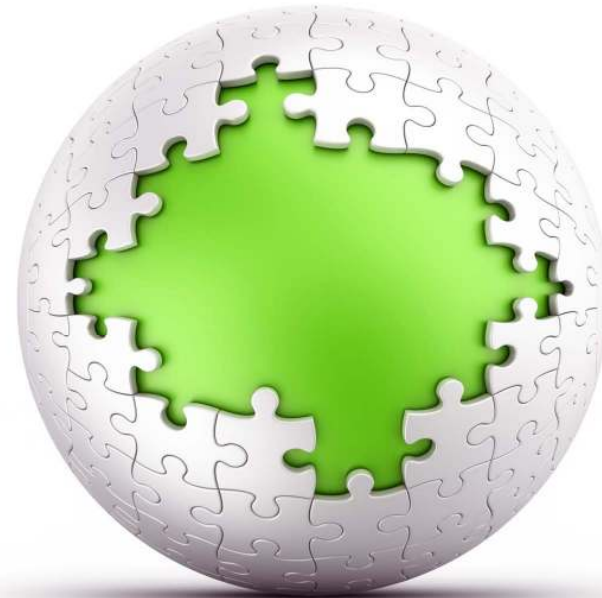


Modelling the meaningful

A stochastic approach to
business risk and risk management

A case study approach



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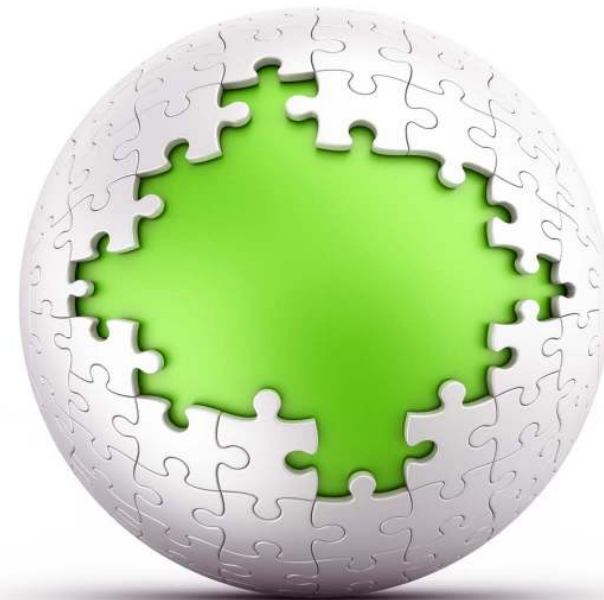
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Palisade Risk Conference 2013, Johannesburg

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Introduction



Introduction

Who are we?

- Deloitte & Touche: Actuarial & Insurance Solutions
We are not auditors or accountants!
We are actuaries
- We consult, provide **analytical solutions** to our clients:
 - ✓ *Insurers, reinsurers, brokers, insurance agents*
 - ✓ *Banks, Financial Institutions*
 - ✓ *Regulators, Government institutions (e.g. National Treasury)*
 - ✓ *Utility companies*
 - ✓ *Mining groups*
 - ✓ *Motor manufacturers, Fleet managers*
 - ✓ *Telecommunications companies*
- *We specialise in complex modelling solutions*
- *We have found that we are able to supplement our analytical solutions with @Risk*





Introduction

The Insurance Industry Today

- It's all about understanding and managing risk these days
 - *Insurers are no exception!*
 - *They are in the business of taking on risk for a premium*
- We as actuaries concern ourselves with quantifying the risk in companies
- Regulatory environment is shifting:
 - **Previously:** simple rules that did not allow for true risk profiles
 - **Now:** Identify the risks, quantify accurately & manage them appropriately

SAM (Solvency & Assessment Management):

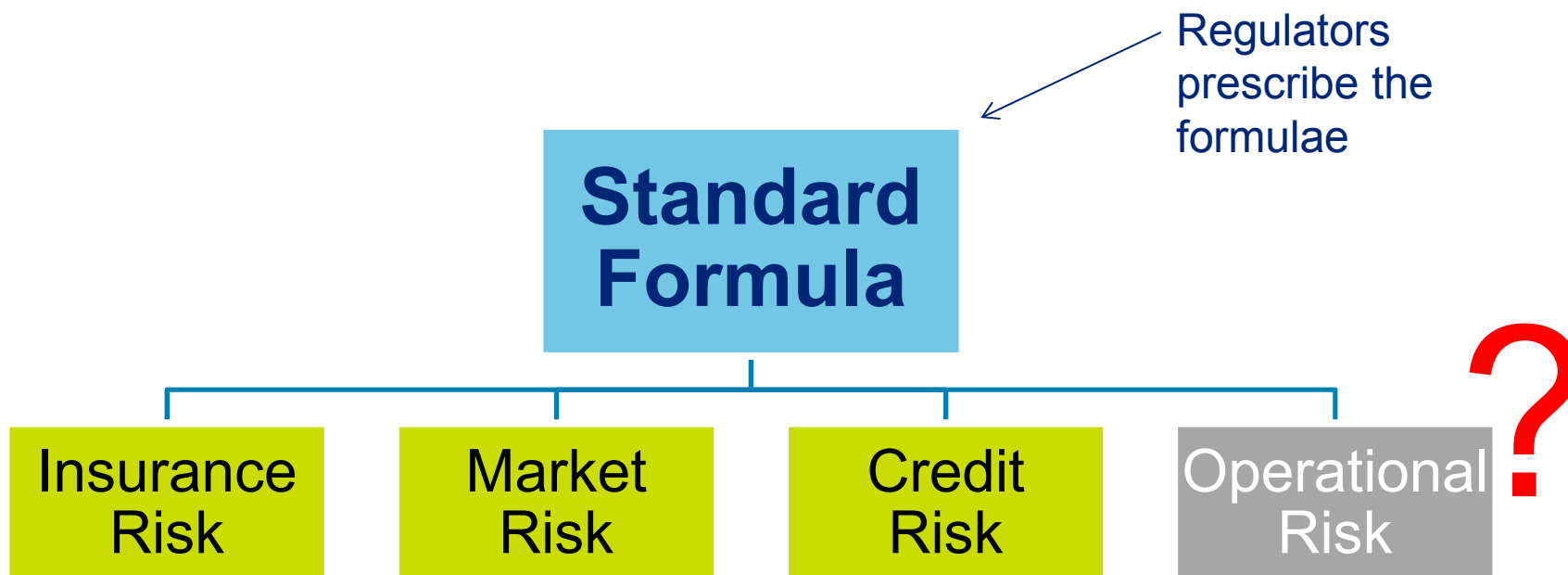
a new risk-based regulatory regime for South African insurers.

