Stochastic BCAR and Internal Models

Using Internal Models to Manage BCAR

- October 7, 2016
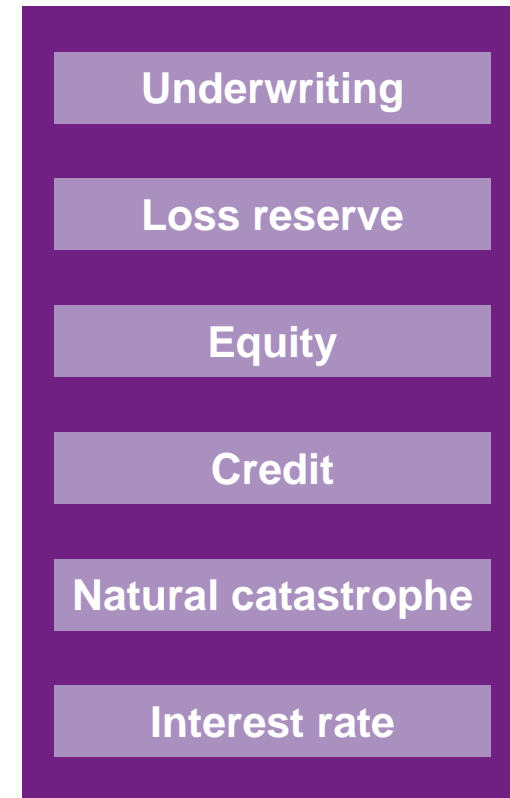
Willis Towers Watson I·I'I·I

Summary

- The changes to BCAR are both a challenge to companies
  - Changes in capital may affect clients in different ways
  - Parameters are more difficult to utilize and replicate
  - Potentially an increased constraint on capital

- However this also presents an opportunity
  - AM Best's results should more closely represent companies risk profile
  - More detail for discussions about individual risk profiles
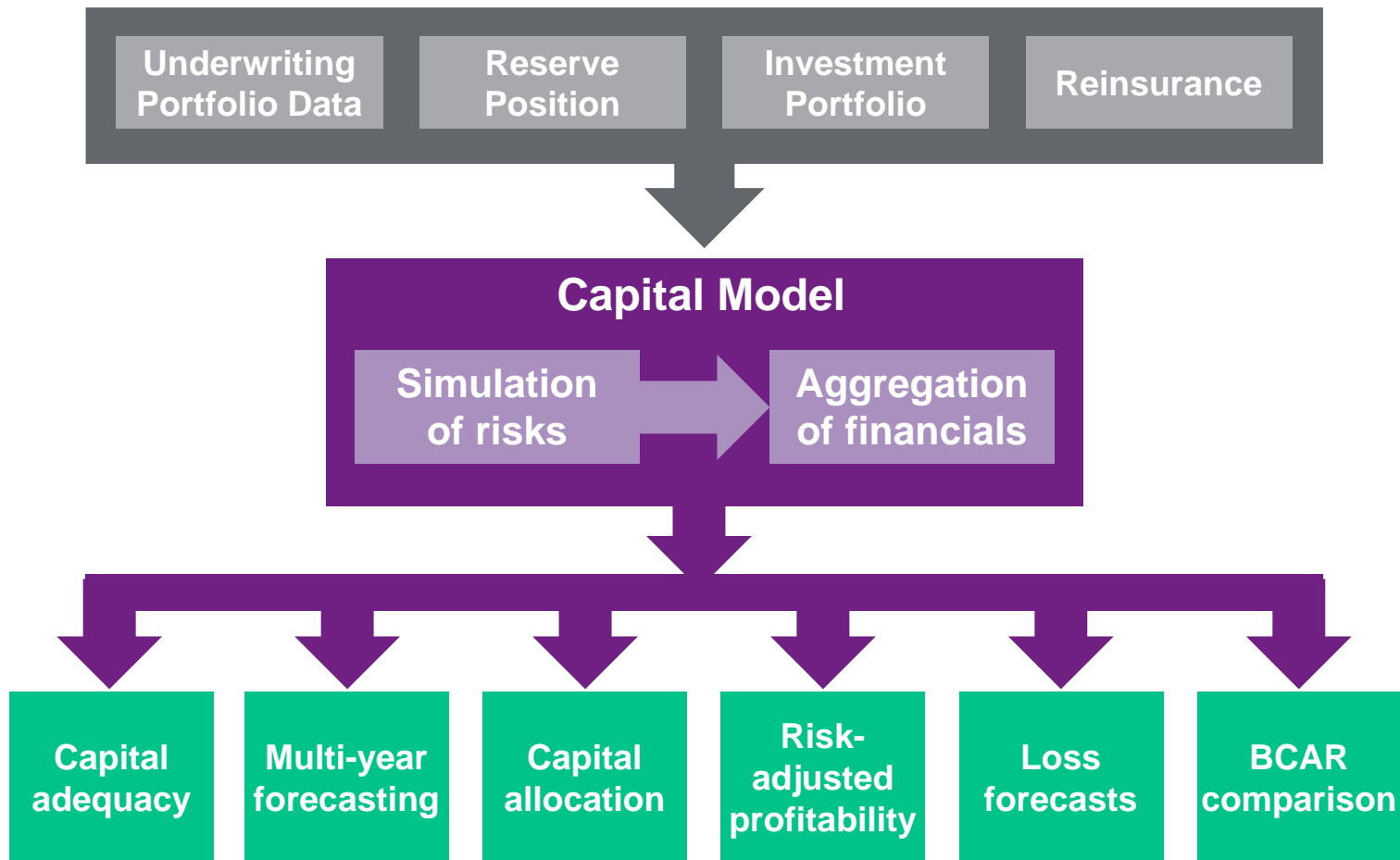 - Opportunities to review ERM practices and risk mitigation strategies

