Thriving on Change

16th General Insurance Seminar

Institute of Actuaries of Australia

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Hyatt Regency Coolum

CAT301 – Catastrophe Management in a Time of Financial Crisis

Will Gardner

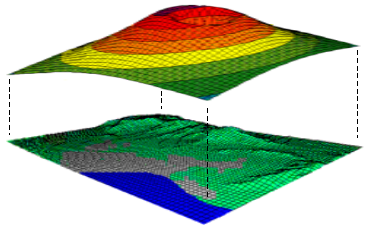
Aon Re Global

Agenda

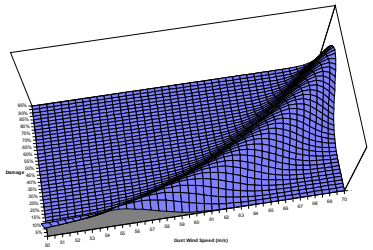
- CAT101 and CAT201 Revision
- The Catastrophe Control Cycle
- Implications of the Financial Crisis

CAT101 - An Application of Actuarial Techniques to Cyclone Simulation (GI Seminar XI 1997)

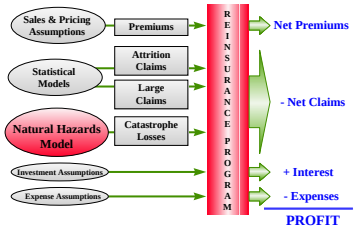
- Models simulate “possible” events



- Events
  - Assumed to be independent
  - Assumed to act in a Poisson process
  - Each have an annual frequency
  - Event severities are determined (mean, s.d., maximum)

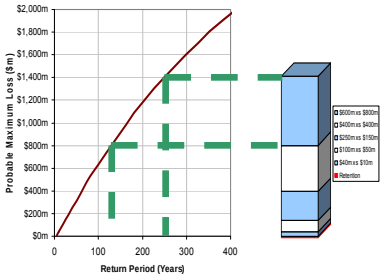


- Event losses are ranked to determine Probable Maximum Loss (PML) curves and can be used for Dynamic Financial Analysis (DFA)



CAT201 – Advanced Catastrophe Modelling Techniques in Practice (GI Seminar XV 2005)

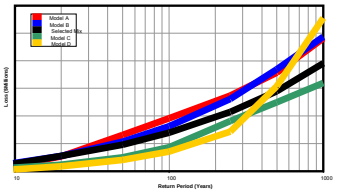
- Limit Selection
  - Review a range of models and use expert advice to select appropriate all-perils whole of portfolio 250 year PML

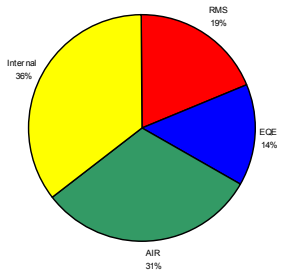


- Price estimation
  - Market price depends on the mix of models used by reinsurance markets

  but

  - Prices are based on more than just the technical price determined from the models