- Insurers are incentivised to understand the risks to which they are exposed.
- Hold the right reserves and capital – be able to explain why they are right

Introduction

Capital Requirements

- Insurers need to take into account their risk exposure when determining the level of capital that must be held.



Introduction

Operational Risk

- One area of particular interest is operational risk...

“Operational risk is defined as the risk of loss resulting from inadequate or failed processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk”

Basel II definition

- **For example:**

- ❖ *Power failures leading to the disruption of business activities.*
- ❖ *Failure by an employee to submit the company’s tax returns -> penalties*
- ❖ *Employees committing fraud*

- Hard to gather data
- Difficult to measure and quantify
 - Rule of thumb **vs** Statistical analysis **vs** Some defined formula (eg. SAM, Basel)...

It can also include other classes of risk, such as fraud, legal risks, physical or environmental risks.

You don’t get rewarded for taking on additional operational risk!

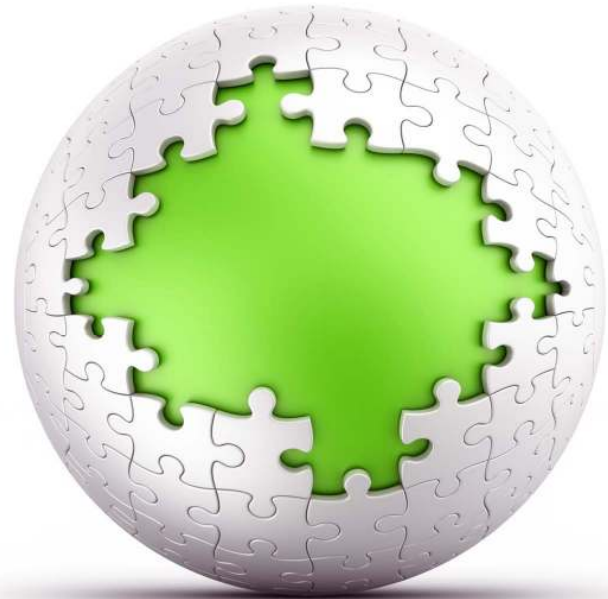
Introduction

Expert Judgement vs Statistical Analysis

- With the recent financial crisis in Europe... many failures because of operational failures!!
- So, the regulator has specifically built it into an industry formula (The Standard Formula)
 - “One-size-fits-all” approach
 - Does not work, because Operational Risk is highly unique to each company
- Often, these events tend to be low likelihood events
- Thus, data collection is poor - hard to parameterise a model.
- Result = glossed over by companies and regulators
- **Tend to rely on expert judgement in these cases – limited analytical justification**



Aim of the Presentation





Aim of the Presentation

1. Understand that there is always underlying risk: **Operational Risk**
2. How do we measure those “immeasurable risks”?
3. Explore the power of @Risk and how it can be used to model uncertainty.

Disclaimer

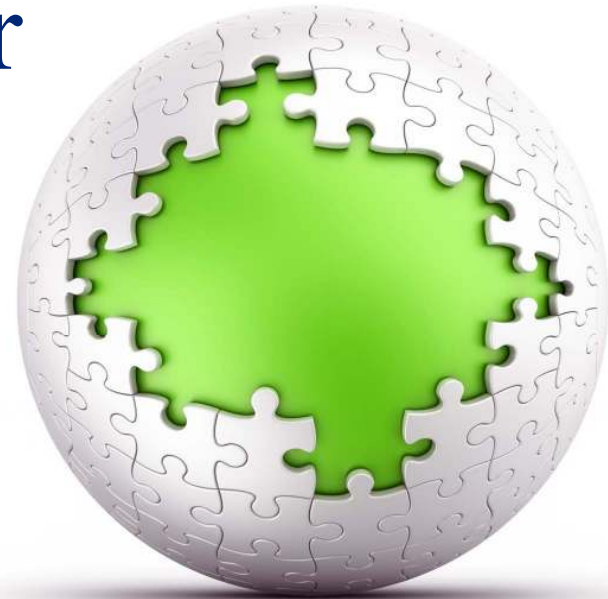




Disclaimer

- This is not meant to be a highly technical presentation.
- It is based on an actual business case that we worked through. But, the real-world scenarios have been **simplified & sanitised** for the purpose of today's discussion.
- It's intended to be illustrative, practical & thought provoking.
- **GIGO**: this is not a fix-all solution to a lack of data. Subjectivity has risks!
- It is aligned with what we see in the industry, but will not reflect all companies' attitudes and levels of sophistication
- **Of course, as always: we accept no responsibility, liability for anything in these slides!**