> How can we use our capital models to compare to BCAR?

Capital modeling background

- Stochastic capital modeling provides an "own view of risk"
- A well built capital model will incorporate a companies key risk categories, customized to your business
  - Typically, the results does not match actual capital held, as additional capital often needed to satisfy rating agencies and other concerns
- Benefits of having a stochastic capital modeling:
  - Simulate financials based on you own risk profile
  - Capital and capital allocation can be based on managements risk appetite and tolerance
  - Can be translated to BCAR, both in total and by risk category

Underwriting

Loss reserve

Equity

Credit

Natural catastrophe

Interest rate

Example Capital modeling process

| Underwriting Portfolio Data | Reserve Position | Investment Portfolio | Reinsurance |

Capital Model

| Simulation of risks | → | Aggregation of financials |

| Capital adequacy | Multi-year forecasting | Capital allocation | Risk-adjusted profitability | Loss forecasts | BCAR comparison |

Willis Towers Watson

Objectives

- Better understand the result of BCAR model
- Use your capital model to compare the results of the BCAR score
- Create metrics from the capital model with similar results to BCAR
- Utilize BCAR metrics as part of the capital process
- Review diversification assumptions

Willis Towers Watson

AM Best Rating Process

- Our focus with an internal capital model is:
  - Balance Sheet Strength
  - Operating Performance

