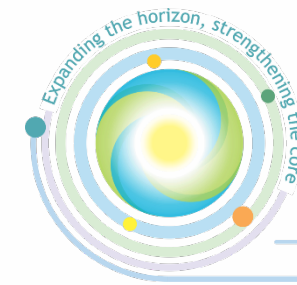




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**20th Global
Conference of Actuaries**
4th - 6th March, 2019 | Mumbai, India

Reinsurance Program Design, Evaluation And Optimization

Speakers:
David Maneval
Manish Singh

Session #
Dated

Reinsurance Program Design, Evaluation And Optimization

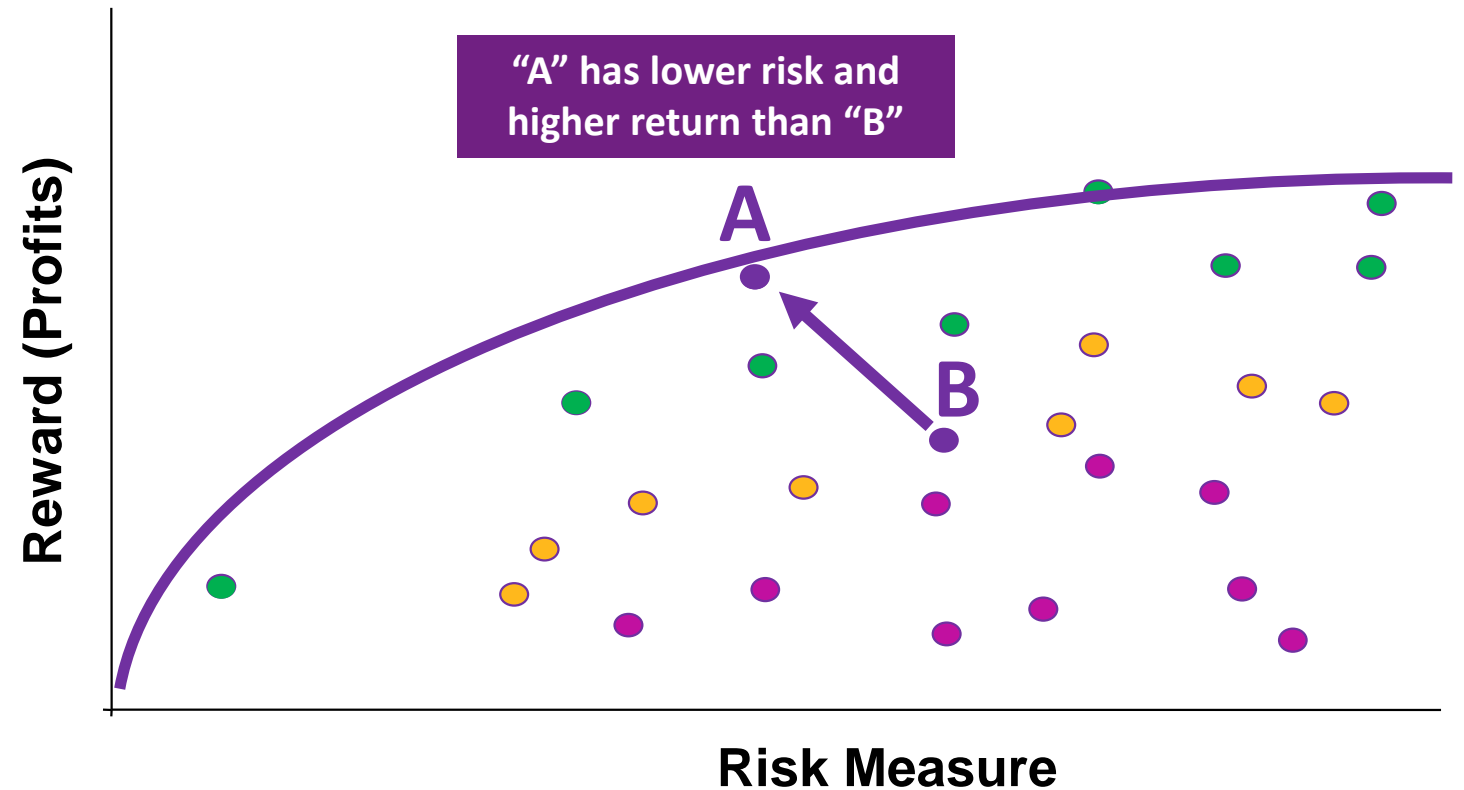
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Portfolio Optimization

Risk-Reward Framework

Modern Portfolio Theory, a hypothesis published in 1952 by **Harry Markowitz** is a theory based on the idea that we can construct portfolios to optimize or maximize expected return based on a given level of market risk, emphasizing that risk is an inherent part of higher reward. It is one of the most important and influential economic theories dealing with finance.