Case Study: TopCover Insurance



Introduction to TopCover Insurance

Case Study

Who are they?

- TopCover is a motor insurance company which operates in South Africa.

- Hold capital commensurate with risk

- Capital determined using quite a sophisticated formula which allows for most major risks....
 - Insurance
 - Market
 - Credit
 - ...
 - Operational → ... Fair?

How does TopCover think about their risks?

TopCover Insurance

Case Study

TopCover's Top Risks

- TopCover holds an annual risk workshop where Exco and senior management identify all material risks to which the company is exposed...

Risk Register						
Risk #	Risk	Owner	Likelihood	Severity	Impact	
1				3	9	
2				2	4	
3				2	2	
4				4	4	
5				2	6	
6				2	2	
7				2	2	
8				3	6	
9				3	6	
10	Financial legislative changes	RF	3	2	6	

Likelihood Scale		Severity Scale	
Rare	1	Very Low	1
Unlikely	2	Low	2
Possible	3	Medium	3
Likely	4	High	4
Almost Certain	5	Very High	5

TopCover Insurance

Case Study

TopCover's Financials

- TopCover's capital charge for operational risk works out to be 3% of premium income ... is this sufficient?

$$3\% * R600m = R18m$$

Income Statement		R'm	Balance Sheet		R'm
Revenue (Premium)	R	600.00	Assets	R	900.00
Investment income	R	60.00			
Claims	R	-450.00	Liabilities	R	700.00
Expenses	R	-45.00	Equity	R	200.00
Profit	R	165.00			

- **Our view** – Given the systems in place, exposure to internal and external events etc., the realistic level of capital is likely to be higher.

TopCover Insurance

Case Study



Change is good...