A.M. Best's Rating Process
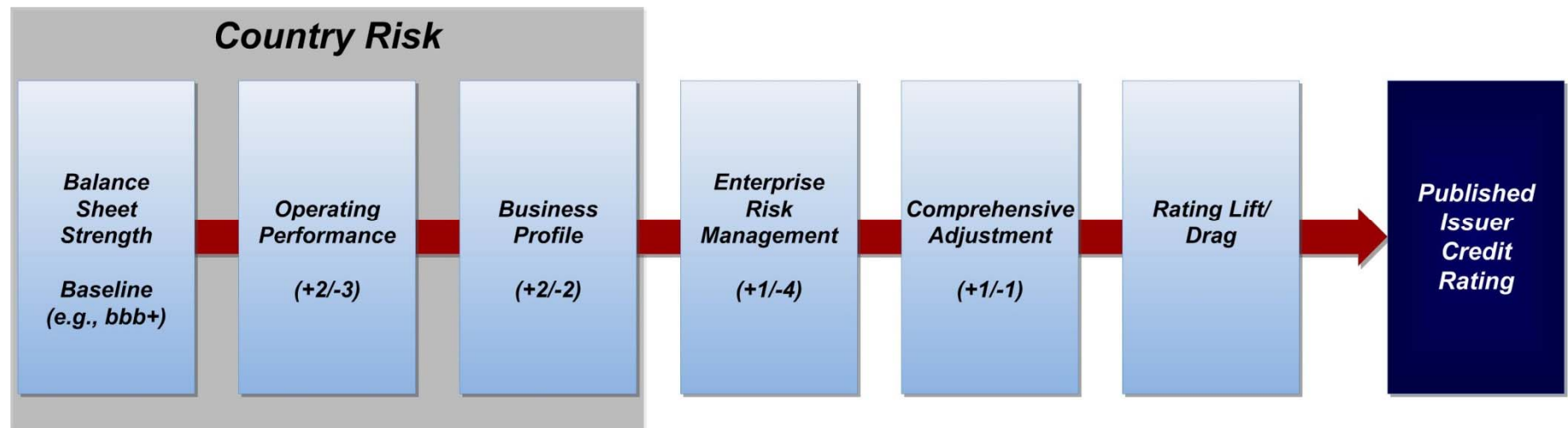
How do we get from a stochastic capital model to BCAR?

Asset and Credit Risk

Fixed Income Credit Risk	Equity Risk	Interest Rate Risk	Credit Risk Reinsurers

- Utilize the capital model Economic Scenario Generator (ESG) for asset risk models derived and tailored to company-specific holdings
  - Incorporates stock portfolio beta, bond value and reinsurance recoverable by rating class

Underwriting Risk

| Reserve Risk	Prospective U/W Risk	Net Catastrophe Risk

- Underwriting and reserving risk models derived from company historical loss triangles and underwriting results
- Cat results not simulated in BCAR

Willis Towers Watson

Example Company

- P&C Personal lines carrier

Total Assets	$495MM
Total Liabilities	$271MM
Statutory Surplus	$224MM
Gross Earned Premiums	$285MM
Expected Loss Ratio	69.7%
Expected Combined Ratio	94.5 %
Premium / Surplus	1.3
Required Capital at 99.5%	152MM

Surplus Distribution
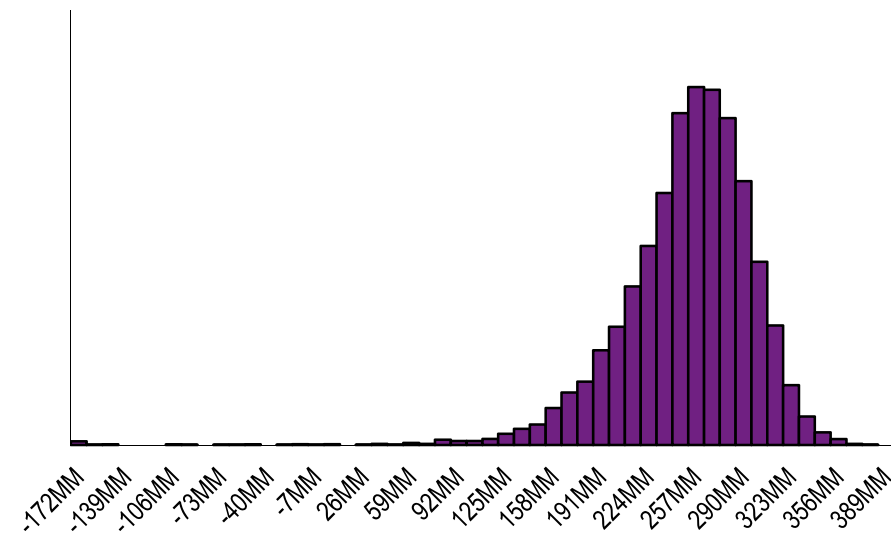
	Auto	Home
Reserves	85MM	25MM
Premiums	180MM	90MM