We use this theory which suggests that it is possible to construct an "efficient frontier" of optimal reinsurance programmes, offering optimal expected return for a given level of risk and size of portfolio.

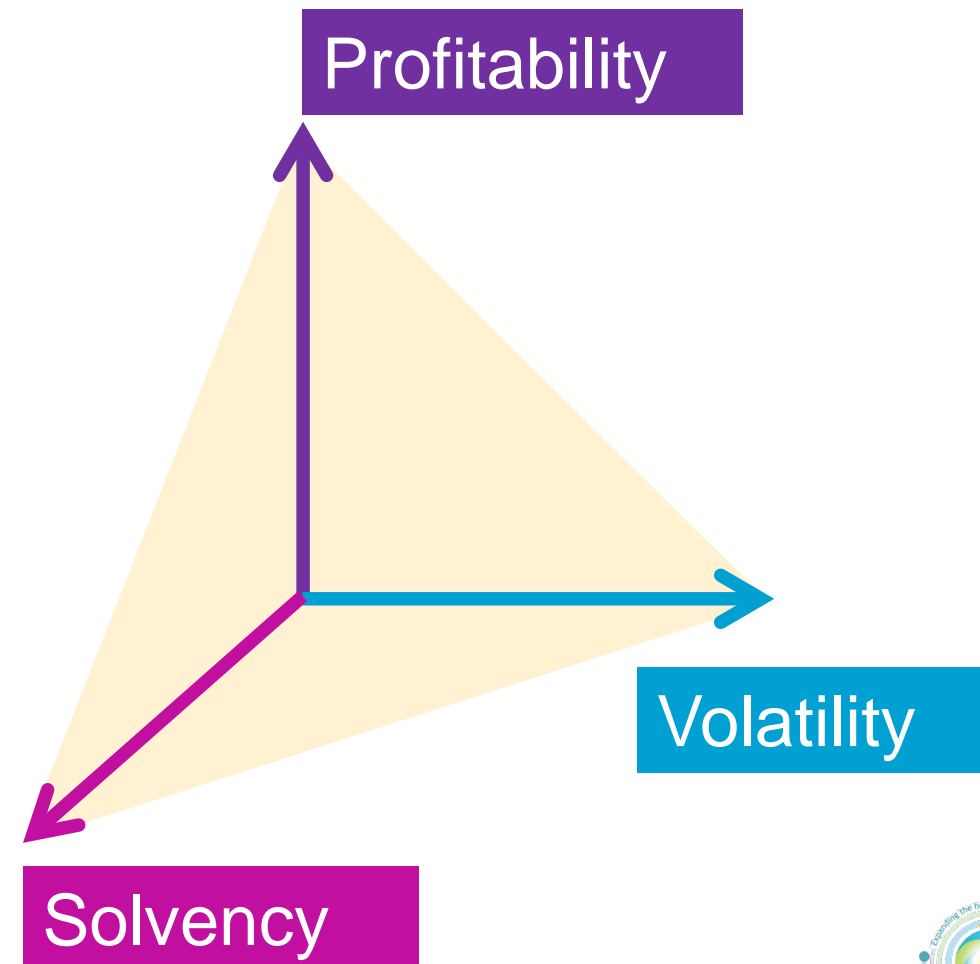


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Reinsurance Program Design : Setting the Scene

- Financial statements and risk appetite statements of insurers make reference to three 'dimensions' (or 'vectors'), for example:
 - Subject to an acceptable level of risk of insolvency, we aim to manage our business in a way which maximises our profitability, while still managing volatility of results***
- Reinsurance is a tool for managing profitability, volatility and solvency
- Make decisions with reference to the 3 key financial dimensions:
 - Profitability** - average year
 - Volatility** - 1:10?
 - Solvency** - 1:200?



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Reinsurance Program : Holistic View

Industry View

- Peer comparison
- Retention to increase with size/ capital/ merger
- Limit benchmarking
- Adjustments of benchmarks for size

Financial View

- Maximum retained loss as a percentage of capital
- Impact on solvency of maximum retained loss
- Impact on projected dividends
- Retained profits

Rating Agency View

- Minimum credit rating constraint

Economic View

- Catastrophe model
- Vertical limits and retentions
- Horizontal limits and necessary number of reinstatements
- Reinsurance optimization (using Financial modelling tool)

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Economic Modelling Process

Step 1 Gross loss parameterization:

- Attritional losses
- Large Losses
- Catastrophe losses

Step 2 Build stochastic model with different reinsurance scenarios to be assessed and compared

Step 3 Run simulations to assess impact of different scenarios on KPIs, net of reinsurance

