



Reinsurance Counterparty Risk

A Transition Matrix / Recovery Rate Approach

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2014 Seminar on Reinsurance – New York, NY
May 21, 2014

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
 - A domiciliary/timing approach; little tie to actual counterparty risk
 - Timing component does incorporate willingness to pay
 - 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

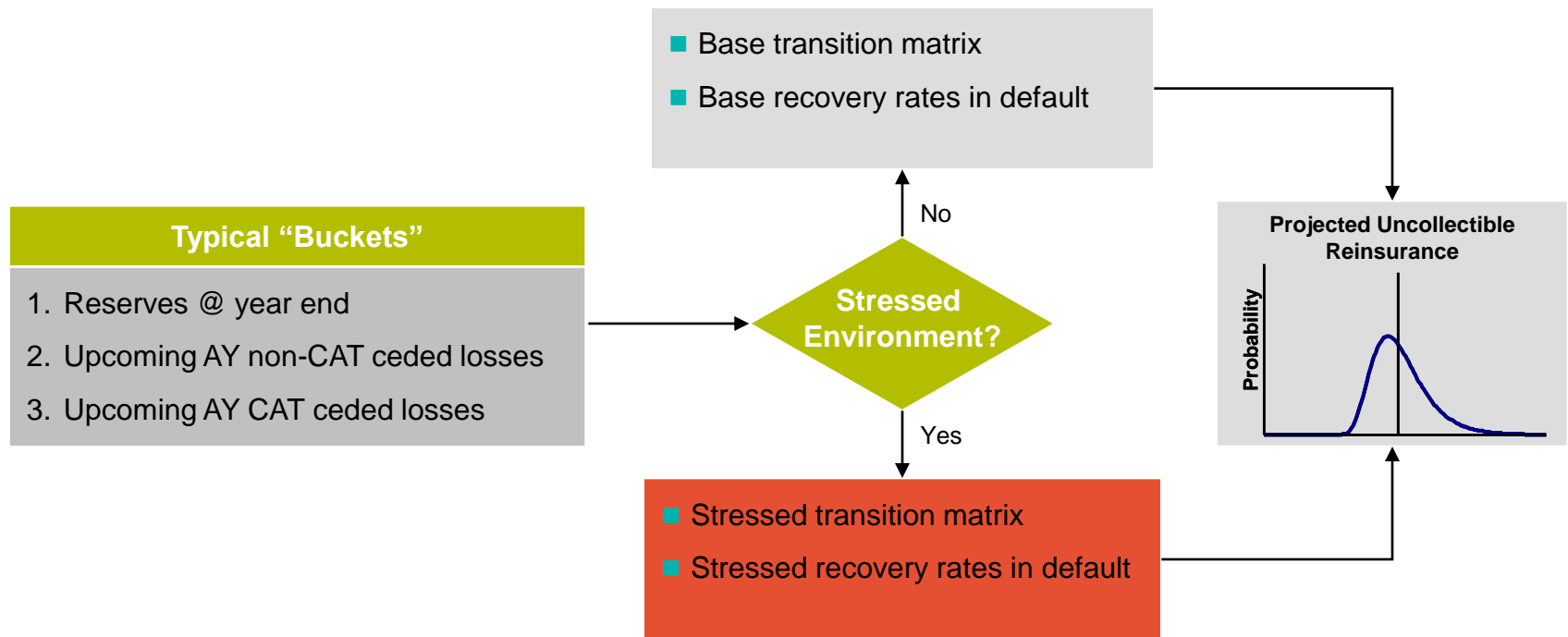
- Incorporation into economic capital modeling work
 - Ability to quantify effect of correlations with other risk types (e.g. catastrophe risk)
- Introduce/Verify a more robust bad debt reserve
 - Schedule F penalty has little to do with actual counterparty risk
- Support Statement of Actuarial Opinion
 - 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

