



Reinsurance Counterparty Risk

A Transition Matrix / Recovery Rate Approach

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TOWERS WATSON 

Introduction

- What is reinsurance counterparty risk?
- Traditional approaches to quantifying reinsurance counterparty risk
- Benefits of reinsurance counterparty risk analysis

What is reinsurance counterparty risk?

- Counterparty risk
 - *“The risk to each party of a contract that the counterparty will not live up to its contractual obligations...In most financial contracts, counterparty risk is also known as “default risk”.”*¹
 - *“Credit risk...the risk that the issuer of a fixed income security may default.”*²
- Reinsurance counterparty risk
 - The risk that ceded reinsurance balances will not be collected
 - Insurance companies’ greatest counterparty risk is usually in non-collection of ceded balances

Risk of greater uncollectible reinsurance than anticipated

¹www.investopedia.com definition

²Fabozzi, *Handbook of Fixed Income Securities*

Traditional approaches to quantifying reinsurance counterparty risk

- Schedule F Penalty
 - A Statutory accounting approach to quantifying uncollectible reinsurance
 - Authorized vs. unauthorized; items in dispute; overdue amounts
 - Statutory accounting approach; little tie to actual counterparty risk
 - Intended as a minimum “bad debt reserve”
- Significant reinsurers’ current AM Best ratings
 - Better tie to current financial strength, but usually a qualitative approach
 - Ratings change over time (usually down)
 - No available measures of how they change or what happens in default

Difficult to create a distribution of results

Benefits of reinsurance counterparty risk analysis

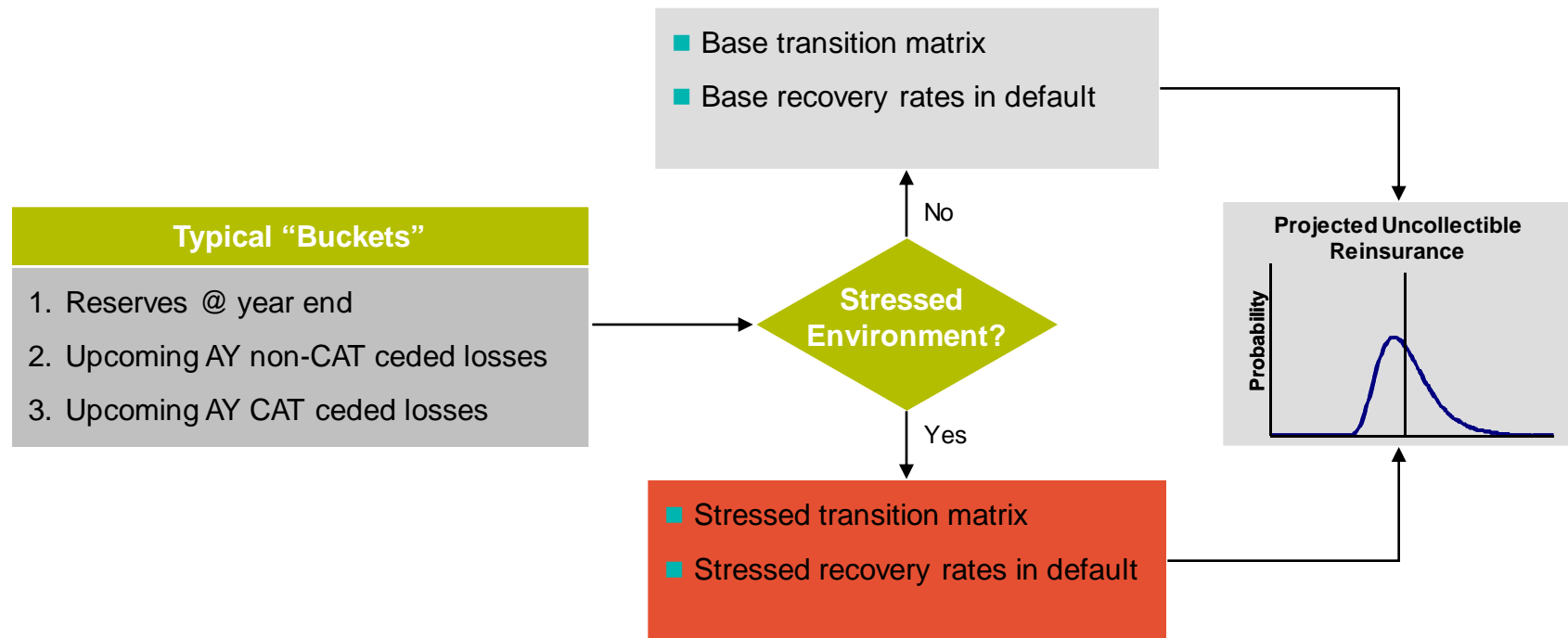
- Incorporation into economic capital modeling work
 - Ability to quantify effect of correlations with other risk types (e.g. catastrophe risk)
- Introduce/Verify a more robust bad debt reserve
 - Schedule F penalty has little to do with actual counterparty risk
- Support Statement of Actuarial Opinion
 - NAIC annual statement instructions require due diligence and comment on reinsurance collectability
- Answer key questions
 - How collectible are ceded reserves?
 - Does current reinsurance structure actually protect surplus?
 - How variable is bad debt? What does a 1 in 100 year event look like?
 - How could systematic risks affect ceded balances?

