Institute of Actuaries of India

1st Capacity Building Seminar

AON BENFIELD

Reinsurance Optimization

The Theoretical and Practical Aspects

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Aon Benfield

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Mumbai

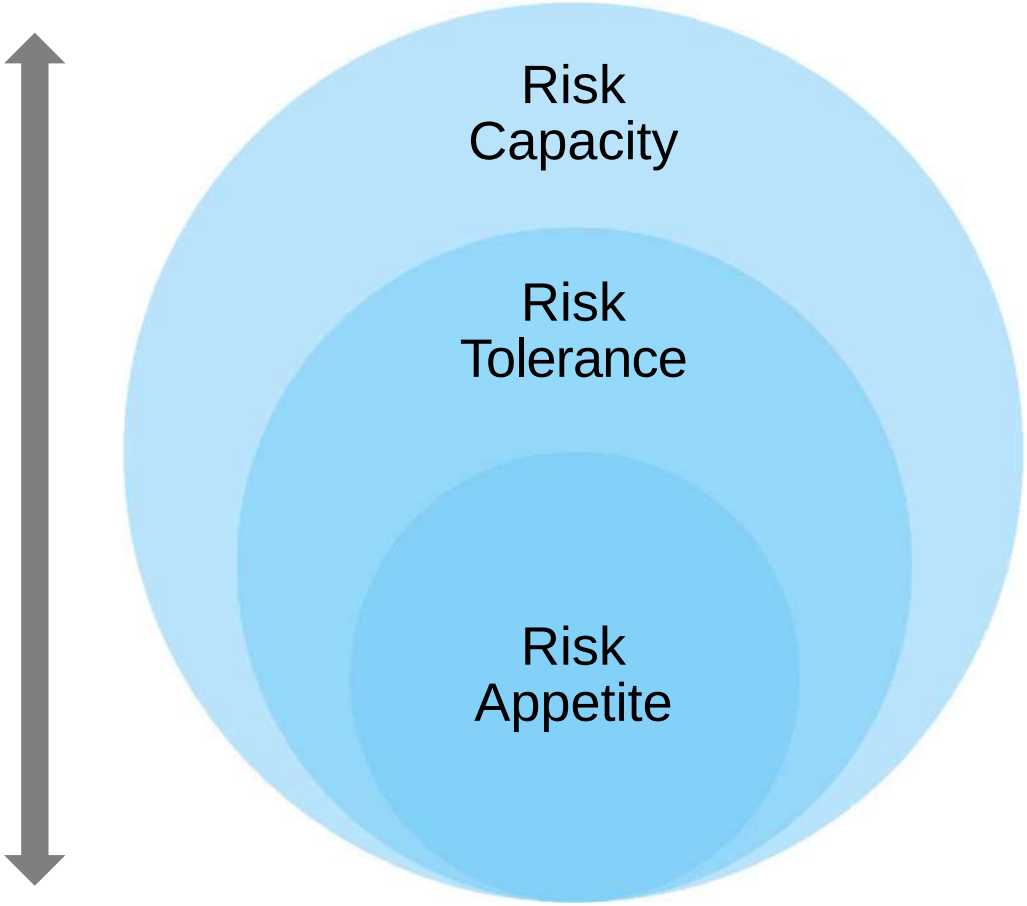
"For someone your age, the yearly premium on a $5,000 policy is $8,000."

Agenda

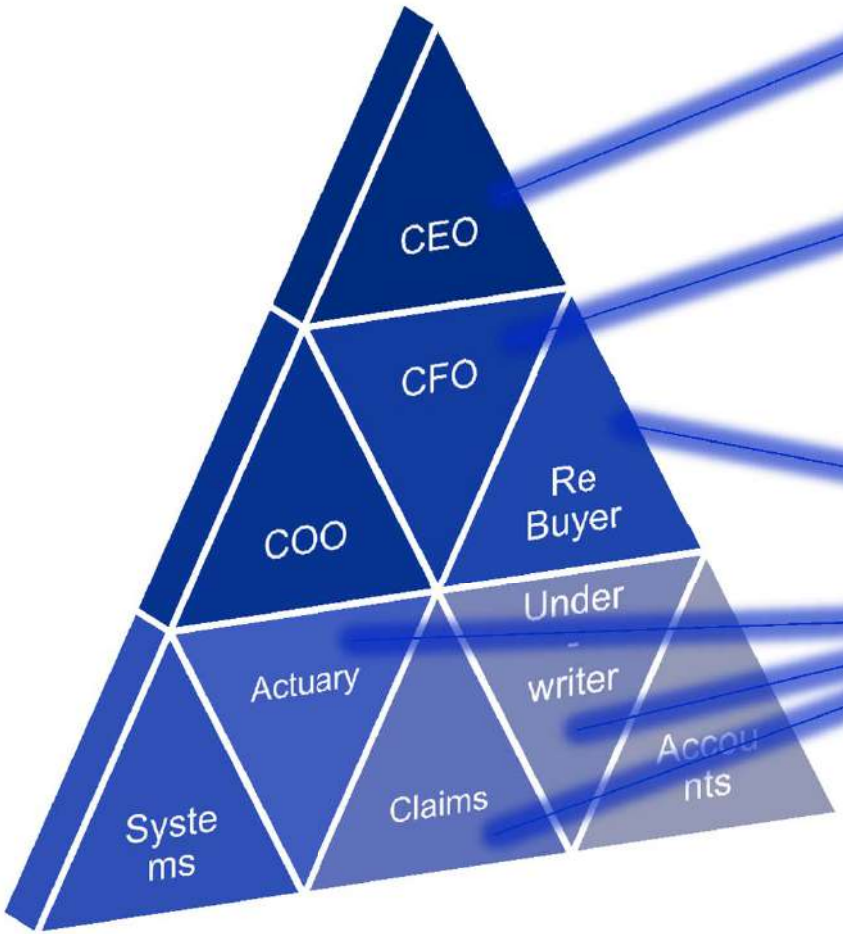
- What is Reinsurance
- Reinsurance Optimization
  - What is Optimization
  - When to Optimize
  - How to Optimize
- Case Study
- Conclusion

Define Risk Appetite

Companies with **Superior ERM** are able to articulate their **risk preferences**, and ensure they align with **stakeholder expectations.**
A clear understanding on risk within a company is key to benefit from any potential risk transfer strategies.



Who's Perspective ?

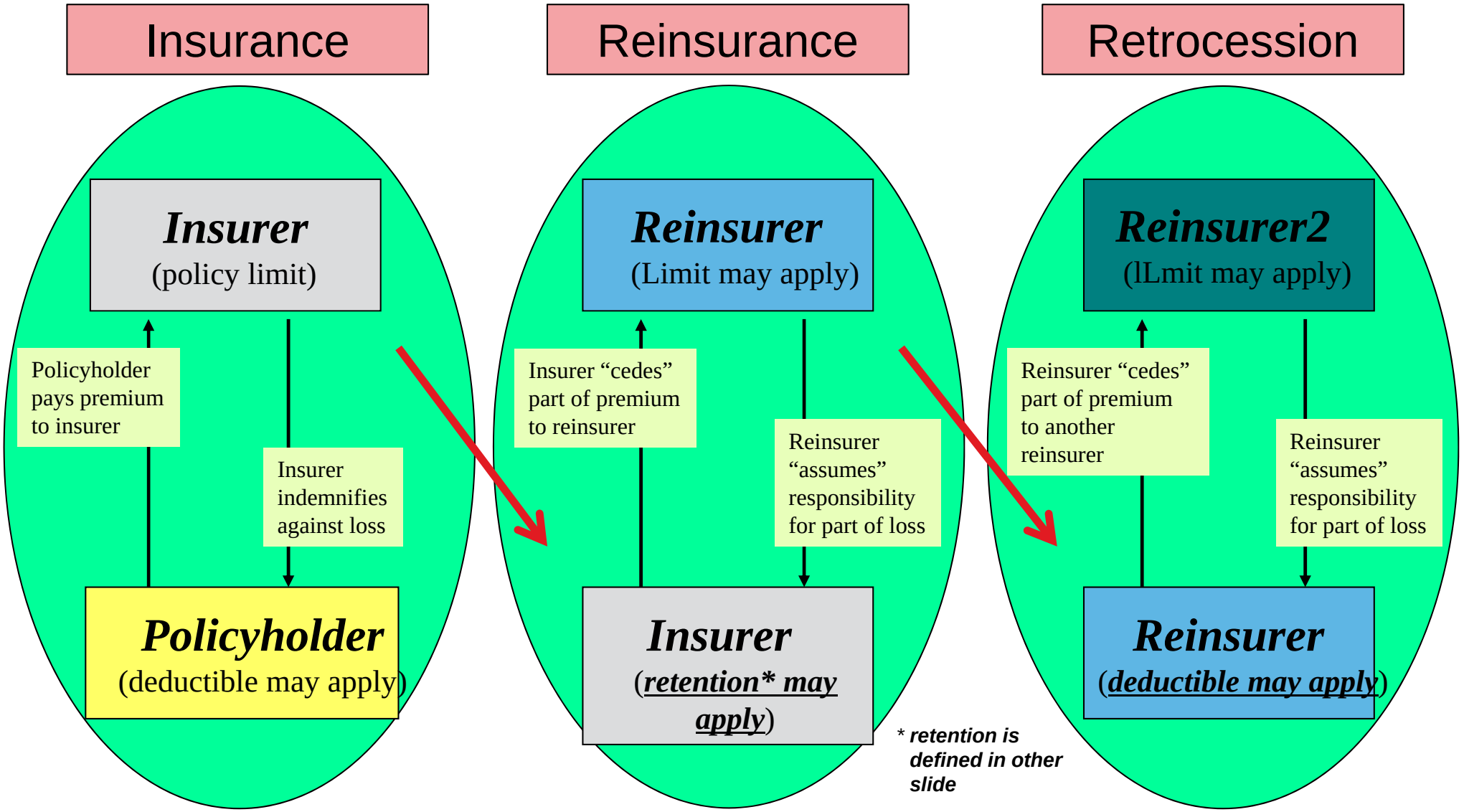


- Better returns on capital
- Reduce volatility of returns
- Reduce risk of insolvency
- Efficient reinsurance purchase
- Increase profitability by line