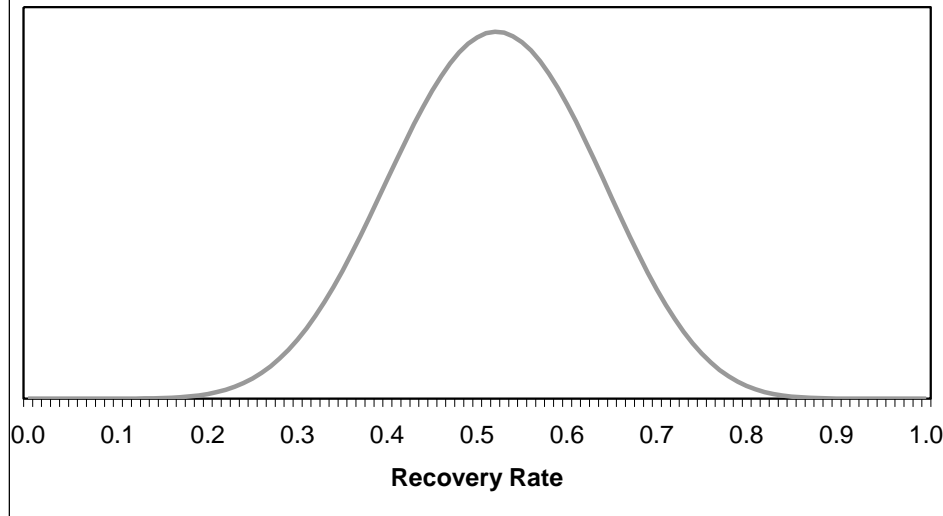
| Base Transition Rates | | | | |
|-----------------------|-------|-------|-------|---------|
| From/to | A | B | C | Default |
| A | 90.0% | 5.0% | 3.0% | 2.0% |
| B | 2.0% | 80.0% | 10.0% | 8.0% |
| C | 1.0% | 4.0% | 60.0% | 35.0% |

| 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% |

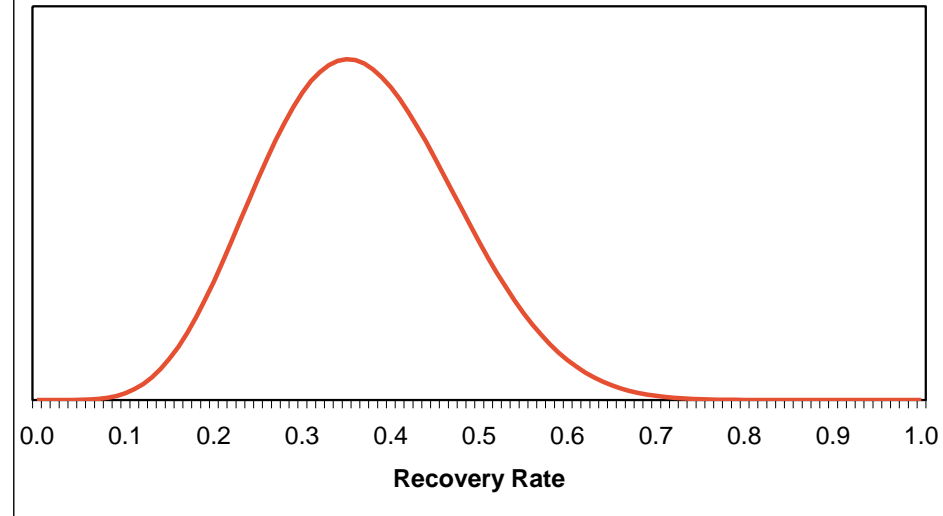
Reinsurance Counterparty Risk Analysis — Recovery Rates

