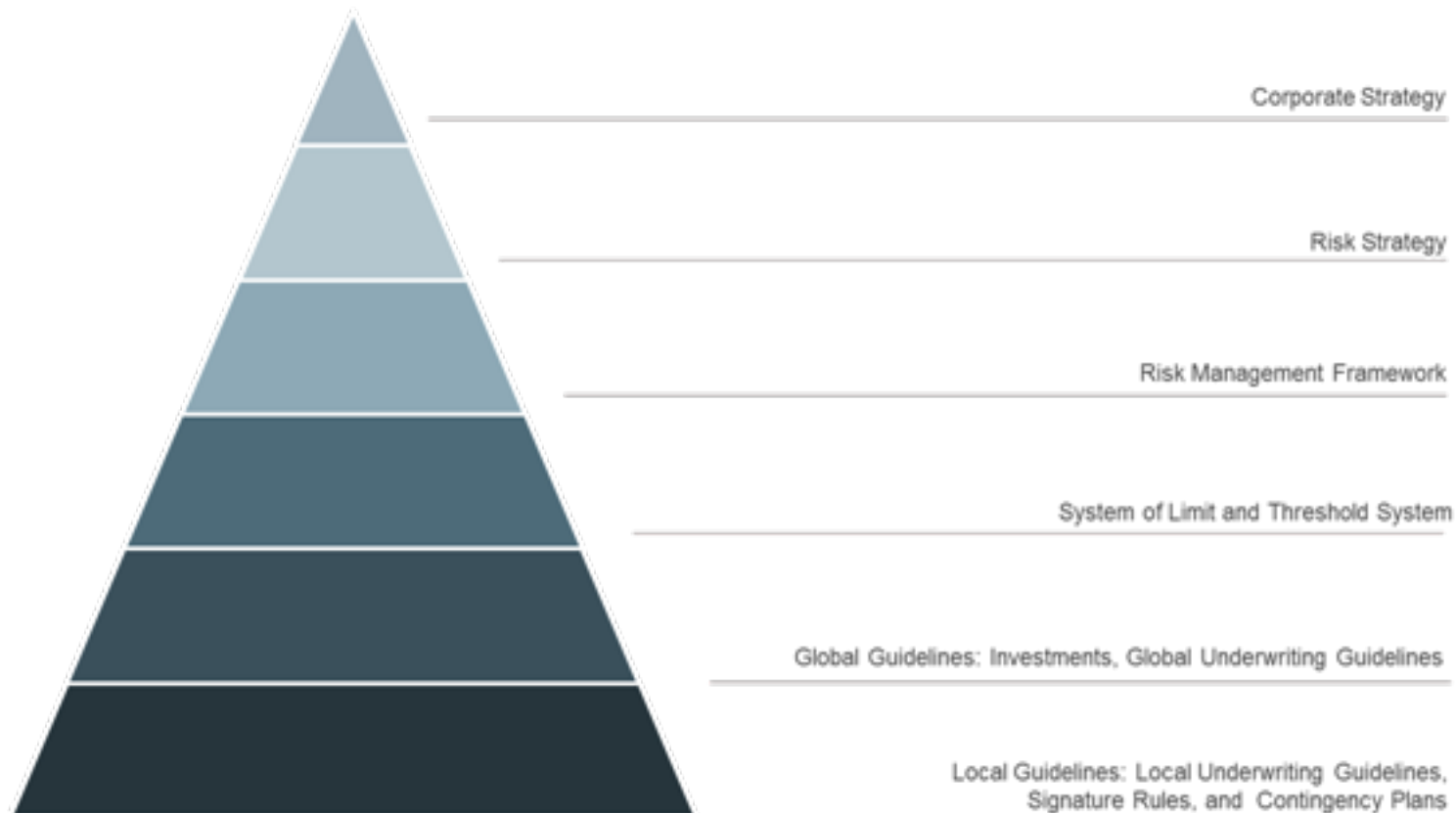
ENTERPRISE RISK
MANAGEMENT SYMPOSIUM

1. Risk appetite and linkage to economic capital modeling
2. Overview of types of economic capital models
3. Hannover Life Re America proxy modeling implementation experience

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Risk Appetite

- ▶ Everything in ERM links back to overall risk appetite (that's why there's an 'E' in ERM)
- ▶ Corporate Strategy & Risk Strategy (Appetite) are set at Group and Local board levels



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Risk Appetite



- ▶ Hannover Life Reassurance Co. of America has 5 core risk appetite statements:
 1. Minimum expected return on capital
 2. Minimum expected intrinsic value creation (change in present value of earnings less cost of capital)
 3. Positive economic capital solvency ratio
 4. Positive current and stressed regulatory capital ratio
 5. Adequate collateral and liquidity in current and stressed scenarios

- ▶ These risk appetite statements are very much aligned between group and local management and entity levels. Risk report and compliance is standing agenda item for Board of Directors.