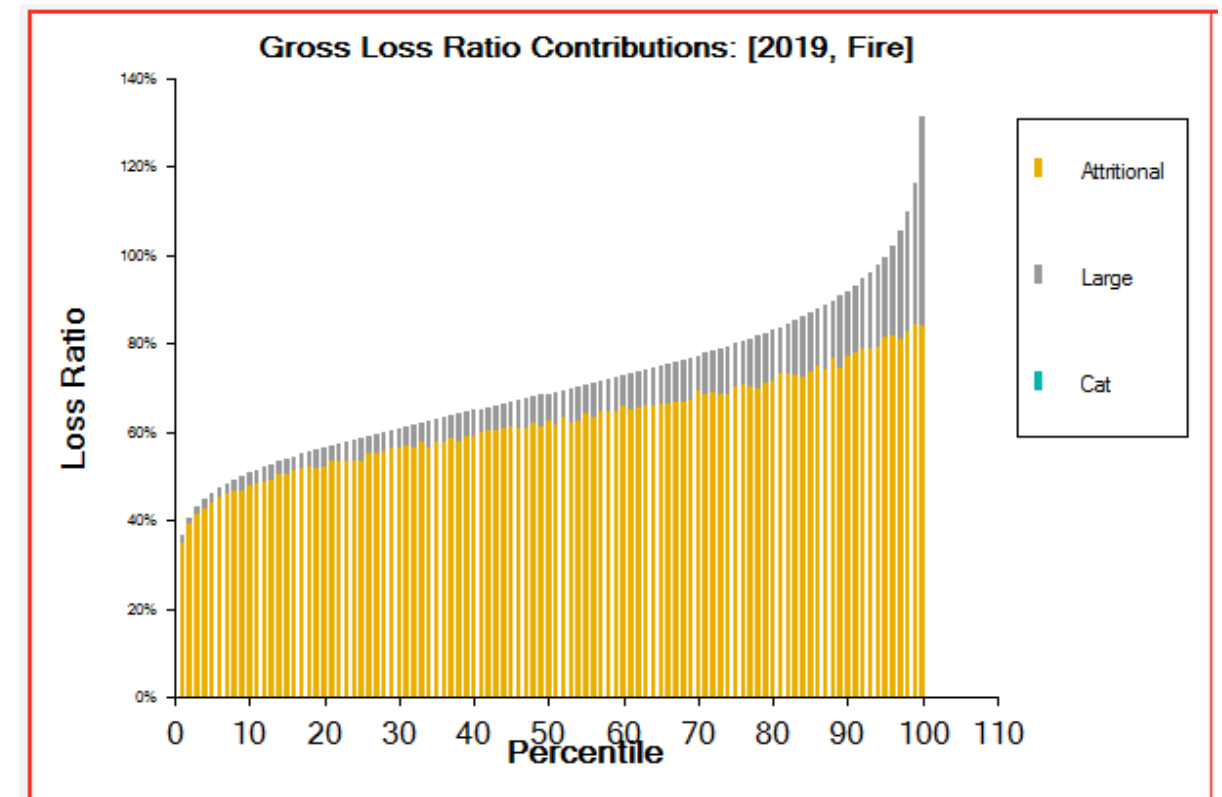
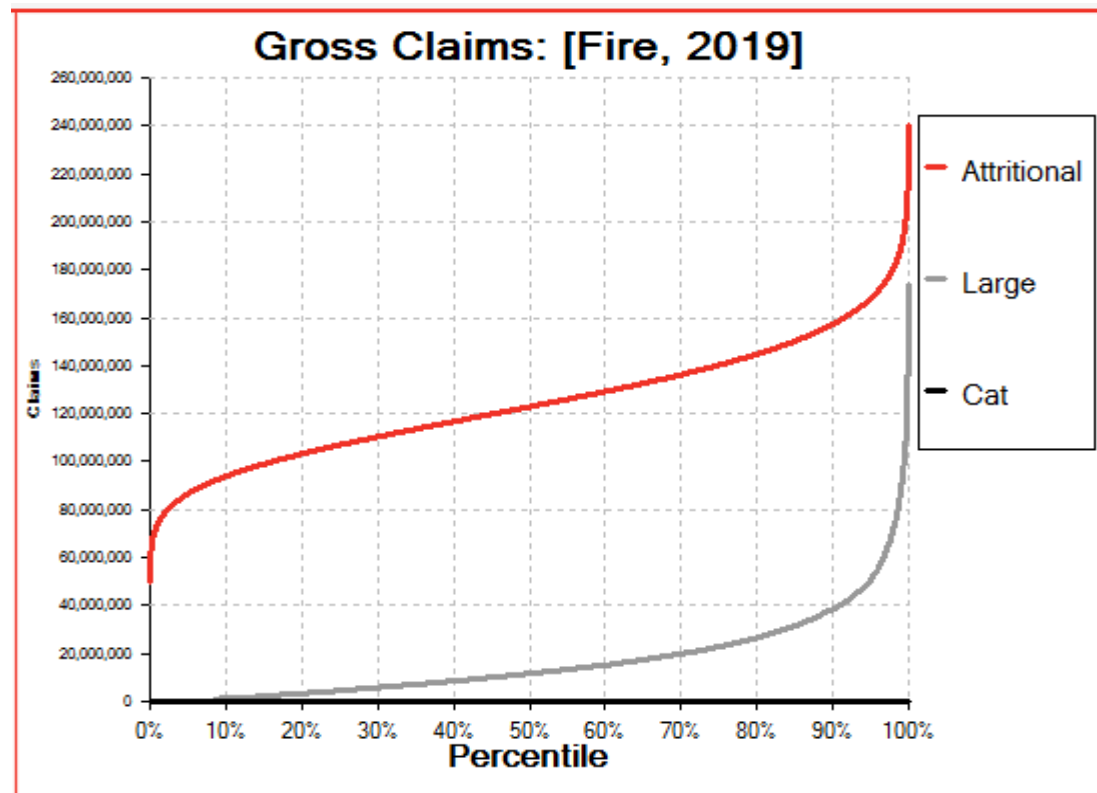
Step 4 Compare the performance of each reinsurance scenario programme and come up with a recommendation with improved KPIs to be discussed in details



