REINSURANCE CREDIT RISK: A MARKET-CONSISTENT PARADIGM FOR QUANTIFYING THE COST OF RISK
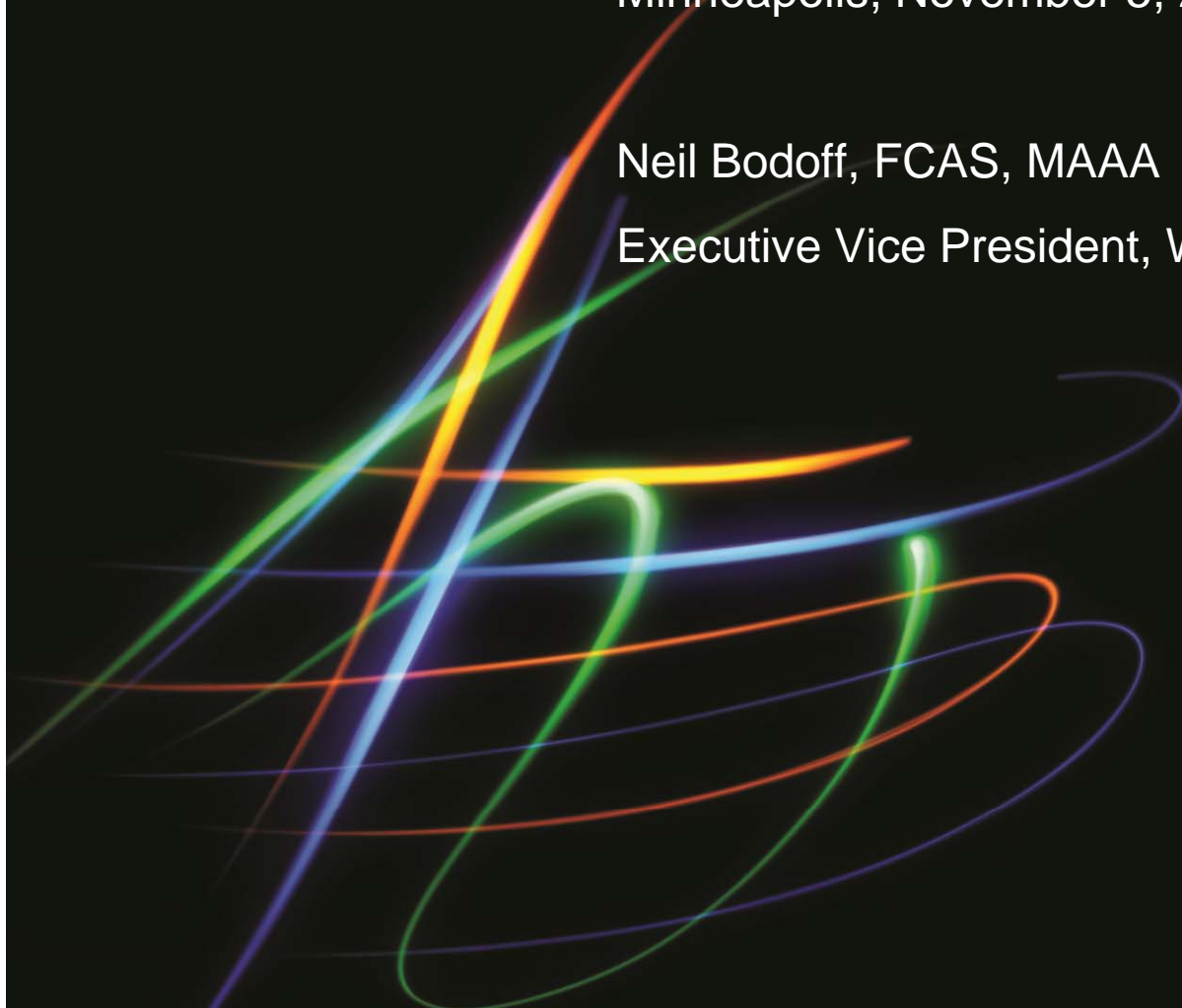
CAS Annual Meeting