WHAT IS REINSURANCE

GENERAL COMMENTS

General Comments – Reinsurance



General Comments – Reinsurance

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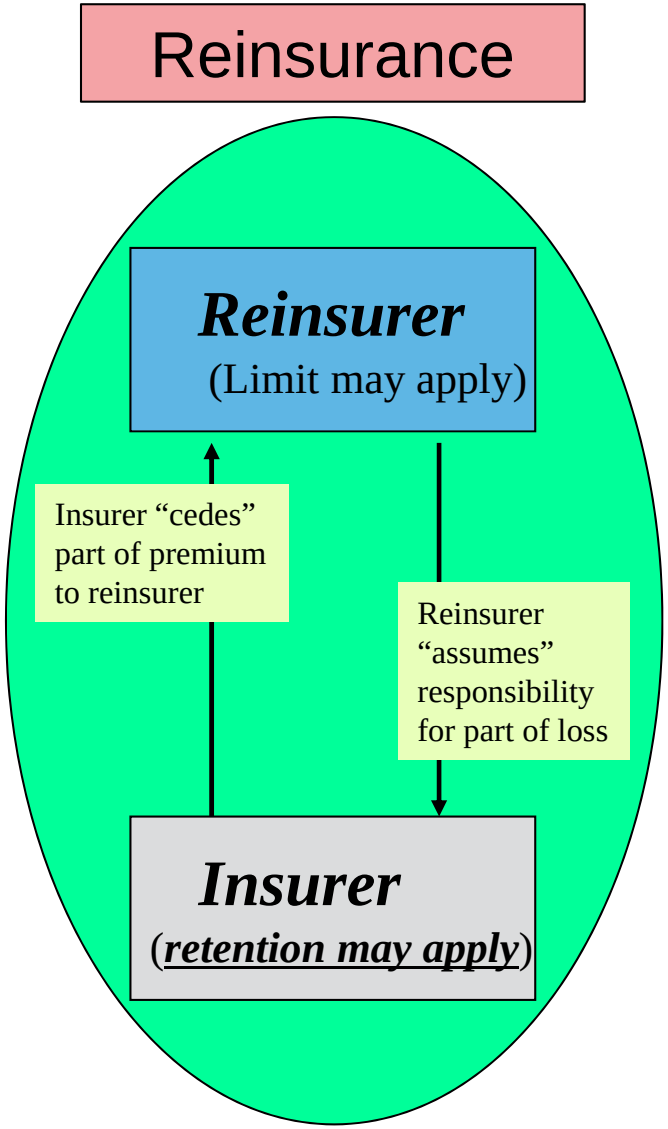
Reinsurance

- Contract of *insurance*
- whereby one insurer agrees for a portion of the premium …
- reinsurer *indemnifies* for losses paid by the reinsured
- under insurance policies issued by the reinsured to its policyholders



Reinsurance is a cost to transfer the part of uncertainty of losses!!

Why Reinsurance

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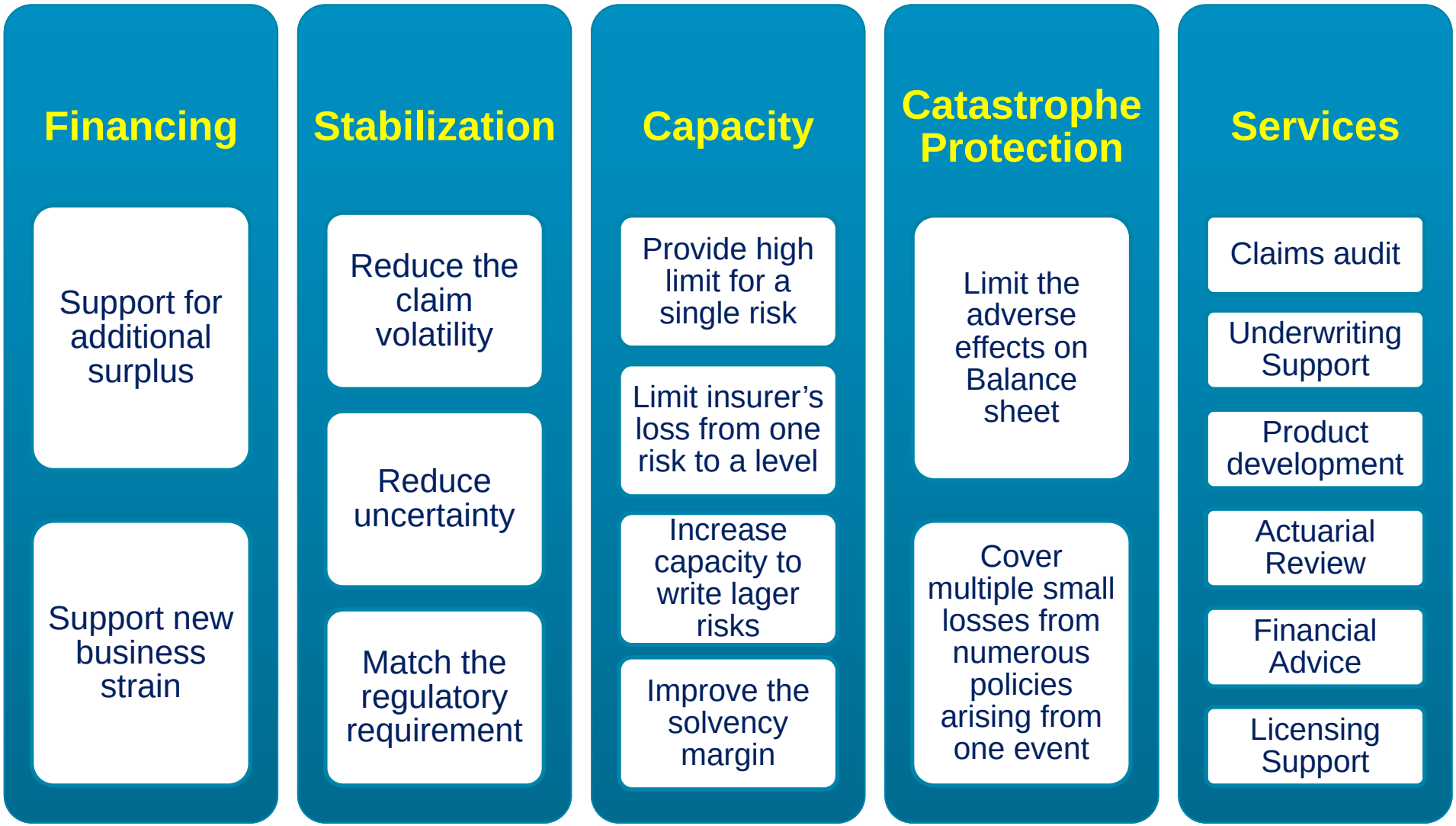

Types of Reinsurance

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Treaty

- Similar risks together …

Facultative

- Individual risk basis …

Proportional

Quota Share
Reinsurer covers the same percent on each risk

Surplus Share
Reinsurer's share based on type or size of risk

Non-Proportional

Excess per Risk

Excess per Occurrence (Catastrophe)
Reinsurer covers over a predetermined amount or limit for all losses arising out of one event or occurrence

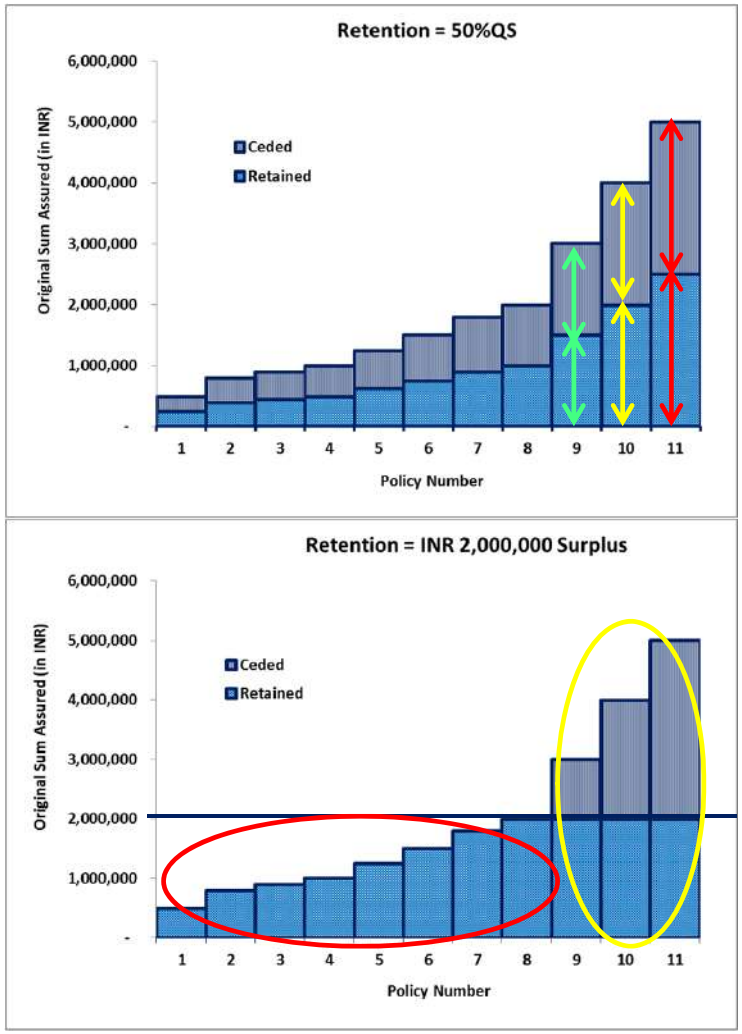
Aggregate Excess (Stop Loss)
Reinsurer covers over a predetermined aggregate limit of loss or loss ratio for a Specific period of time

