



*Session 4: Economic Capital Modeling in Insurance
- A View on the Dependency Modeling*

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Disclaimer: Views expressed in this presentation are those of the authors alone

Waves of Reforms...Oceans of Opportunities

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What is Economic Capital?

Balance Sheet Capital

=

Book Value of Assets –

Book Value of Liabilities

Economic Capital

- **Realistic Balance Sheet**
- **Market Value of Assets and Liabilities**
- **Time Horizon**
- **A risk measure (e.g. VaR, TVaR)**
- **Confidence Interval**

Waves of Reforms...

- Solvency II and similar regimes in many countries
- Swiss Solvency Test (SST)
- ORSA in US
- IFRS Phase II

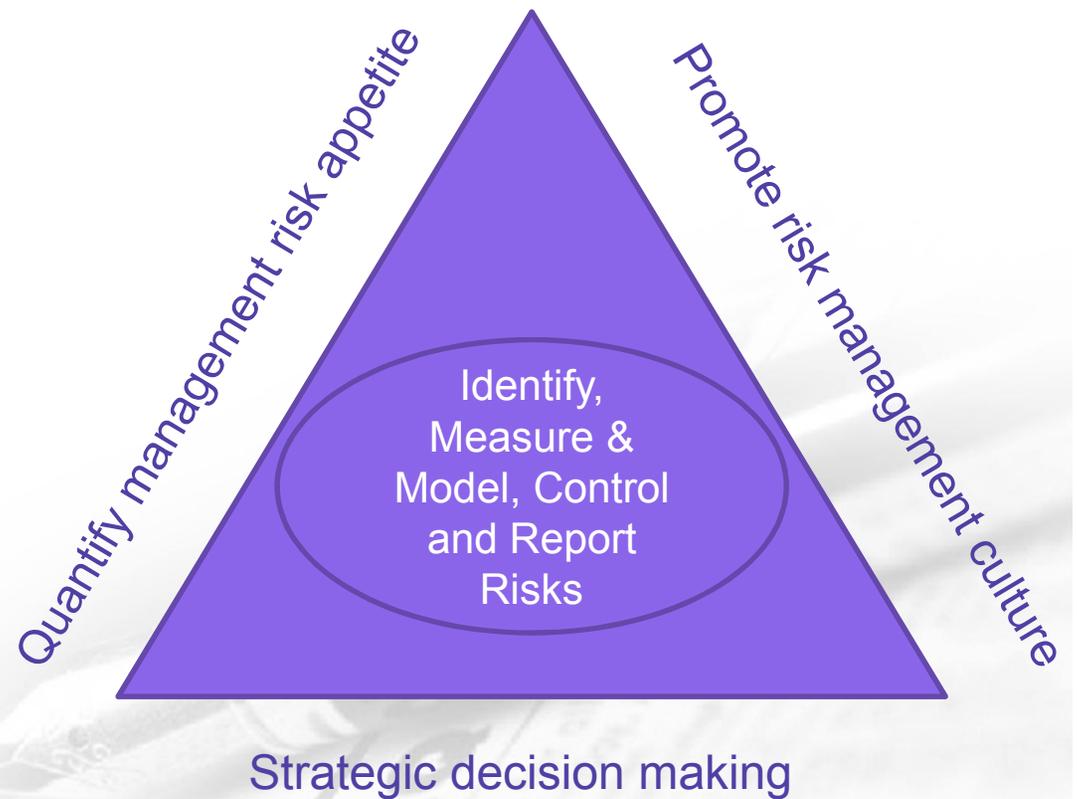


Regulators are focusing more on the Risks an enterprise is facing

EC Modeling – Benefits



Economic Capital Modeling



EC Modeling - Challenges

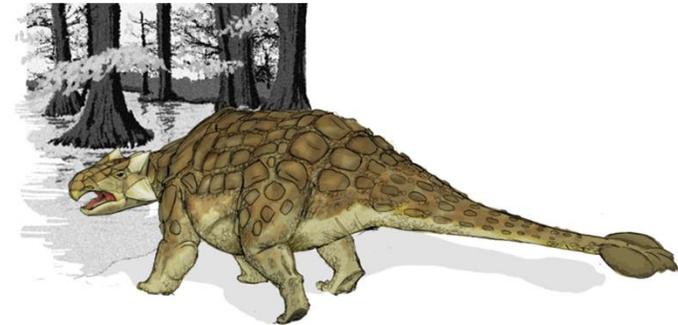


Dependency Modeling – one of the major pain areas for the insurance companies

Why care about Dependence?

...Have a look at the tail

Dependence in the extreme scenarios or the Tail Correlation can hit us very hard.