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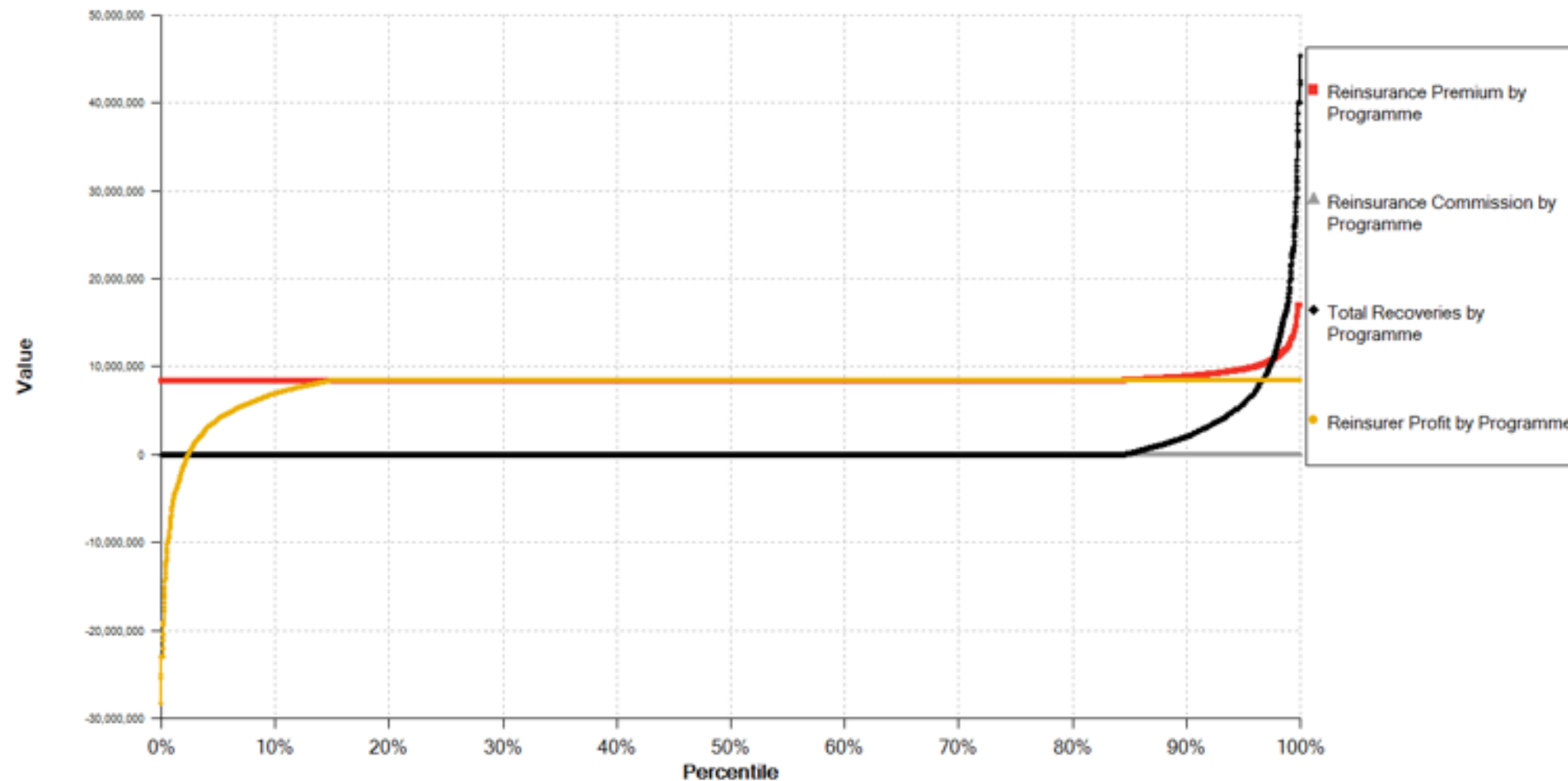
Economic Modelling: Input Validation



