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The Global Economic and Financial Crisis

**Implications for financial modelling
and the need for efficient use of
capital**

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Agenda

- Lessons from the global financial crisis
- Capital, risk and return
- Stochastic capital modeling
- Maximising the utility of limited capital resources
- Conclusion

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Lessons from the financial crisis: The G20

- In its "Declaration of the Summit on Financial Markets and the World Economy," dated 15 November 2008, leaders of the Group of 20 cited the following causes:

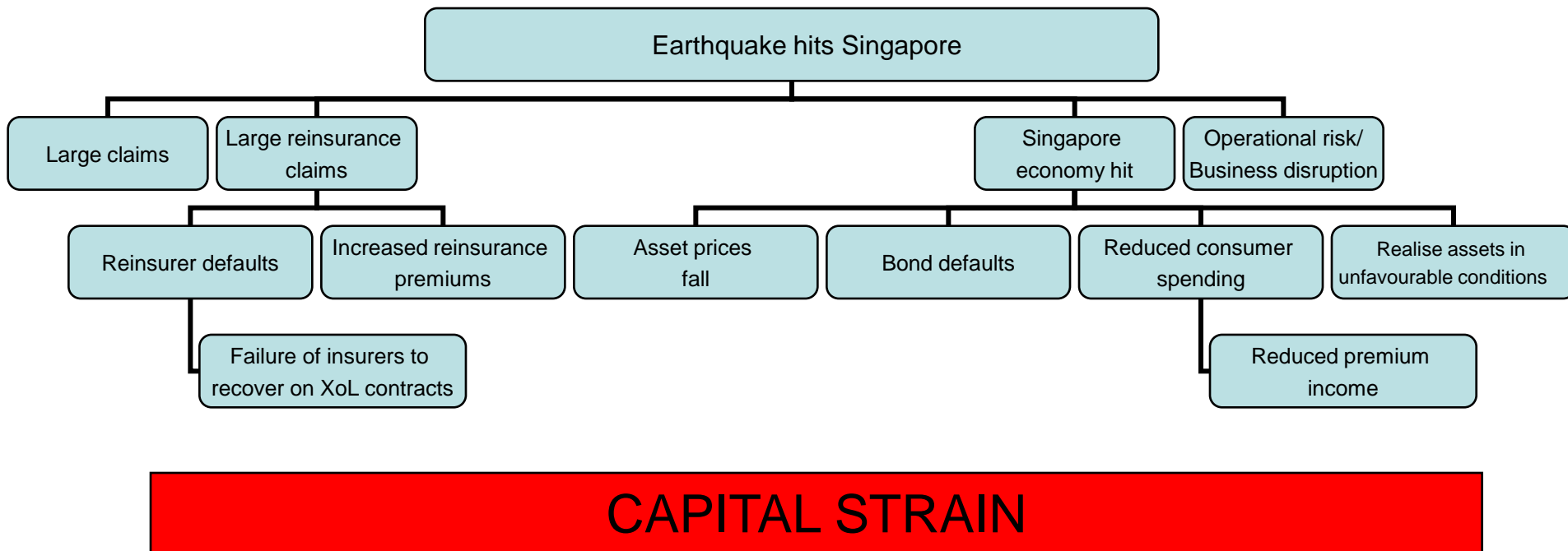
*“During a period of strong global growth, growing capital flows, and prolonged stability earlier this decade, market participants sought higher yields **without an adequate appreciation of the risks** and **failed to exercise proper due diligence**. At the same time, **weak underwriting standards, unsound risk management practices**, increasingly complex and opaque financial products, and consequent excessive leverage combined to create vulnerabilities in the system. Policy-makers, regulators and supervisors, in some advanced countries, **did not adequately appreciate and address the risks** building up in financial markets, **keep pace with financial innovation**, or take into account the systemic ramifications of domestic regulatory actions”*

Lessons from the financial crisis: Correlation in the tails

- Assumed diversification of Mortgage Backed Securities (“MBSs”)/ Collateralized Debt Obligations (“CDOs”) by:
 - Company of origination
 - Geographical region of property
 - Diversification to other assets in banks portfolio
- However, high correlation in the tail due to:
 - Diversification swamped by systematic actions of inability of borrowers to continue payments on similar products and falling house prices
 - Correlation of falling house prices across regions
 - Sub-prime losses associated as cause and effect of downturn in mainstream economy
 - Feedback effects (House price falls – re-negotiate mortgages – foreclosure – lending/securitisation tightens – further house price falls)

Lessons from the financial crisis: Correlation in the tails

■ Example insurance scenario:



Lessons from the financial crisis: How to defend yourself?

- Enterprise Risk Management (“ERM”)
 - Risk Identification
 - Risk Modeling
 - Risk Mitigation
 - Risk Monitoring
- Accurate and comprehensive modeling
 - Dynamic financial analysis (“DFA”)
- Capital adequacy to:
 - Meet required risk appetite of company
 - Meet required return on capital
- Use limited capital resources efficiently

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Capital, risk and return: What do we mean by capital

Liabilities



Assets

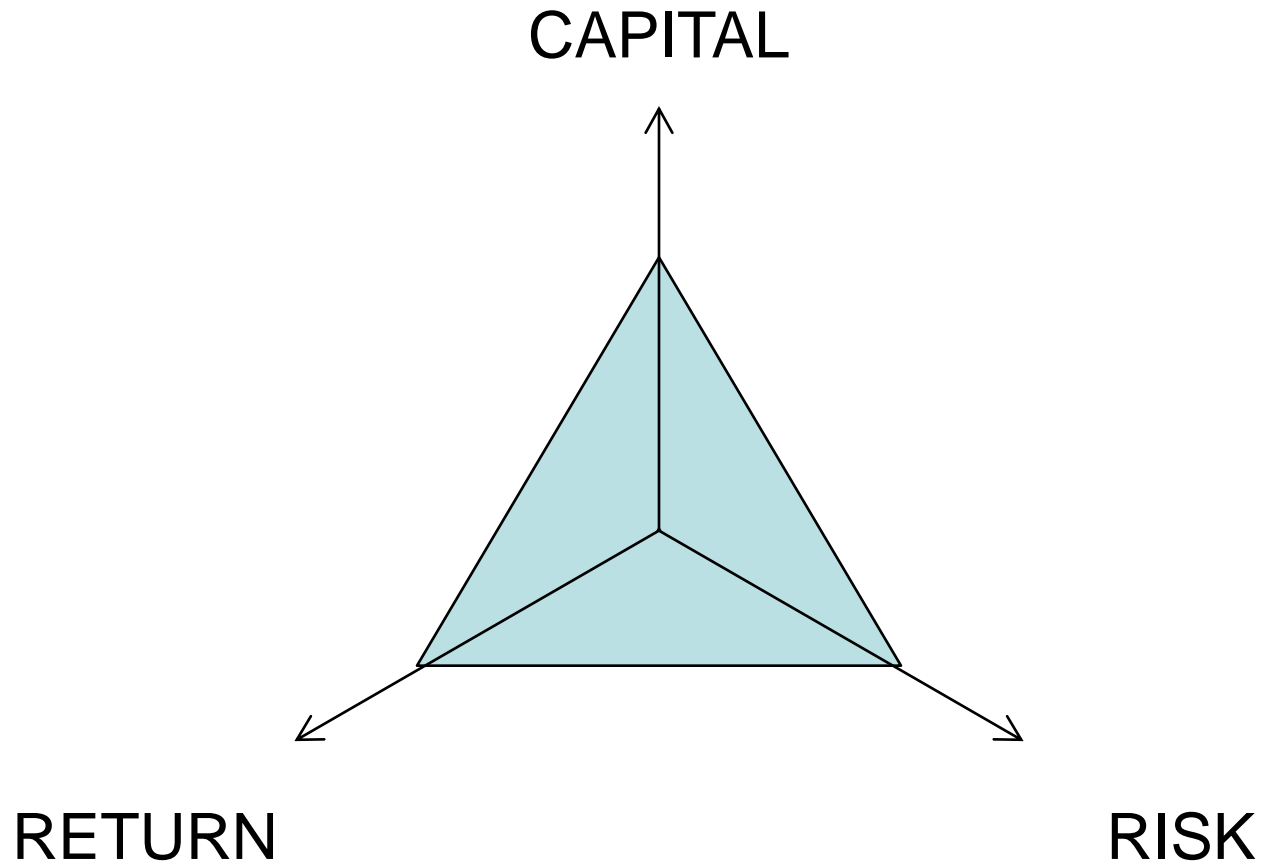


$$\text{Capital Adequacy Ratio ("CAR")} = \frac{\text{Financial resources}}{\text{RBC determined capital requirements}}$$