Modeling Reinsurance Counterparty Risk

- Overview
- Stressed Scenarios
- Transition Matrix
- Recovery Rates in Default

Reinsurance Counterparty Risk Analysis — Overview

- Reinsurance Counterparty Risk can be modeled using a transition matrix/recovery rate approach



Reinsurance Counterparty Risk Analysis — Stressed Scenarios

- Stress scenarios triggered by events that would negatively affect the financial soundness of the reinsurance industry:
 - Catastrophic events (natural and manmade)
 - Hurricanes
 - Other (wind)storms
 - Earthquakes
 - Liability catastrophesAggregate industry effect of events over one year considered
 - Financial catastrophe events
 - Bond market downturn
 - Stock market crashEconomic scenarios used to simulate annual returns
- Stress trigger can be due to individual event (huge hurricane), or combination of smaller catastrophic and/or economic events.

Once triggered, stressed scenario applies for one period only

Reinsurance Counterparty Risk Analysis — Transition Matrix

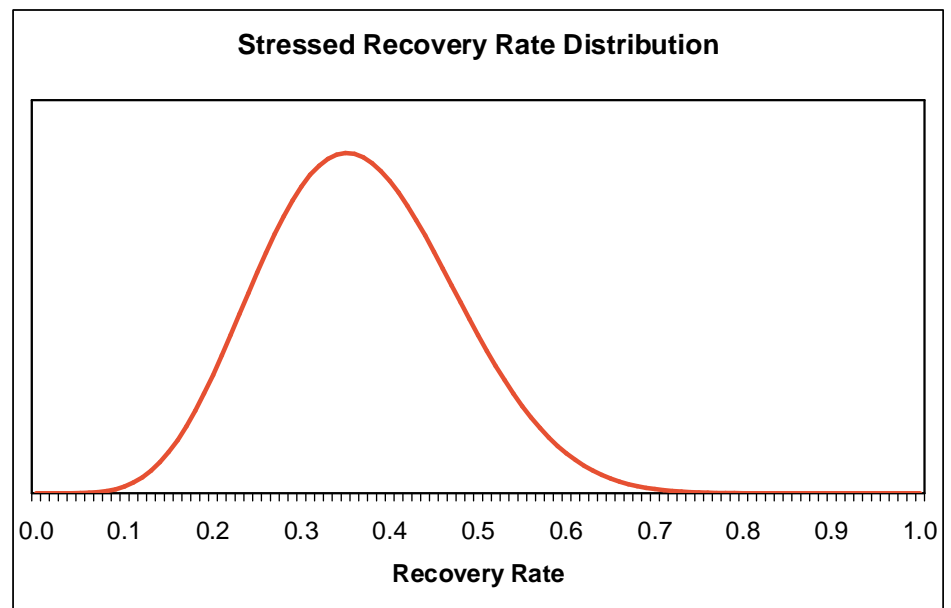
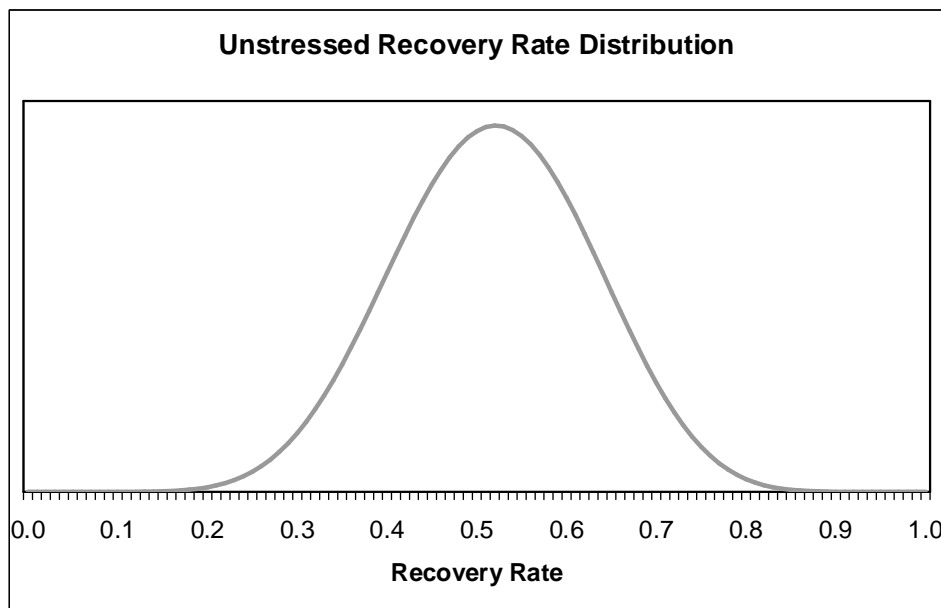
- Example one year base and stressed matrices