- ▶ Risk committee owns and manages the 'System of Limits and Thresholds' that link tolerances for all the relevant risks back to the core appetite statement.

- ▶ Our economic capital models are foundational to measuring many aspects of the enterprise risks we are exposed to in our business model

- ▶ Quality timely models are therefore key to a successful & effective ERM framework

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Model Governance in Practice

- Requirements and uses for models are only growing...

ORSA



**National Association of
Insurance Commissioners**



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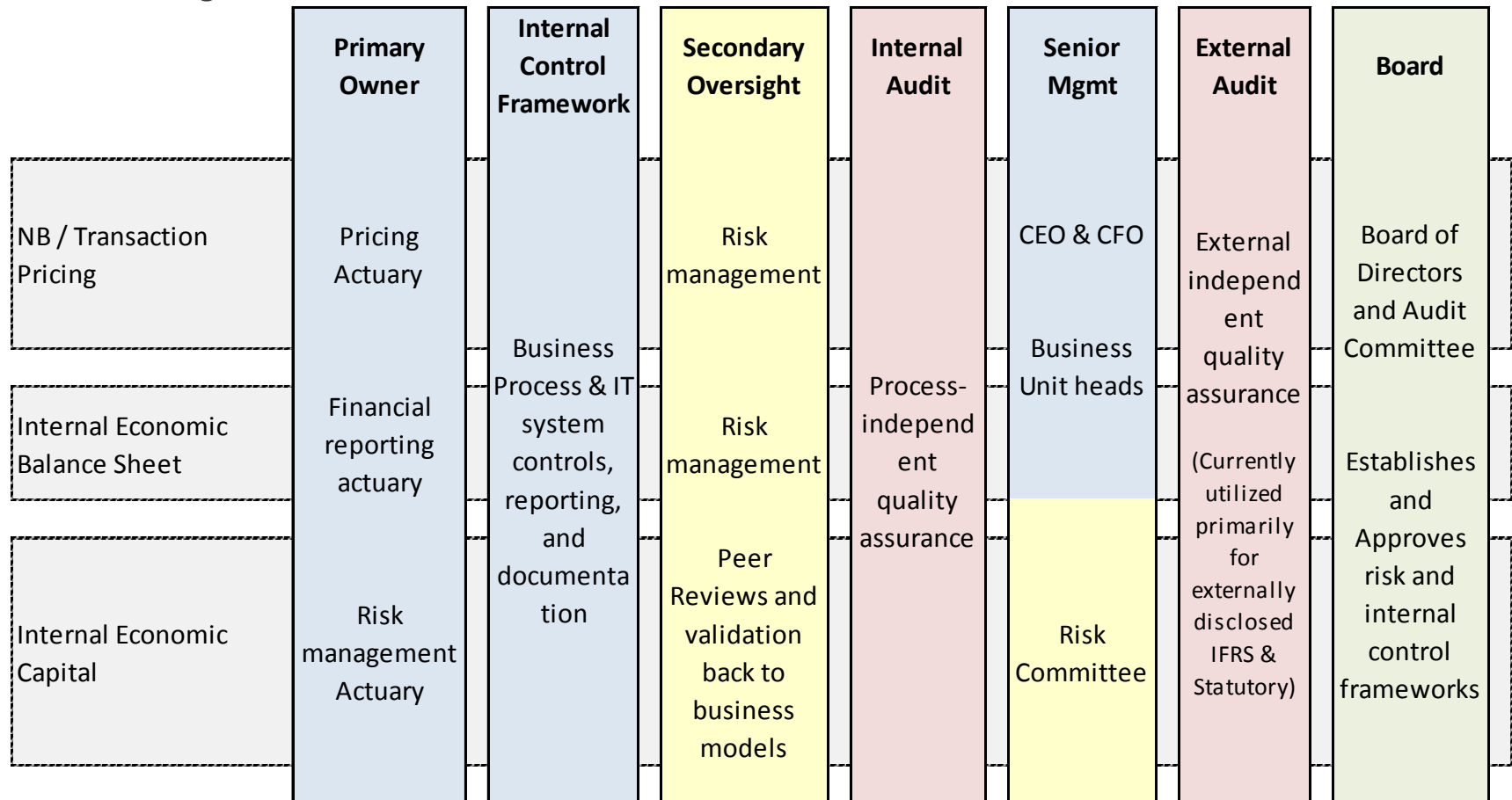
Models in Practice