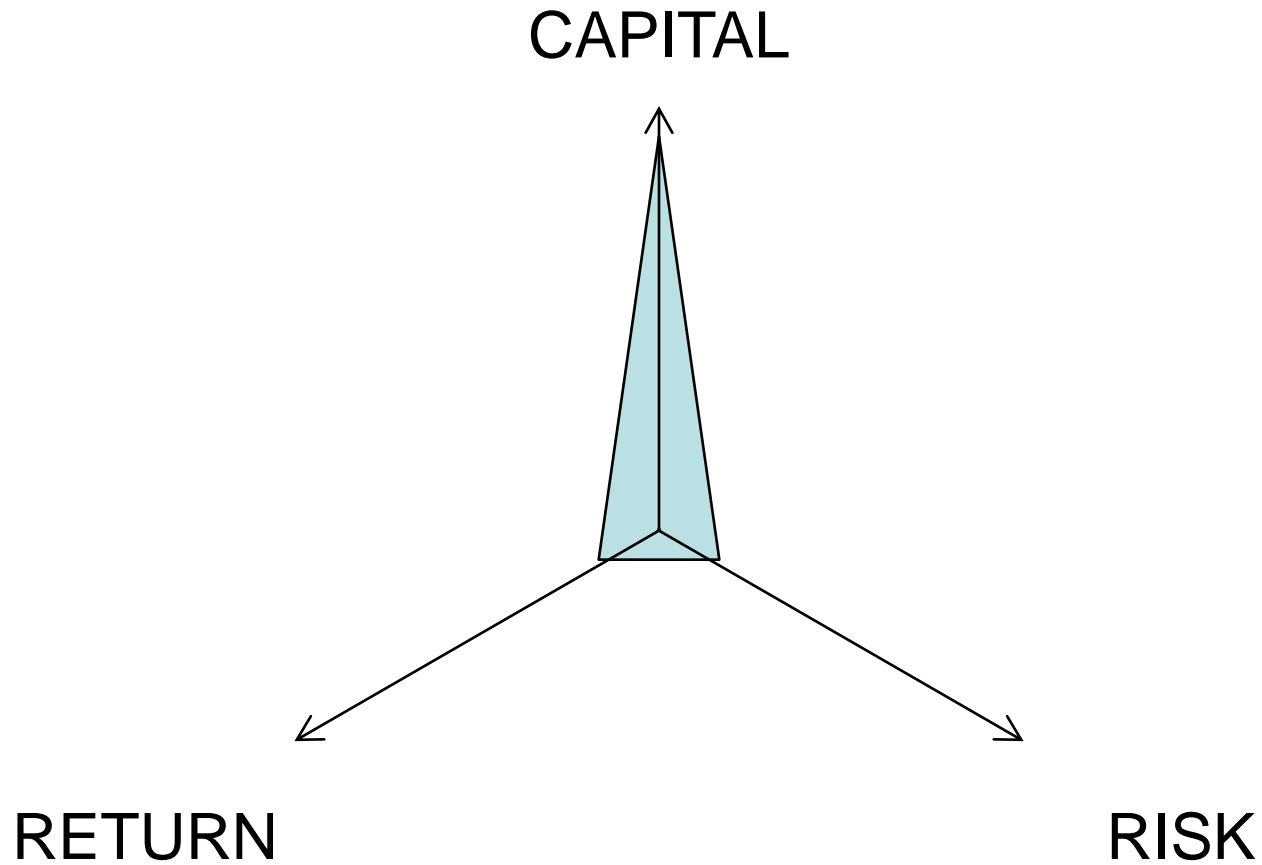
Capital, risk and return: What do we mean by risk?

- What are your risk metrics?
 - Risk of insolvency
 - Risk of regulatory intervention
 - Risk of making a loss
 - Risk of underperforming business plan
 - Risk of not being able to pay dividends
 - Risk of downgrading by the rating agencies
- What is your risk appetite?
 - Probability of risk event e.g. 5%
 - Timeframe e.g. 5 years
- What are your return requirements?
 - e.g. Annual return on capital of 15%

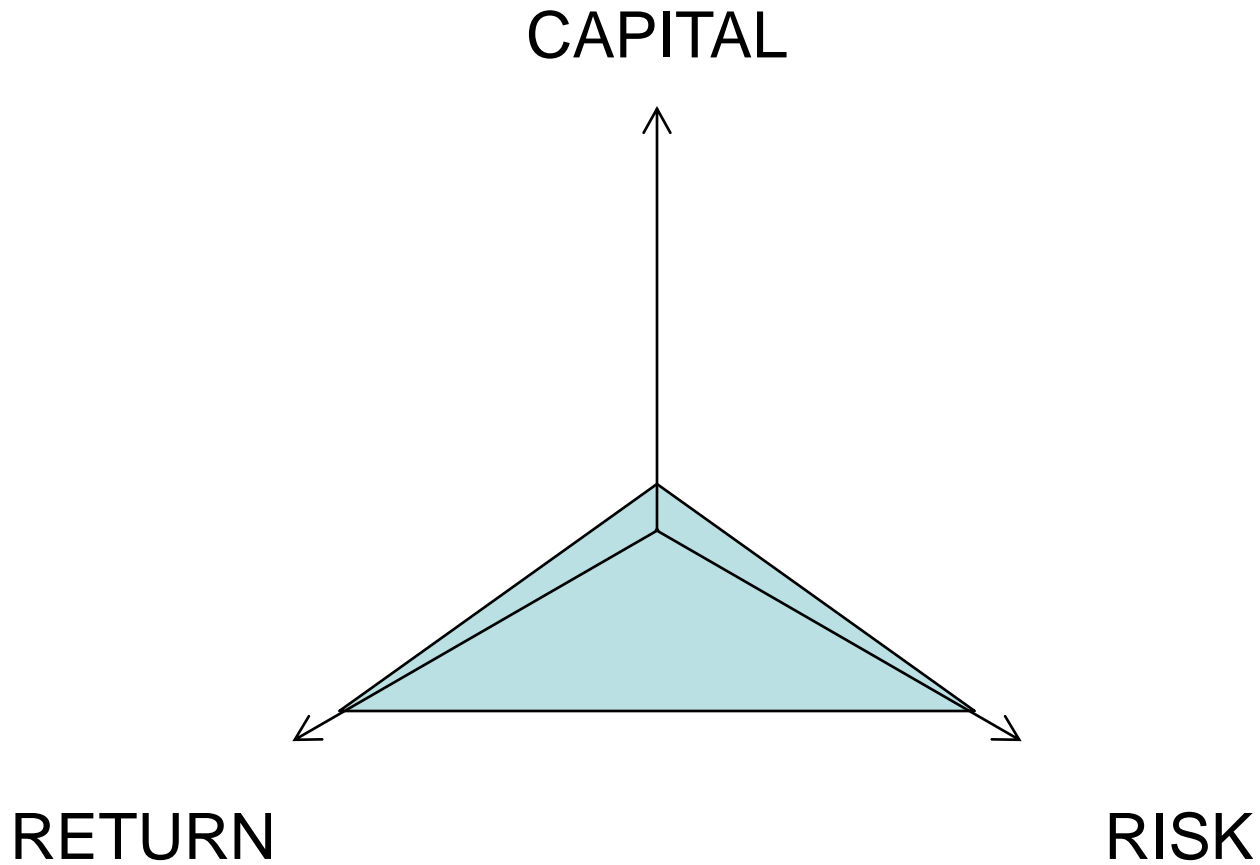
Capital risk and return: How do they interact?



Capital risk and return: How do they interact?