Base Transition Rates				
From/to	A	B	C	Default
A	90.0%	5.0%	3.0%	2.0%
B	2.0%	80.0%	10.0%	8.0%
C	1.0%	4.0%	60.0%	35.0%

Stressed Transition Rates				
From/to	A	B	C	Default
A	45.0%	24.5%	19.0%	11.5%
B	1.5%	40.0%	35.5%	23.0%
C	0.5%	1.5%	30.0%	68.0%

Reinsurance Counterparty Risk Analysis — Recovery Rates

- Recovery Rate = Proportion of debt recovered in default (complement of LGD)
- Average close to 50% over time; individual default situations vary
- Worse in years when defaults are more frequent (stress scenarios)
- Example graphs of base and stressed recovery rate distributions below



Numerical Example

Reinsurance Counterparty Risk Analysis — Numerical Example

- Example Company – simple reinsurance structure
 - 3 Reinsurers – 2 strong; 1 weak
 - \$300 Reserve balance with each reinsurer; \$900 total ceded reserves
 - Reserve balances all repaid within three years:
 - \$100 per year for reinsurers 1 and 3
 - \$150/\$100/\$50 for reinsurer 2

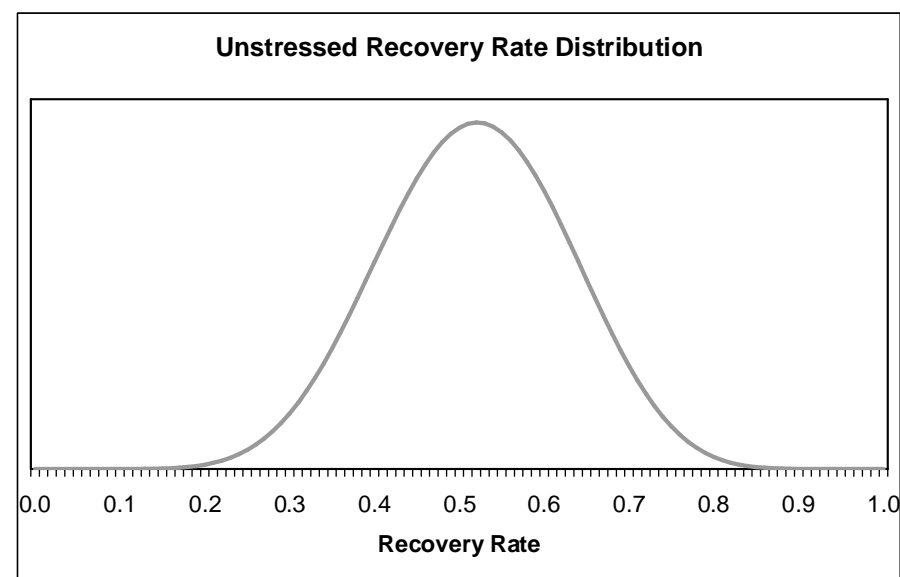
Reinsurer	Beginning Rating	Beginning Reserve Balance
Reinsurer 1	A	\$300
Reinsurer 2	A	\$300
Reinsurer 3	C	\$300
Total:		\$900

Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- **Step 1 – Determine Stress Environment**
 - Aggregate catastrophe information
 - Economic scenario information
 - Compare to trigger levels
- **Assume year 1 returns “unstressed”**

Year 1 → Base (Unstressed) Environment

Base Transition Rates				
From/to	A	B	C	Default
A	90.0%	5.0%	3.0%	2.0%
B	2.0%	80.0%	10.0%	8.0%
C	1.0%	4.0%	60.0%	35.0%



Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- **Step 2 – Determine default occurrence**

- Monte Carlo simulation approach
- Transition considered for each company individually
- Only default results in non-payment (transition to lower rating does not directly affect cash flow)

Year 1 Transitions

Base Transition Random Number Ranges				
From/to	A	B	C	Default
A	.000-.900	.900-.950	.950-.980	.980-1.000
B	.000-.020	.020-.820	.820-.920	.920-1.000
C	.000-.010	.010-.050	.050-.650	.650-1.000

Reinsurer	Beginning Rating	Random Number Generated	Transition Result	Ending Rating
Reinsurer 1	A	0.40	A	A
Reinsurer 2	A	0.60	A	A
Reinsurer 3	C	0.70	Default	N/A

Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- **Step 3 – Determine non-payment due to any default; remaining reserves**
- **Monte Carlo simulation approach**
 - Recovery rate assigned to any defaults
 - Payout of ceded reserves required for all companies

Year 1 Payment & Reserve Calculations

Reinsurer	Beginning Reserve Balance	Paid Amount	Ending Reserve Balance
Reinsurer 1	\$300	\$100	\$200
Reinsurer 2	\$300	\$150	\$150
Reinsurer 3	\$300	\$100	\$200

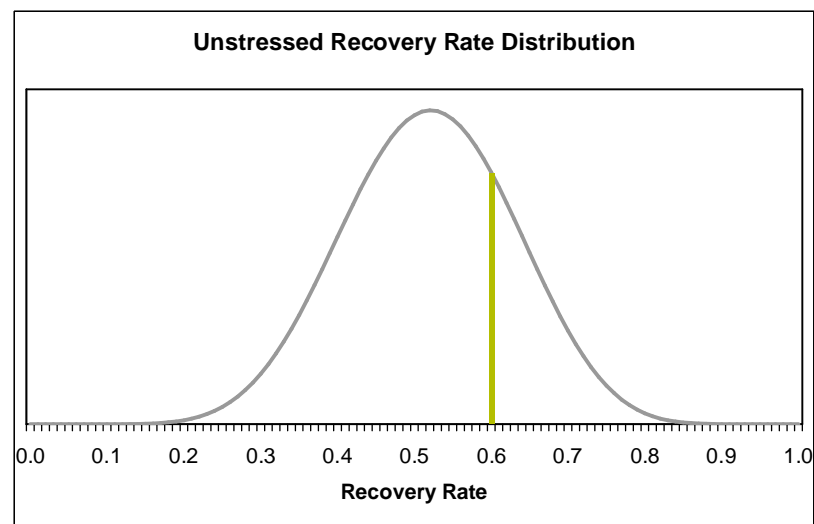
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- Step 3 – Determine non-payment due to any default; remaining reserves
- Non-Payment Amounts are key finding

Year 1 Calculations (cont'd)

Reinsurer	Transition Result	Random Number Generated	Recovery Rate	Recovered Amount	Non-Payment Amount
Reinsurer 1	A	N/A	N/A	\$100	\$0
Reinsurer 2	A	N/A	N/A	\$150	\$0
Reinsurer 3	Default	0.75	0.60	\$60	\$40

$$\begin{aligned}
 &\text{Company 3 Non-Payment} \\
 &= \text{Paid Amt.} \times (1 - \text{Recov. Rate}) \\
 &= \$100 \times (1 - 0.60) \\
 &= \mathbf{\$40}
 \end{aligned}$$