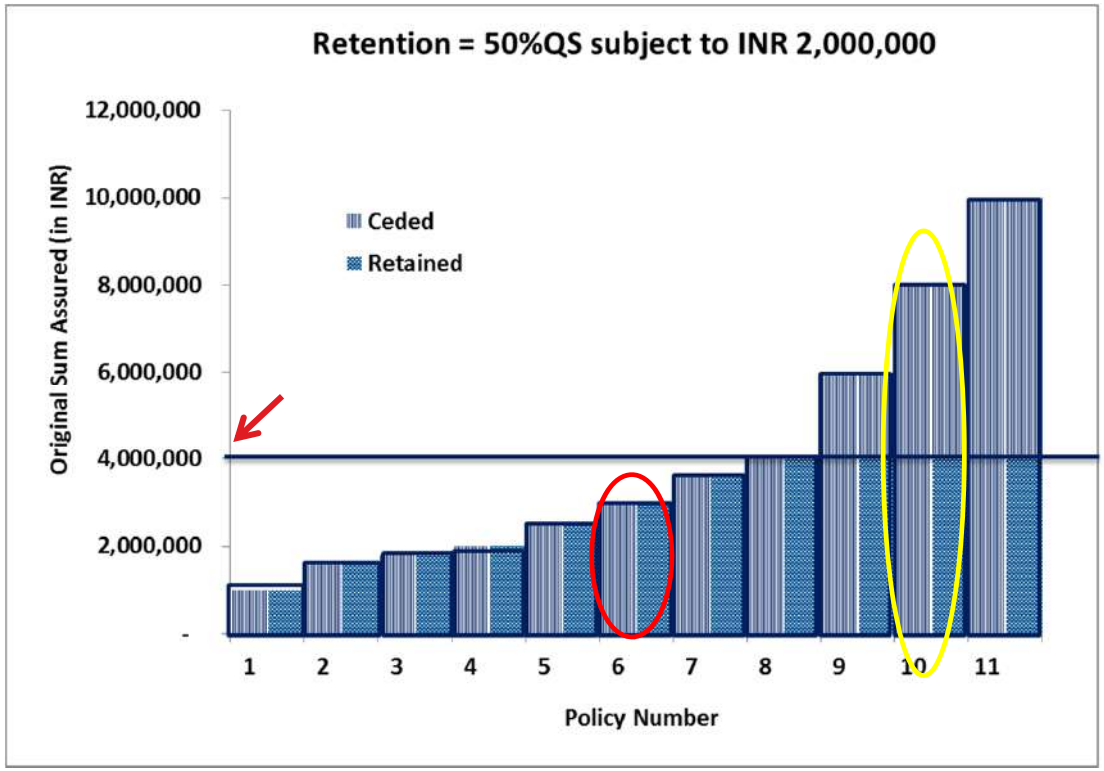
Per Risk Excess of Loss
Reinsurer covers excess of a predetermined amount; limits apply separately to each loss

Per Risk Aggregate Excess of Loss
Reinsurer covers over aggregate claims for a risk in a specified period of time

Types of Reinsurance continued…

- Some Reinsurance Structures





Retention

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Meaning

- Insurer's limit of liability
- The maximum amount the insurer is willing to pay

Caution

- Different retention for Insurer with similar portfolios but having different corporate aims

Factors Affecting

- Size of insurer,
- Premium income, size of portfolio, profitability
- Financial strength of the insurer
- Type & cost of reinsurance
- Claims experience
- Corporate strategy

Setting retention level needs proper analysis of portfolio/business

Regulation

Regulatory requirement may be different from what a Company aims

Justifying reinsurance structure

REINSURANCE OPTIMISATION

Reinsurance Optimization

Reinsurance Optimization continued …

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✓ What to optimize

Cost of the reinsurance programme

Objective evaluation of the ceded margin (expected premium less expected recoveries)

Reduction in volatility of the programme

tail risk and with year-to-year volatility

Capital provided by the programme

Is it cheaper to use your own capital or reinsurer capital to bear the risk?

Reinsurance Optimization continued …

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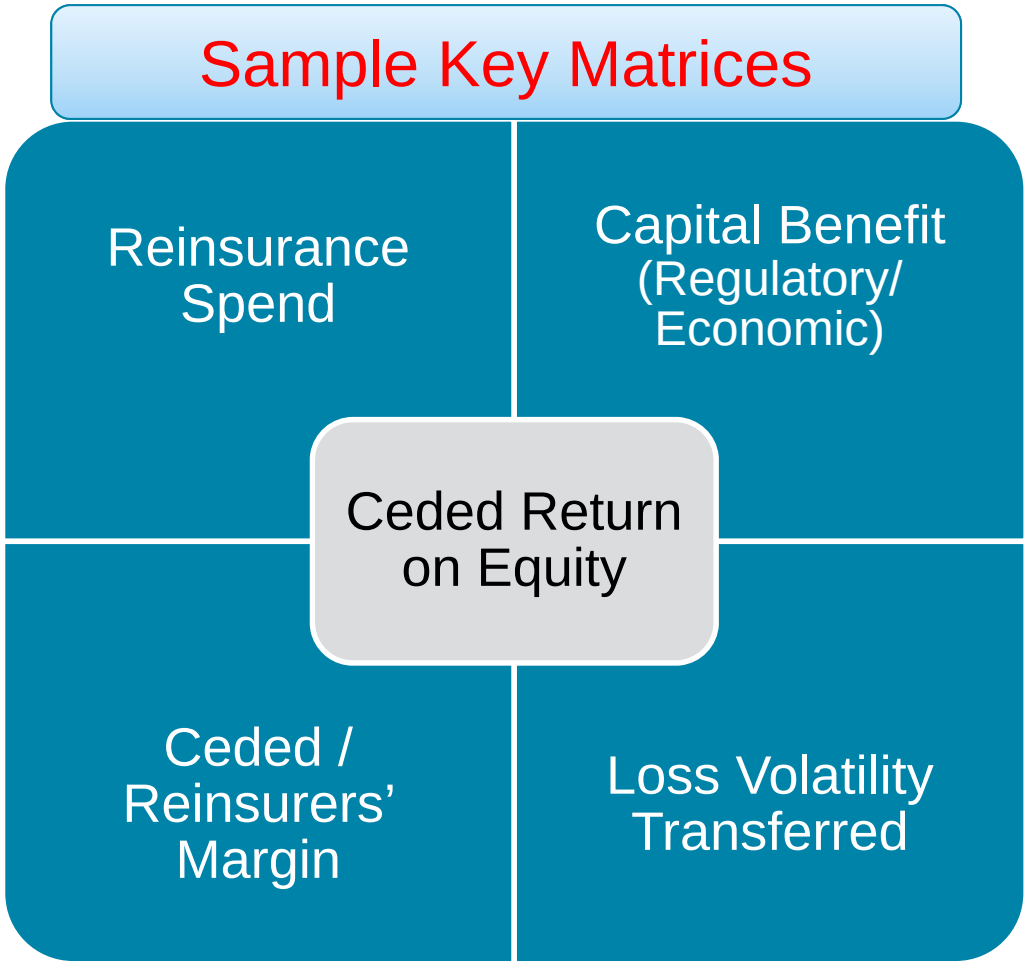
✓ What to optimize



Keeping in mind that Life Reinsurance is also

- Reinsurers' underwriting tools & services
- Reinsurers' market knowledge / product advice / claims expertise
- Reinsurers' financial strength

Reinsurance Optimization continued …

- ✓ When to optimize

Reinsurance Optimization continued …

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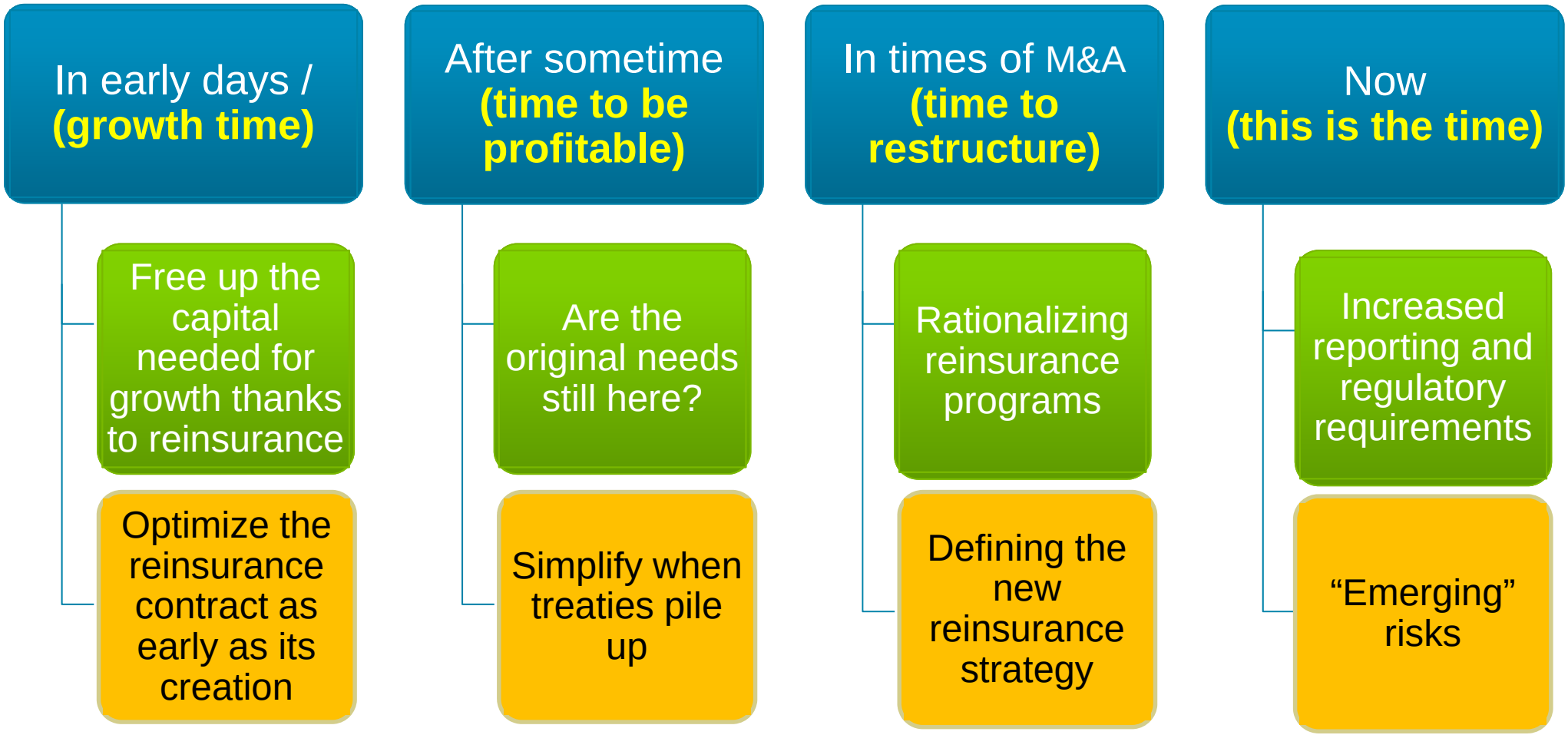
✓ When to optimize



Reinsurance Optimization continued …

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✓ How to optimize

- **Review Current Reinsurance Treaty (Structure & wording)**
  - What is worth optimizing?
  - What can be changed?
- **Understanding the risk / Assessing benefits of reinsurance**
  - What is the need for reinsurance?
  - How effective is the current reinsurance?
  - Identify/test different reinsurance structures
- **Finding the best solution / Making the decision**
  - Pro's and Con's of alternative reinsurance structures
  - Optimal structure based on different risk-reward criteria

CASE STUDY

"I'll be performing your surgery on you, but I just got back from tailgating, so I'm a little drunk. Do you have life insurance?"

