Risk Margins:
Impacts to Pricing and Profitability

Risk Margins under IFRS:
A Practical Approach for
Property & Casualty Insurance

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IFRS Risk Margins

- Risk Adjustment
- in the Valuation of Insurance Liabilities
- for Risk & Uncertainty
- Associated with Cash Flows
- both Amount and Timing
- for IFRS (GAAP)
- not for Regulatory Reports (may be different)

Approach to Risk Margins

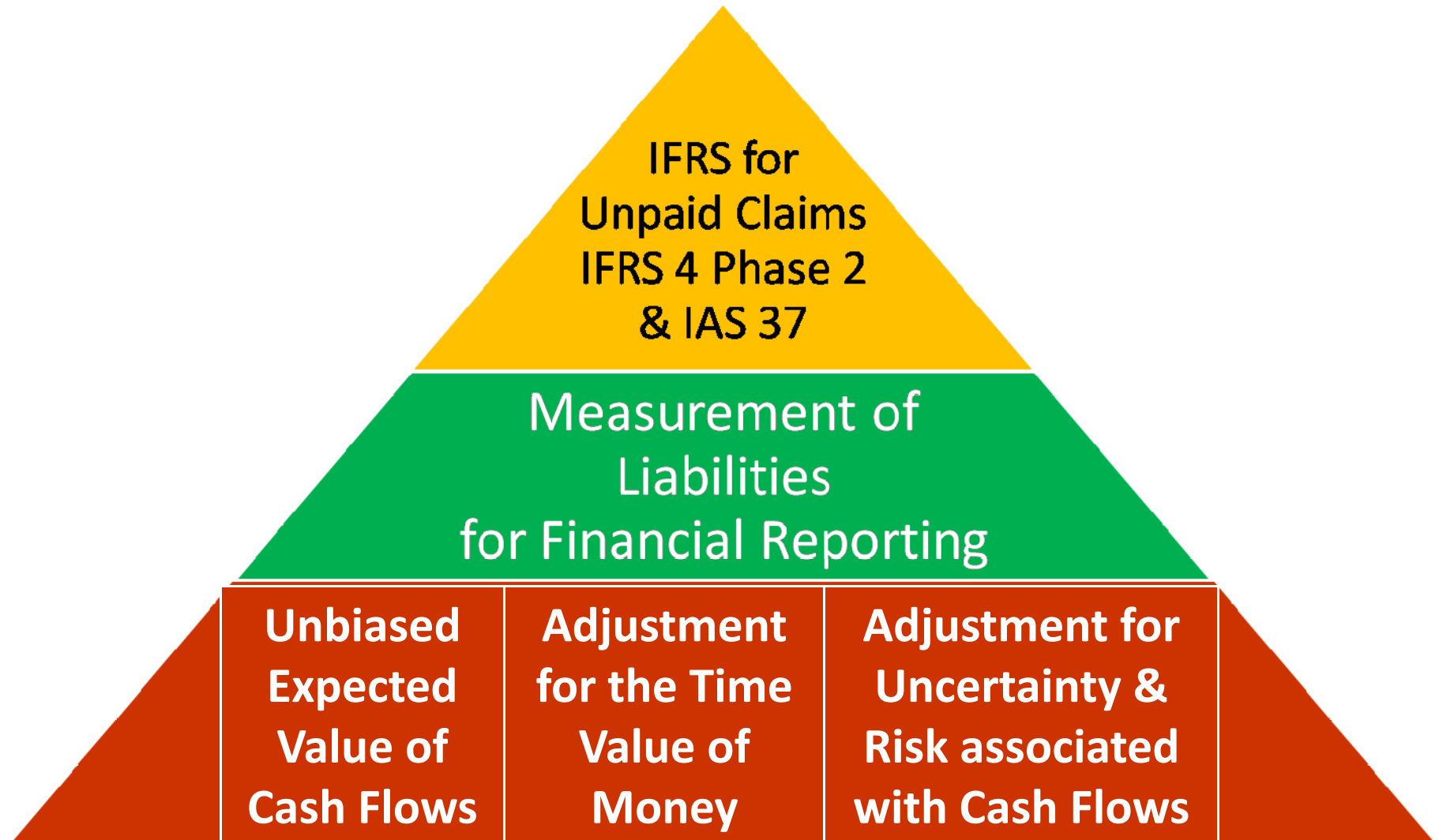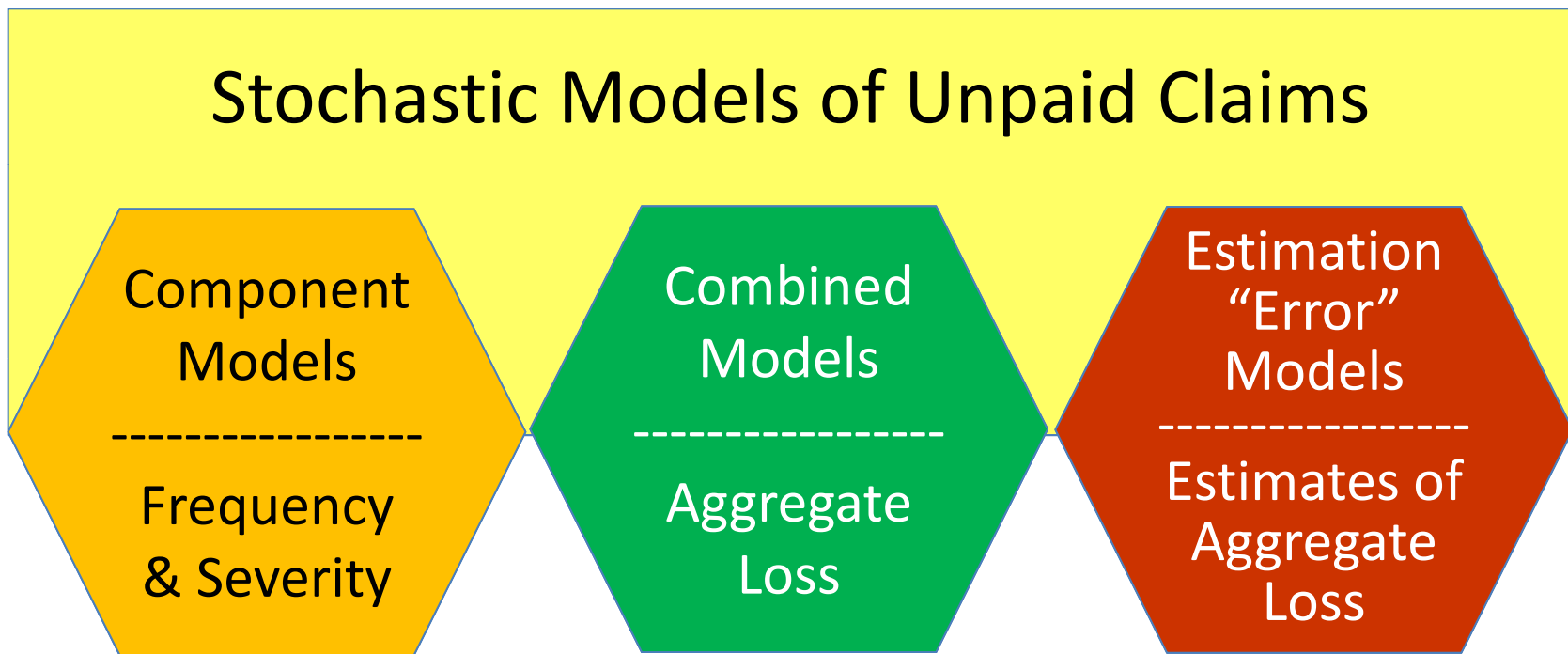|	
Stochastic Model of New & Renewal Contracts (Prospective Claims)	Market Inputs to Value of Risk
Value to Company of Eliminating Uncertainty in Cash Flows	Company Portfolio of Unpaid Claim Obligations