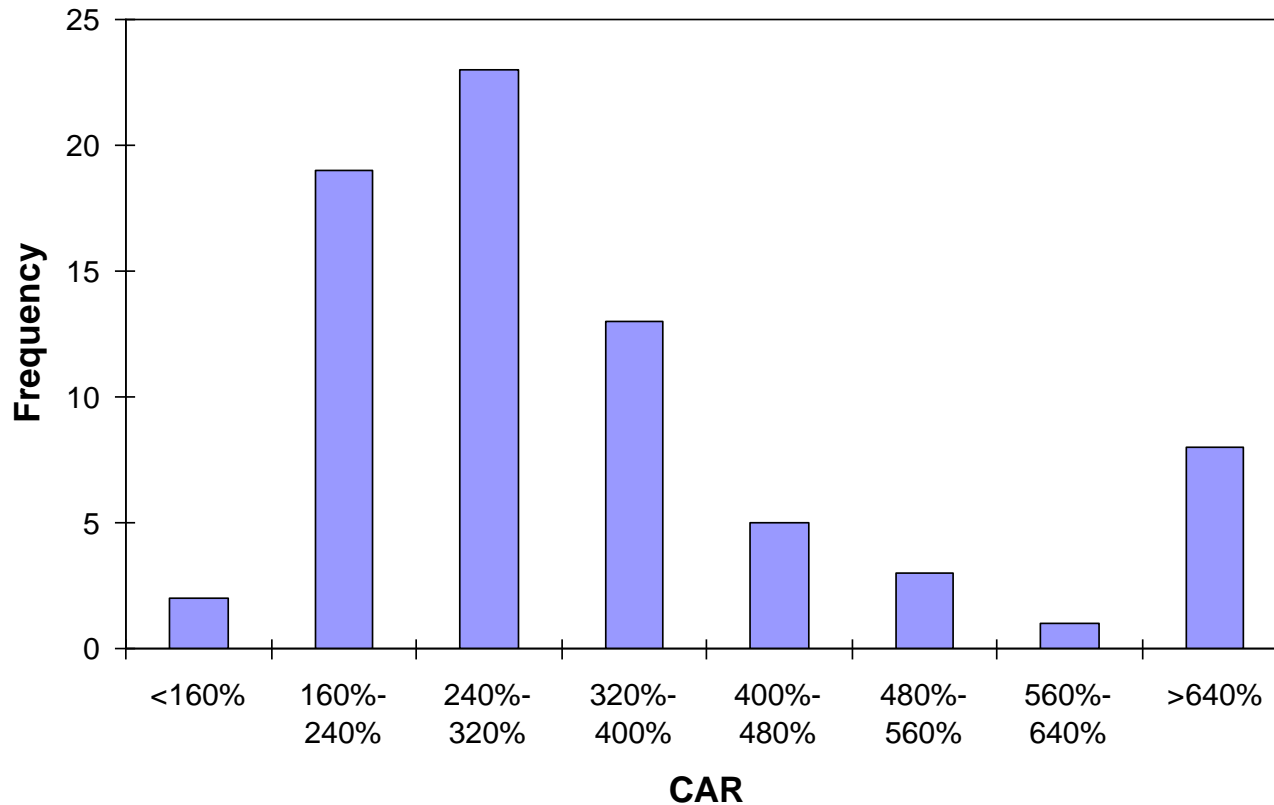


Capital risk and return: How do they interact?



Capital, risk and return: The Singapore market

Top 25 Singapore Direct Insurers over last 3 years



- Mean CAR = 374%
- Mean CAR for top 5 reinsurers = 1358%

Capital, risk and return: Why free capital is more important than RBC

- Large variation in CARs and high average CAR in Singapore demonstrates a great degree of freedom in selecting capital levels
- Small probability of Singapore companies breaching RBC level in the near future
- At the point you meet RBC requirements it may already be too late
 - Regulator intervened
 - Downgraded by rating agencies
 - Difficult to raise capital under stressed scenario

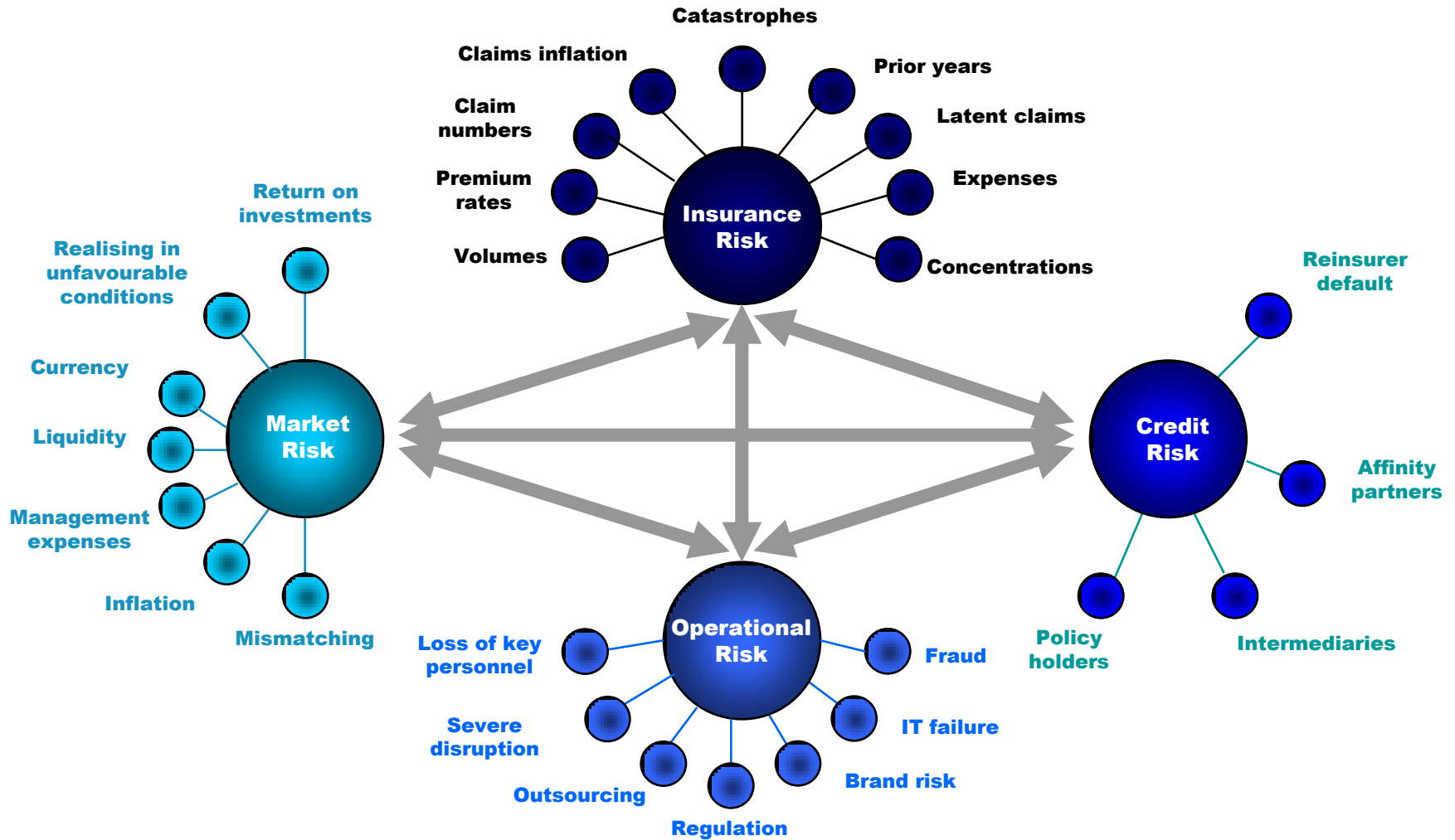
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- **Stochastic capital modeling**
- Maximising the utility of limited capital resources
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Stochastic capital modelling: What is it?