Case Study

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- Case Study - Life Reinsurance Optimization
  - ✓ Modelling principles and assumptions
  - ✓ Gross Results Analysis
  - ✓ Testing reinsurance structures
  - ✓ Making the decision

Case Study - Life Reinsurance Optimization

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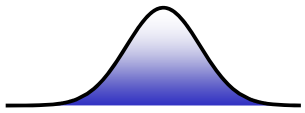
Modeling Principles: Modeling Process

Data requirements

- Product type
- Distribution channel
- Individual policy information / model points
- Mortality/Morbidity basis
- Lapse basis
- Expense charges (acquisition and renewal)
- Commission terms
- Reinsurance terms
- Other factors

Assumptions and calibrations

- Stochastic variables and distributions – including mortality and lapse variables
- Interest rate
- Inflation rate
- Regulatory requirements



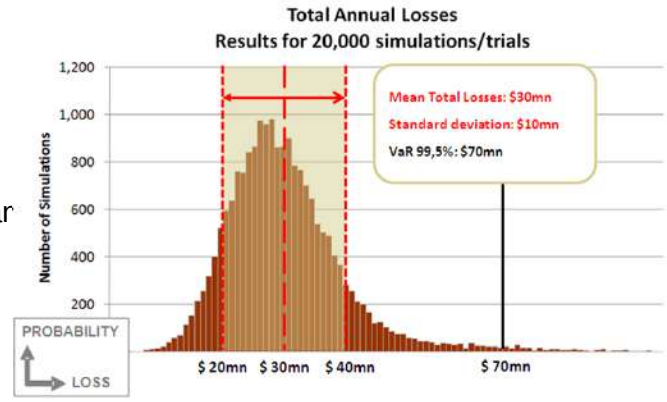
DFA TOOL STOCHASTIC SIMULATIONS

Gross results analysis

Reinsurance Programmes

Ceded and retained results

- Distribution of results allows to:
  - Expected NPV
  - Volatility of results/NPV
  - 1 in 200 year scenario ar
  - Var or TVar analysis
  - …



Case Study - Life Reinsurance Optimization

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- Modeling Portfolio Data
  - ✓ Group Credit Life Term Plan
  - ✓ Model Point based on
    - 24,000 Policies
    - Reducing Sum Assured
    - Max Term 20 years
    - Max Sum Assured INR 50 Million

Case Study - Life Reinsurance Optimization

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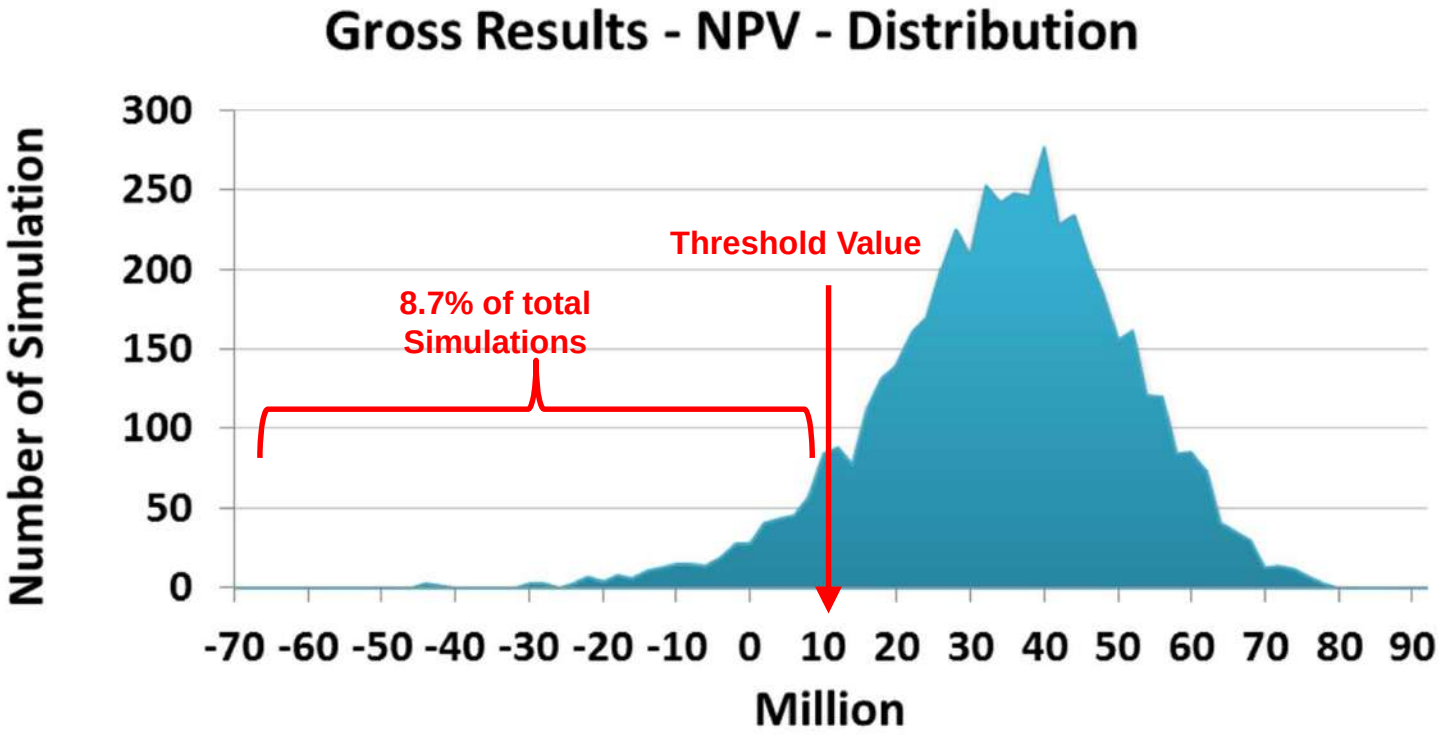
- Modeling Assumptions

  - ✓ Model construction
    - Which variables are stochastic ? → Mortality
      - Mortality based on Country specific Standard Table
      - Multinomial distributions
      - Claims: 50% of table
    - Lapse, Expenses
    - Reserve Calc
    - Others

Case Study - Life Reinsurance Optimization

- Gross Results – Cumulative 5 Years
  - ✓ And we can also view the entire **distribution** of the results (5,000 simulations):



Case Study - Life Reinsurance Optimization

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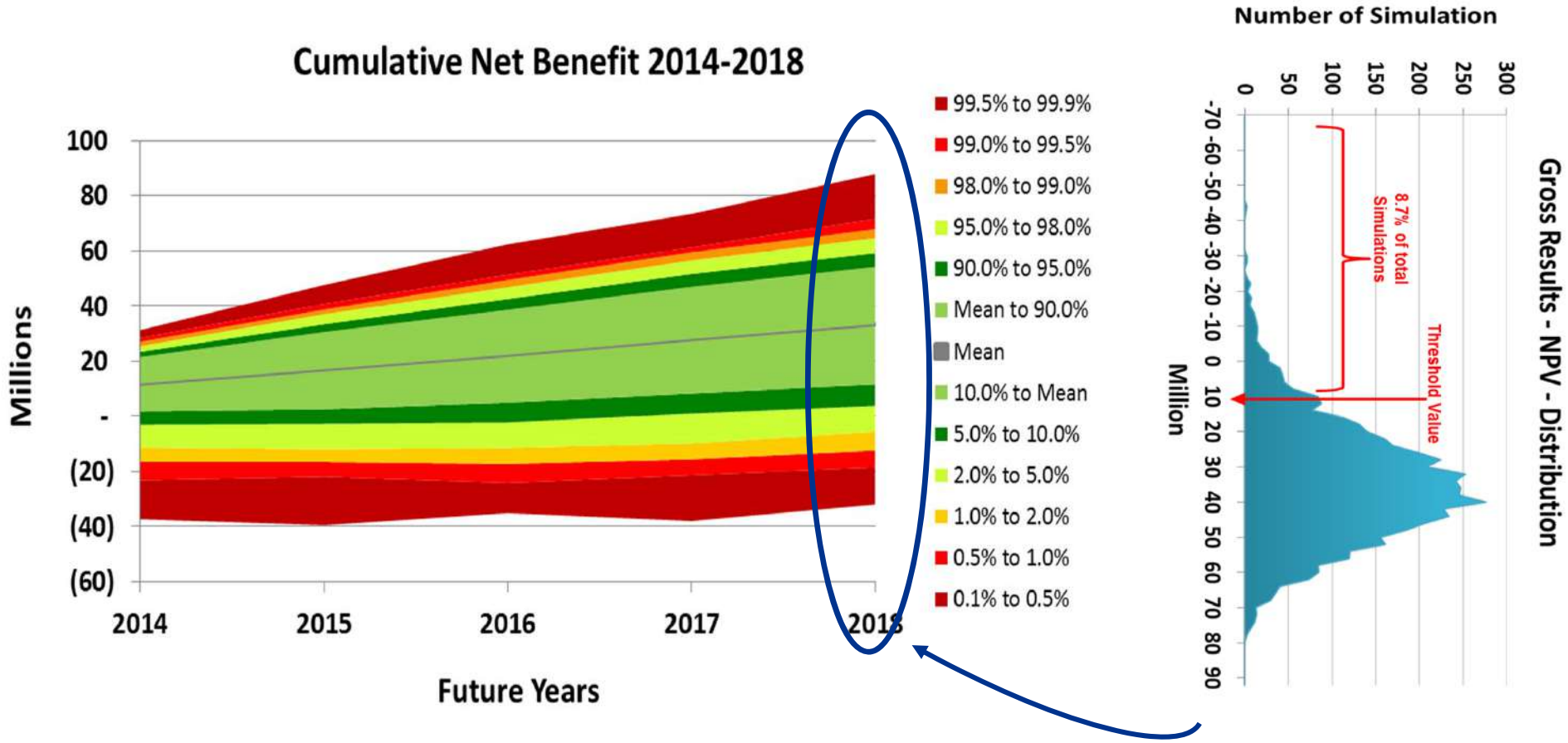