Asset Results

- Should be the most straight forward of the risks to calculate
- Economic scenario generator should produce equity, interest rates, and credit default simulations
- Asset model will need to be able to break out Interest rate risk and default risk

- Holdings for the example company are

Asset	Opening Market Value
Muni	150MM
Government	45MM
Corporate	150MM
Equity	100MM

Asset risk

Bond Default Results:

Rating	Market Value	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8
Aaa	42,000.00	294.00	420.00	504.00	504.00	420.00
Aa	111,000.00	777.00	1,110.00	1,332.00	1,332.00	1,110.00
A	60,000.00	420.00	600.00	720.00	720.00	600.00
Baa	60,000.00	2,520.00	3,180.00	3,480.00	3,540.00	3,780.00
Ba	18,000.00	2,070.00	2,358.00	2,448.00	2,466.00	2,574.00
B	9,000.00	2,124.00	2,250.00	2,295.00	2,304.00	2,340.00
BCAR Total	300,000.00	8,205.00	9,918.00	10,779.00	10,866.00	10,824.00
Calculated Factor		2.7%	3.3%	3.6%	3.6%	3.6%
Modeled results		11,217.22	21,259.95	24,580.90	25,770.88	32,286.53

- Bond model shows significantly more risk then the BCAR model
  - Modeled results include different recovery factors and transitions for Muni bonds (50% of bond portfolio)
- Equity Result are very similar to BCAR

Equity Results:

| Value (000s)	Beta	Factors	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8
			0.25	0.38	0.43	0.44	0.48
100,000	0.97	BCAR	24,250.00	36,860.00	41,710.00	42,680.00	46,560.00
		Modeled	23,520.06	36,022.45	40,727.33	42,543.97	46,836.43

Reinsurance Default Risk

- Defaults are calculated on reinsurance on balance sheet

- BCAR looks at reinsurance default on reinsurance recoverables already on the balance sheet

- Does not consider new contracts or future recoverables

- Sample company has 38M in reinsurance recoverables
  - 50% A
  - 50% Baa

- Model results in the example are higher then BCAR
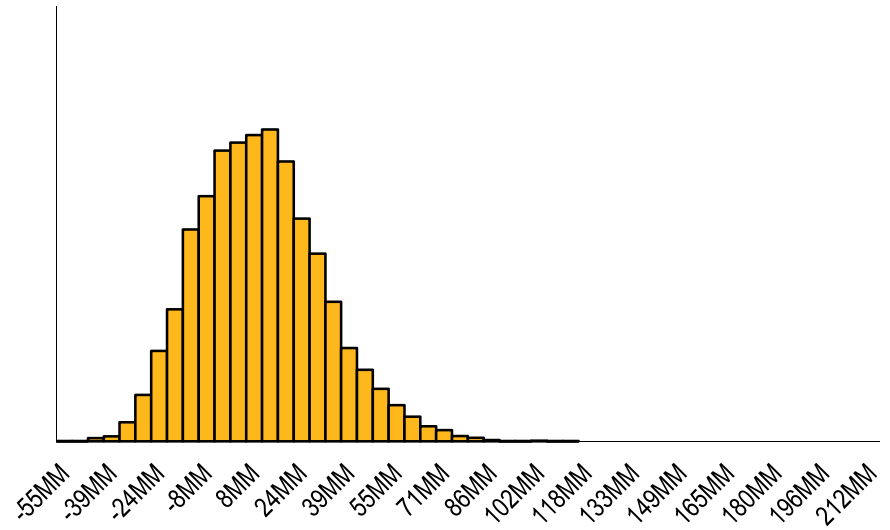 - High concentration, only two reinsurers in this example

