Internal Modelling under Solvency II

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Introduction

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Introduction

About Hans Waszink

- Mathematician & Actuary
- 15 years of experience in modelling Insurance Risks
- Led various implementation projects for Risk Management in various Insurance companies in UK & European Continent.
- Currently assisting several companies in preparations for Solvency II.

What is Solvency II

- Solvency II is a complete overhaul of Solvency Regulations for Insurance Companies in the European Union, which will come into effect at the end of 2012.
- Solvency Requirements for Insurance Companies will be more in line with each company's risk exposures – comparable to Basel II for banks.
- More advanced assessment of the magnitude of insurance & financial risks on Insurance Companies' balance sheets.
- In particular, insurance companies will have the option to submit their own internal models for regulatory approval.

Internal Models

- Internal models are a tool to assess the risk profile of an individual company.

- Main risk types are:

  - Insurance risk
  - Market risk
  - Credit risk
  - Operational risk

- The internal model estimates the capital required to withstand the worst case loss at **99.5% confidence level over a 1 year period**.

Use of @Risk

- With the help of @Risk, we can perform Monte-Carlo simulation of the individual risk types as well as the aggregation over all the risks:

Insurance risk
Market risk
Credit risk
Operational risk +

Total Aggregate risk

Use of @Risk

- Not only can we use the @Risk models to satisfy Regulatory Requirements, but also we can optimise the company's Risk/Return trade-off. For example:
  - Buying more risky assets will improve investment returns in normal circumstances, but also lead to larger losses in a worst case scenario.
  - Buying reinsurance helps to protect against large insurance losses, but also comes at a cost.

Example: Reinsurance

Reinsurance = insurance of insurance companies.

> In order to limit heavy losses, a retail insurance company buys reinsurance, for example at Lloyds of London.

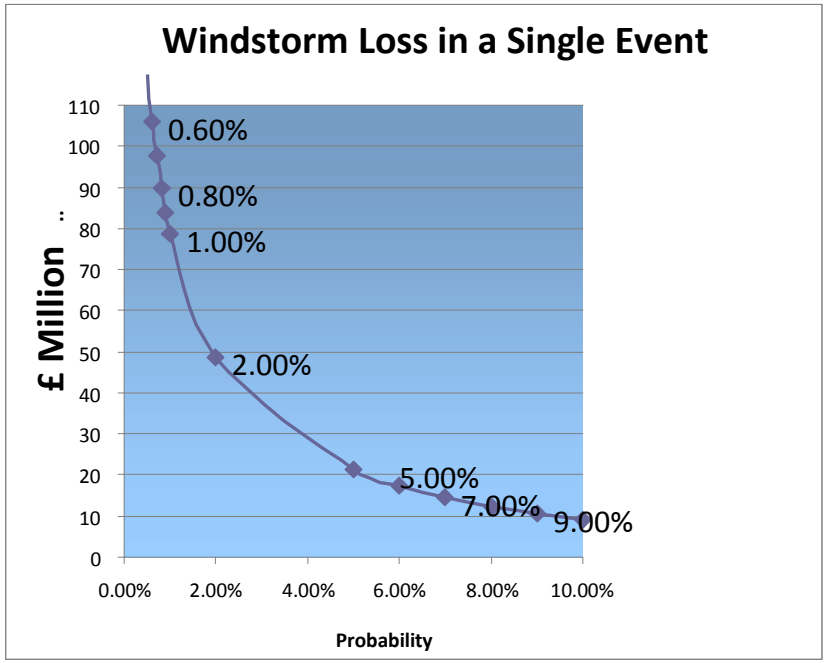
For a client company, we investigated which reinsurance coverage would be optimal given their exposure and risk tolerance.

Example: Reinsurance

An insurance company in the UK with a medium sized Property Insurance portfolio wants to buy reinsurance protection against windstorm. Total loss in a single storm is reinsured in excess of £10 million up to £100 million.