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Economic Modelling: Reinsurance Program Result



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Reinsurance Optimisation: Simulation Modeling Helps Answer...

How much will it reduce your risk?

- Downside risk metrics
- VaR, TVaR, etc.



How much will it cost?

- Up-front spend
- Expected profit ceded



Is the trade-off worth it?

- Net and Ceded ROE
- Other considerations



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Reinsurance Program Optimization Case Study : Background

A simple business plan for a company writing one class of business

Item	Amounts in \$m
Gross Premiums	40.0
Attritional Loss Ratio	50%
Large Loss Ratio	30%
Cat Loss Ratio	10%

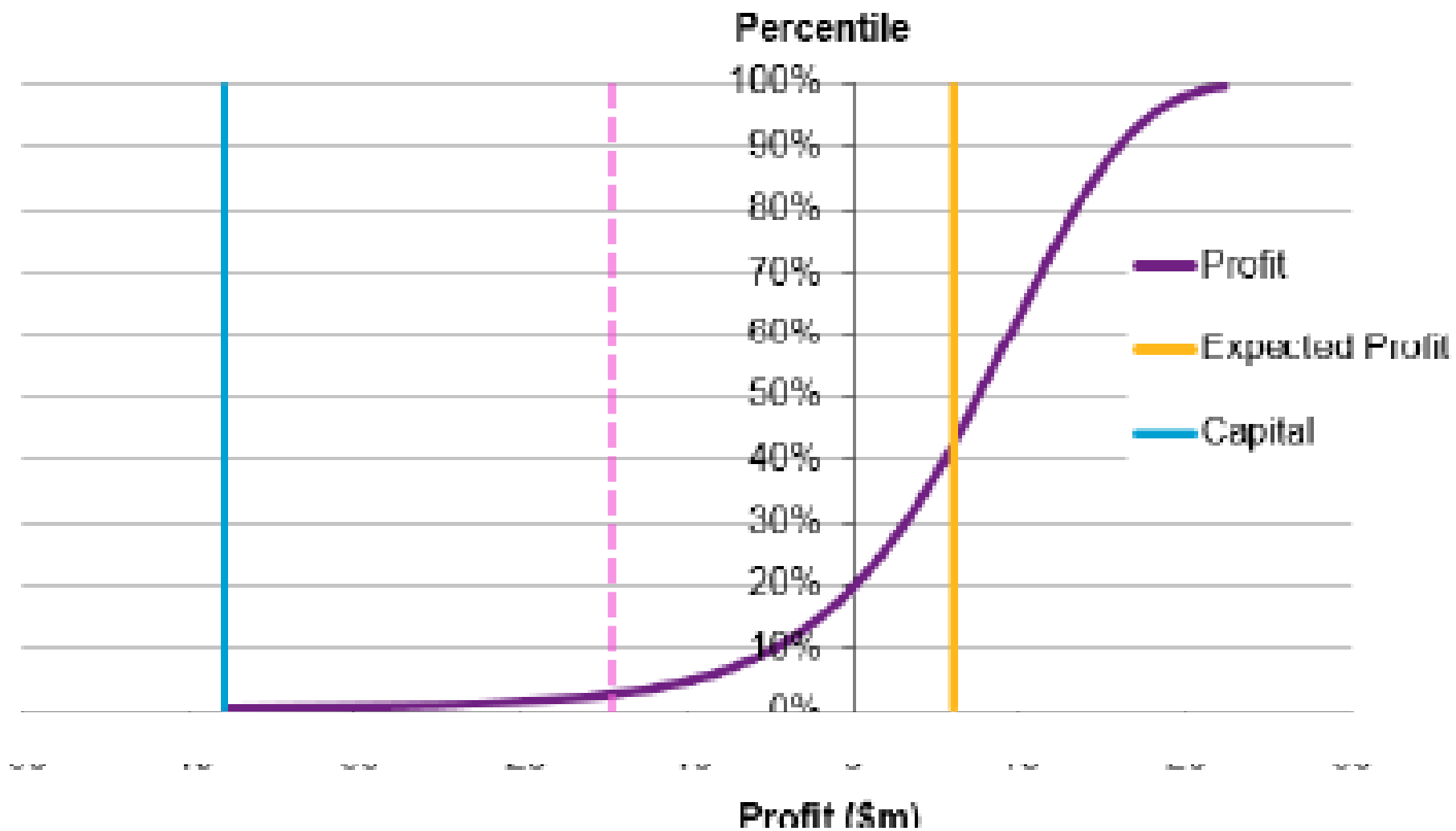
- Consider Some Differing Reinsurance Options
 - A structured quota share arranged to cede 30% (Current Program)
 - Excess of loss (XOL) layer of \$30 m above \$5m
 - XOL layer of \$8m xs \$2m
 - A stop loss reinsuring 90% of losses when loss ratio is 100%-150%
- Company required to hold capital to remain solvent at 1 in 200 level