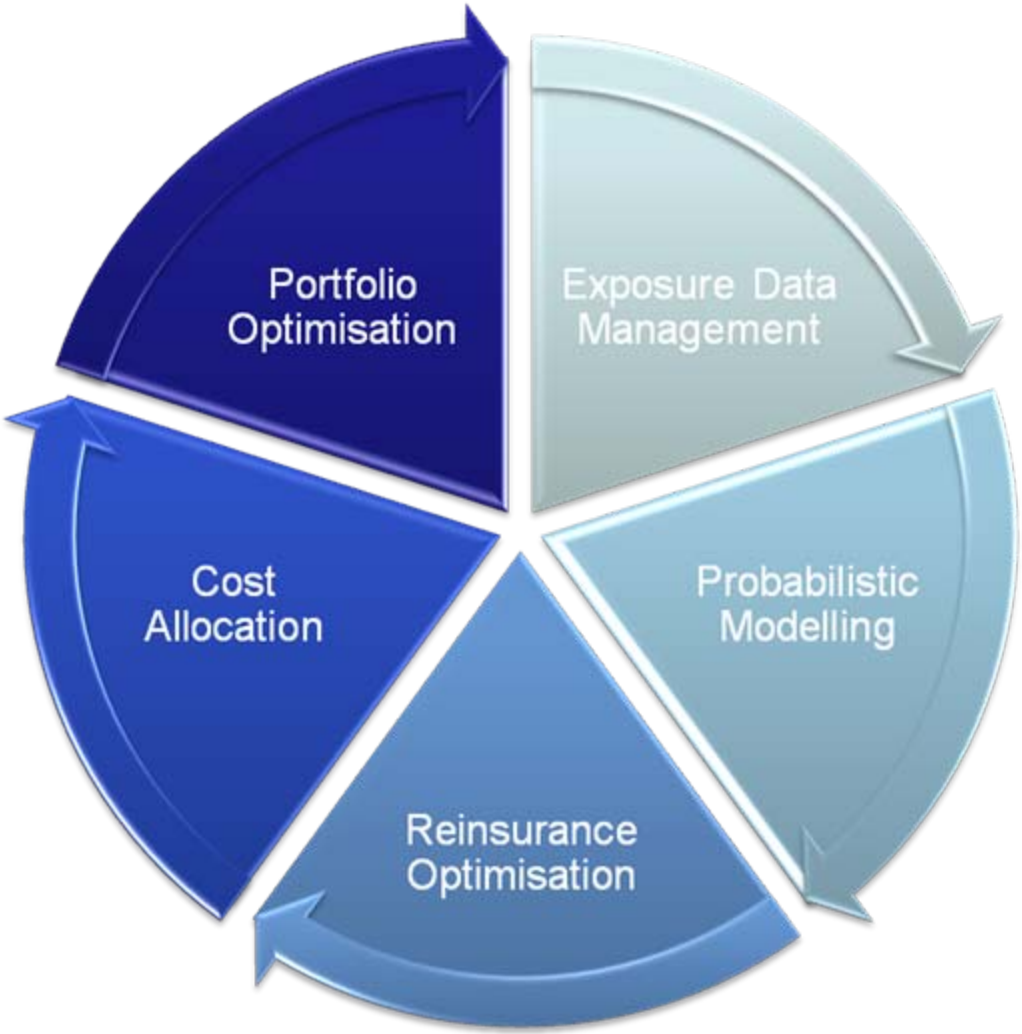




Some of the Needs of Catastrophe Management

- Quantify total exposure to any one event
- Quantify potential event loss at various probabilities
- Quantify potential aggregate loss at various probabilities
- Optimise net risk in terms of risk and return
- Allocate catastrophe cost across business units, geographies and policies
- Develop direct pricing to incorporate catastrophe risk due to
  - Cost Pure peril risk
  - Cost of Concentration
- Optimise pricing and exposure mix to manage overall company profitability and risk

Catastrophe Control Cycle



Financial Crisis

- APRA Prudential Standard GPS 116 - Capital Adequacy: Concentration Risk Capital Charge
  - *"APRA will expect the insurer to be able to demonstrate an understanding of the model used in estimating the MER. This understanding will include:*
    (a) the type of data and assumptions used in the model;
    (b) the methodology used to incorporate the data and assumptions into the model; and
    (c) the sensitivity of the resulting MER figure to changes in the model's assumptions. "
- US standard
  - Actuarial Standards Board, June 2000, "Actuarial Standard of Practice No. 38 - Using Models Outside the Actuary's Area of Expertise (Property and Casualty)", Casualty Actuarial Society, Doc. No. 071 (***Note – Revision pending***)

Data Collection

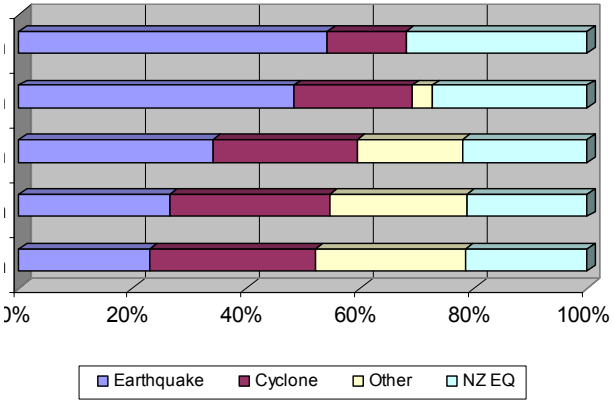
- Data typically collected
  - Risk location, Sum Insured, Wall material, Roof material, Year of construction, Deductible amount
- Data implied
  - Geographic coordinates, Insured to Value Ratio (level of underinsurance), Building code level, Building quality, State of repair, no irregularities or appurtenant structure
- “If you have a five star model but two star data, you will get two star results” – Dr George Walker

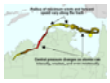
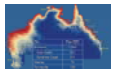
Data Collection – Financial Crisis

- Sums Insured could increase
  - Eg. “This is my primary asset”
- Sums Insured could decrease
  - Premiums going up too much
- Sums Insured growth will not match official Inflation
  - Inflation → Construction costs → Building values → Sums insured
- Misinformation – Fraud
    - Rade Musulin – Session 7.a

PML Estimation

- Multi-model approach offers best solution
  - Better central estimate of the PML
  - Better understanding of the possible range
- Non-modelled perils need to be considered
  - Bushfire, flood, thunderstorm, hail, terrorism
- Need to allow for model adjustments
  - Before running model - Eg. Input Tax credits
  - After running model – Eg. Demand surge
- Expert opinion is valuable
  - The Black Box syndrome