	BCAR	Modeled
VaR 95	1,045	1,943
VaR 99	1,615	5,364
VaR 99.5	2,033	6,856
VaR 99.6	2,166	7,367
VaR 99.8	2,603	9,008

Reserve risk

**Reserve Distribution**
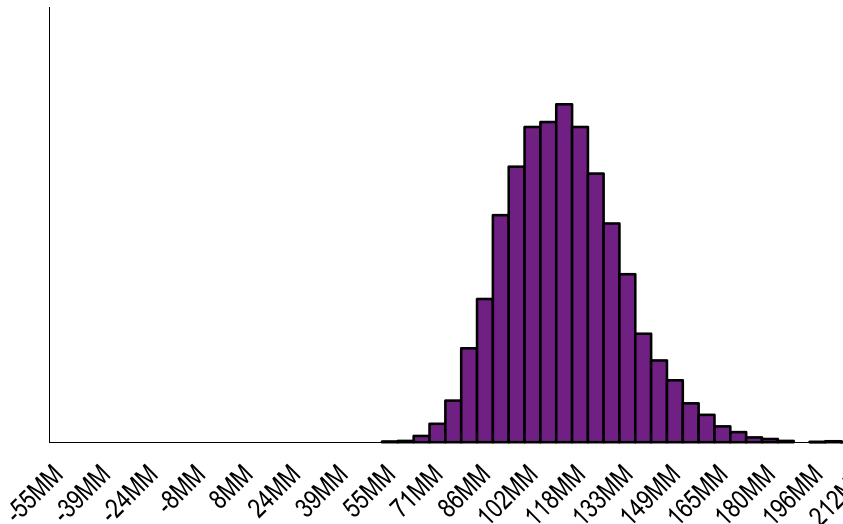
Reserve Development

- Reserve Distributions is shown as total of all future payments
- SBCAR looks at the reserve development compared with the booked best estimates (110M)
 - (Booked Reserve – Future Payments) * -1

	($000s)	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8
BCAR	Auto	20,570	30,940	35,020	36,210	40,375
	Home	4,225	8,750	7,025	7,275	8,000
	Total	**24,795**	**39,690**	**42,045**	**43,485**	**48,375**
Model	Auto	42,168	60,315	66,365	67,899	72,428
	Home	7,773	10,841	12,194	12,505	13,260
	Total	**44,164**	**62,621**	**68,101**	**70,368**	**76,305**