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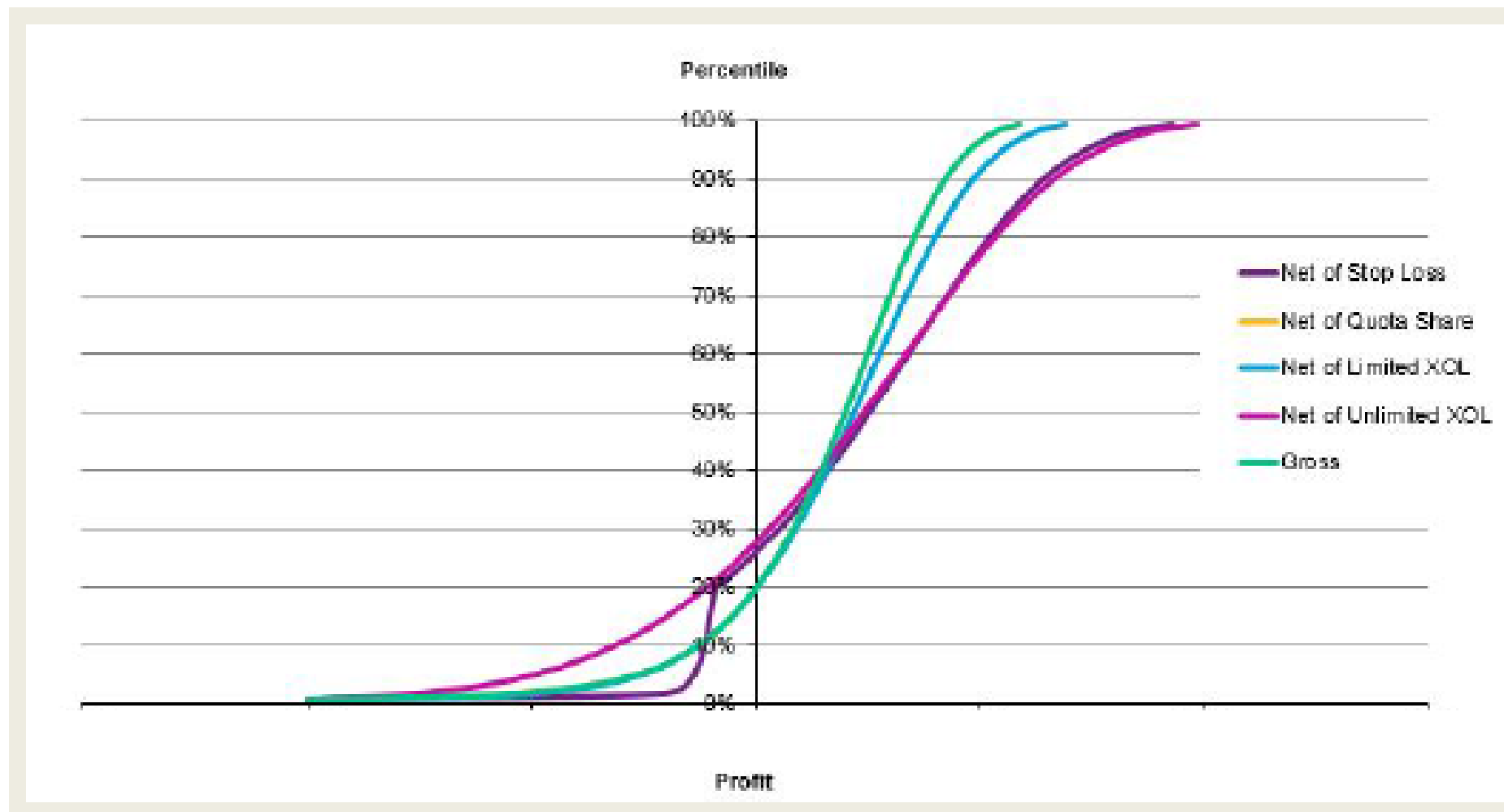
Reinsurance Program Optimization Case Study : Gross Profile