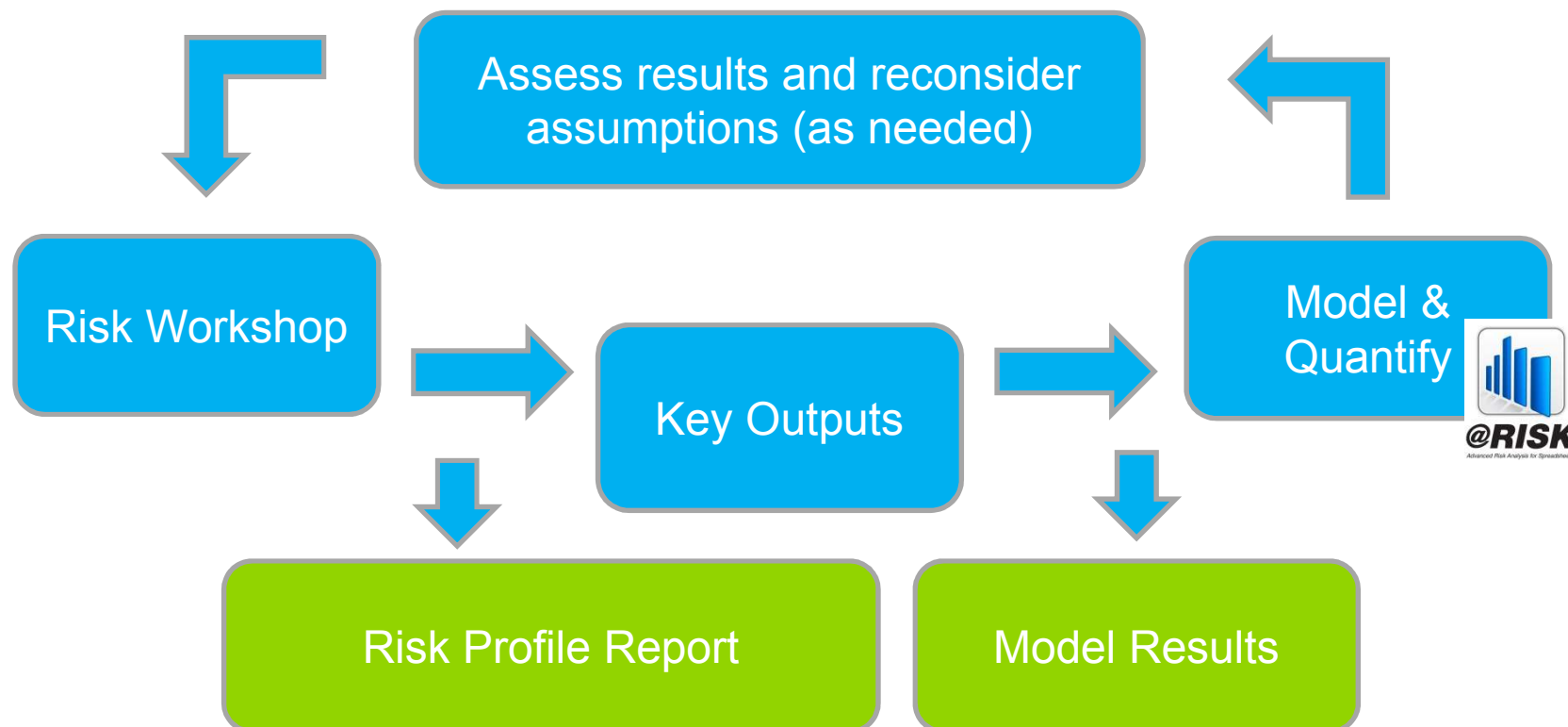
TopCover Insurance

Case Study



A change in approach...

- Blend some technical expertise with the existing approach



TopCover Insurance

Case Study

TopCover’s Top Risks (Updated)

- **“We have to find a way of making the important measurable, instead of making the measurable important” – Robert McNamara**

Risk Register					
Risk #	Risk Label	Owner	Likelihood	Severity Upper	Severity Lower
1	Processing of fraudulent claims	GJ	1/2	7 500 000	8 500 000
2	Loss of key staff		2/3	7 500 000	11 500 000
3	Lack of appropriate cred		1/2	12 000 000	14 500 000
4	Non-compliance to the l		1/2	7 500 000	8 500 000
5	Power outages		2/3	2 000 000	6 000 000
6	Failure to submit tax ret		1/2		
7	BEE requirements may n		2/3		
8	IT systems crash	RF	1/2		
9	Inadequate physical access controls	CH	1/4		
10	Financial legislative changes	RF	1/2		

Expect power outages to occur twice every 3 years.



TopCover Insurance

Case Study



Allow for controls...

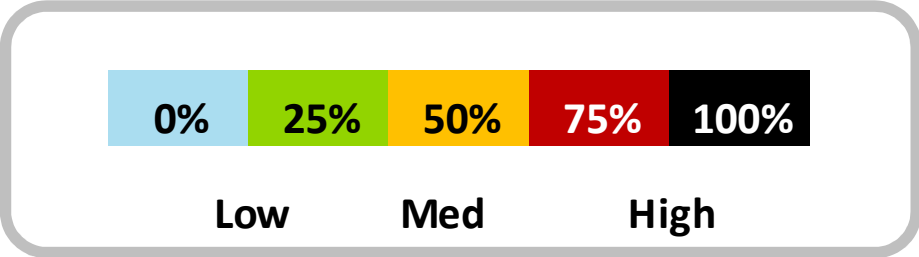
Frequency Parameters				Severity Parameters			
Risk #	Mitigation	Unmitigated	Mitigated	Risk #	Mitigation	Mitigated Lower	Mitigated Upper
1	20%			1	20%		
2	40%			2	40%		
3	20%			3	20%		
4	40%			4	40%		
5	20%			5	20%		
6	40%			6	40%		
7	40%	1/3	2/15	7	40%	500 000	7 500 000
8	40%	1/2	1/5	8	40%	4 500 000	6 000 000
9	60%	1/4	9/20	9	60%	10 000 000	12 000 000
10	20%	1/2	1/10	10	20%	6 000 000	10 000 000

IT systems crash – update systems more often, perform regular maintenance.

IT systems crash – ensure backups are kept at all times.

TopCover Insurance

Case Study



What about correlations?

- Allow for the fact that some of the risks might be correlated...