Case Study - Life Reinsurance Optimization

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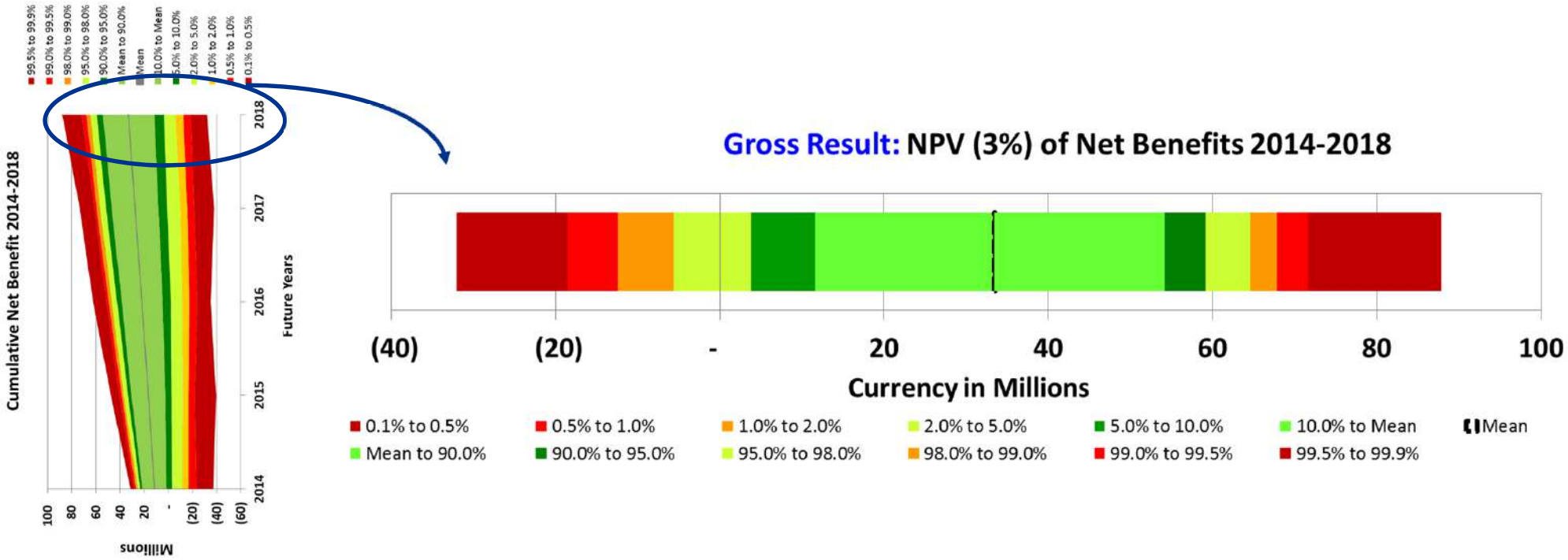

Case Study - Life Reinsurance Optimization

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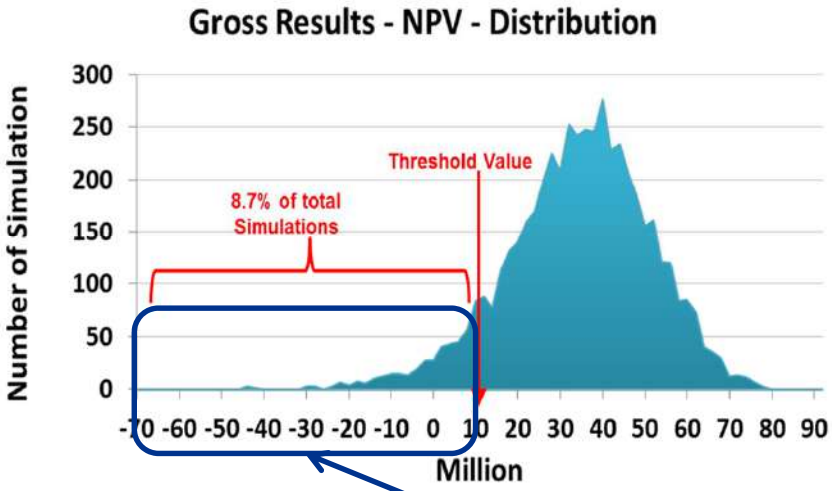
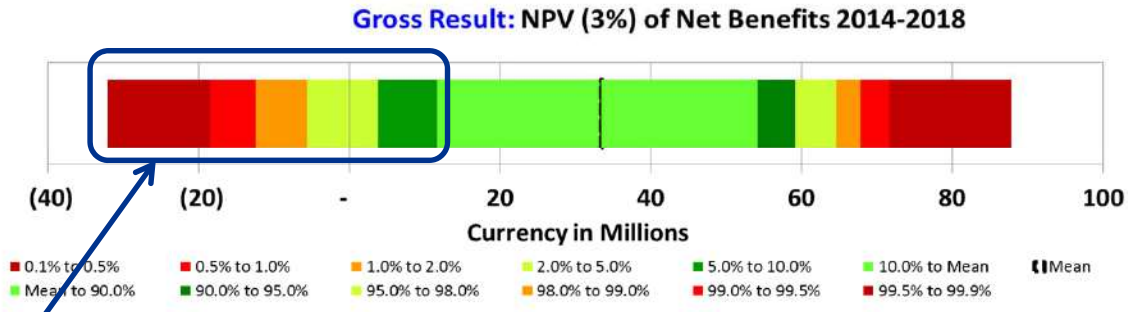
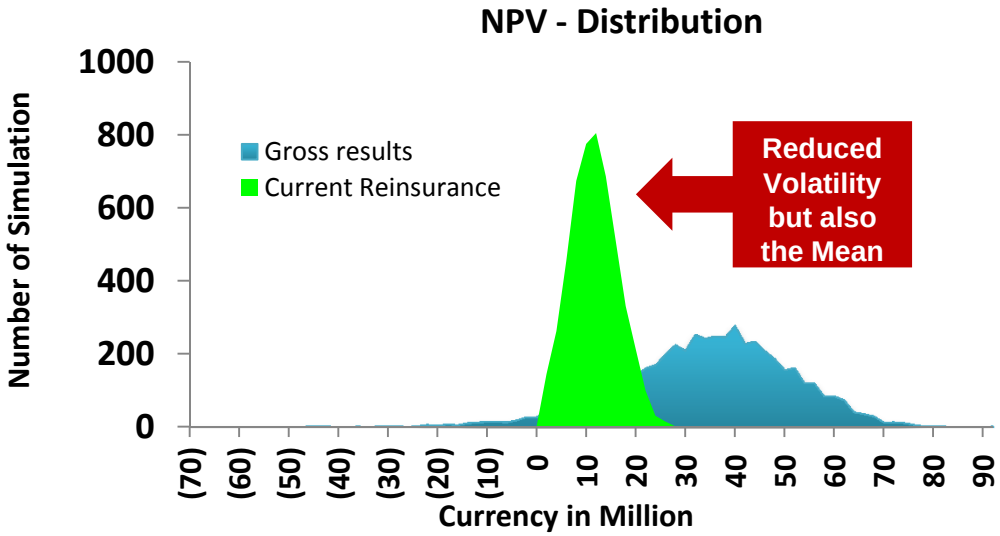


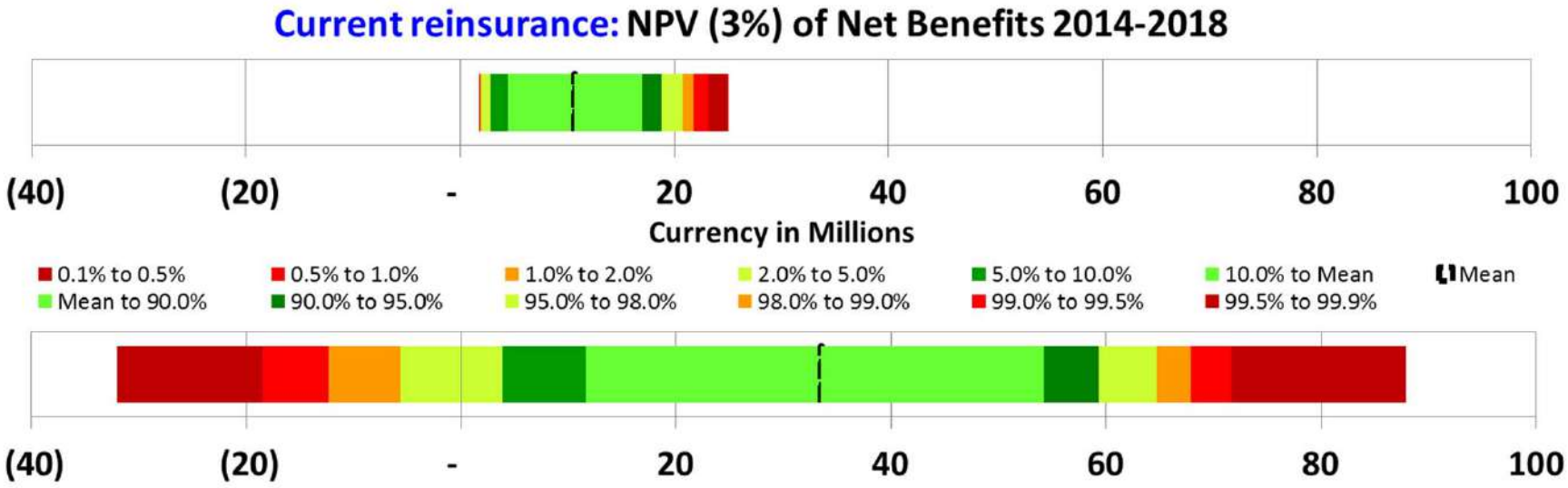


Is Reinsurance Required ?