- Used to determine most appropriate CAR ratio based on risk and return requirements
- Used to quantify the effects of risks facing the insurance company on the overall level of risk and necessary capital
- Used as part of an ERM framework
- Used to monitor risk, capital, return
- Used to maximise the utility of capital
- Mandatory in some developed markets including UK and is a large part of Solvency II in Europe

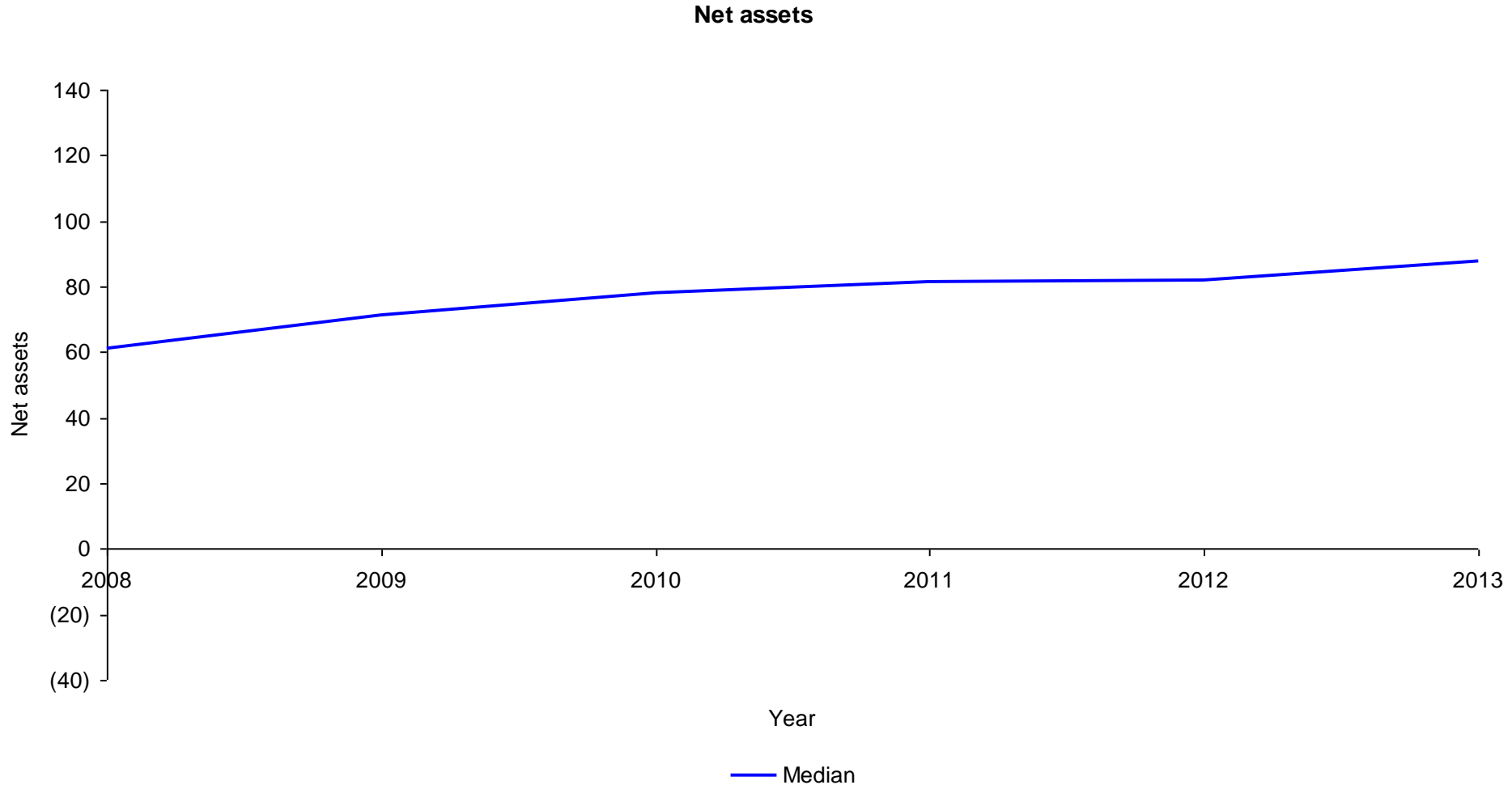
Stochastic capital modelling: Modelling insurance risks



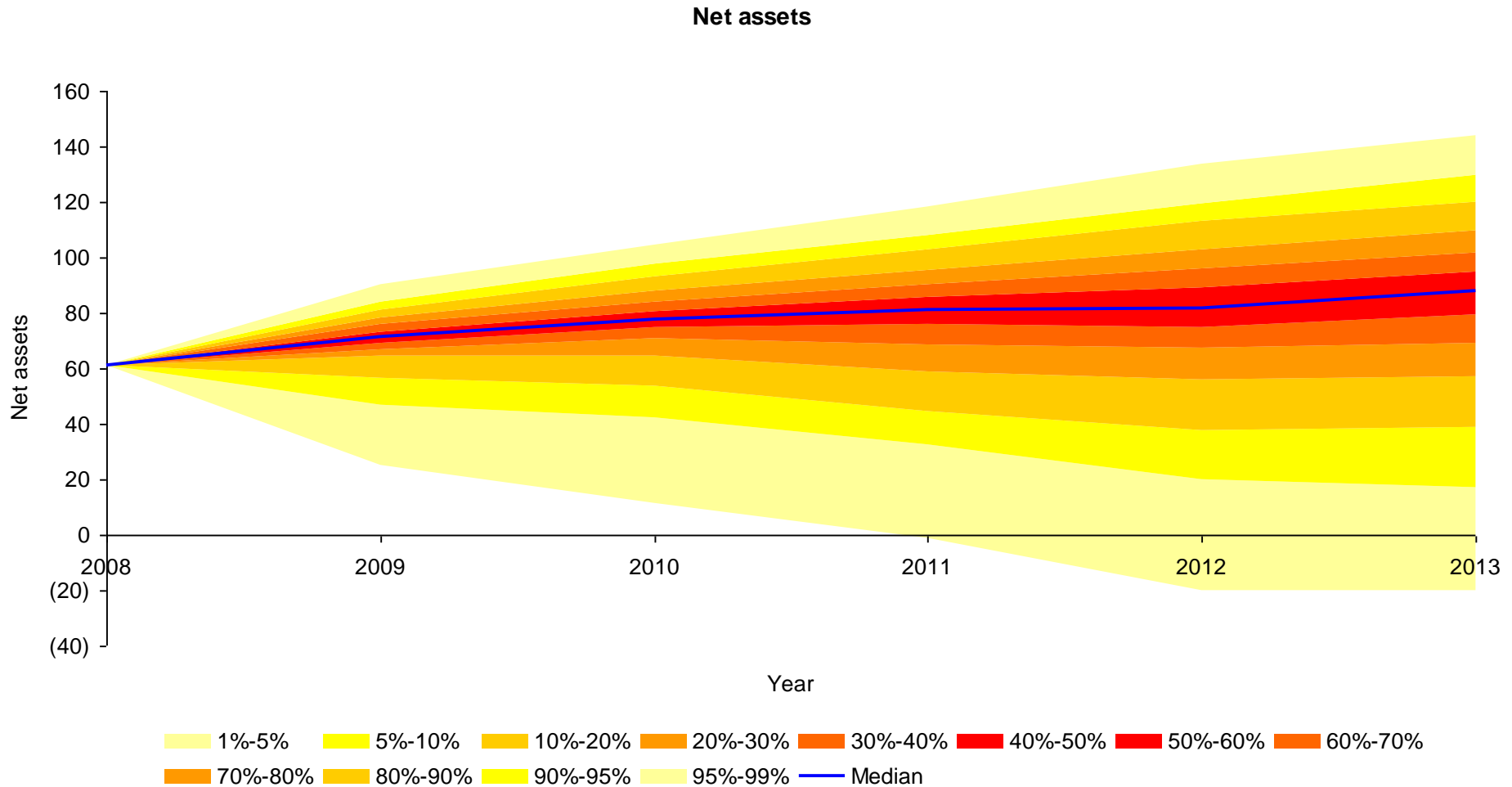
Stochastic capital modelling: What is it?

- Input assumptions both deterministic and stochastic:
 - Premium growth
 - Expenses
 - Attritional claims
 - Large claims
 - Cats
 - Credit risk
 - Asset return
 - Reserves
 - Correlations and interactions
 - etc
- Outputs both deterministic and stochastic over model time period e.g. 5 years:
 - Projected financial statements; Cashflow, P&L, BS
 - Projected return
 - Projected RBC capital
 - Projected CAR

Stochastic capital modelling: What is it?