- 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

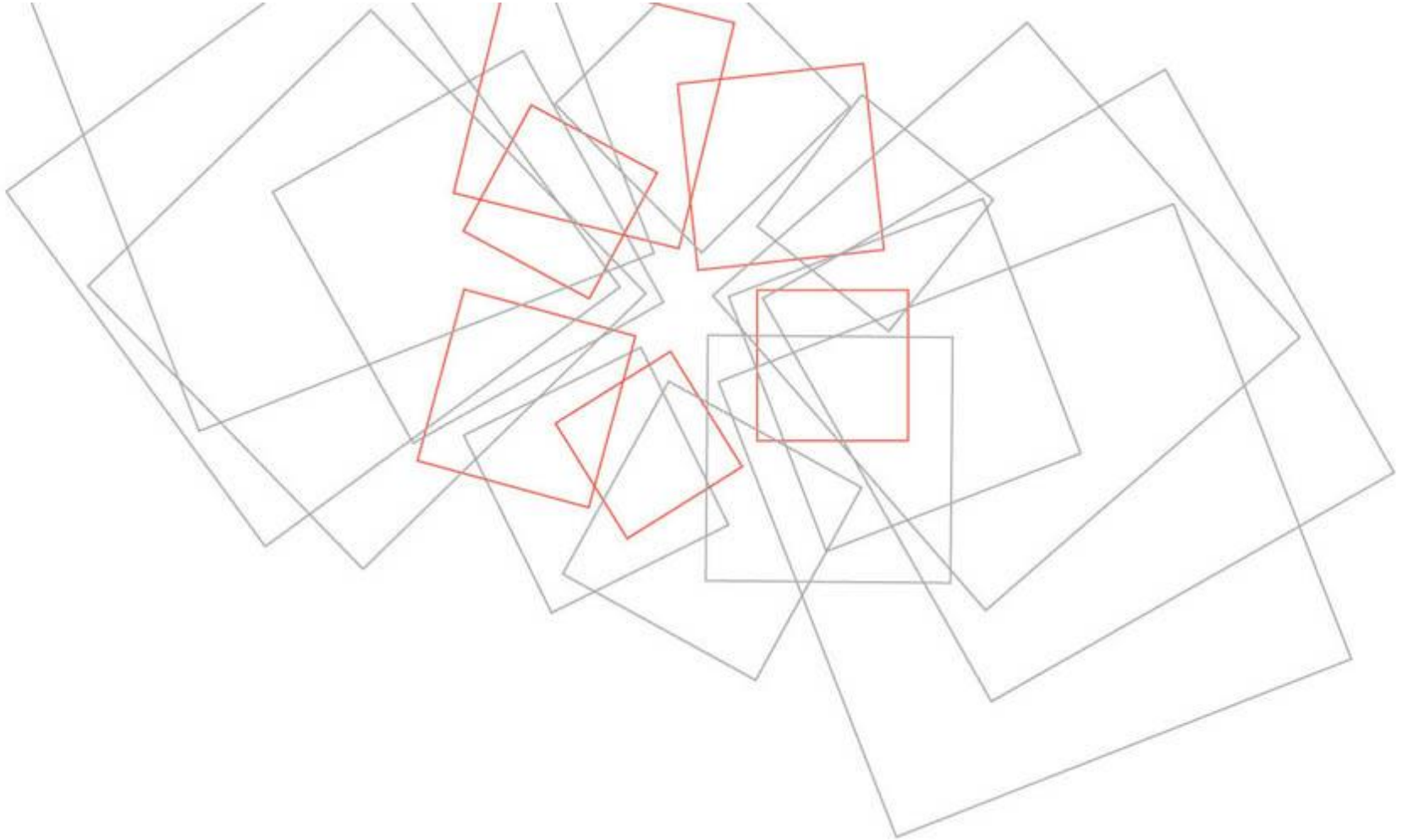
Unstressed Recovery Rate Distribution



Stressed Recovery Rate Distribution



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

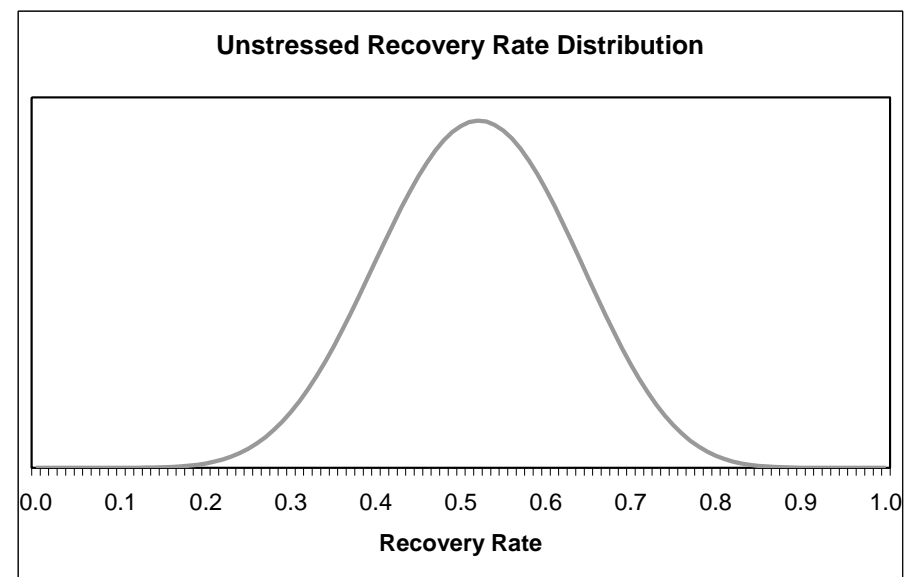
| Reinsurer | Beginning Rating | Beginning Reserve Balance |
|---------------|------------------|---------------------------|
| Reinsurer 1 | A | \$300 |
| Reinsurer 2 | A | \$300 |
| Reinsurer 3 | C | \$300 |
| Total: | | \$900 |