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Reinsurance Program Optimization Case Study : Profit distribution under different programs



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Reinsurance Program Optimization Case Study : Summary

Amount in \$m	Premium	Cost of Reinsurance	Expected Losses	Expected Profit	Capital 1-200	1-10 loss	Expected ROE
Gross	40.0	0.0	35.5	4.5	57.8	-38.3	8%
A. Structured Quota Share	28.0	12.0	24.2	3.8	26.4	-7.6	14%
B. XOL 30x5	37.1	2.9	33.0	4.1	19.8	-0.7	21%
C. XOL 8x2	38.3	1.7	34.1	4.2	29.8	-10.6	14%
D. Stop Loss	37.9	2.1	34.6	3.3	21.8	-3.5	15%

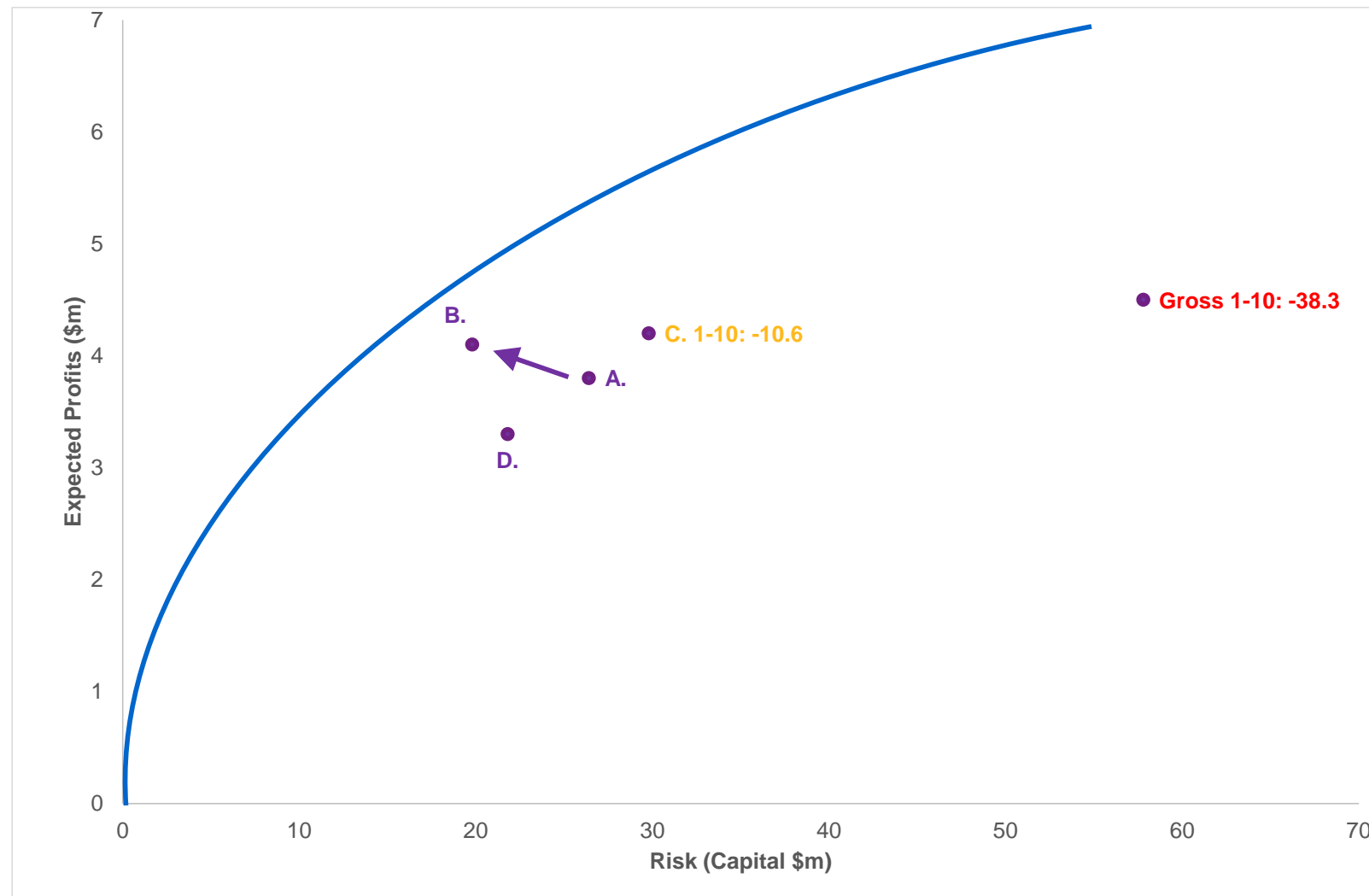
Which is important for the Company?