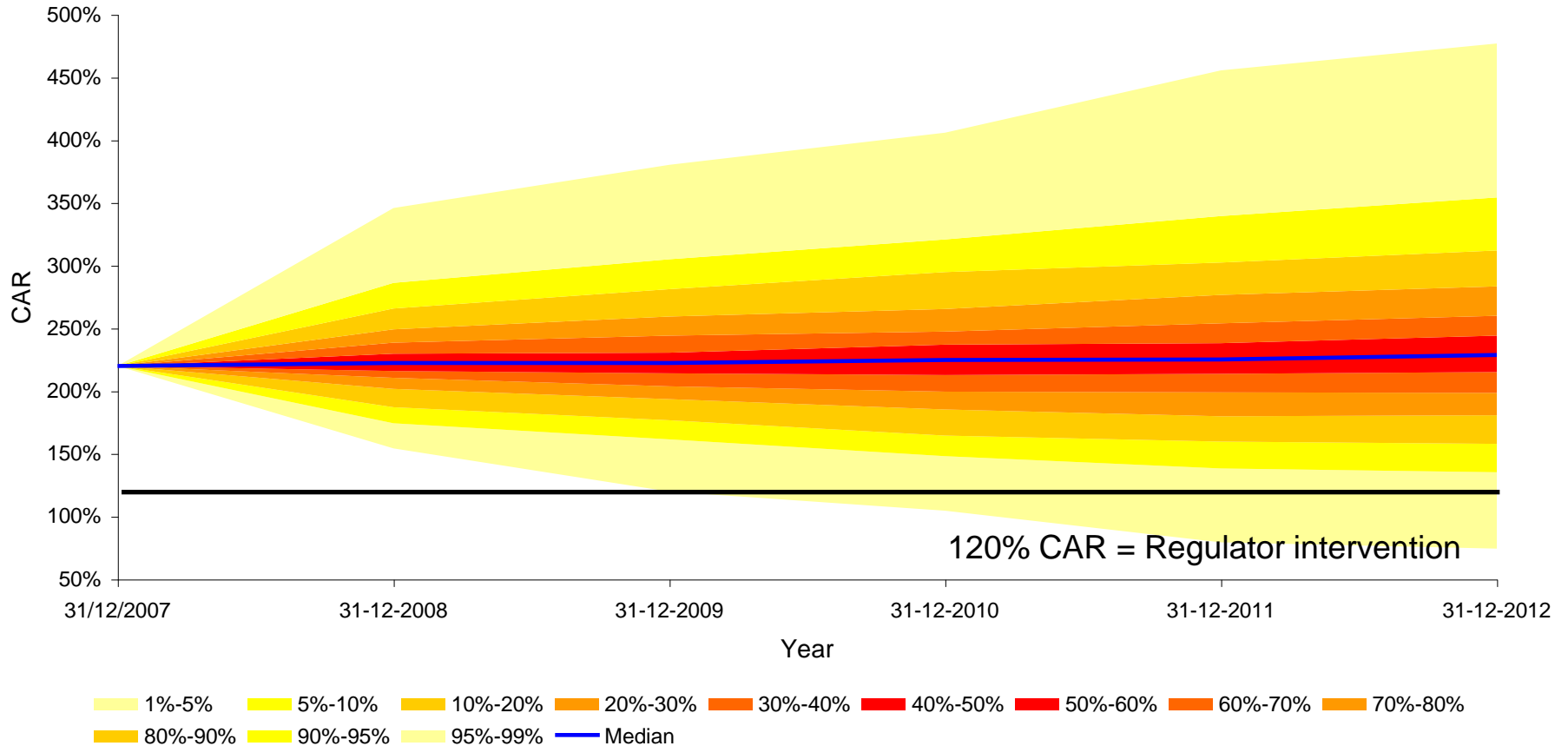


Stochastic capital modelling: What is it?

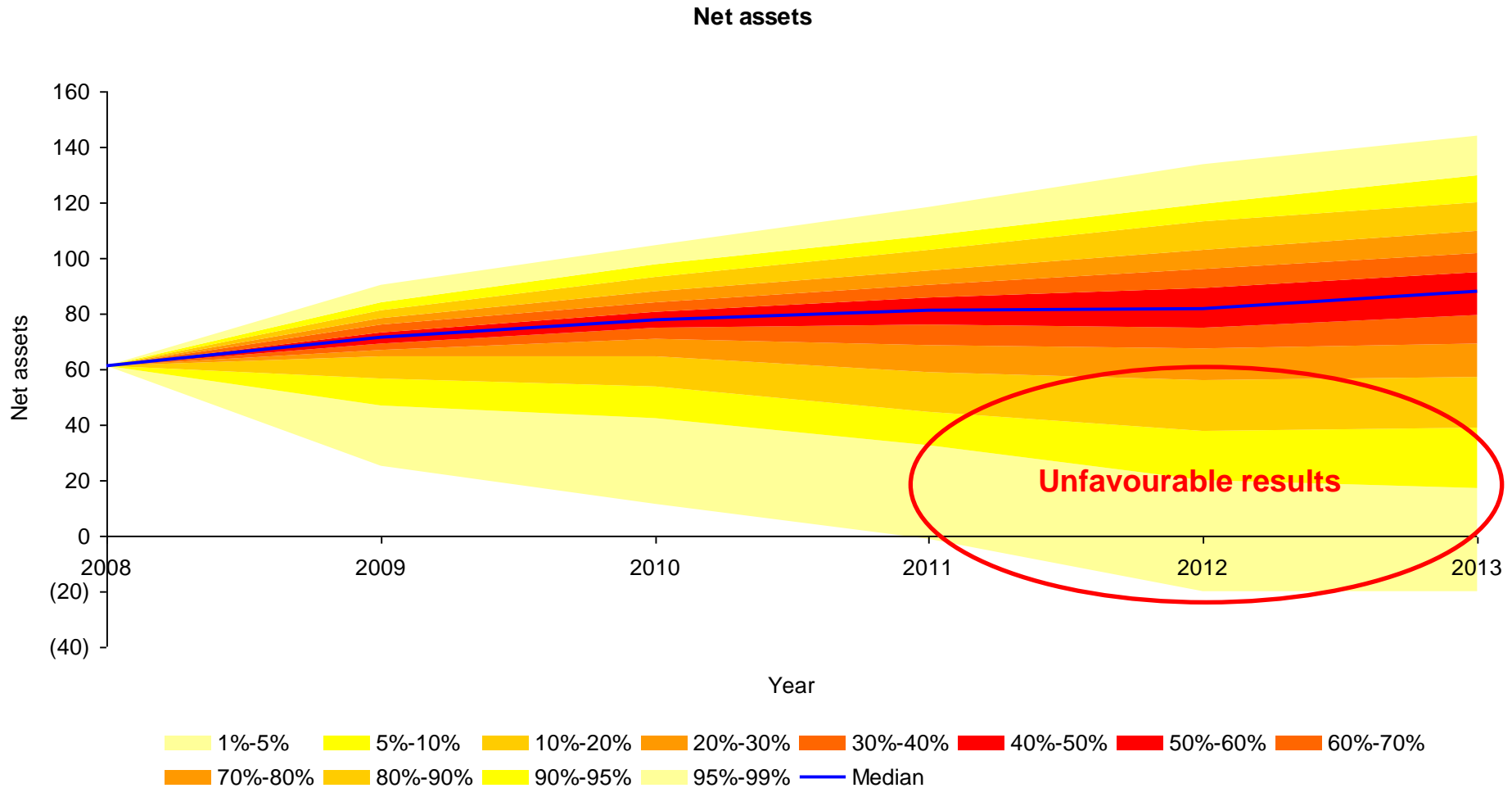


Stochastic capital modelling: Determining your CAR

Capital Adequacy Ratio



Stochastic capital modelling: Risk Mitigation



Stochastic capital modelling: Lessons from GFC for advanced modelling

- Using copulas to allow for increased correlations in low frequency events e.g. GFC/Catastrophe?
- Model major events separately and overlay standard capital model?
- Compare capital model with single extreme ‘stress test’?
- Model causation instead of correlation?
- Are you being imaginative enough?