Minneapolis, November 5, 2013

Neil Bodoff, FCAS, MAAA

Executive Vice President, Willis Re

Willis Re

MANAGING EXTREMES

Agenda

- Goal

- Background & motivation

- Proposed model

- Discussion: pros and cons

- Conclusion

Goal

- Propose a new approach to managing reinsurance credit risk

  - Quantify

  - Decide

  - Hedge

Goal

- Quantify
  - Use market instruments to estimate the cost of risk

- Decide
  - Incorporate the cost of risk into decision making

- Hedge
  - Consider using market instruments to hedge risk

BACKGROUND & MOTIVATION

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Background & motivation

- Some current practices for managing reinsurance credit risk
  - Approved vs. non-approved
    - Short tail vs. long tail, etc.
  - Binary:
    - Yes or no (or maybe or depends)
  - Ordinal ranking of risk but no dollar cost of risk
  - No connection to price

Background & motivation

- Ramifications of current set up
    - No price penalty or benefit a for a reinsurer that is financially weaker or stronger than others
    - Firm misses out on better prices from non-approved reinsurers
    - Difficult to weigh risk versus reward
    - Difficult to evaluate the cost-benefit of traditional reinsurance versus collateralized reinsurance
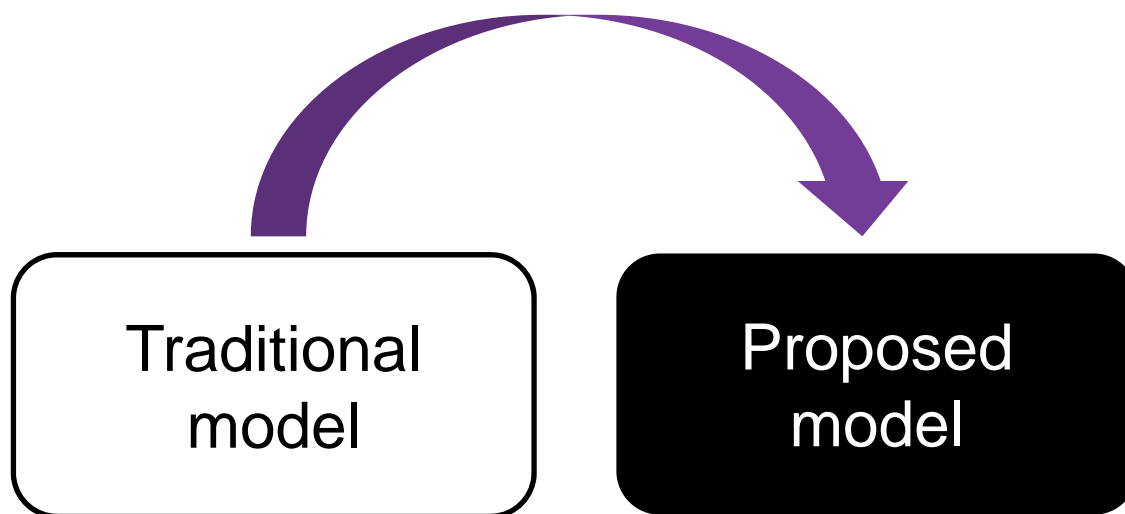
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Traditional model