Case Study - Life Reinsurance Optimization

- Current Reinsurance
  - *(QS100) - Quota-Share with cession 100%, profit commission 75% after 10% reins. expenses*





Case Study - Life Reinsurance Optimization

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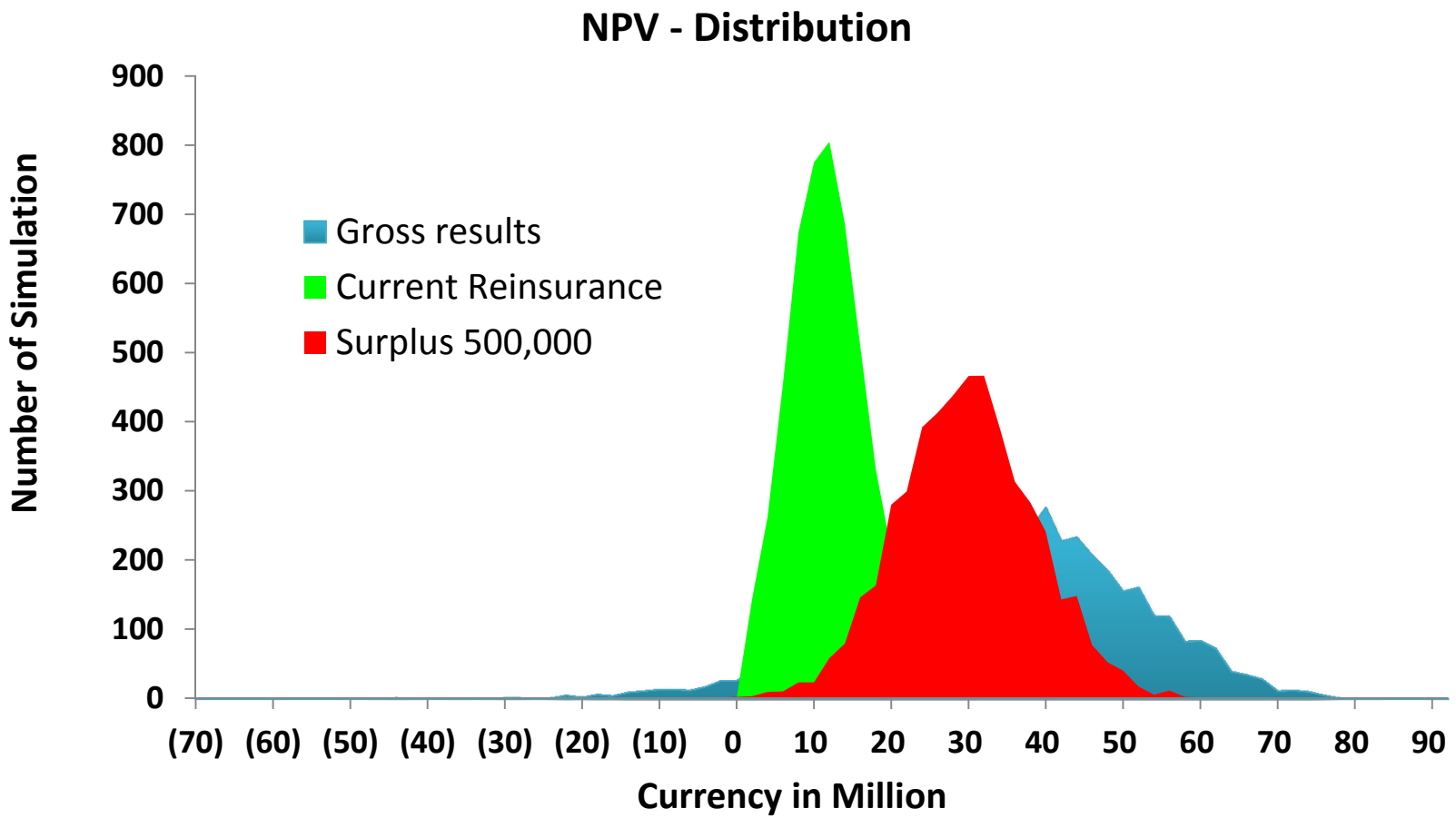
- Testing reinsurance structures
  - Alternative reinsurance structures:
    - ***A.*** **Surplus** Reinsurance with ABC's retention at **INR 500,000**
    - ***B:*** **Surplus** Reinsurance with ABC's retention at **INR 750,000**
    - ***C:*** **Surplus** Reinsurance with ABC's retention at **INR 1,250,000**
    - ***D:*** **Surplus** Reinsurance with ABC's retention at **INR 2,000,000**
    - ***E:*** **Surplus** Reinsurance with ABC's retention at **INR 2,500,000**
    - ***F:*** **Quota Share** Reinsurance with **50% cession** (i.e. ABC's retention of 50%)
    - ***G:*** **Quota Share** Reinsurance with **70% cession** (i.e. ABC's retention of 30%)
    - ***H:*** **Quota Share** Reinsurance with **70% retention subject to maximum of INR 1,250,000** (i.e. ABC's maximum retention on one life/benefit is INR 1,250,000)
    - ***I:*** **Quota Share** Reinsurance with **50% retention subject to maximum of INR 1,250,000** (i.e. ABC's maximum retention on one life/benefit is INR 1,250,000)

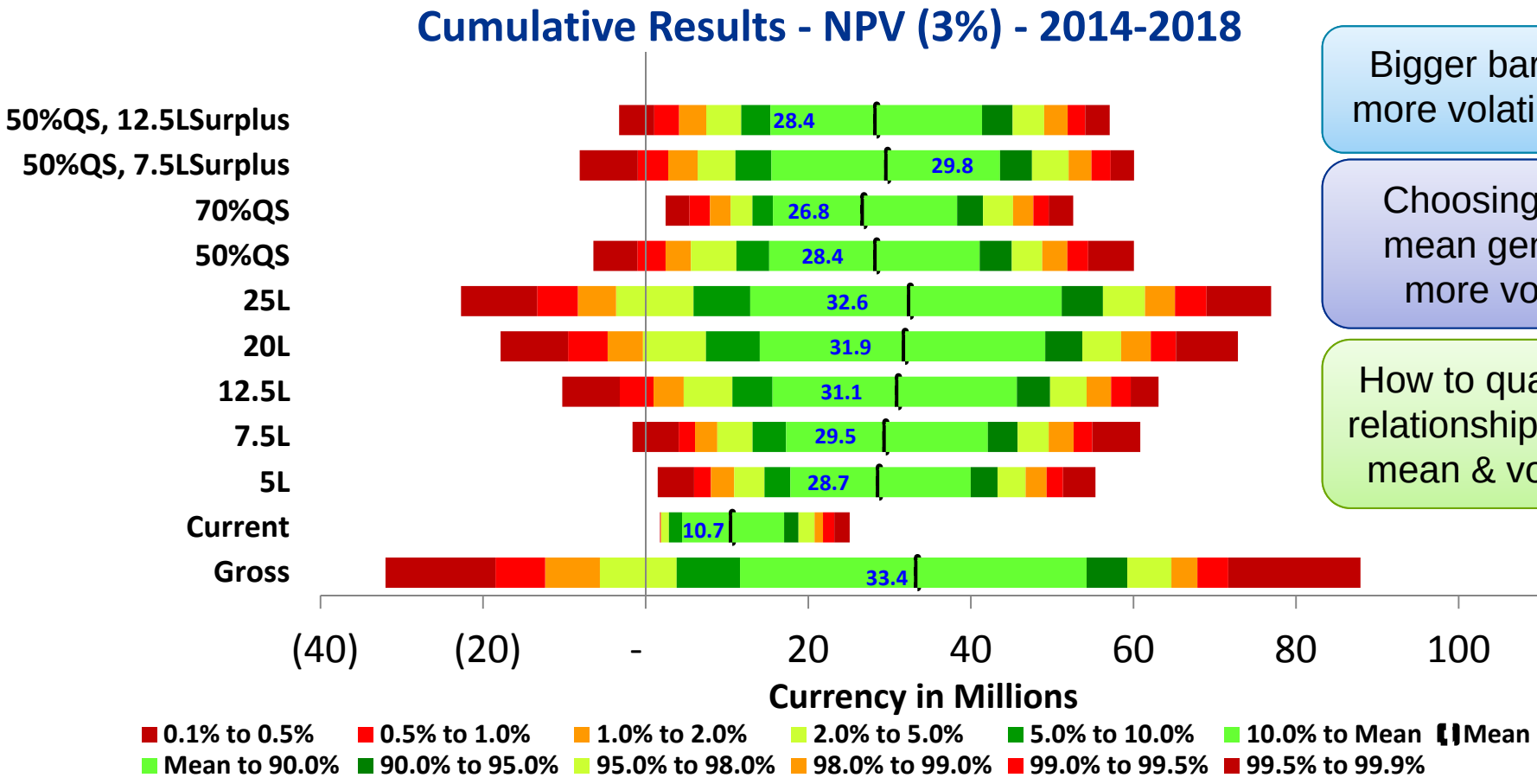
Case Study - Life Reinsurance Optimization

- Testing reinsurance structures
  - ✓ Looking at reinsurance impact on Results distribution



Case Study - Life Reinsurance Optimization

- Testing reinsurance structures:
  - ✓ Volatility analysis of the different reinsurance solutions