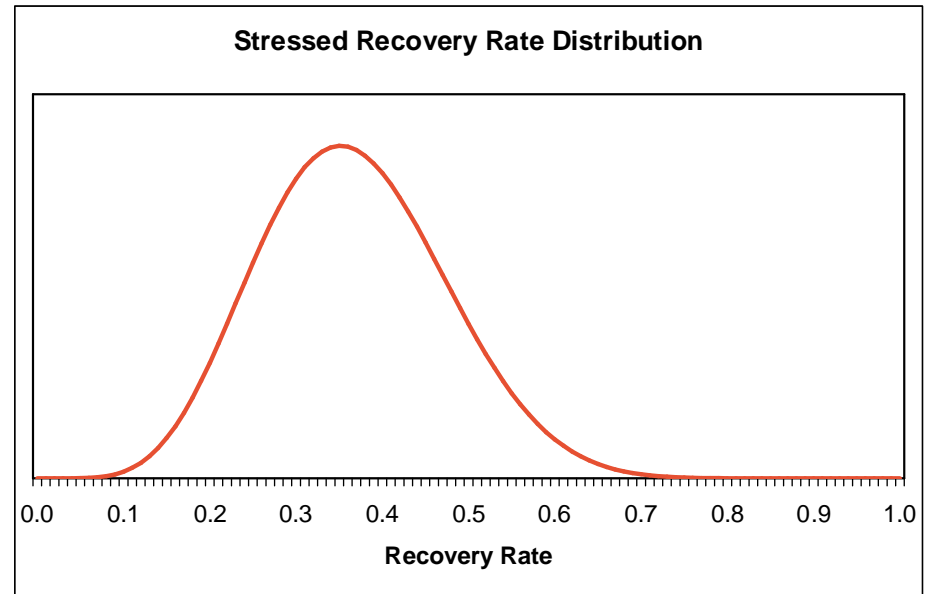


Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- Assume year 2 returns “stressed” (large catastrophe and/or economic downturn)

Year 2 → Stressed Environment

Stressed Transition Rates				
From/to	A	B	C	Default
A	45.0%	24.5%	19.0%	11.5%
B	1.5%	40.0%	35.5%	23.0%
C	0.5%	1.5%	30.0%	68.0%



Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

Year 2 (Stressed) Transitions, Reserve Calculations

Stressed Transition Random Number Ranges				
From/to	A	B	C	Default
A	.000-.450	.450-.695	.695-.885	.885-1.000
B	.000-.015	.015-.415	.415-.770	.770-1.000
C	.000-.005	.005-.020	.020-.320	.320-1.000

Reinsurer	Beginning Rating	Random Number Generated	Transition Result	Ending Rating
Reinsurer 1	A	0.50	B	B
Reinsurer 2	A	0.90	Default	N/A
Reinsurer 3	N/A	N/A	Default	N/A

Reinsurer	Beginning Reserve Balance	Paid Amount	Ending Reserve Balance
Reinsurer 1	\$200	\$100	\$100
Reinsurer 2	\$150	\$100	\$50
Reinsurer 3	\$200	\$100	\$100

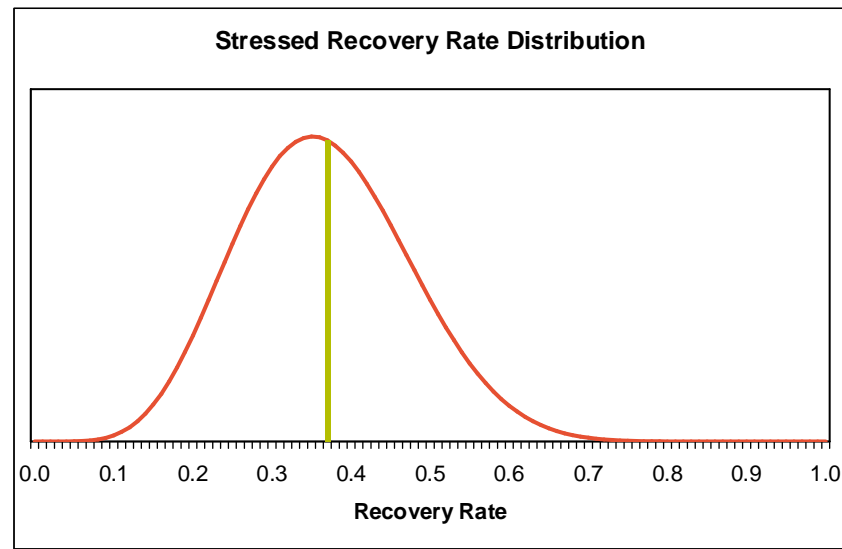
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

Year 2 Calculations (cont'd)

Reinsurer	Transition Result	Random Number Generated	Recovery Rate	Recovered Amount	Non-Payment Amount
Reinsurer 1	B	N/A	N/A	\$100	\$0
Reinsurer 2	Default	0.50	0.38	\$38	\$62
Reinsurer 3	Default	N/A	0.60	\$60	\$40
Total:					\$102