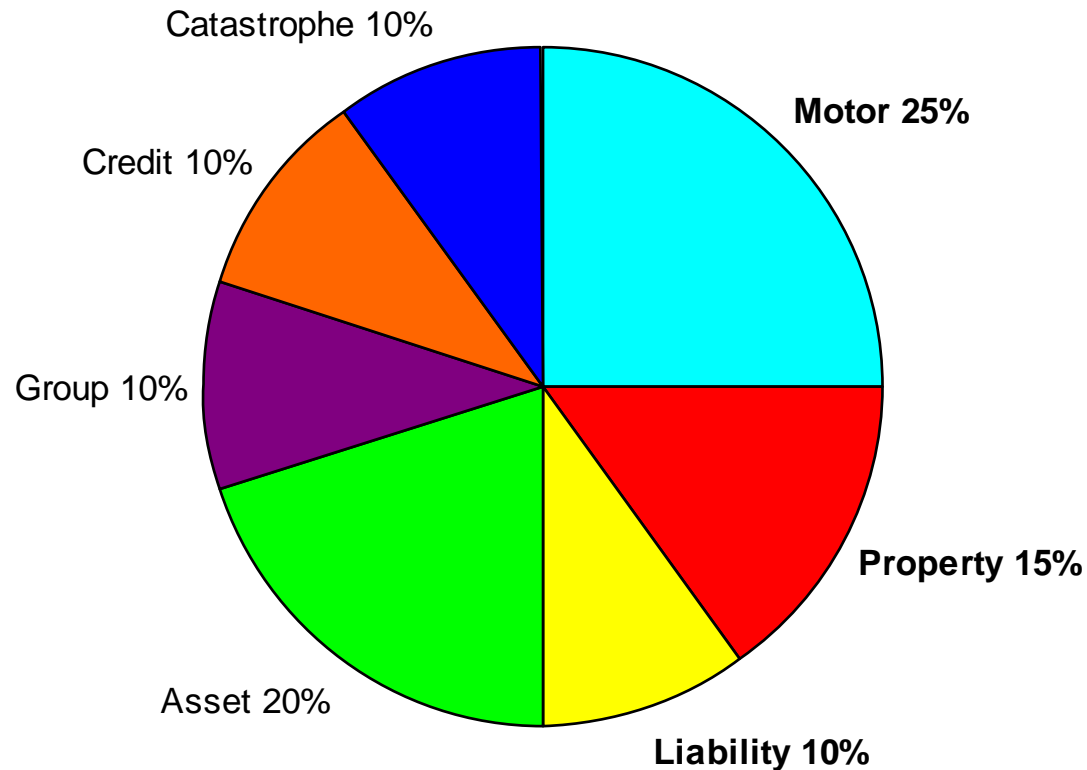
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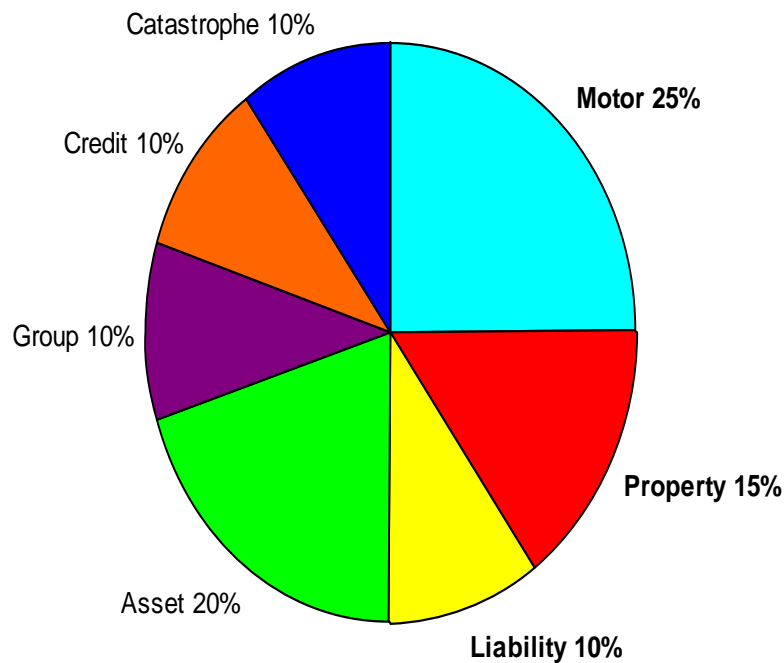
Maximising the utility of limited capital resources: The uses of capital modelling

- Determining capital levels
- Risk mitigation
- Capital allocation
- Reinsurance optimisation
- Investment strategy optimisation
- Business planning and strategic decision making:
 - Marketing
 - New product testing
 - Expansion planning
 - Scenario testing e.g. regulation changes
- Insurance company valuation

Maximising the utility of limited capital resources: Capital allocation

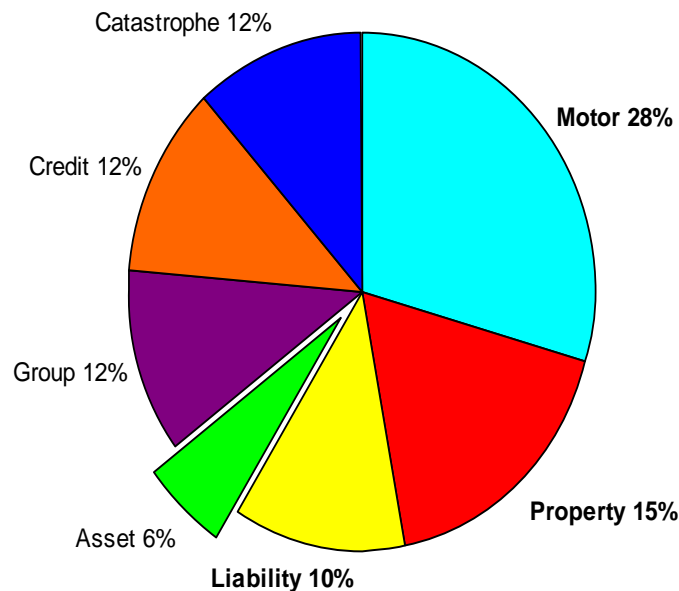


Maximising the utility of limited capital resources: Capital allocation



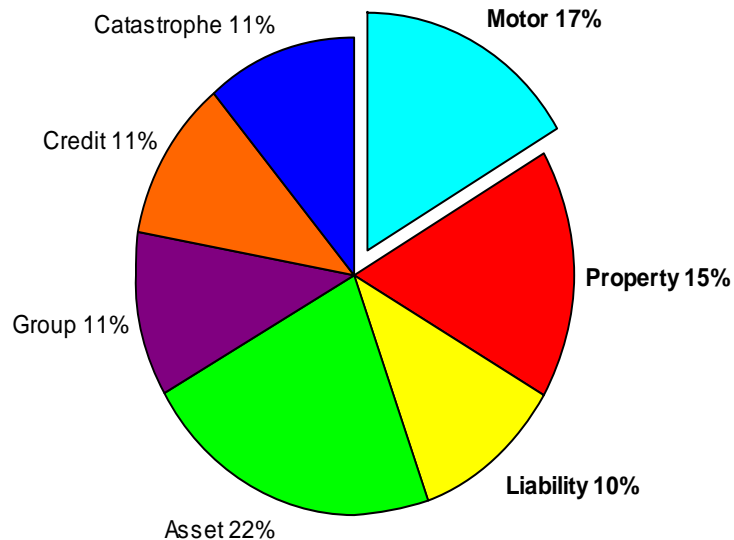
- How can change:
 - Decrease asset risk
 - Lower retention limit
 - Cat XoL
 - Use AAA Reinsurers
 - Diversification

Maximising the utility of limited capital resources: Capital allocation



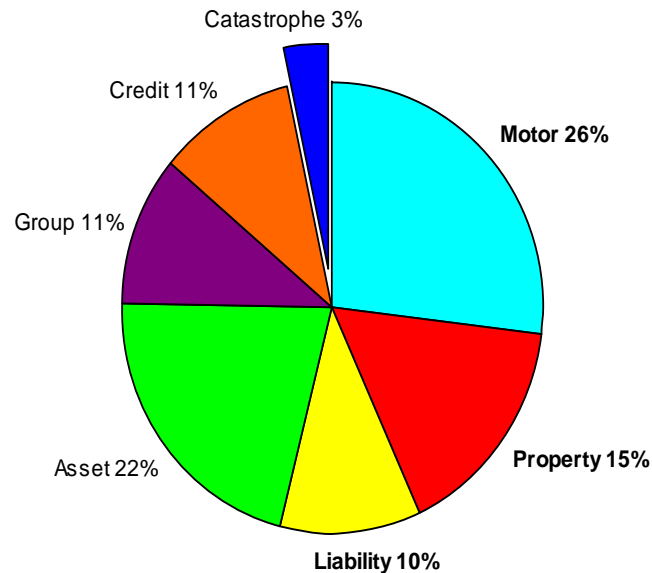
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Maximising the utility of limited capital resources: Capital allocation