Proposed model

Proposed model

- Quantify

- Decide

- Hedge

Quantify

- Calculate credit-risk-adjusted price of reinsurance

Quantify

- Quoted reinsurance price

  = credit-risk-adjusted price of reinsurance

    - cost of reinsurance credit risk

Quantify

- Credit-risk-adjusted price of reinsurance

  = quoted reinsurance price

    + cost of reinsurance credit risk

Quantify

- What we observe

Insurer → Quoted price of reinsurance → Reinsurer

Quantify

- **What really is happening**

```
  Insurer  ──── Credit-risk-adjusted price of reinsurance ───▶  Reinsurer
           ◀─── Price discount for reinsurance credit risk ────
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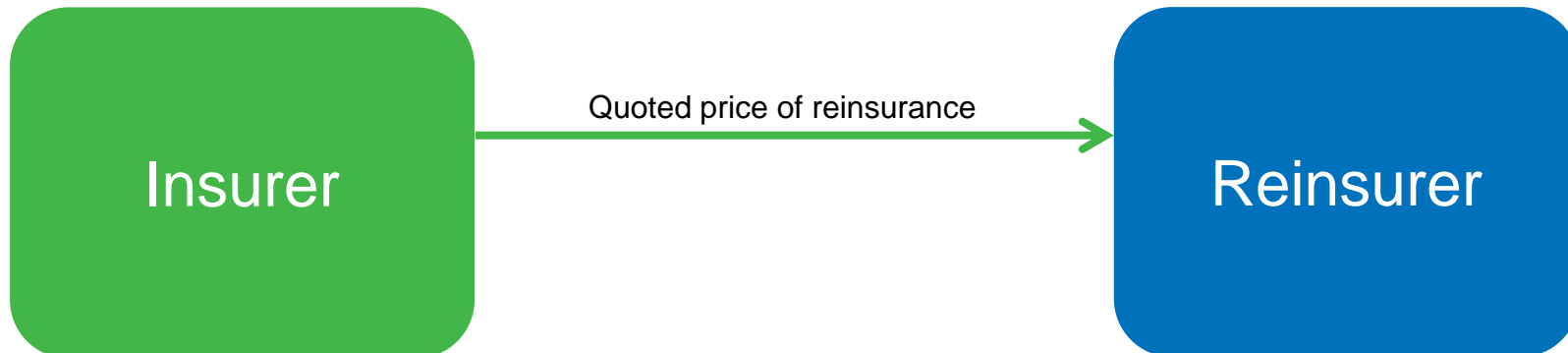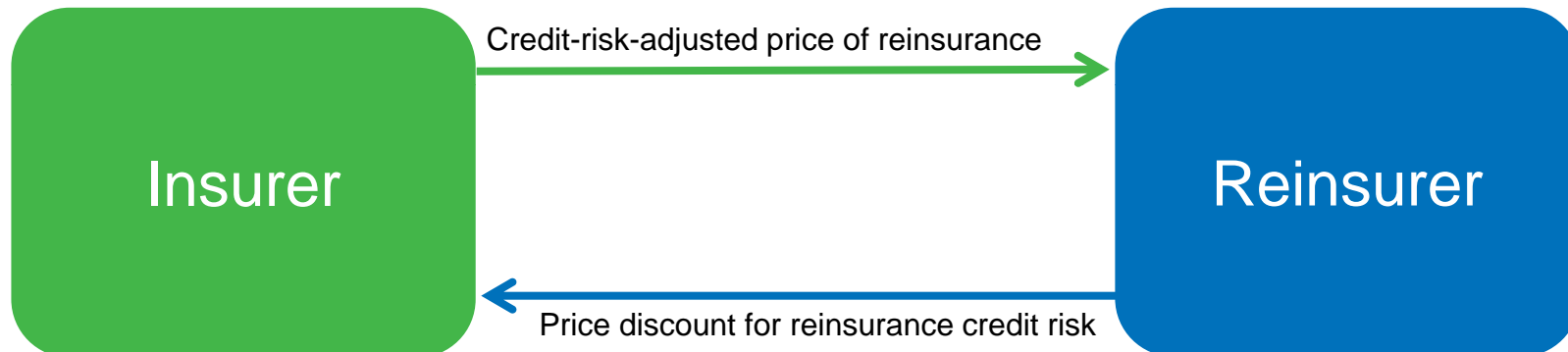
- Quoted price

  = credit-risk-adjusted price of reinsurance

    - cost of reinsurance credit risk

Quantify

- What we observe

Insurer

Reinsurer

Quoted price of reinsurance

Reinsurance coverage

Quantify

- ● What really is happening

Insurer		Reinsurer
	Credit-risk-adjusted price of reinsurance →	
	← Reinsurance protection	
	Toleration of reinsurer's credit risk →	
	← Price discount for reinsurance credit risk	

Quantify

- ## What really is happening

Insurer		Reinsurer
	Credit-risk-adjusted price of reinsurance →	
	← Reinsurance protection	
	Toleration of reinsurer's credit risk →	
	← Price discount for reinsurance credit risk	
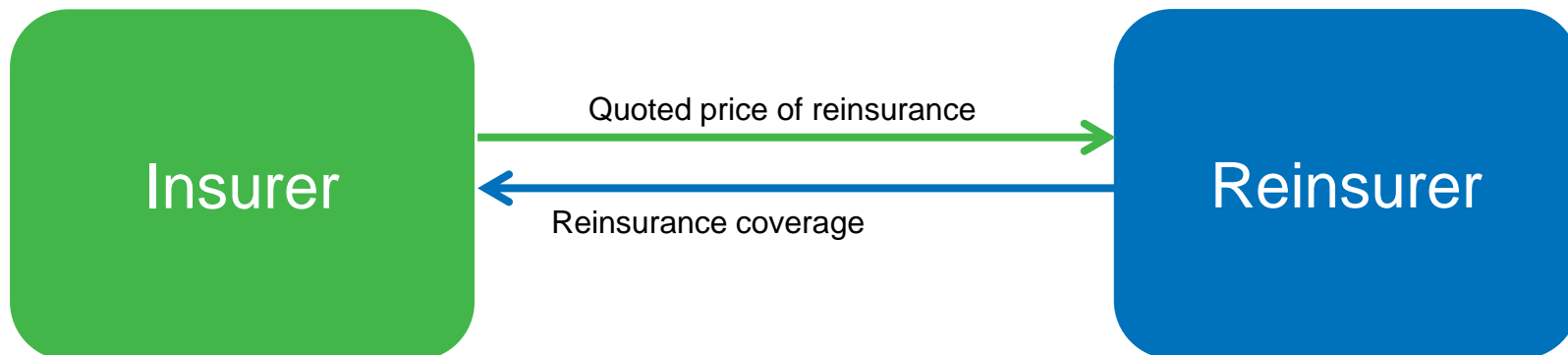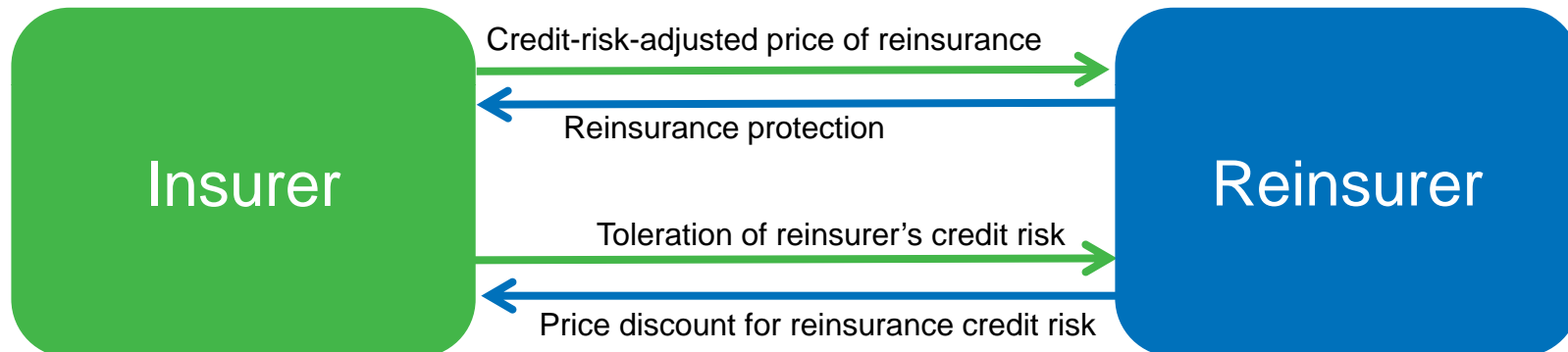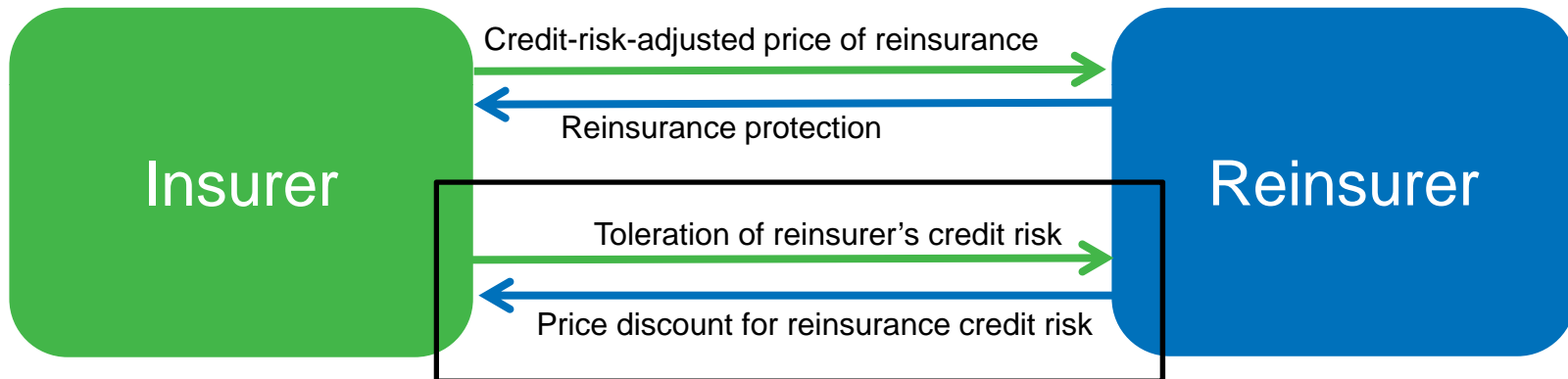