Example

	Motor	Engineering
Premium	50	10
Mean Loss	45	7
CV Loss	33%	100%
Mean Profit	5	3
99.5%ile Loss	98	40
Stand-alone Capital Need	48	30

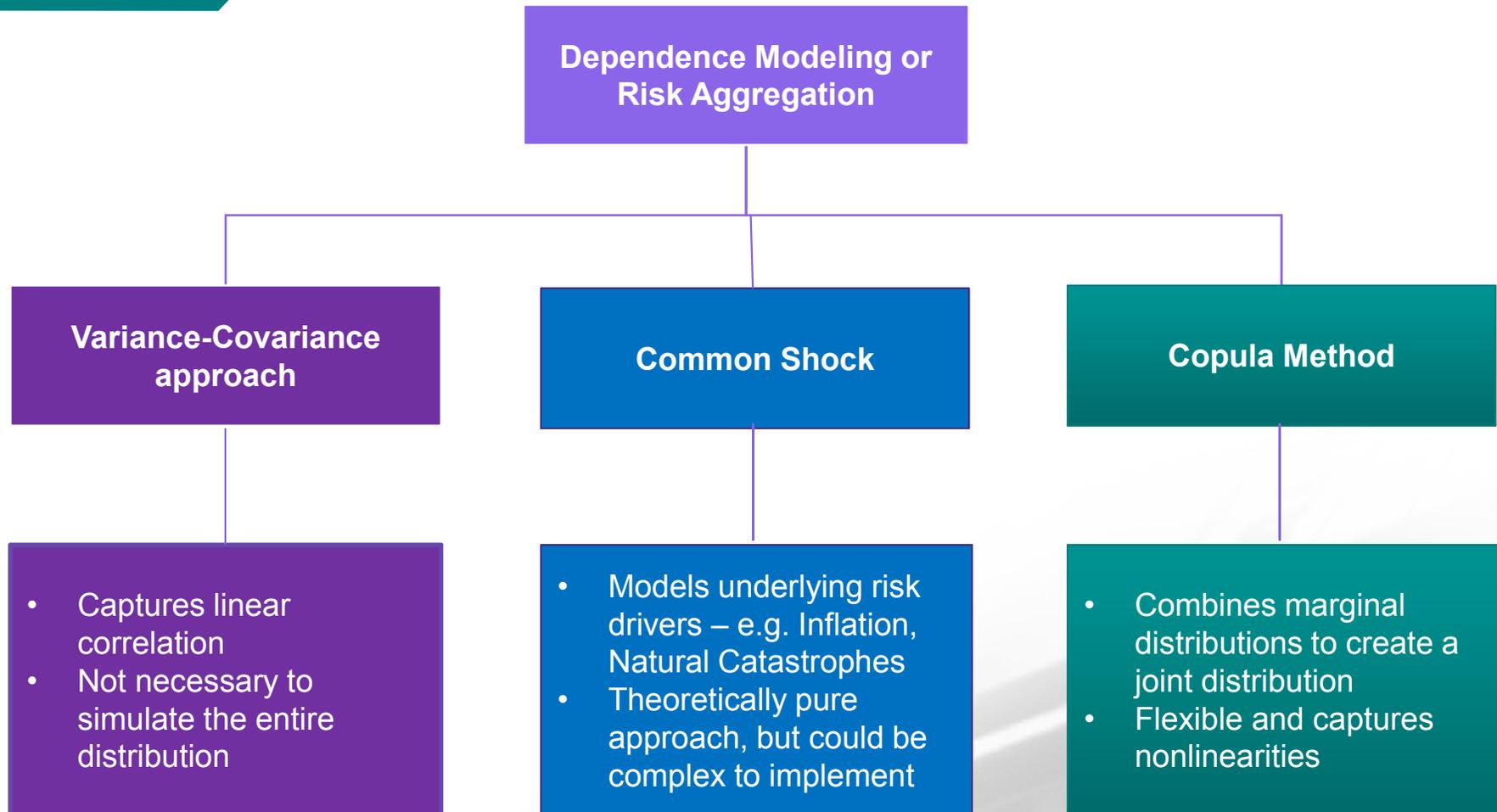
Aggregate



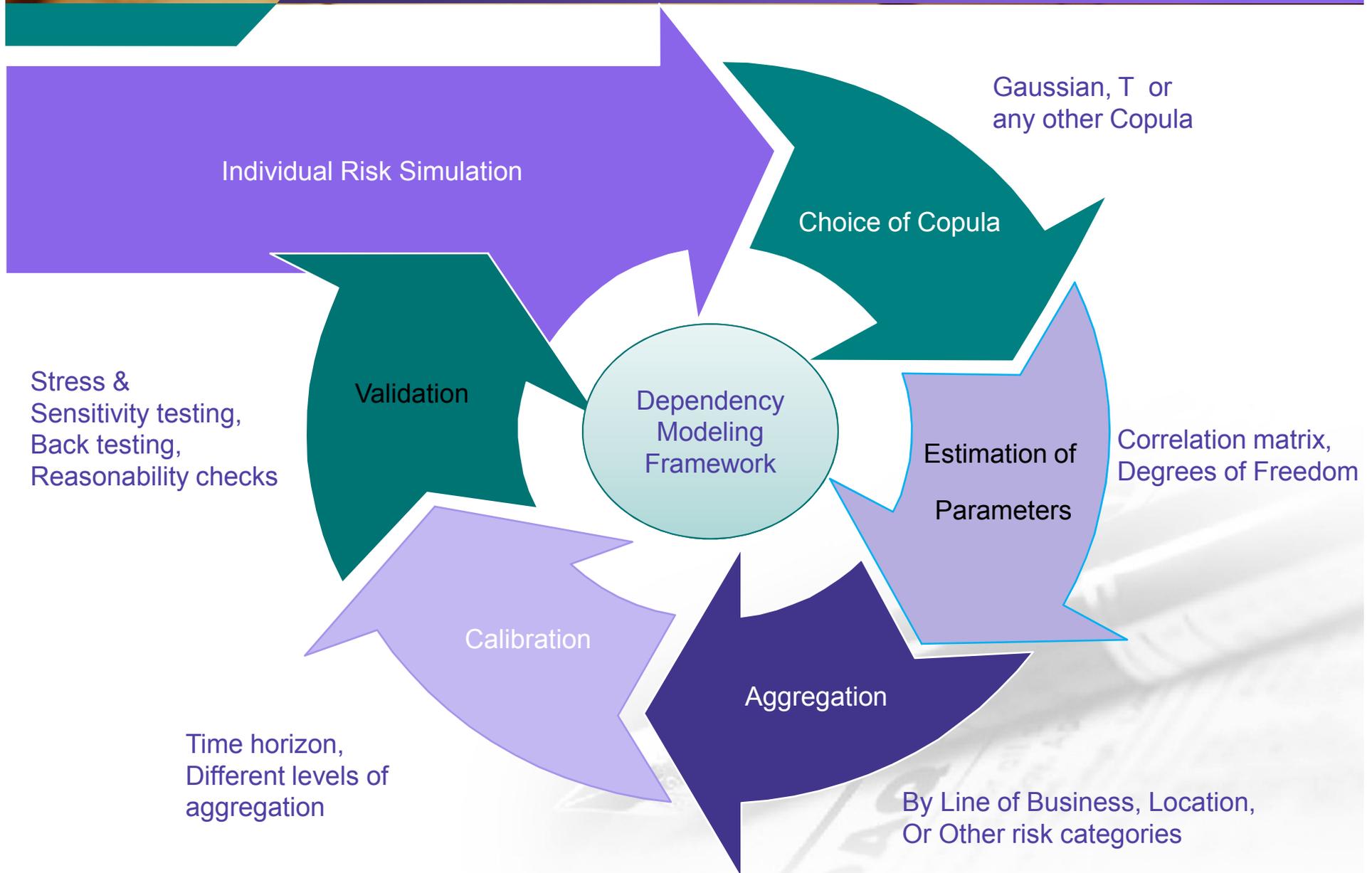
Total Capital Need		Dependence	
		Normal	T
Correlation	10%	53	58
	30%	60	63
	70%	71	71
	100%	78	78

All values are in million Rupees

Dependency Modeling Approaches



Dependency Modeling – using Copula



Technical Implementation

Simple and cost effective risk aggregation technique

Tools:

- Statistical packages – R / MATLAB / SAS
- Our very own Excel

Iman-Conover Method

- Technically similar to the copula methods
- Concurrent sorting of marginals to achieve desired correlation
- Simple to implement



Estimating Correlation - considerations

Develop intuition
Positive Definite matrix
Size of the correlation matrix
Industry data
Company's own data?
Reasonability checks
Expert Judgment



Other uses...

Not thinking about Economic Capital Modeling yet...What else can we do with dependency modeling?

Pricing and Underwriting

- Price based on the risk adjusted returns

Portfolio Management

- Diversification benefit, profitability analysis by line of business



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99.5%ile Loss	98	40		
Stand-alone Capital Need	48	30		
Risk Adjusted Return	10%	10%		

Aggregate →

Risk Adjusted Return for Engineering		Dependence	
		Normal	T
Correlation	10%	58%	32%
	30%	27%	20%
	70%	13%	13%
	100%	10%	10%

All values are in million Rupees