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 |

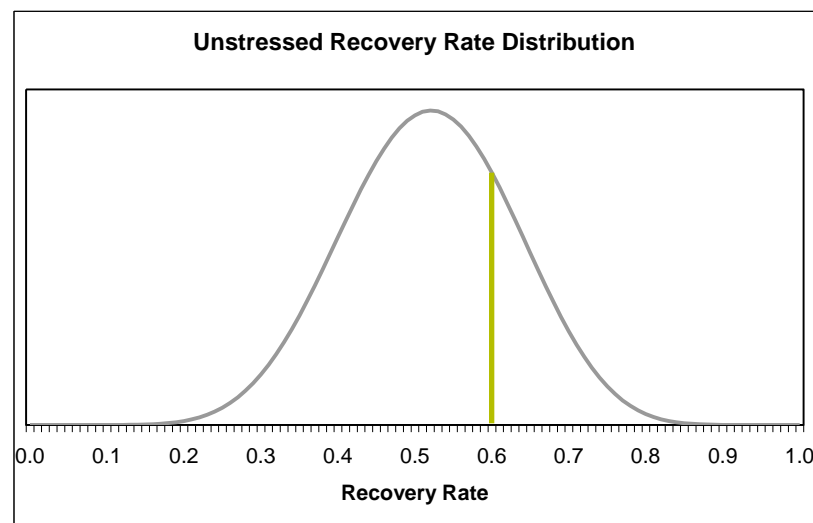
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- 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 |

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

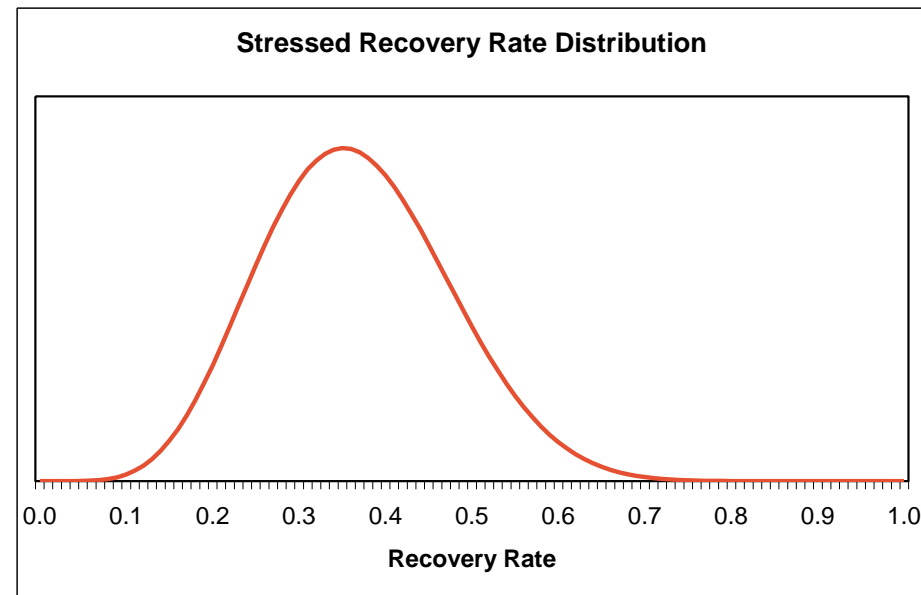


Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- 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 |

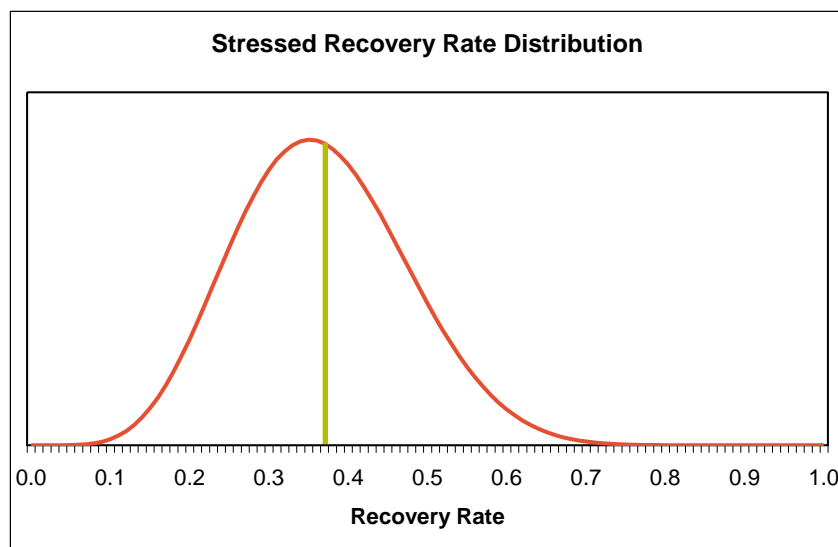
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

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 |

$$\begin{aligned}
 &\text{Company 2 Non-Payment} \\
 &= \text{Paid Amt.} \times (1 - \text{Recov. Rate}) \\
 &= \$100 \times (1 - 0.38) \\
 &= \mathbf{\$62}
 \end{aligned}$$

$$\begin{aligned}
 &\text{Total Year 2 Non-Payment} \\
 &= \mathbf{\$62 + \$40 = \$102}
 \end{aligned}$$



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

Wrap Up

- Current & Potential Uses
- Potential Enhancements
- Contact Details
- Questions / Discussion

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)

Contact Details

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Questions / Discussion