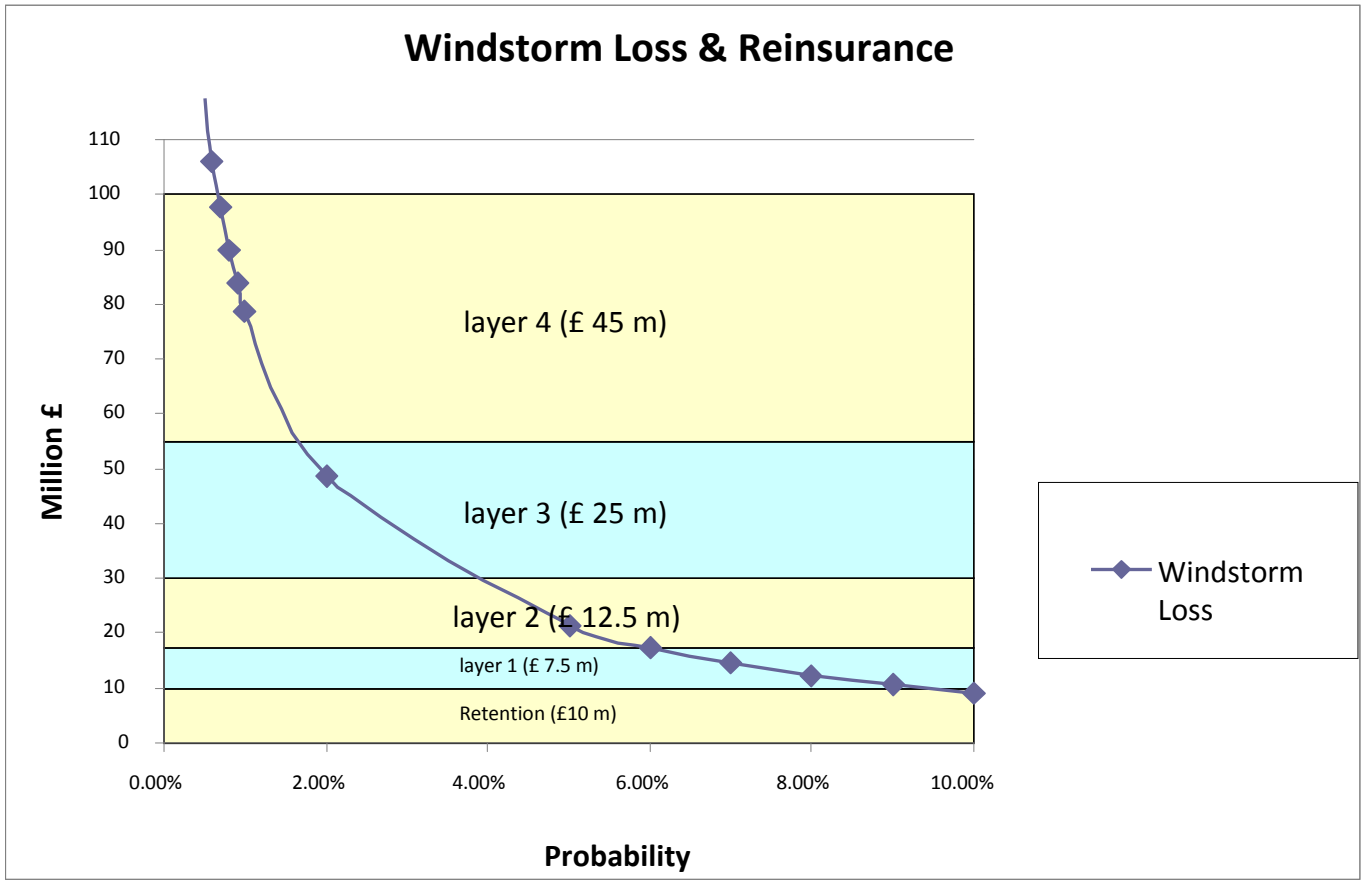
Windstorm Risk

Using a dedicated software for Natural Catastrophe modelling, we obtain parameters for the frequency and severity of Windstorm losses. The total windstorm loss, aggregated over all insured buildings, may look as follows:



Reinsurance Program

Reinsurance program providing coverage from £ 10 tot £100 million Euro divided in 4 separate ‘layers’:



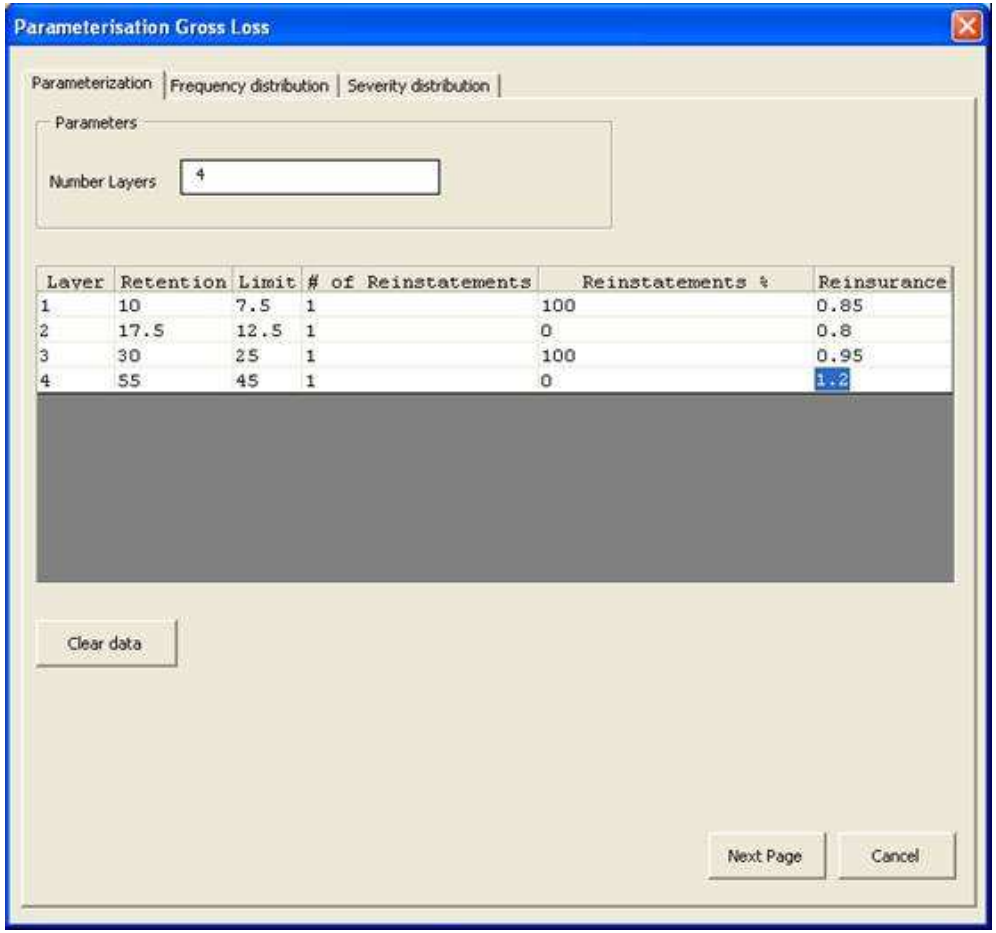
@Risk Analysis

- Why different layers?