Bigger bar implies more volatile results

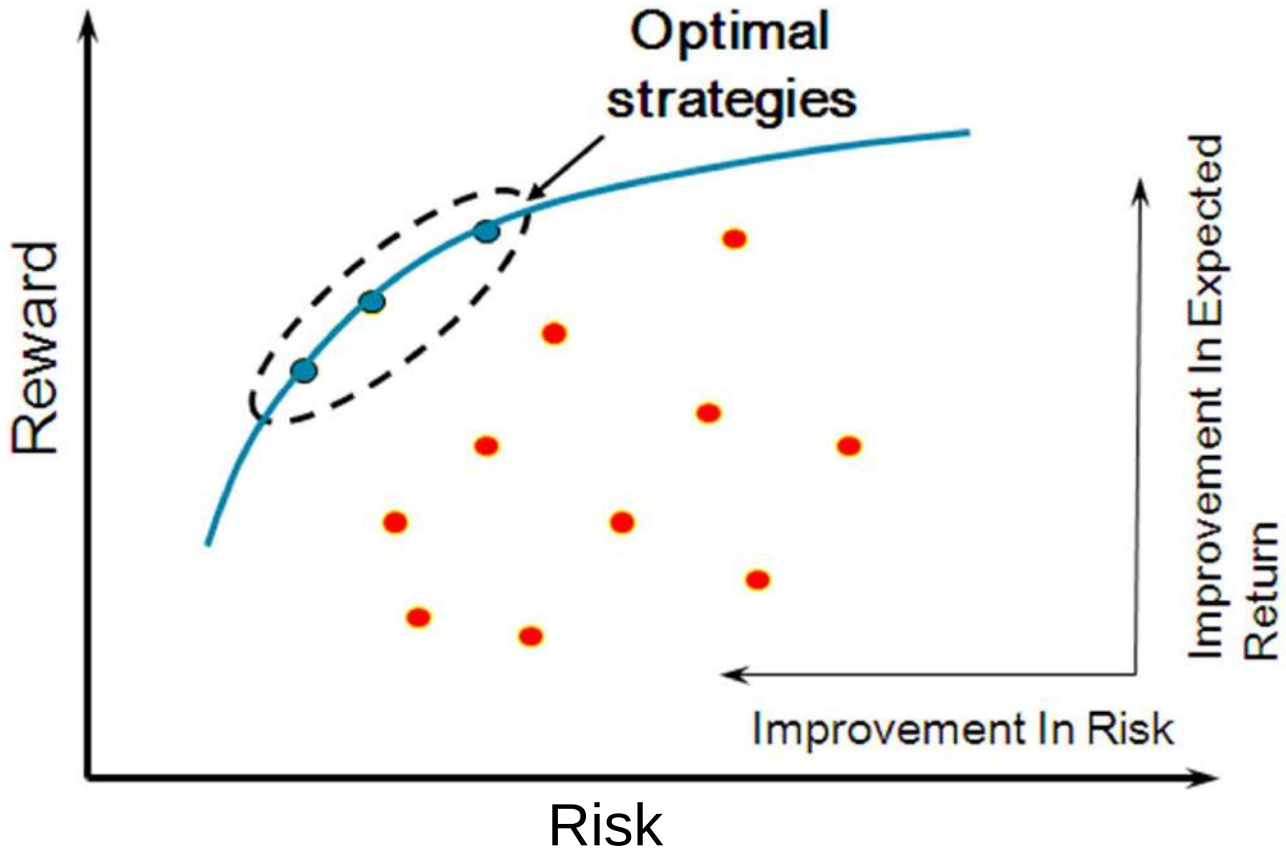
Choosing higher mean generates more volatility

How to quantify the relationship between mean & volatility ?

Case Study - Life Reinsurance Optimization

- Testing reinsurance structures:
  - ✓ Risk-Reward analysis of the different reinsurance solutions

Principle



Case Study - Life Reinsurance Optimization

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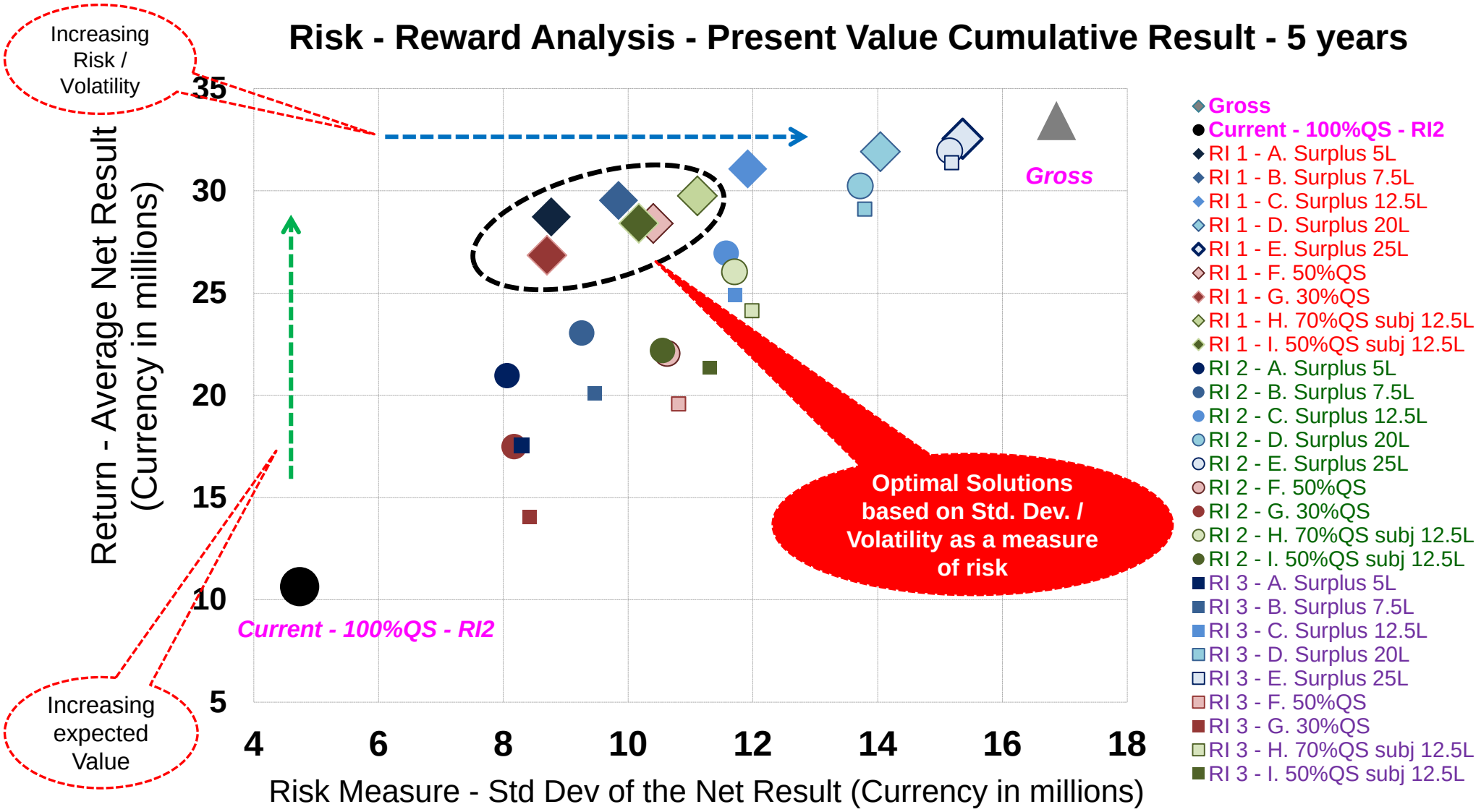
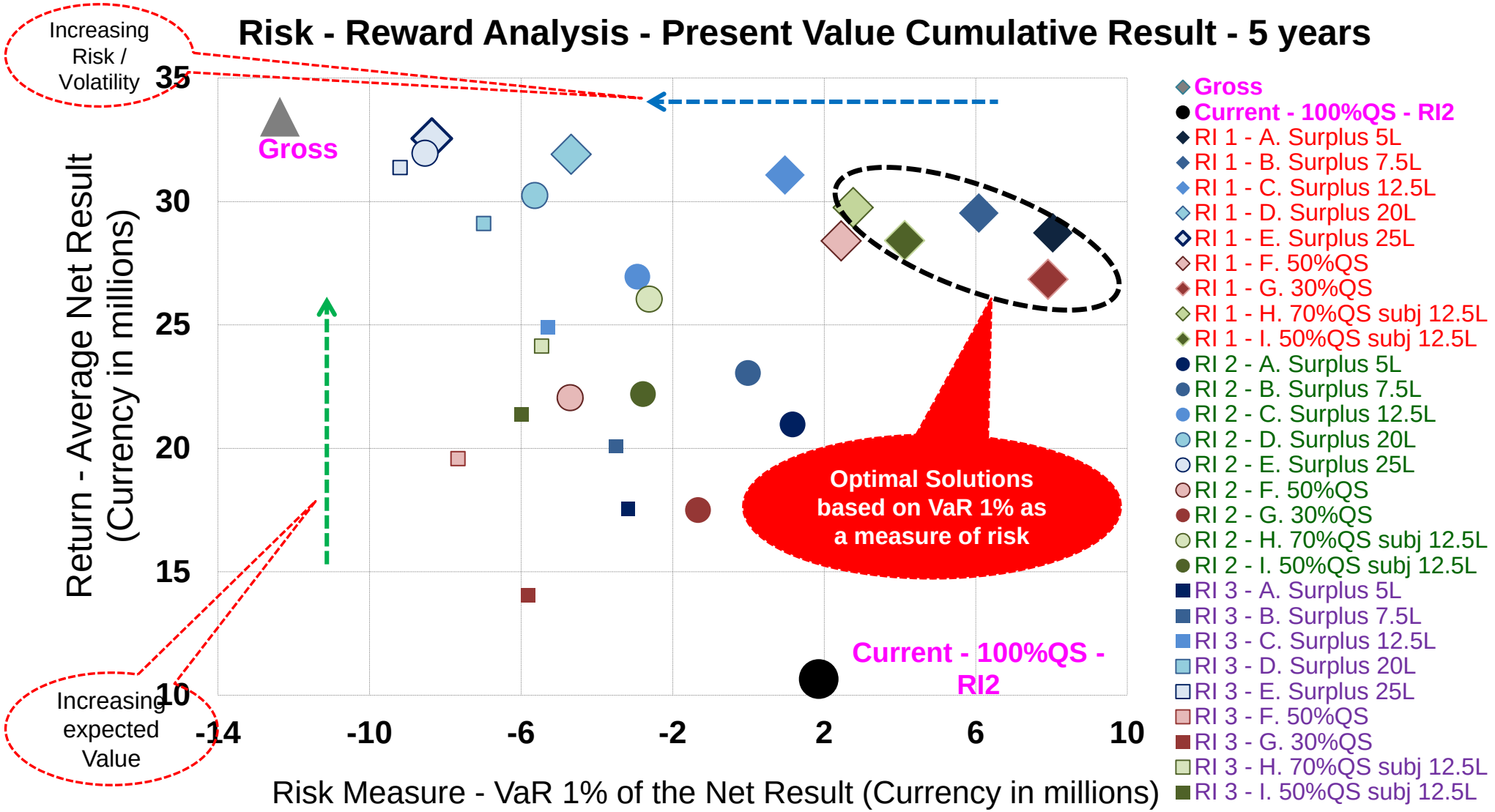
- **Cumulative Result – 5,000 simulations, Std. Dev. as Risk Measure**