- ▶ Requirements and uses for economic capital models are only growing...
 - Risk management
 - Pricing of new business
 - Inforce analysis & steering
 - Regulatory valuation (Solvency II)
 - Asset-liability management
 - Financial planning
 - Internal economic balance sheet
 - ORSA and prospective solvency assessment

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Model Governance in Practice

- ▶ Model runs, control, validation, and governance is multi-layered and time consuming



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Hannover Re's Economic Model and Other Approaches

- ▶ Hannover Re's internal capital model starts with stochastic cash flow projections over many combinations of scenarios across all variations of risk drivers (mortality, morbidity, financial markets, property and casualty, etc.)
 - The dependencies and interactions between all the different risk drivers are built into the many scenarios using copulas and other dependency modeling techniques
 - Many scenarios are required at the Group level given the myriad risk drivers (~100 thousand)
 - The life and health business centers need to produce ~2,500 scenarios to capture potential variation for life and health specific risks. Separate model runs with additional risk neutral scenarios are used to value financial options and guarantees for product lines where relevant.
- ▶ Our scenario approach generates a full probability distribution of results and enables bottom-up valuation of diversification benefits.
- ▶ Results are aggregated and used for different purposes at asset, liability, product type, business center, entity, and Group level.
- ▶ There are other approaches to economic capital models
 1. Regulatory capital ratios at risk across selected scenarios
 2. Run-off cash flow testing approach to assess initial total balance sheet requirements
 3. Solvency II style (value at risk, 99.5% confidence, economic valuation) but using a few independent stress scenarios and then a correlation matrix to combine (rather than bottom-up many-scenario interaction approach)

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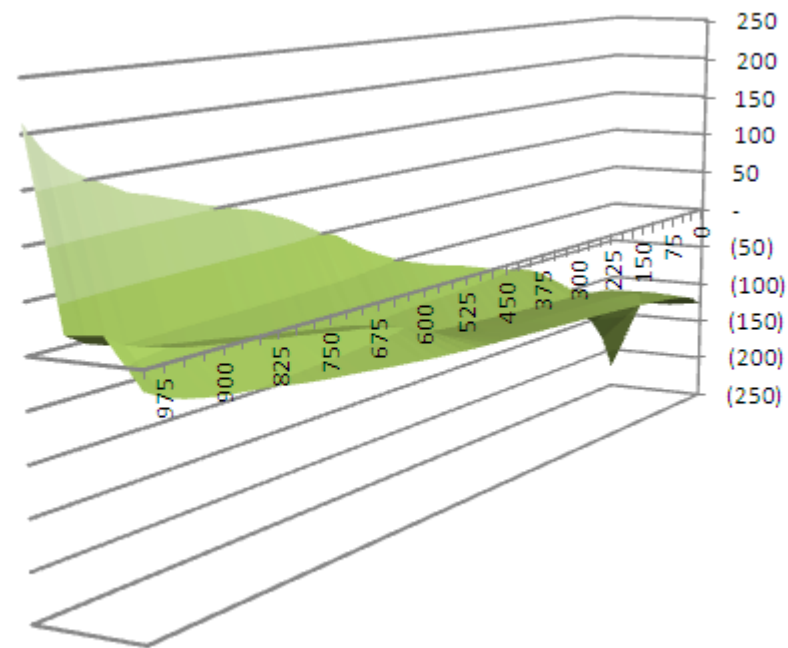
Need for Proxy Model

- ▶ Hannover Re's internal economic capital and balance sheet model has been developed over many years and is now deeply integrated into most aspects of the business
- ▶ In some ways the economic capital model is a “**victim of its own success**” because results now need to be generated faster and more frequently with more time for analysis and explanations for use in business steering and Solvency II compliance
- ▶ Results that are produced **after-the-fact** are not as useful and may result in missing the boat in terms of both identifying opportunities and management of risks

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Proxy Model Overview

- ▶ Proxy models are one example of how companies are focusing on producing materially correct results more quickly and efficiently
- ▶ Generically proxy models are “light” models that are periodically calibrated from the real “heavy” models. They run much faster and can be integrated into production reporting cycles more easily.
- ▶ Traditional generalized regression proxy models don’t work for us. The non-linear effects and interactions are difficult to capture accurately in one model; but we don’t give up easily.
- ▶ We (finally) found an approach that can quickly generate 1000’s of new scenarios for different combinations of stresses and economic environments from previously run “seeds”



Liabilities across stresses and scenarios are complex