Company 2 Non-Payment
 = Paid Amt. x (1 - Recov. Rate)
 = \$100 x (1 - 0.38)
 = **\$62**

Total Year 2 Non-Payment
 = **\$62 + \$40 = \$102**



Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- Assume year 3 returns “unstressed” environment

Year 3 (Base) Transitions, Reserve Calculations

Base Transition Random Number Ranges				
From/to	A	B	C	Default
A	.000-.900	.900-.950	.950-.980	.980-1.000
B	.000-.020	.020-.820	.820-.920	.920-1.000
C	.000-.010	.010-.050	.050-.650	.650-1.000

Reinsurer	Beginning Rating	Random Number Generated	Transition Result	Ending Rating
Reinsurer 1	B	0.01	A	A
Reinsurer 2	N/A	N/A	Default	N/A
Reinsurer 3	\$0	N/A	Default	N/A

Reinsurer	Beginning Reserve Balance	Paid Amount	Ending Reserve Balance
Reinsurer 1	\$100	\$100	\$0
Reinsurer 2	\$50	\$50	\$0
Reinsurer 3	\$100	\$100	\$0

Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

Year 3 Calculations (cont'd)

Reinsurer	Transition Result	Random Number Generated	Recovery Rate	Recovered Amount	Non-Payment Amount
Reinsurer 1	A	N/A	N/A	\$100	\$0
Reinsurer 2	Default	N/A	0.38	\$19	\$31
Reinsurer 3	Default	N/A	0.60	\$60	\$40
Total:					\$71

$$\begin{aligned}
 &\text{Company 2 Non-Payment} \\
 &= \text{Paid Amt.} \times (1 - \text{Recov. Rate}) \\
 &= \$50 \times (1 - 0.38) \\
 &= \mathbf{\$31}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Company 3 Non-Payment} \\
 &= \text{Paid Amt.} \times (1 - \text{Recov. Rate}) \\
 &= \$100 \times (1 - 0.60) \\
 &= \mathbf{\$40}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Total Year 3 Non-Payment} \\
 &= \mathbf{\$31 + \$40 = \$71}
 \end{aligned}$$

Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- Total non-payments by year create uncollectible reinsurance cash flow

Reinsurer	Beginning Reserve Balance	Non-Payment Amounts				Uncollected % of Beg. Reserve
		Year 1	Year 2	Year 3	Total	
Reinsurer 1	\$300	\$0	\$0	\$0	\$0	0%
Reinsurer 2	\$300	\$0	\$62	\$31	\$93	31%
Reinsurer 3	\$300	\$40	\$40	\$40	\$120	40%
Total	\$900	\$40	\$102	\$71	\$213	24%
PV @ 3%	\$900	\$39	\$96	\$65	\$200	22%

- Company 3: 40% of Beginning reserve uncollected = $(1 - 0.60 \text{ recovery rate})$
- Company 2: 31% of Beginning reserve uncollected $< (1 - 0.38 \text{ recovery rate})$, due to default in year 2, after year 1 \$150 payment fully collected
- \$200 is expected PV bad debt for this trial = 22% of reinsurance reserves
- Many trials create a distribution of expected uncollectible reinsurance
- Above models reserves at time zero only; current year expected/actual ceded amounts should also be considered

Reinsurance Counterparty Risk Analysis — Current & Potential Uses

- Economic capital modeling
- Quantify bad debt due to unrecoverable reinsurance
 - Hold a more appropriate bad debt reserve
 - Satisfy regulators and NAIC Annual Statement instructions
- Acquire a better feel for actual protection provided by past, current, and future reinsurance structures
- Raise awareness of actual financial strength of reinsurers
- Plan for potential uncollectibility/cash flow issues
- Securitization of non-payment amounts
- Commutation valuation
- Analysis of credit risk to a large insured (national account) with multiple primary insurers

Reinsurance Counterparty Risk Analysis — Potential Enhancements

- Momentum-driven transition matrices
- Stochastic payment patterns
- Differing recovery rate distributions by rating preceding default
- Lag between stress trigger and stress scenario occurrence
- Lump-sum settlement in default
- Multiple stress scenario “levels” or continuum of stressed parameters
- Refined ceded balance payment patterns, time horizons
- More well-defined stress and otherwise adjusted transition matrices
- Consideration of amounts in dispute (coverage vs. credit issues)

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Questions / Discussion



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