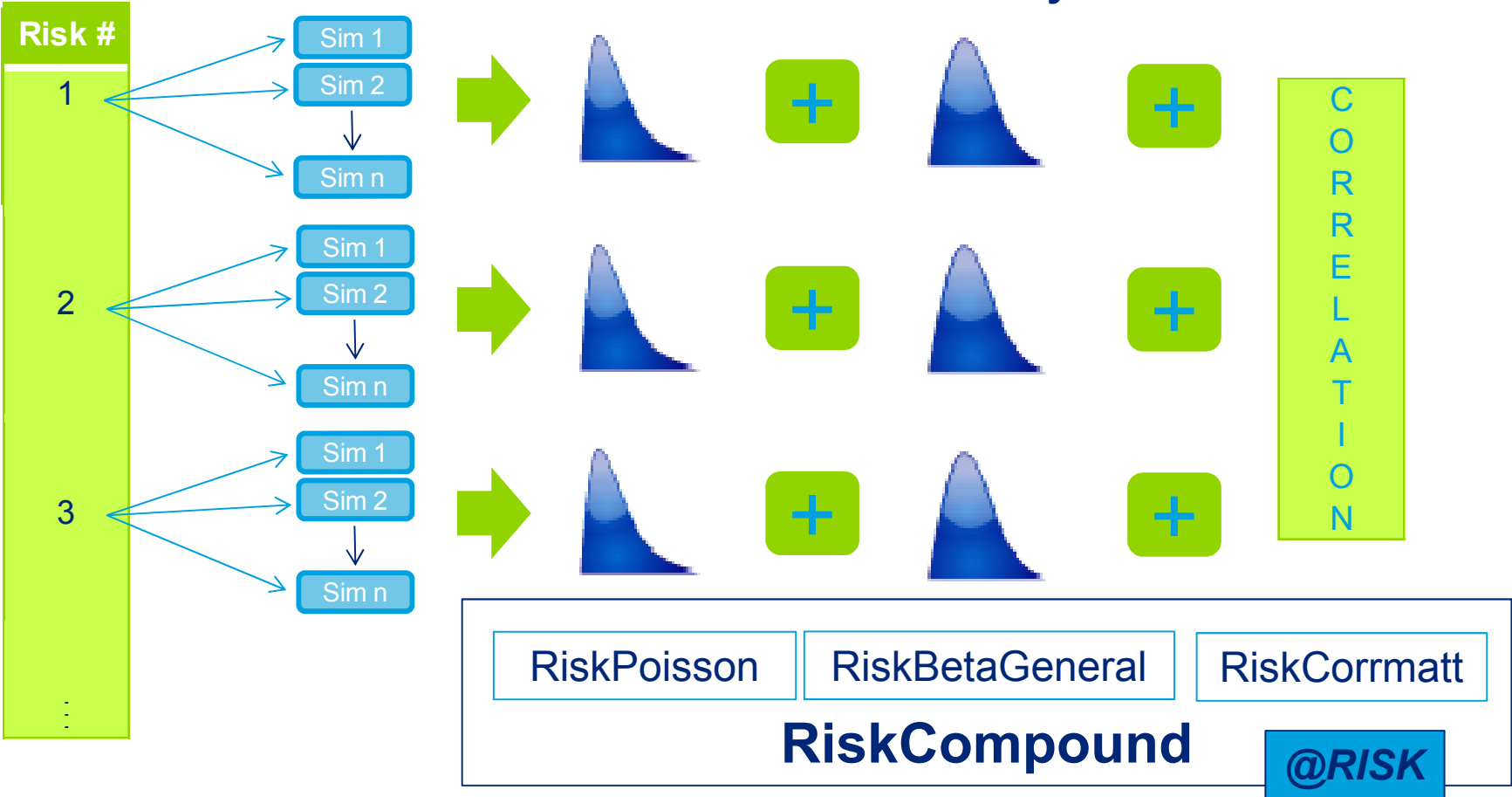
Risk #	1	2	3	4	5	6	7	8	9	10
1	100%									
2	-	100%								
3	-	-	100%							
4	-	-	-	100%						
5	-	-	-	-	100%					
6	-	-	-	-	-	100%				
7	-	25%	-	-	-	-	100%			
8	-	-	-	-	50%	-	-	100%		
9	-	-	-	-	-	-	-	-	100%	
10	-	-	-	-	-	-	-	-	-	100%