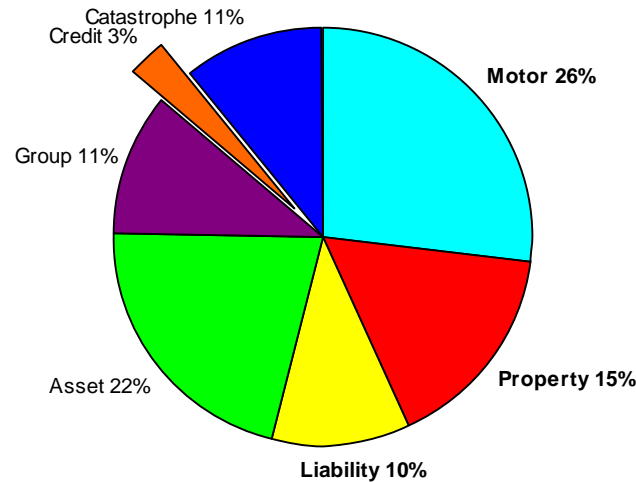
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Maximising the utility of limited capital resources: Capital allocation



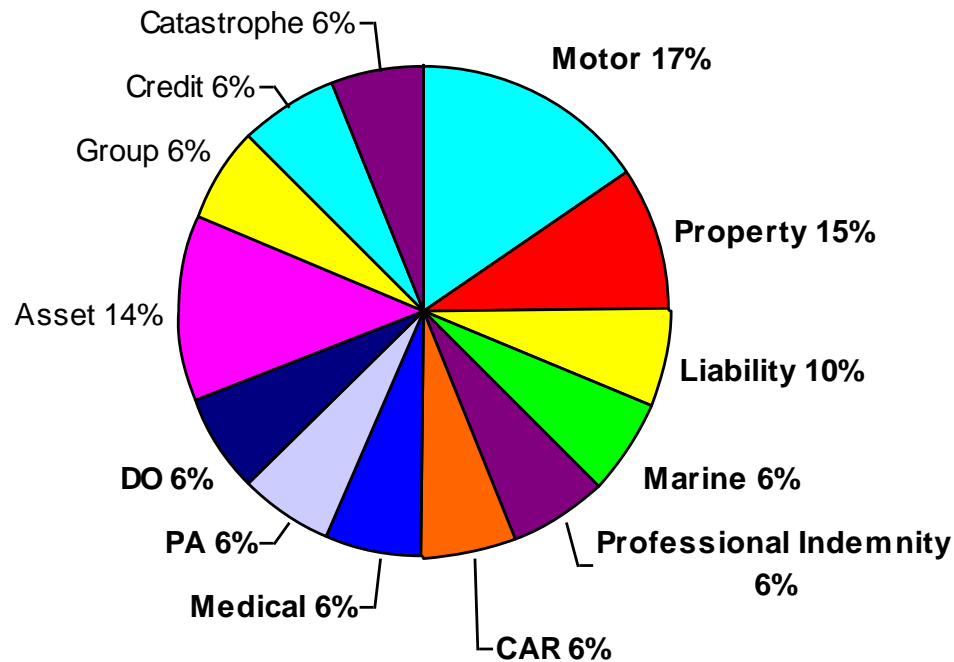
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Maximising the utility of limited capital resources: Capital allocation



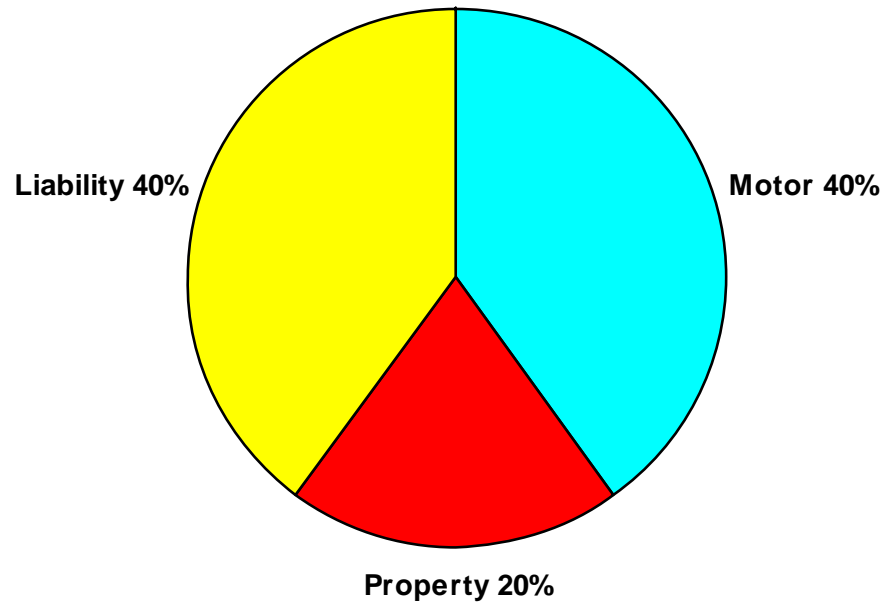
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Maximising the utility of limited capital resources: Capital allocation



- How can change:
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Maximising the utility of limited capital resources: Using capital allocation for decision making



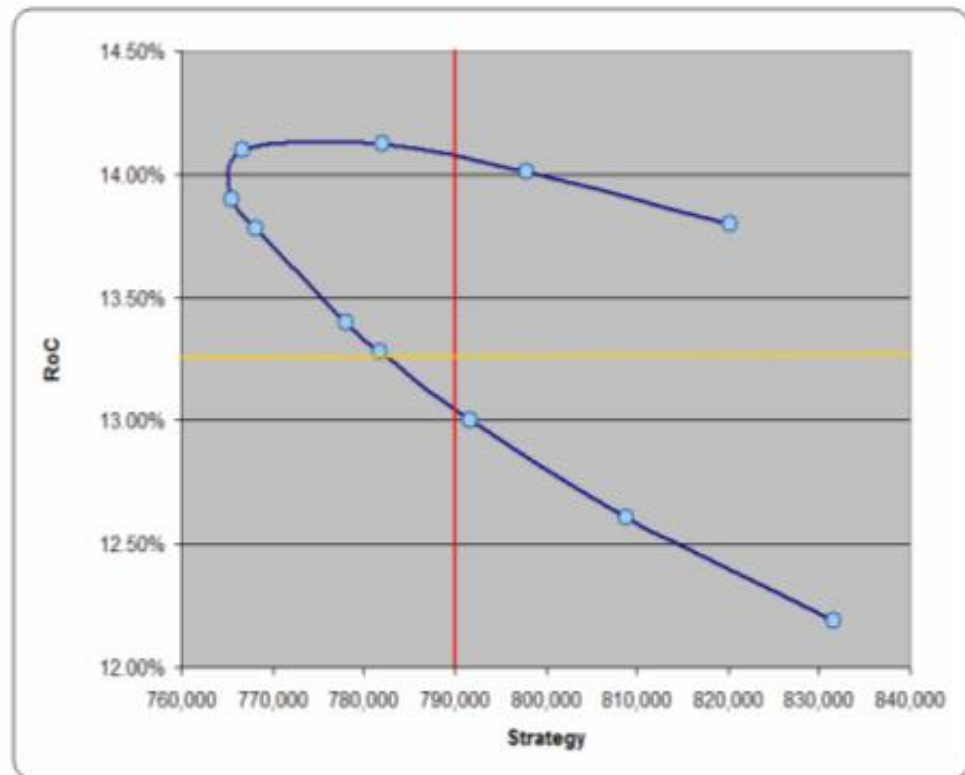
Class	Allocated capital	Profit	ROCE
Motor	40,000	3,000	7.5%
Liability	40,000	4,000	10%
Property	20,000	3,000	15%

Maximising the utility of limited capital resources: Strategic decision making – Reinsurance optimisation