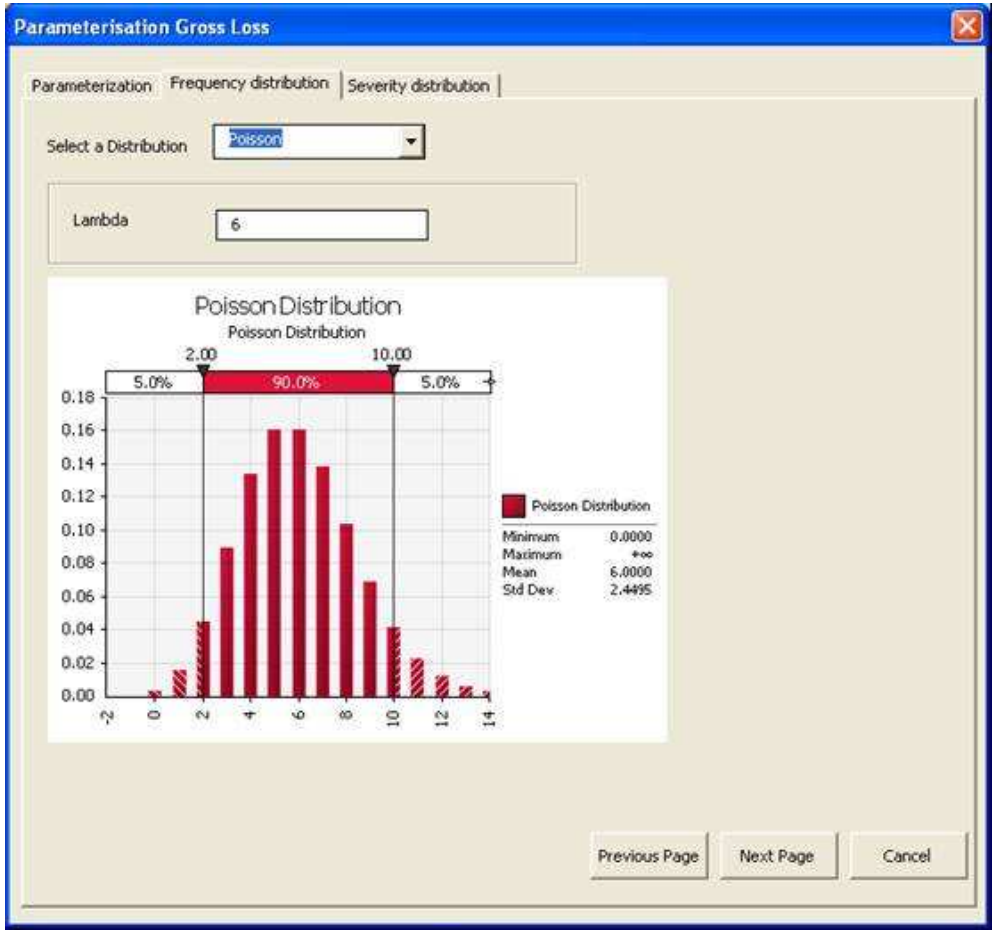
  The layers are all individually priced and placed as different contracts, with different underwriters.

- We can evaluate the price and value of each reinsurance layer by entering its details into @Risk and simulating the Loss net of reinsurance for the company.