Stochastic Model of Unpaid Claims

IFRS Building Blocks

IFRS for
Unpaid Claims
IFRS 4 Phase 2
& IAS 37

Measurement of
Liabilities
for Financial Reporting

| Unbiased Expected Value of Cash Flows | Adjustment for the Time Value of Money | Adjustment for Uncertainty & Risk associated with Cash Flows |

Alternative Actuarial Models

Stochastic Models of Unpaid Claims

Component Models

Frequency & Severity

Combined Models

Aggregate Loss

Estimation "Error" Models

Estimates of Aggregate Loss

Estimation Error Model

- ## Data is successive re-estimates of ultimate aggregate claim values
  - Development triangle of estimated ultimate values
  - By accident year or by underwriting (policy) year

- ## Measurement of Risk & Uncertainty
  - Fitting a probability distribution of the estimate errors
  - Lognormal fits very well in tested cases

- ## Distribution of development risk by age
  - Probability of the errors in the estimates
  - Correlations of errors in the estimates
  - Paper by Zia Rehman and Stuart Klugman

Risk Margins for IFRS

- **Consideration of Various Types of Risk**

  – Process, Parameter, Model, Specification, etc.

- **Measurement of Risk & Uncertainty**

  – Risk Measurement as Captured by Model(s)

  – Relationship among "type of risks"

- **Valuation of Risk & Uncertainty**

  – Cost of Risk

  – Price to Transfer Risk

  – Value of Mitigation of Risk

Insurance Contract Pricing

- Basic Valuation of Uncertain Outcomes

- Expected Value

    (portfolio basis – law of large numbers)

- Value (Price) for the Risk that:

    Σ actual outcomes $> \Sigma$ expected outcomes

- Pricing Levels: a basis for "value" of risk

- Value of Risk: value of risk for unpaid claims is calibrated via value of risk for prospective claims

Market Data for Risk Margins

- ## Market Inputs
  - No real "trading" of portfolio of unpaid claims
  - Existing active markets for insurance contracts

- ## Market Profitability to calibrate risk margins
  - Observable in some markets (aggregate or sample data)
  - Competition in markets drives profit levels
  - Profit levels (company or market level) reflect:
    1. Risk & Uncertainty of insurance portfolios
    2. Capital needed to compete in marketplace
    3. Risk vs. Return Probabilities

Value of Risk Parameter

- Variable to reflect profitability (company or market) associated with risk of profit/loss from an insurance/claim portfolio

- Modeled using a Risk Preference Function (transformed probability distribution function)

- *Wang Transform* - good example of such function
  - addresses spectrum of profit & loss outcomes
  - desirable risk measure attribute(s): e.g., "coherent"
  - consistent with Bühlmann's economic premium principle
  - easy to use, particularly for lognormal probability function

Computing the Risk Margin using the Wang Transform

F(x) = Aggregate Loss probability function

S(x) = 1 – F(x)

E[x] = expected value using F(x)

F*(x) = Transformed probability function

Φ(x) = Normal Probability Function

S*(x) = Φ(Φ^{-1}(b · S(x) + λ) (λ = risk preference)

E*[x] = expected value using F*(x)

Risk Margin = E*[x] - E[x]

Testing of Risk Margin Estimation

- Largest 100 US Insurers (groups)
- 5 Lines of Insurance
- Value of Risk Parameters (λ)
  - Calibration by line of insurance
  - Used US industry aggregate profitability (long term)
  - Probability distribution of ultimate loss estimates
- By Line By Company
  - Probability distribution of Unpaid Loss Estimate
  - Applied λ for line to estimate risk margin

Results of Risk Margin Testing

Line of Insurance	Results for Total of Largest 100 Insurers by Line of Insurance				
	% of Expected Unpaid Loss				% of Booked
	Average Risk Margin	Average Present Value	Net Impact: Risk Margin & Pres Value	Booked vs. Expected Reserves	Net Impact: vs. Booked Reserves
Commercial Auto	10.1%	(1.7%)	8.4%	101.8%	6.3%
Commercial Multiple Peril	13.3%	(3.0%)	10.3%	100.9%	8.8%
Personal Auto Liability	9.2%	(1.4%)	7.8%	112.6%	(4.3%)
Workers Compensation	7.7%	(8.9%)	(1.2%)	95.5%	2.7%
Other Liability	13.6%	(3.8%)	9.8%	99.5%	9.8%

Results of Risk Margin Testing

Line of Insurance	Results for Total of Largest 100 Insurers by Line of Insurance		
	Average Risk Margin	Approx. Equivalent Percentile	Approx. Equivalent Conditional Tail Expectation (CTE or TVAR)
Commercial Auto	10.1%	83%	58%
Commercial Multiple Peril	13.3%	85%	62%
Personal Auto Liability	9.2%	87%	69%
Workers Compensation	7.7%	81%	55%
Other Liability	13.6%	83%	57%

Note: CTE (TVAR) relates the risk margin to the expected loss in the tail above the indicated percentile

Research Paper (2010)

A Practical Approach to Risk Margins in the Measurement
of Insurance Liabilities for Property and Casualty
(General Insurance) under Developing International
Financial Reporting Standards

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