Willis Towers Watson

Prospective Underwriting Risk

Loss Distribution
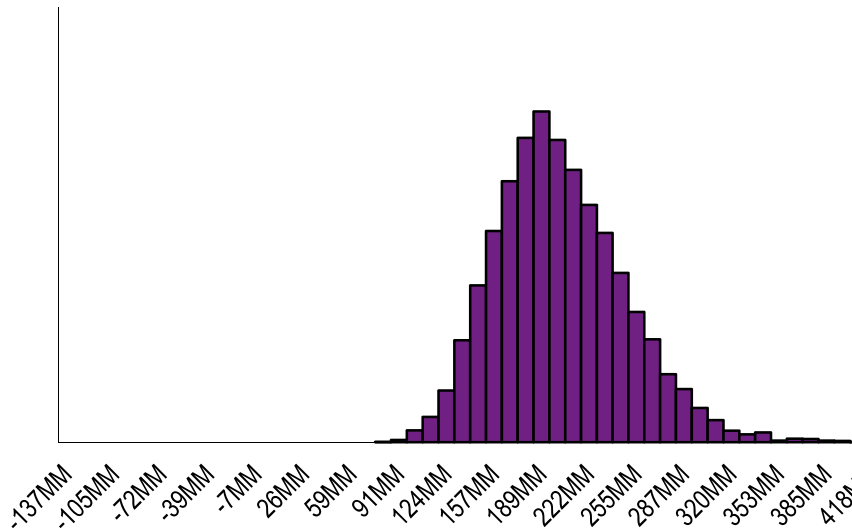
Underwriting Results
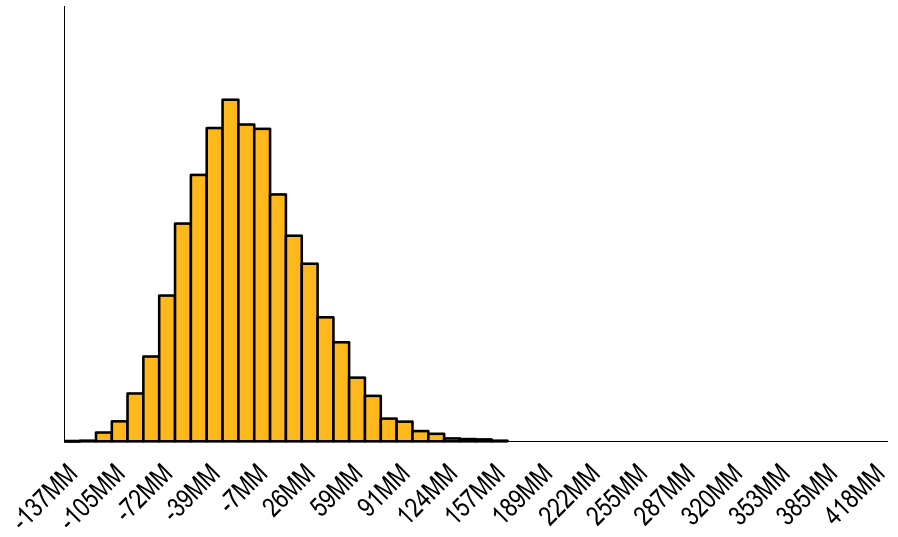
- Most similar to views from the capital model
- Capital model will typically show premiums – losses on calendar year
- BCAR looks at the Premiums – Losses – Expenses for a single year
    - (Premiums – Losses - Expenses) * -1

	($000s)	VaR 95	VaR 99	VaR 99.5	VaR 99.6	VaR 99.8
BCAR	Auto	38,417	57,706	65,260	67,672	74,583
	Home	22,584	34,318	38,979	40,426	44,927
	Total	**61,001**	**92,024**	**104,240**	**108,098**	**119,510**
Model	Auto	56,270	84,949	98,081	101,283	111,037
	Home	3,733	15,411	19,599	21,401	25,094
	Total	**51,363**	**86,302**	**100,272**	**105,784**	**119,066**

Summary of Results

Results at VaR 99.5

	Capital Model	Modeled BCAR	BCAR
Bond Default	6,861	24,580	10,779
Equity	23,640	36,022	36,860
Reins Credit Risk	21,307	6,856	2,033
Reserve	60,284	68,101	42,045
Premium	93,910	100,272	104,240

- The capital model allocated 99.5 VaR using a VaR allocation formula
- The capital model include more explicit diversification between risks
- The comparison between the model and BCAR will show difference in parameter and correlation assumptions
- The capital model allocates less capital to default and equity results
- Reinsurance credit risk for capital model includes prospective risk