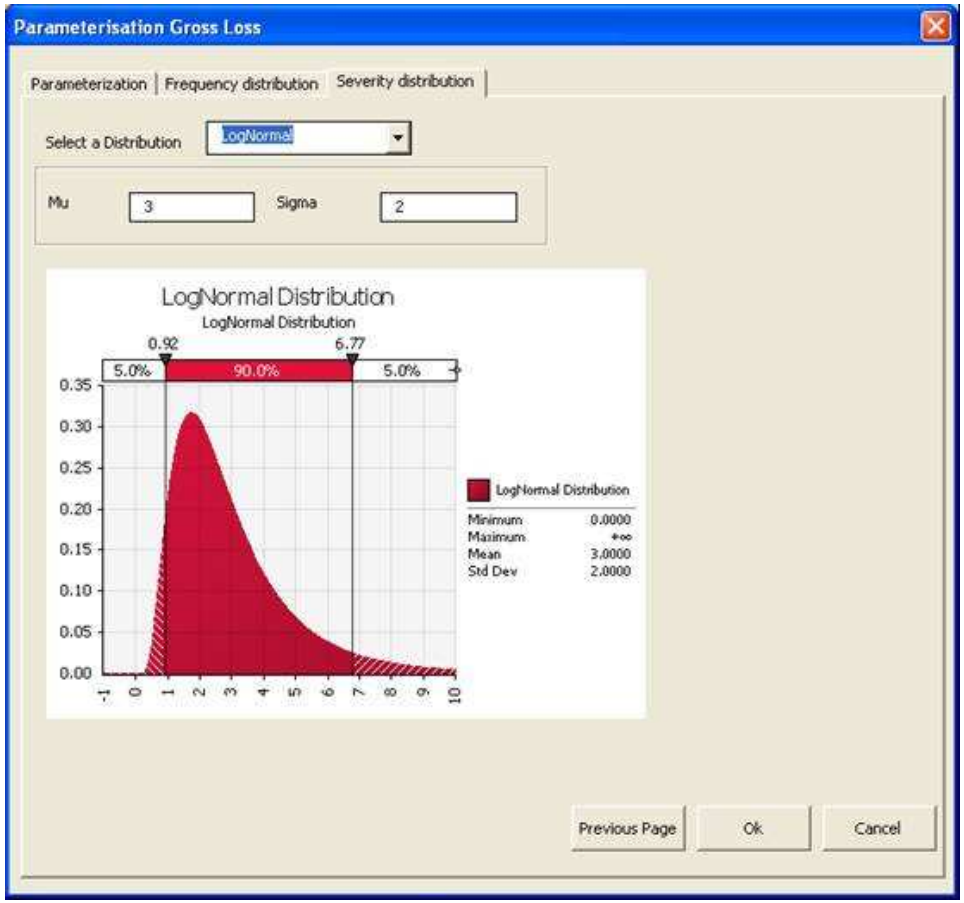
@Risk Input


Parameterisation Gross Loss
Parameterization
Frequency distribution
Severity distribution
Parameters
Number Layers
4
Layer | Retention | Limit | # of Reinstatements | Reinstatements % | Reinsurance
1 | 10 | 7.5 | 1 | 100 | 0.85
2 | 17.5 | 12.5 | 1 | 0 | 0.8
3 | 30 | 25 | 1 | 100 | 0.95
4 | 55 | 45 | 1 | 0 | 1.2
Clear data
Next Page
Cancel