TopCover Insurance

Case Study

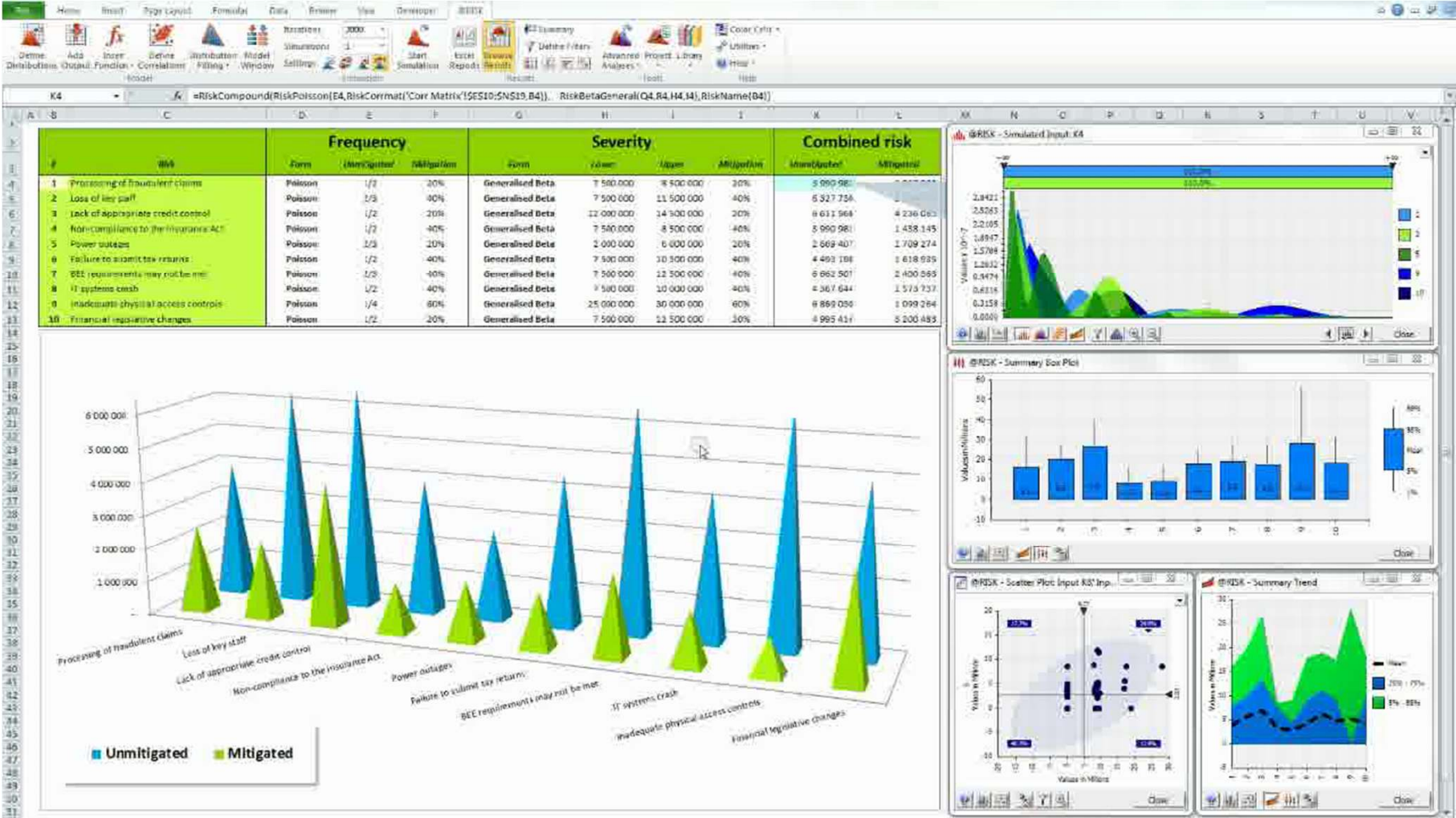


Bringing it all together



TopCover Insurance

Case Study



TopCover Insurance

Case Study



Results

Estimate of expected loss



Risk #	Risk Label	Unmitigated Loss	Mitigated Loss	Rank
1	Processing of fraudulent claims	3 990 982	2 557 073	3
2	Loss of key staff	6 327 730	2 279 723	5
3	Lack of appropriate credit control	6 611 568	4 236 083	1
4	Non-compliance to the Insurance Act	3 990 982	1 438 145	9
5	Power outages	2 669 407	1 709 274	6
6	Failure to submit tax returns	4 493 198	1 618 935	7
7	BEE requirements may not be met	6 662 507	2 400 363	4
8	IT systems crash	4 367 644	1 573 737	8
9	Inadequate physical access controls	6 869 030	1 099 264	10
10	Financial legislative changes	4 995 414	3 200 483	2



Rank the risks

TopCover Insurance

Case Study



Too low

Results

Standard Formula	Prescribed for 99.5% confidence level
Operational risk charge	18 000 000

Modelled with @Risk	Confidence level				
	Best estimate	75th	90th	95th	99.5th
Before mitigation	48 132 486	66 256 923	85 636 624	99 487 827	124 902 215
Mitigation - Likelihood	-10 845 210	-14 390 242	-18 225 170	-21 227 768	-25 460 440
Mitigation - Severity	-16 546 223	-21 954 776	-27 805 615	-32 386 592	-38 844 257
After mitigation	20 741 053	29 911 904	39 605 839	45 873 468	60 597 519
Difference	2 741 053	11 911 904	21 605 839	27 873 468	42 597 519

Regulatory formula seems to underestimate capital - @Risk analysis confirms number is too low

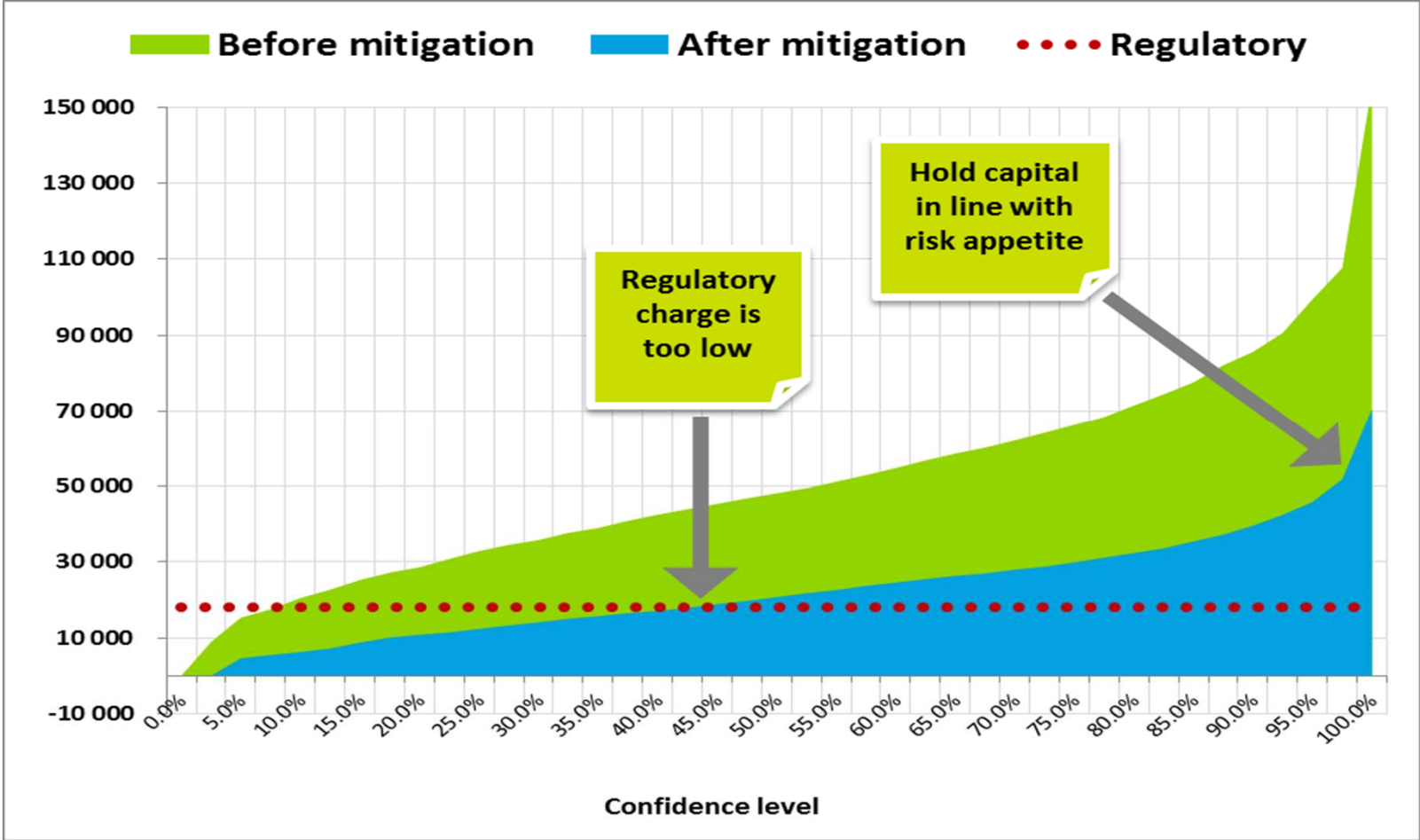
Management decided to hold more capital – in line with their true risk profile and risk appetite