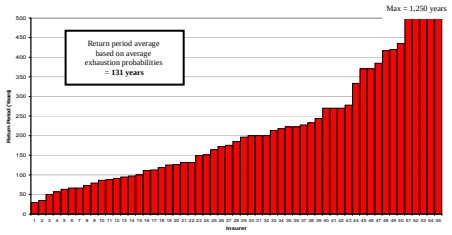
	AIR	IF	EQE	RMS
Model Type	Detailed & Aggregate	Detailed & Aggregate	Detailed	Detailed & Aggregate
Last Update	2002	2005	1998	2005
Hazard Technique	1.25° x 1.25° grid cell at land fall	100 coastal gates (~100km)	24 gates (~400km)	98 coastal Gate (~100Km) 5 bypassing Gates (250km)
				
Wind Methodology	• Random-walk using 1.25°x1.25° cell grid	• Intensity based on fits to historic data • Wind model based on Daneshvaran and Gardner (2001)	• Windfield based on Holland (1980), modified to fit Schwerdt et al (1979)	• Random-walk simulation Drayton (2005) • Time-stepping directiona wind field model
Other Components	• AS 1170 • AUSLIG (1:25k)	• AS 1170.2 1989 for roughness factors		• Variable resolution grid (VRG) • 50 x 50 km • 10 x 10 km • 1 x 1 km
Vulnerability	• Detailed curves for 48 construction types • Discriminate 4 regions based on AS 1170	• Detailed curves for 21 construction types • Discriminate 4 regions based on AS 1170	• 4 construction types • Unknown • Timber • Masonry • Concrete	• Detailed curves (>30) including country specific curves (e.g. Brick Veneer)
Additional Component	• 3 age ranges • 4 Classes: Residential, Apartments, Commercial and Mobile Homes	• Age discrimination (Pre-1980 & Post- 1980)	• Two Structural modifiers (Fair & Poor) • No Age discrimination	• Age (4 bands) • Building inventory define 11 regions • 40 Occupancy Class • High spatial resolution

PML Estimation – Financial Crisis

- Eventual Concentration Shifts → Changing PMLs?
- Demand Surge → Higher cost of materials and labour?
- Exchange rate movements → Higher cost of materials?
- Fraud → More claims, larger claims?
- For major damage, do we bother to rebuild?

Reinsurance Optimisation

- Limit Selection and Retention management



- Deterministic
  - Regulatory indicators
  - Deterministic scenarios
  - Peer group comparisons

- Probabilistic
  - Dynamic Financial (Reinsurance) Analysis
  - Tradeoff between
    - Risk – Reduction in volatility due to reinsurance
    - Return – True cost in terms of ceded return on economic capital

Reinsurance Optimisation – Financial Crisis

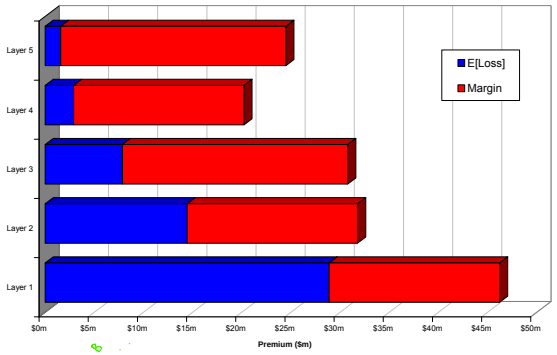
- Changes in insurer cost of capital
- Change in solvency levels of insurers and reinsurers
- Reinsurer Rating Agency downgrades → May effect mix of reinsurers on your "panel"
- Credit charges on reinsurance recoveries
- Reinsurance prices are on the move
  - A previously attractive layer may no longer be

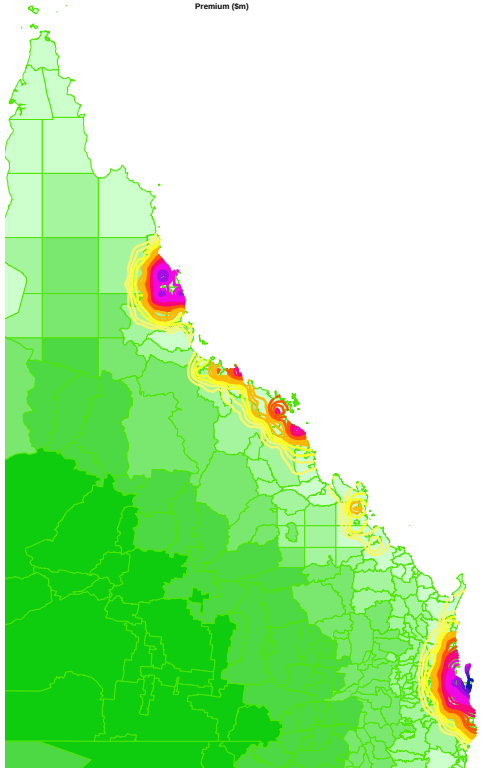
Cost Allocation

- Real cost is the sum of
  - Pure cat expected loss
  - Reinsurer margins
  - Return on net capital at risk