This portion of the transaction varies across reinsurers

No way to compare prices

Quantify

- ## What really is happening

Credit-risk-adjusted price of reinsurance →

Reinsurance protection ←

Insurer

Reinsurer

Toleration of reinsurer's credit risk →

Price discount for reinsurance credit risk ←
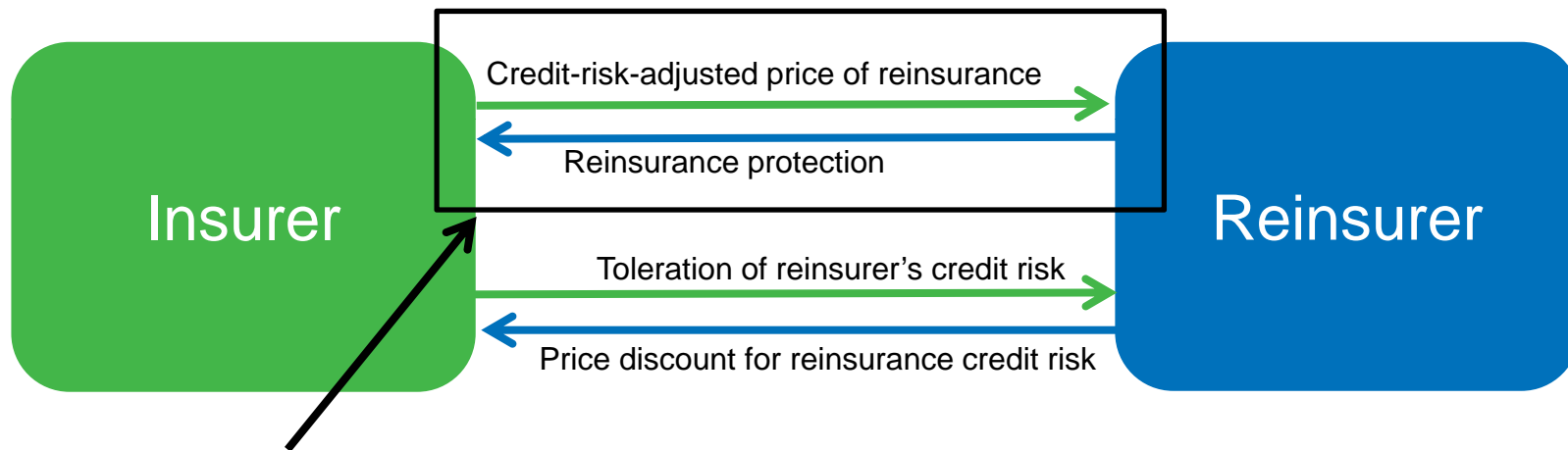
This portion of the transaction does not vary across reinsurers

Compare prices on an apples-to-apples basis

Quantify

- ## What really is happening

Insurer		Reinsurer

Credit-risk-adjusted price of reinsurance →

← Price discount for reinsurance credit risk
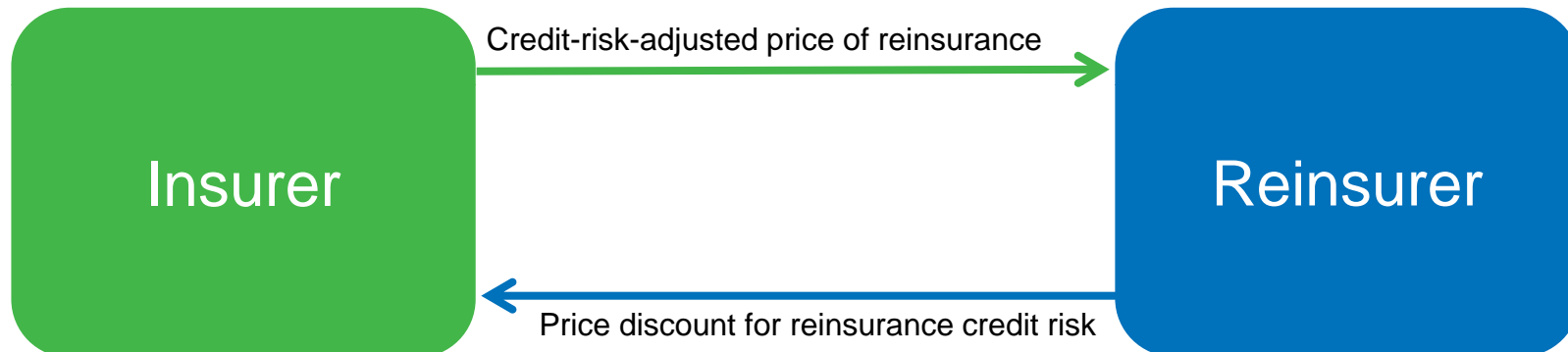
- ## Credit-risk-adjusted price of reinsurance

   = quoted price

   + cost of reinsurance credit risk

Use this metric to compare reinsurance quotes on a consistent basis

Quantify

- How to calculate the cost of reinsurance credit risk?

Quantify

- Use market instruments like credit default swaps (CDS)

  – Example below for discussion purposes

Company Name	1Y CDS Spread bps (as of 28-Sep-2009)
Reinsurer 1	13.25
Reinsurer 2	73.50
Reinsurer 3	102.37
Reinsurer 4	15.00
Reinsurer 5	273.24
Reinsurer 6	26.00
Reinsurer 7	65.24
Reinsurer 8	131.22
Reinsurer 9	95.03
Reinsurer 10	49.30

source: Thomson Reuters

Decide

- Incorporate the cost of credit risk when making comparisons and making decisions

- Example: when comparing reinsurance quotes

	1	2	3 = 1 * 2	4	5	6 = 4 / 10k * 5	7 = 3 + 6	8 = 7 / 1