Case Study - Life Reinsurance Optimization

- **Cumulative Result – 5,000 simulations, VaR 1% as Risk Measure**



Case Study - Life Reinsurance Optimization

- Testing reinsurance structures:
  - ✓ Reinsurance impact on solvency requirements and/or economic balance sheet:

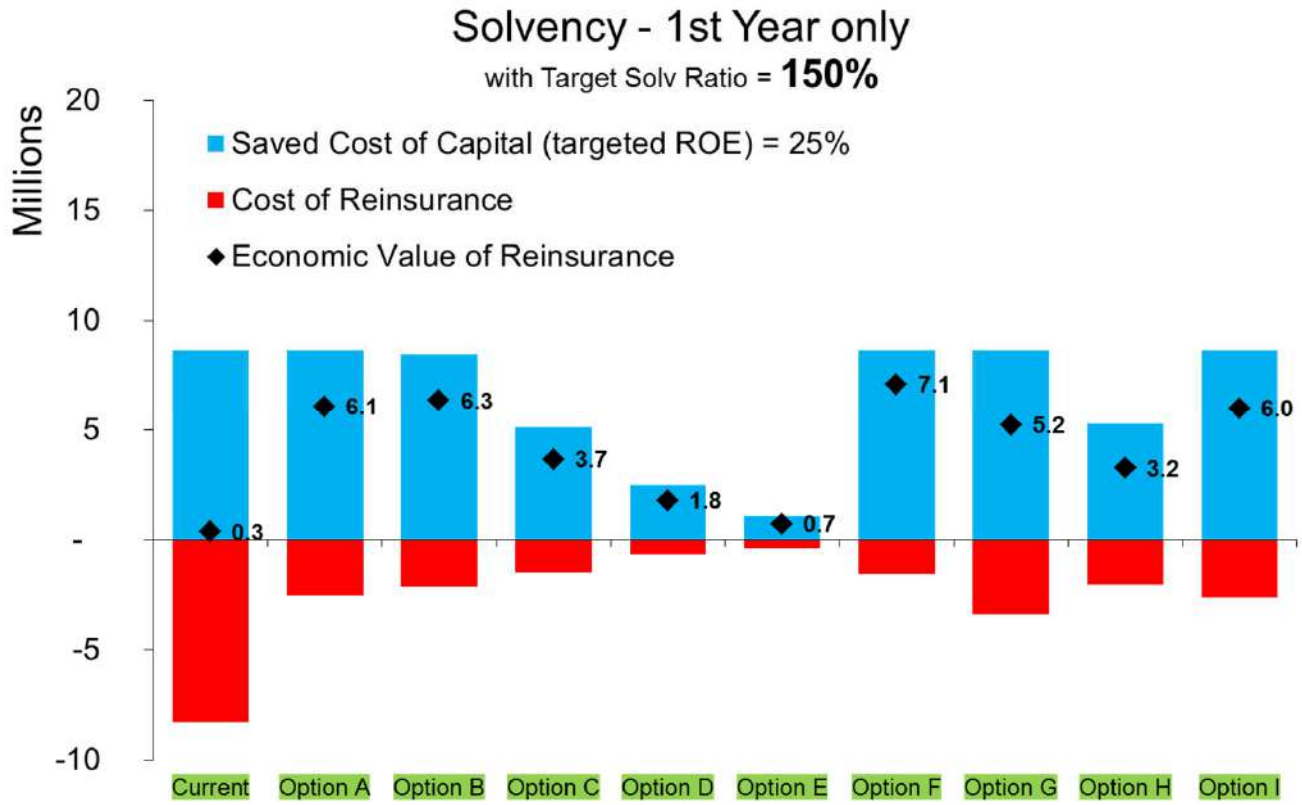
Saved Cost of Capital

minus

Cost of Reinsurance

=

ECONOMIC VALUE of Reinsurance



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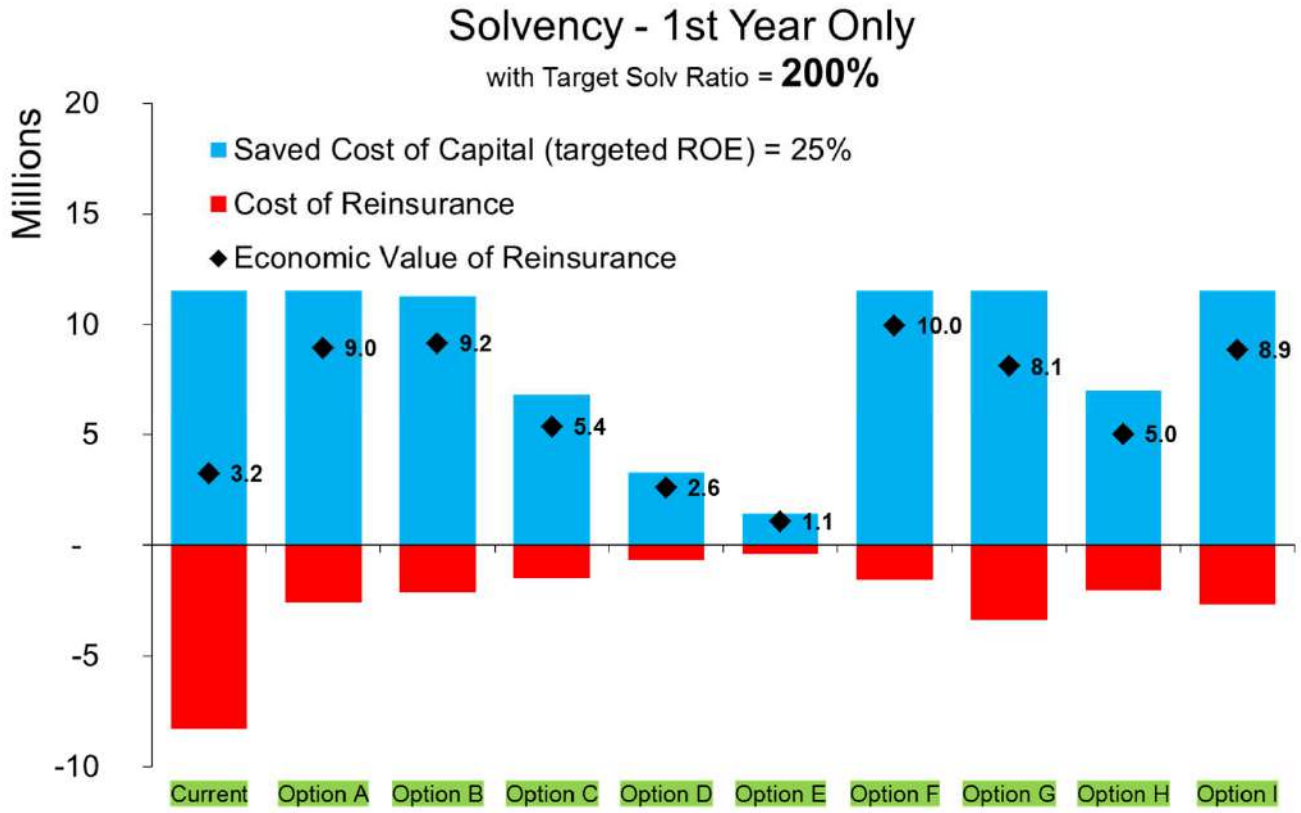

Case Study - Life Reinsurance Optimization

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- Making the decision
  - ✓ Identifying optimal solution:

R1	Ceded Reinsurance Premium - Present Value - Total over 5 years	Risk Ceded (% of SA /claims)	Present Value of Cumulative Result at the end of Year 5 - @ 3% - (mn)					
			Expected Result	Standard Deviation	Probability < 0 (p.a.)	VaR 95%	VaR 5%	VaR 1%
Gross	0	0%	33	17	5.844%	59	4	-12
Current QS 100%	124	100%	11	5	0.000%	19	3	2
Solution A Surplus INR 500,000	64	60%	29	9	0.996%	43	15	8
Solution B Surplus INR 750,000	54	51%	30	10	1.428%	46	13	6
Solution C Surplus INR 1,250,000	35	35%	31	12	2.572%	50	11	1
Solution D Surplus INR 2,000,000	19	18%	32	14	4.144%	54	7	-5
Solution E Surplus INR 2,500,000	10	10%	33	15	5.096%	56	6	-8
Solution F QS 50%	55	50%	28	10	2.400%	45	11	2
Solution G QS 70%	77	70%	27	9	0.860%	41	13	8
Solution H 70% retention subj to INR 1,250,000	47	44%	30	11	2.272%	48	11	3
Solution I 50% retention subj to INR 1,250,000	60	55%	28	10	1.768%	45	12	4

Case Study - Life Reinsurance Optimization

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- Making the decision

Modelling Results	• Helps to make decisions • Not a decision itself
Need to Share & Understand	• Sensitivity of the results • Decision framework and criteria (profitability measure, risk appetite, solvency requirement, etc.) • Feasibility of the suggested reinsurance alternatives according to specific criteria/constraints (financial strength of reinsurers, services expected from reinsurers…)

Conclusion

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- Conclusion – Life Reinsurance Optimization

✓ Asking questions:
  - Why reinsurance ? (transferring volatility? capital need? services?)
  - Which criteria / which framework ?

✓ Getting answers:
  - Understanding risk / Portfolio modeling
  - Testing, comparing structures

Thank you !