Final Thoughts

- You can replicate results from BCAR with your capital model
  - Do understand why you have different results?
  - Provides an additional metric for comparison purposes
- Ensures completeness of your capital modeling efforts
- Better understand diversification and stand alone results
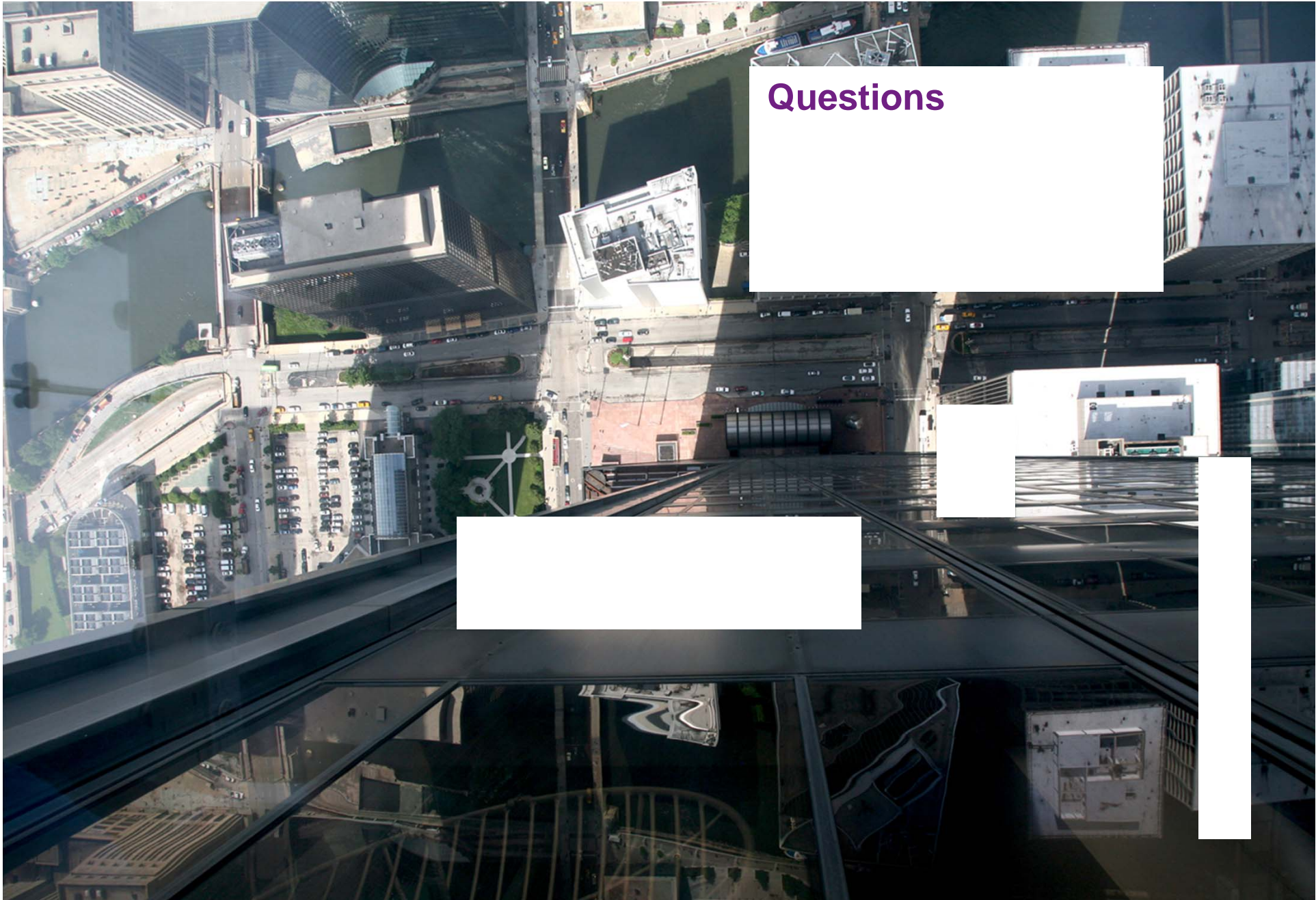
Questions

Willis Towers Watson

Willis Towers Watson disclaimers

- This analysis has been prepared by Willis Limited and/or Willis Re Inc. and/or the "Willis Towers Watson" entity with whom you are dealing ("Willis Towers Watson" is defined as Willis Limited, Willis Re Inc., and each of their respective parent companies, sister companies, subsidiaries, affiliates, Willis Towers Watson PLC, and all member companies thereof) on condition that it shall be treated as strictly confidential and shall not be communicated in whole, in part, or in summary to any third party without written consent from Willis Towers Watson.