Type RoC vs Capital

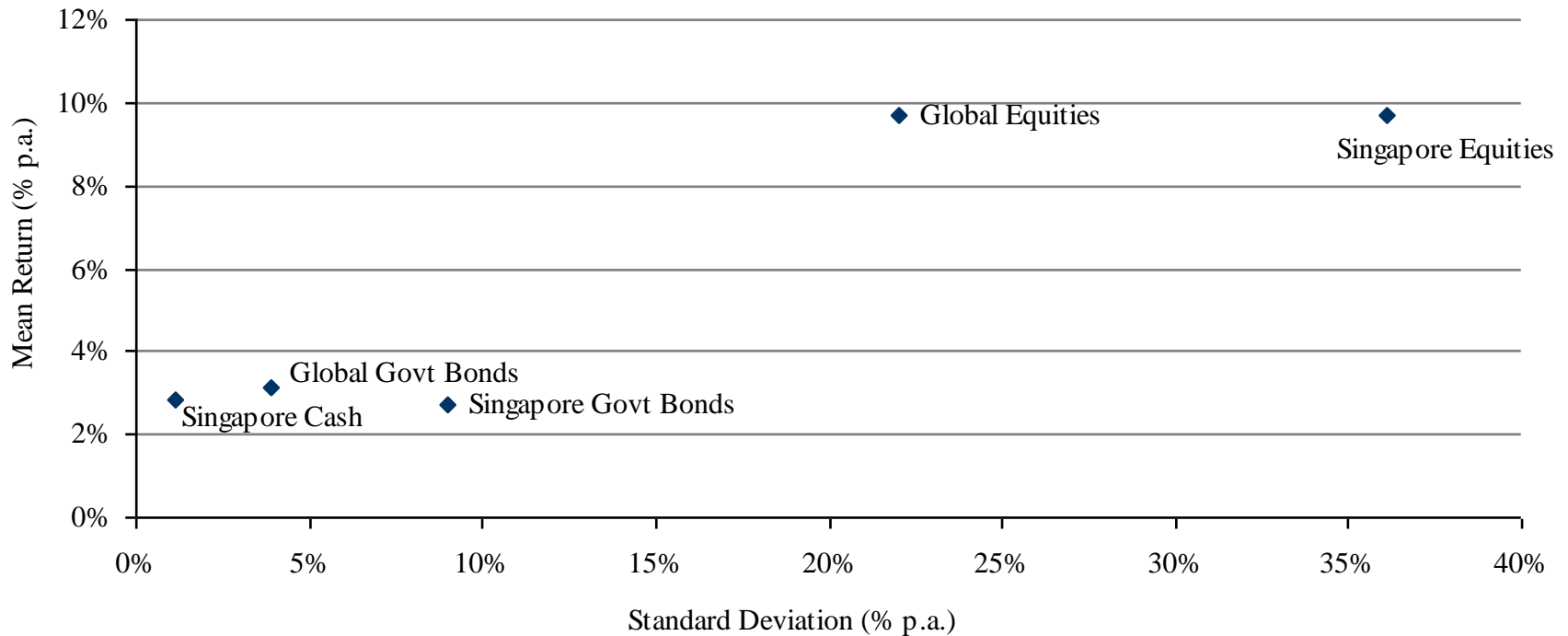
Risk Appetite 99.50%

Scenario	RoC	Capital	Insurance Result
1	12.19%	831,500	101,360
2	12.61%	808,811	101,991
3	13.00%	791,687	102,919
4	13.28%	781,687	103,808
5	13.40%	778,012	104,245
6	13.78%	768,133	105,849
7	13.90%	765,398	106,390
8	14.10%	766,709	108,105
9	14.12%	782,000	110,418
10	14.01%	797,845	111,778
11	13.80%	820,122	113,177



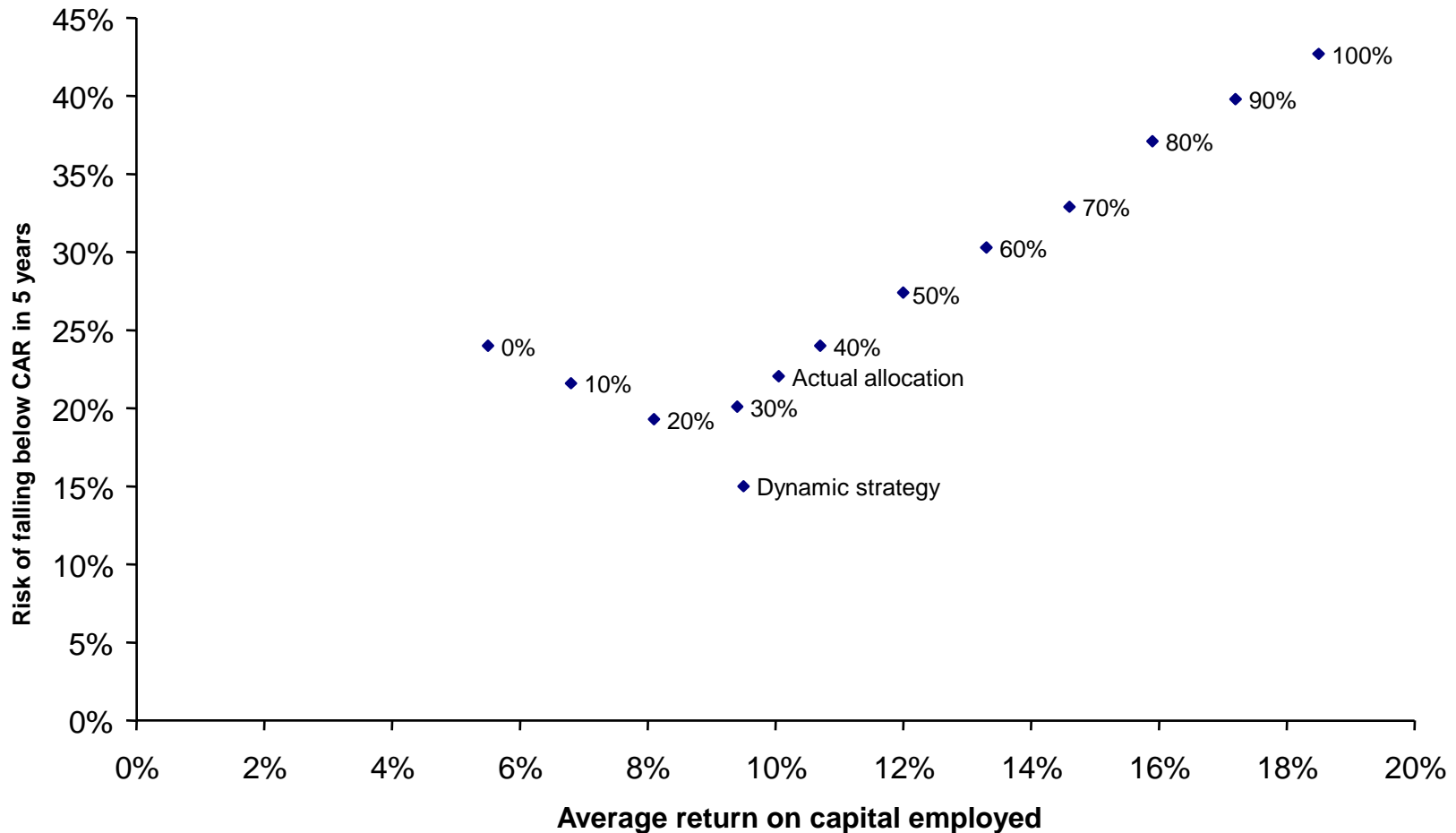
Maximising the utility of limited capital resources: Making investment decisions

Risk v Return for Singapore asset classes



Maximising the utility of limited capital resources: Making investment decisions

Percentage of assets invested in equities



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Conclusions

- The GFC has taught us that we need to focus on risk management for which capital modelling is the main tool for insurance and reinsurance companies
- Capital, risk and return are inter-related
- Stochastic models are needed to determine appropriate CAR ratio, RBC is only minimum
- You can optimise your return on capital based on your risk appetite and capital resources by allocating your capital effectively
- You can maximise your return on capital through educated strategic decision making based on analysis e.g. retention/asset mix
- Actuaries can help improve the bottom line!

Conclusion: A Firm Foundation for Taking Risk

Enterprise Risk Management