TopCover Insurance

Case Study



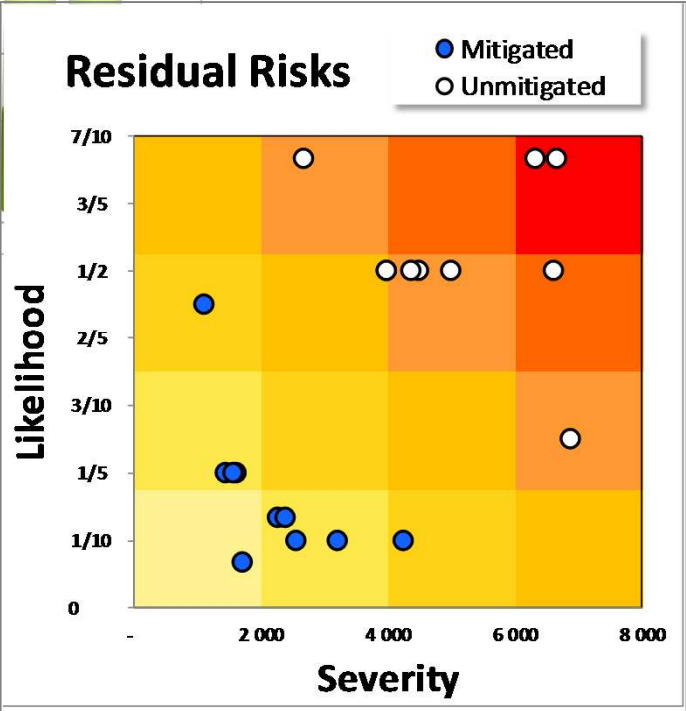
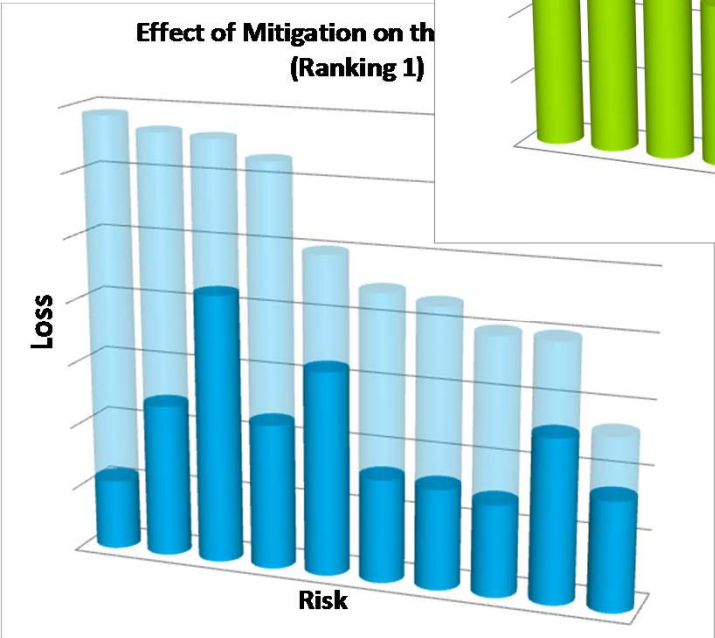
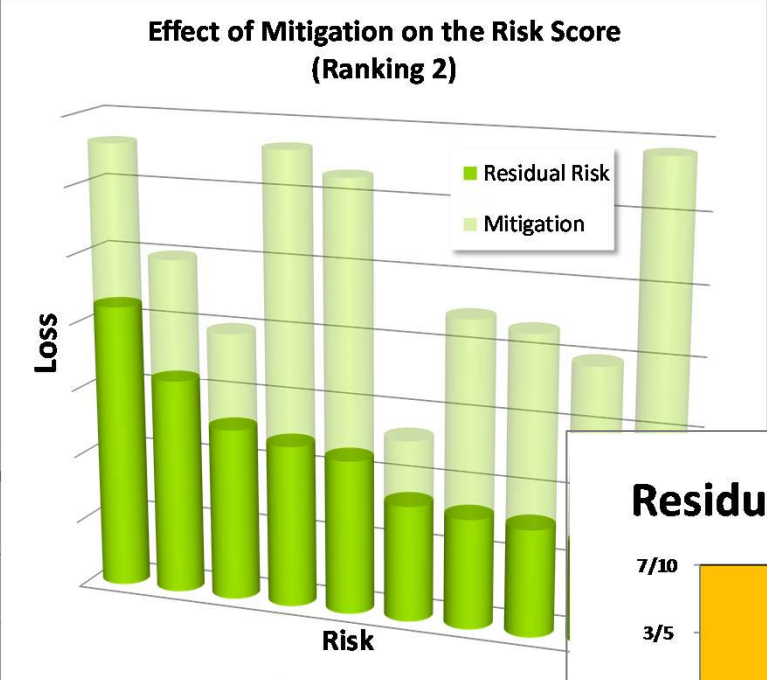
Results Visualisation