Reinsurer	Reinsurance Occurrence Limit	Quoted Reinsurance Rate on Line (RoL)	Quoted Reinsurance Price	Price of CDS (in basis points)	Notional amount of CDS protection	Price of one year CDS protection	Credit risk adjusted reinsurance price	Credit risk adjusted reinsurance RoL
Reinsurer 1	100,000,000	6.00%	6,000,000	13.250	100,000,000	132,500	6,132,500	6.13%
Reinsurer 8	100,000,000	5.50%	5,500,000	131.220	100,000,000	1,312,200	6,812,200	6.81%

- Time to modify traditional "approved list"?

Reinsurer	Status	1 Reinsurance Occurrence Limit	2 Quoted Reinsurance Rate on Line (RoL)	3 = 1 * 2 Quoted Reinsurance Price	4 Price of CDS (in basis points)	5 Notional amount of CDS protection	6 = 4 / 10k * 5 Price of one year CDS protection	7 = 3 + 6 Credit risk adjusted reinsurance price	8 = 7 / 1 Credit risk adjusted reinsurance RoL	9 Share authorized by reinsurer
Reinsurer 4	Approved	100,000,000	8.50%	8,500,000	15.000	100,000,000	150,000	8,650,000	8.65%	50.00%
Reinsurer 9	Approved	100,000,000	7.00%	7,000,000	95.030	100,000,000	950,300	7,950,300	7.95%	50.00%
Reinsurer 8	Not Approved	100,000,000	6.50%	6,500,000	131.220	100,000,000	1,312,200	7,812,200	7.81%	50.00%

Decide

- Casualty more complex

  - Multiple future years to worry about

  - Expand view of CDS pricing across various time horizons

  - Example: compare cost of credit risk from 2 reinsurers

Decide

- Reinsurer #1

1	2	3	4	5	6	7	8	9	10	11	12
Time	% Paid	Expected Loss	NPV Expected Loss	Incremental VaR (t)	NPV Incremental VaR(t)	CDS spread (bps): annual price for cover through time t	Number of years need to hold CDS	Interest rate	Discount Factor from time (t) to t=0	Total NPV CDS cost	Total NPV CDS cost (bps) as % of total VaR