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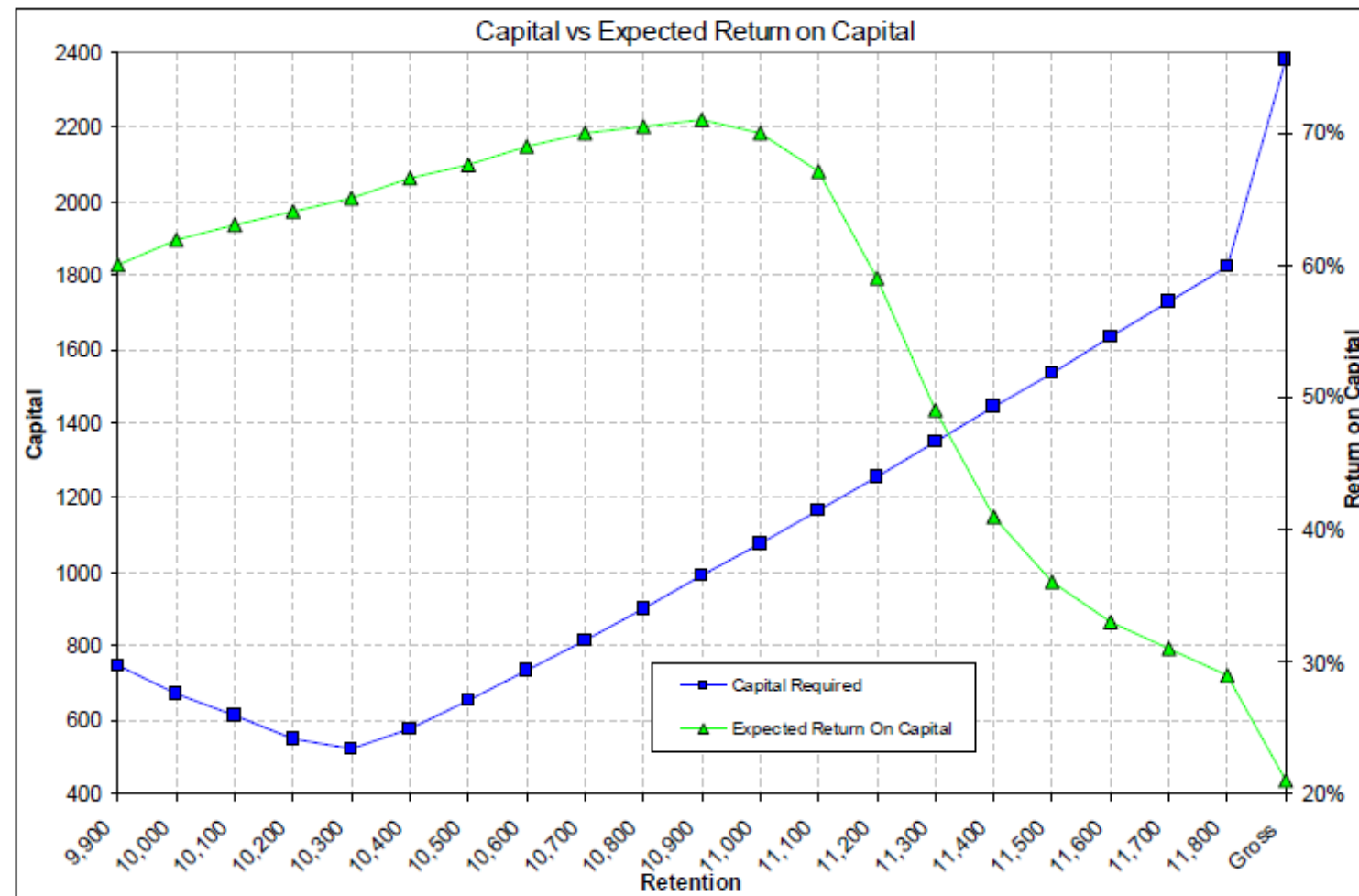
Reinsurance Program Optimization Case Study : Summary



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Reinsurance Optimization : Balancing Return on Capital and Required Capital



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Conclusion

- With regulators and rating agencies imposing stricter monitoring and controls on capital requirements, **reinsurance is becoming increasingly important as a source of capital**
- Reinsurance is a huge spend; it should be analysed critically and actuaries are in a good position to **facilitate the analysis**
- Ideally reinsurance purchase should be linked with a **company's risk appetite or identified KPIs**





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THANK YOU

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