@Risk Input

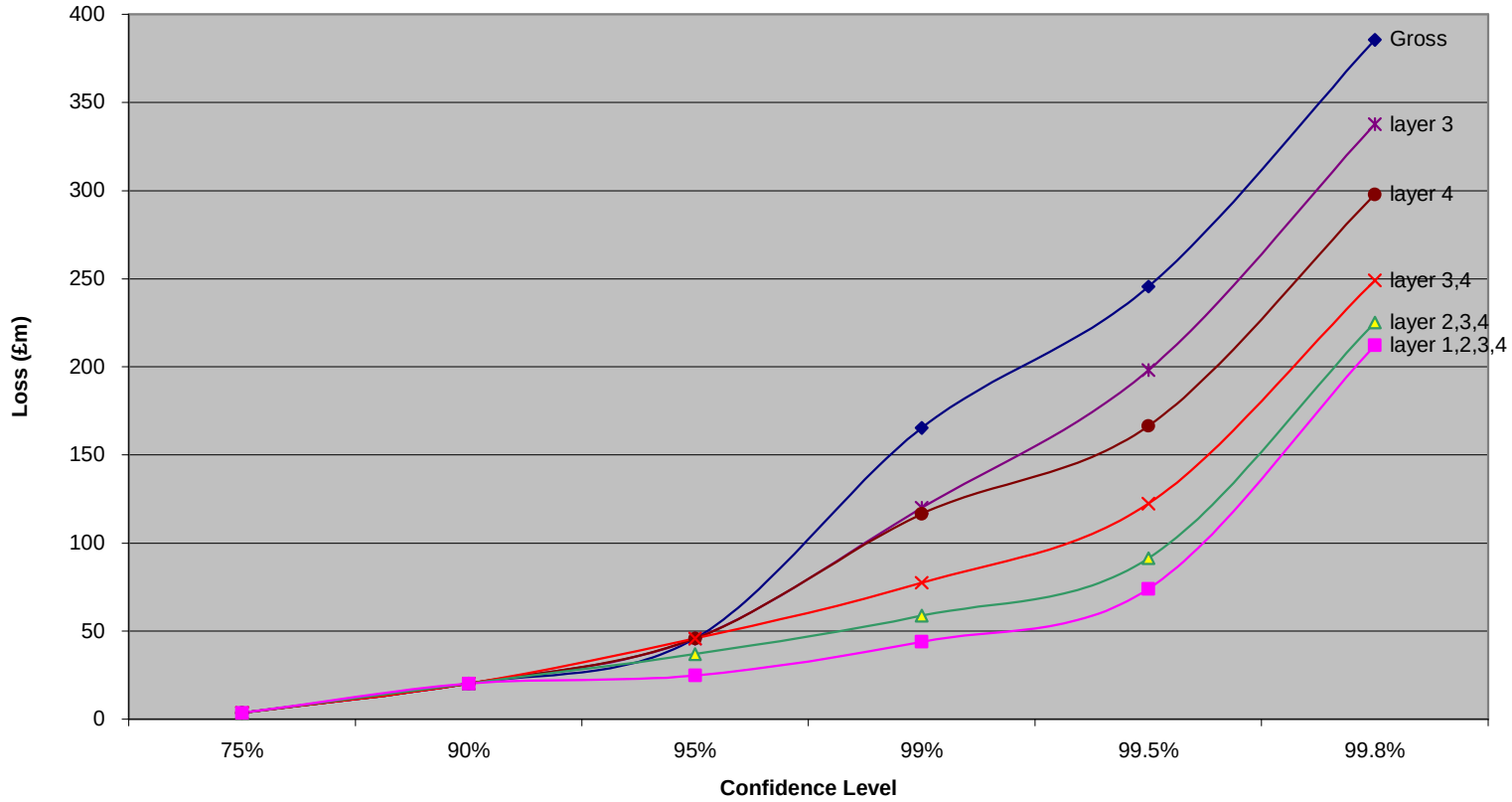

Parameterisation Gross Loss
Parameterization
Frequency distribution
Severity distribution
Select a Distribution
Poisson
Lambda
6
Poisson Distribution
Poisson Distribution
2.00
10.00
5.0%
90.0%
5.0%
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
-2
0
2
4
6
8
10
12
14
Poisson Distribution
Minimum 0.0000
Maximum +∞
Mean 6.0000
Std Dev 2.4495
Previous Page
Next Page
Cancel