1	5%	1,250,000	1,245,268	5,000,000	4,981,072	15.00	1	0.38%	99.62%	7,472	0.75
2	10%	1,250,000	1,227,800	5,000,000	4,911,201	21.50	2	0.90%	98.22%	21,118	2.11
3	25%	3,750,000	3,602,491	15,000,000	14,409,963	22.25	3	1.35%	96.07%	96,186	9.62
4	45%	5,000,000	4,656,854	20,000,000	18,627,418	28.50	4	1.79%	93.14%	212,353	21.24
5	70%	6,250,000	5,594,687	25,000,000	22,378,749	32.25	5	2.24%	89.51%	360,857	36.09
6	85%	3,750,000	3,244,233	15,000,000	12,976,934	33.45	6	2.44%	86.51%	260,447	26.04
7	90%	1,250,000	1,041,014	5,000,000	4,164,056	34.65	7	2.65%	83.28%	100,999	10.10
8	95%	1,250,000	998,178	5,000,000	3,992,713	35.60	8	2.85%	79.85%	113,712	11.37
9	99%	1,000,000	762,677	4,000,000	3,050,707	36.55	9	3.06%	76.27%	100,353	10.04
10	100%	250,000	181,392	1,000,000	725,569	37.50	10	3.26%	72.56%	27,209	2.72
				-							
Total		25,000,000	22,554,595	100,000,000	90,218,380					1,300,707	130.07
								% of NPV Expected Loss		5.8%	

Notes
1 Column 11 = Column 6 * Column 7 /10k * Column 8
2 Column 12 = Column 11 / (Column 5 total / 10k)

Decide

- Reinsurer #2

1	2	3	4	5	6	7	8	9	10	11	12
Time	% Paid	Expected Loss	NPV Expected Loss	Incremental VaR (t)	NPV Incremental VaR(t)	CDS spread (bps): annual price for cover through time t	Number of years need to hold CDS	Interest rate	Discount Factor from time (t) to t=0	Total NPV CDS cost	Total NPV CDS cost (bps) as % of total VaR
1	5%	1,250,000	1,245,268	5,000,000	4,981,072	73.50	1	0.38%	99.62%	36,611	3.66