TopCover Insurance

Case Study

Other Outputs



TopCover Insurance

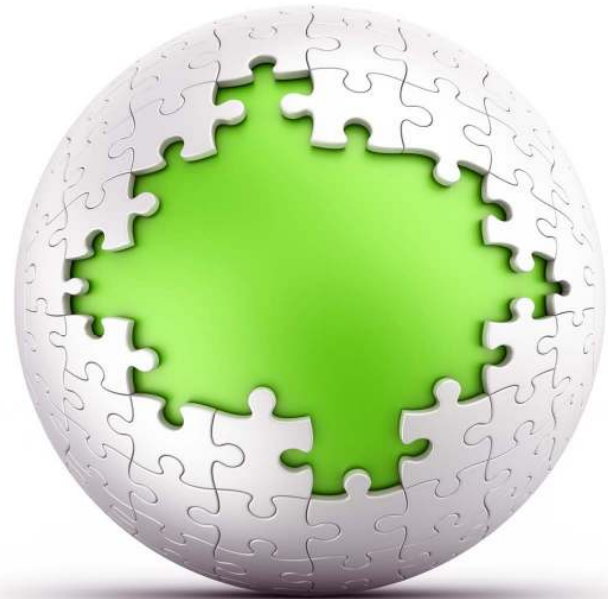
Case Study



Pros and Cons

Pros	Cons
<ul style="list-style-type: none">+ Insight: what is the real risk ballpark?+ Quantifies the qualitative: What does High/Low risk really mean?+ Is the regulatory number suited to my business? False comfort?+ Understand how simultaneously risk events can affect us. Test the Correlation effects+ Increased knowledge of how controls affect likelihood and severity+ Fits into traditional approaches: risk register/matrix+ Helps to prioritise risks properly Real numbers vs ordinal values+ Insurers: motivate different capital requirements+ Faster & easier to do with @Risk - cleaner approach	<ul style="list-style-type: none">- Lack of Data: this is not a silver bullet!- Results are subjective - cannot be used in isolation- Explain additional complexity to Snr Management- False sense of security if blindly trusted- Can be slow for large registers- Can produce more info than management knows how to digest! Parsimony NB

Conclusion





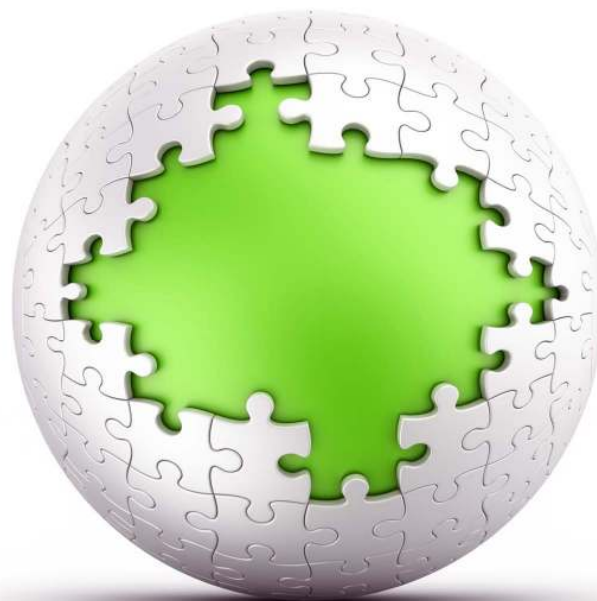
Conclusion

The Benefits of @Risk

How did @Risk help?

- **Familiarity:** Remain in a familiar analytical environment: Microsoft Excel
- **Speed:** Runs very fast, quick to build, set-up & populate
- **Cost:** More affordable than other insurance modelling solutions
- **Complexity:** Easier to deal with more complex scenarios (correlations, compound distributions)
- **Flexibility:** Able to alter results easily by changing the parameters or updating the register... can even do this in real time
- **Visualisation:** Able to visualise Monte Carlo simulation elegantly
- **Ultimately:** Got client to think about the risks, instead of worrying about modelling

Any Questions?





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