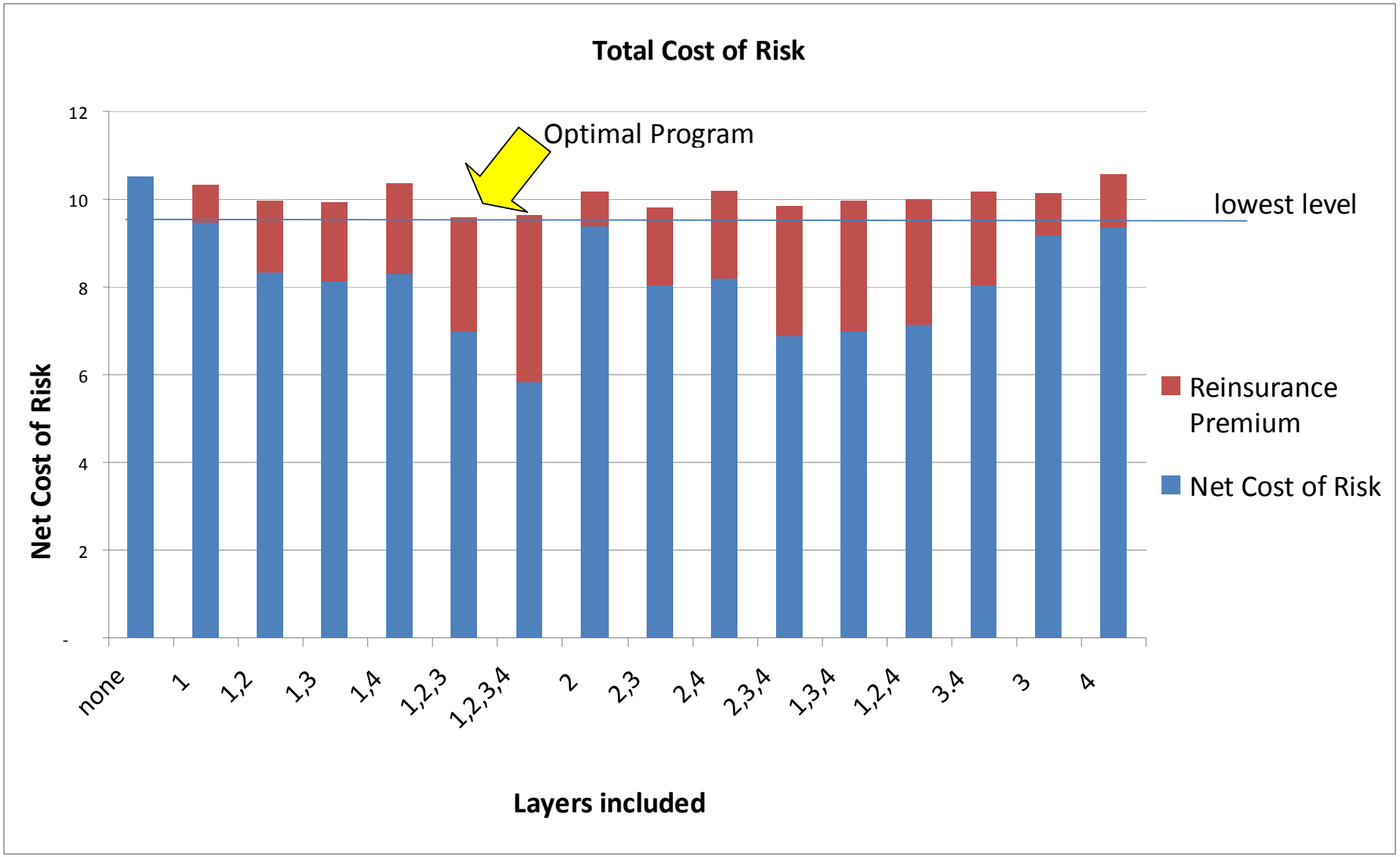
@Risk Input


Parameterisation Gross Loss
Parameterization
Frequency distribution
Severity distribution
Select a Distribution
LogNormal
Mu
3
Sigma
2
LogNormal Distribution
LogNormal Distribution
0.92
6.77
5.0%
90.0%
5.0%
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-1
0
1
2
3
4
5
6
7
8
9
10
LogNormal Distribution
Minimum 0.0000
Maximum +∞
Mean 3.0000
Std Dev 2.0000
Previous Page
Ok
Cancel

Results

Aggregate Windstorm Loss Gross and Net Reinsurance
for various combinations of layers of the Current Program




Total Cost of Risk
Optimal Program
lowest level
Reinsurance Premium
Net Cost of Risk
Net Cost of Risk
Layers included
12
10
8
6
4
2
-
none
1
1,2
1,3
1,4
1,2,3
1,2,3,4
2
2,3
2,4
2,3,4
1,3,4
1,2,4
3,4
3
4

Questions you may have

- Why @Risk?
  - With @Risk you can develop a simple yet effective model relatively easily, with limited cost & effort.
- How can a piece of software on my PC possibly predict what will happen in the real world?
  - It can not. But it does give a range of possible outcomes, and demonstrates the effect of different decisions and risk mitigation tools.
  - When appropriately caveated, it's better to have imperfect models than no models. By the end of the day, someone will have to take the risk whether it's modelled or not.

Are the models not perfect?

According to Goldman's mathematical models, August 2007, was a very special month. Things were happening then that were only supposed to happen about once in every 100,000 years. Either that… or Goldman's models were wrong…We were seeing things that were 25-standard-deviation events, several days in a row. (David Viniar, CFO Goldman Sachs).

Recap

- We have seen:
  - Insurance companies are now encouraged by regulation to perform assessment of their own risk exposure.
  - These risk assessments can be used not only to satisfy regulators, but also to improve financial risk management within the company.
  - Monte Carlo Simulation, and particularly @Risk are extremely useful in performing this type of assessment.

Conclusion

- When appropriately caveated, Monte Carlo Simulation models greatly contribute to the understanding of Insurance & Financial risk. Immediate gains are reduction of Tied Capital, Cost Savings on risk protection, and improved protection of policyholders.

- @Risk software can be used for model runs, with key advantages:

  - Build what you need – no more & no less
  - High quality through tried and tested platform.
  - Cost effective
  - User friendly