- Contribution of more severe events to cost is more significant in concentrated areas

- Allocate between
  - Business units
  - Classes of business
  - Geographic locations
    - State, ICA Zone, Postcode, Building





Cost Allocation – Financial Crisis

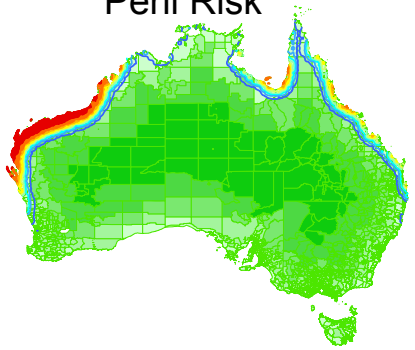
- Concentration shifts may increase or decrease allocation to various geographic regions
- Across company classes of business
  - Capital allocation will change
  - Expense allocations will change
  - Cross-subsidies and correlations will change
- Larger potential impact on Multinationals
  - Exchange rate volatility
  - Cost of Capital between markets

Portfolio Optimisation

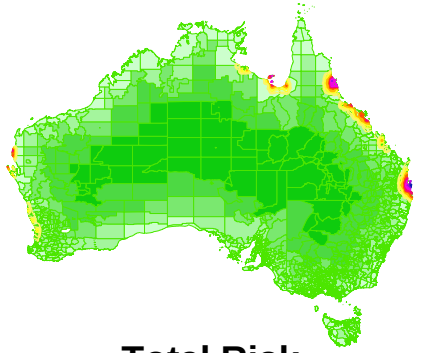
- Optimise using iterative process to
  - Increase reward
    - Premium, Expected profit, Number of policies
  - Reduce risk
    - PML, Tail Conditional Expectation (TCE), Probability of Ruin

- Benefits
  - Limit growth of PMLs while maintaining overall portfolio premium growth
  - Reduce the risk of “Over the Top” events
  - Target dilutive pricing in areas of large exposure concentrations and natural peril risk
  - Select areas for profitable growth

Peril Risk



+ Concentration Risk



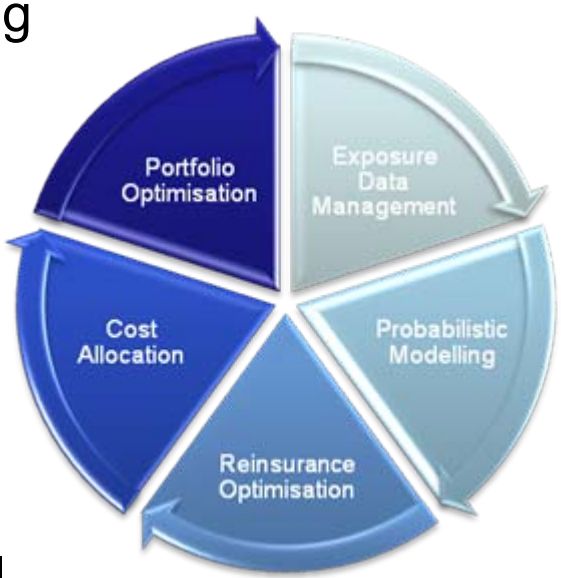
= Total Risk

Portfolio Optimisation – Financial Crisis

- Most volatile of the 5 steps in the Catastrophe Control Cycle
- Reduced investment returns are putting strain on profits
  - Insurers are indicating (as at early Nov 08) impending price increases
- People could tend to shop around on renewals
  - Expect increased non-renewals
  - New business expenses could increase
- Price elasticity will change
  - Market will see greater movement between insurers
  - Effect of small price adjustments will disappear
- Optimisation measures may need to change
  - Eg. Use Probability of Ruin instead of APRA MCR
- Asset reductions will alter MCR calculation and hence optimisation metrics

Conclusions

- The Financial Crisis could have a major impact on the successful use of catastrophe modelling for insurance companies
- The Black Box approach does not work here and the potential impact across all areas of catastrophe risk should be reviewed in a comprehensive manner
- The Catastrophe Control Cycle offers a useful framework on which to base such a review and to manage catastrophe risk



Questions and Discussion

Will Gardner

Head of Aon Re Services Asia Pacific

will.gardner@aon.com.au

(02) 9650-0390