2	10%	1,250,000	1,227,800	5,000,000	4,911,201	87.00	2	0.90%	98.22%	85,455	8.55
3	25%	3,750,000	3,602,491	15,000,000	14,409,963	101.00	3	1.35%	96.07%	436,622	43.66
4	45%	5,000,000	4,656,854	20,000,000	18,627,418	109.50	4	1.79%	93.14%	815,881	81.59
5	70%	6,250,000	5,594,687	25,000,000	22,378,749	123.50	5	2.24%	89.51%	1,381,888	138.19
6	85%	3,750,000	3,244,233	15,000,000	12,976,934	125.55	6	2.44%	86.51%	977,552	97.76
7	90%	1,250,000	1,041,014	5,000,000	4,164,056	127.60	7	2.65%	83.28%	371,933	37.19
8	95%	1,250,000	998,178	5,000,000	3,992,713	129.23	8	2.85%	79.85%	412,793	41.28
9	99%	1,000,000	762,677	4,000,000	3,050,707	130.87	9	3.06%	76.27%	359,312	35.93
10	100%	250,000	181,392	1,000,000	725,569	132.50	10	3.26%	72.56%	96,138	9.61
					-						
Total		25,000,000	22,554,595	100,000,000	90,218,380					4,974,186	497.42
								% of NPV Expected Loss		22.1%	

Notes

1   Column 11 = Column 6 * Column 7 /10k * Column 8

2   Column 12 = Column 11 / (Column 5 total / 10k)

Hedge

- Proposal (until now)

  - Do quantify the cost of reinsurance credit risk

  - Do include the cost of risk when comparing prices

  - Do use market instruments like CDS to quantify

- But should you actually buy CDS and hedge the risk of reinsurance credit default?

  - Yes, no, or maybe so?

Hedge: 4 (or 5) strategies

- Rely on modeling and capital
  - Don't hedge

- Focus on the tail event
  - Hedge tail risk
  - Otherwise: don't hedge

- Be wary of parameter uncertainty
  - Hedge

- Add value based on theory of the firm
  - Hedge

Hedge: 4 (or 5) strategies

- Rely on modeling and capital
  - Don't hedge

- Focus on the tail event
  - Hedge tail risk
  - Otherwise: don't hedge

- Be wary of parameter uncertainty
  - Hedge

- Add value based on theory of the firm
  - Hedge

Combine long-term strategy from choices above together with a short-term tactics

Hedge

- Also consider "drift"
  - Even if reinsurance credit risk is acceptable now, what if something changes?
  - What if reinsurers sustain downgrades?

- Reinsurance credit risk could drift from low to high
  - If you're hedged then you're OK
  - If not, then … ?

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Discussion: pros and cons

- Critiques

  - Still have counterparty credit risk via the provider of the credit risk protection

  - Basis risk: bond default vs. reinsurance default and holding company versus operating company

  - Basis risk: priority of payments and recovery rates

  - Reinsurance credit risk emanates not just from ability to pay but also form willingness to pay

  - Market prices of credit instruments show volatility and noise

  - Not all reinsurers have actively traded credit instruments

CONCLUSION

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Conclusion

- Quantify

  - Use market instruments such as CDS to quantify the cost of risk

- Decide

  - Incorporate the cost of risk into decision making

- Hedge

  - Consider using CDS instruments to actively hedge the risk of reinsurance credit default or other "credit events"

Questions & comments?

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