- Willis Towers Watson has relied upon data from public and/or other sources when preparing this analysis. No attempt has been made to verify independently the accuracy of this data. Willis Towers Watson does not represent or otherwise guarantee the accuracy or completeness of such data nor assume responsibility for the result of any error or omission in the data or other materials gathered from any source in the preparation of this analysis. Willis Towers Watson shall have no liability in connection with any results, including, without limitation, those arising from based upon or in connection with errors, omissions, inaccuracies, or inadequacies associated with the data or arising from, based upon or in connection with any methodologies used or applied by Willis Towers Watson in producing this analysis or any results contained herein. Willis Towers Watson expressly disclaims any and all liability arising from, based upon or in connection with this analysis. Willis Towers Watson assumes no duty in contract, tort or otherwise to any party arising from, based upon or in connection with this analysis, and no party should expect Willis Towers Watson to owe it any such duty.

- There are many uncertainties inherent in this analysis including, but not limited to, issues such as limitations in the available data, reliance on client data and outside data sources, the underlying volatility of loss and other random processes, uncertainties that characterize the application of professional judgment in estimates and assumptions, etc. Ultimate losses, liabilities and claims depend upon future contingent events, including but not limited to unanticipated changes in inflation, laws, and regulations. As a result of these uncertainties, the actual outcomes could vary significantly from Willis Towers Watson's estimates in either direction. Willis Towers Watson makes no representation about and does not guarantee the outcome, results, success, or profitability of any insurance or reinsurance program or venture, whether or not the analyses or conclusions contained herein apply to such program or venture.

- Willis Towers Watson does not recommend making decisions based solely on the information contained in this analysis. Rather, this analysis should be viewed as a supplement to other information, including specific business practice, claims experience, and financial situation. Independent professional advisors should be consulted with respect to the issues and conclusions presented herein and their possible application. Willis Towers Watson makes no representation or warranty as to the accuracy or completeness of this document and its contents.

- This analysis is not intended to be a complete actuarial communication, and as such is not intended to be relied upon. A complete communication can be provided upon request. Willis Towers Watson actuaries are available to answer questions about this analysis.

- Willis Towers Watson does not provide legal, accounting, or tax advice. This analysis does not constitute, is not intended to provide, and should not be construed as such advice. Qualified advisers should be consulted in these areas.

- Willis Towers Watson makes no representation, does not guarantee and assumes no liability for the accuracy or completeness of, or any results obtained by application of, this analysis and conclusions provided herein.

- Where data is supplied by way of CD or other electronic format, Willis Towers Watson accepts no liability for any loss or damage caused to the Recipient directly or indirectly through use of any such CD or other electronic format, even where caused by negligence. Without limitation, Willis Towers Watson shall not be liable for: loss or corruption of data, damage to any computer or communications system, indirect or consequential losses. The Recipient should take proper precautions to prevent loss or damage – including the use of a virus checker.

- This limitation of liability does not apply to losses or damage caused by death, personal injury, dishonesty or any other liability which cannot be excluded by law.

- This analysis is not intended to be a complete Financial Analysis communication. A complete communication can be provided upon request. Willis Towers Watson analysts are available to answer questions about this analysis.

- Willis Towers Watson does not guarantee any specific financial result or outcome, level of profitability, valuation, or rating agency outcome with respect to A.M. Best or any other agency. Willis Towers Watson specifically disclaims any and all liability for any and all damages of any amount or any type, including without limitation, lost profits, unrealized profits, compensatory damages based on any legal theory, punitive, multiple or statutory damages or fines of any type, based upon, arising from, in connection with or in any manner related to the services provided hereunder.

- Acceptance of this document shall be deemed agreement to the above.