



Reinsurance Counterparty Risk

A Transition Matrix / Recovery Rate Approach

A presentation at the Seminar on Reinsurance
by Stuart Hayes

May 6, 2010

© 2010 Towers Watson. All rights reserved.

TOWERS WATSON 

Antitrust Notice

- The Casualty Actuarial Society is committed to adhering strictly to the letter and spirit of the antitrust laws. Seminars conducted under the auspices of the CAS are designed solely to provide a forum for the expression of various points of view on topics described in the programs or agendas for such meetings.
- Under no circumstances shall CAS seminars be used as a means for competing companies or firms to reach any understanding – expressed or implied – that restricts competition or in any way impairs the ability of members to exercise independent business judgment regarding matters affecting competition.
- It is the responsibility of all seminar participants to be aware of antitrust regulations, to prevent any written or verbal discussions that appear to violate these laws, and to adhere in every respect to the CAS antitrust compliance policy.

towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

2

Introduction

What is reinsurance counterparty risk?

Traditional approaches to quantifying reinsurance counterparty risk

Why should (re)insurers do reinsurance counterparty risk analysis?

What do rating agencies do?

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

Traditional approaches to quantifying reinsurance counterparty risk

- Schedule F Penalty
 - 100% of uncollateralized unauthorized reinsurance reserves, plus 20% of:
 - Collateralized unauthorized overdue (>90 days) reinsurance reserves
 - Items in dispute
 - Authorized Reinsurance recoverable on either:
 - All items, if $\frac{\text{Reinsurance recoverable on Paid loss+LAE overdue (>90 days)}}{[\text{Total recoverable on paid} + \text{Amounts received in last 90 days}]} >20\%$
 - 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

towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only. 5

Benefits of reinsurance counterparty risk analysis

- Quantify a previously unquantified risk
 - Risks typically modeled in an ERM/EC framework include other major risks P&C Insurance companies face; counterparty risk rarely considered
 - Easily incorporated as part of a broader Economic Capital model
- 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 collectibility
- Answer key questions
 - Are ceded reserves collectible?
 - Does current reinsurance structure actually protect surplus?
 - How variable is bad debt? What does a 1 in 200 year event look like?

towerswatson.com

• How could systematic risks affect ceded balances?

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only. 6

What do rating agencies do?

- Evaluate financial strength of companies who issue debt; ratings actions
 - Generally, financial strength ratings are applied to bondholder counterparty risk (individual bond issuances and general financial strength of issuing company)
 - Upgrades/Downgrades make news, affect stakeholder perceptions of companies
 - Can also be used to model reinsurance counterparty risk
- Study historical financial strength and changes; publish studies/articles
 - Ratings actions over time
 - Overall economic and industry-specific trends
 - Company behavior in default (recovery rates)
- Major Agencies include:
 - S&P
 - Moody's
 - Fitch
 - AM Best (Insurance)

towerswatson.com

7
© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

Modeling Reinsurance Counterparty Risk

Overview

Stressed Scenarios

Transition Matrix

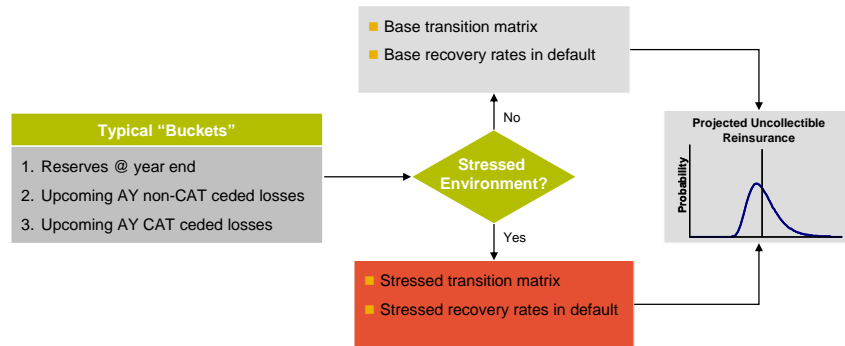
Recovery Rates in Default

towerswatson.com

8
© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

Reinsurance Counterparty Risk Analysis — Overview

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



towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

9

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 catastrophes
 Aggregate industry effect of events over one year considered
 - Financial catastrophe events
 - Bond market downturn
 - Stock market crash
 Economic scenarios used to simulate annual returns
- Stress trigger can be due to individual event (huge hurricane), or combination of smaller catastrophe and/or economic events.

Once triggered, stressed scenario applies for one period only

towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

10

Reinsurance Counterparty Risk Analysis — Transition Matrix

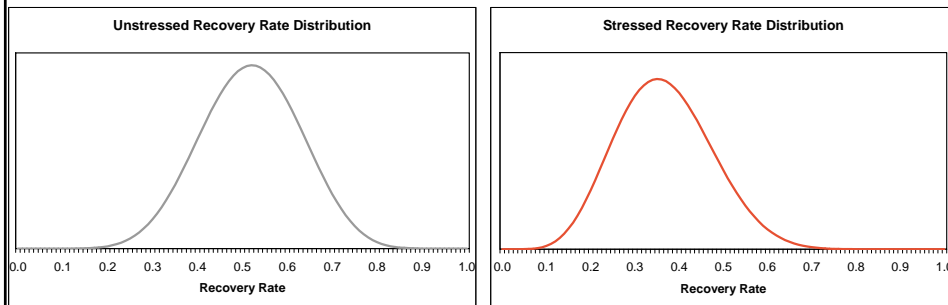
- Example one year base and stressed matrices

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 full debt recovered in default
- 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)

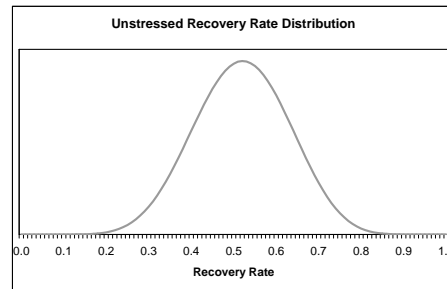
- **Step 1 – Determine Stress Environment**

- 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%



towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

15

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

towerswatson.com

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

16

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

towerswatson.com

17

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

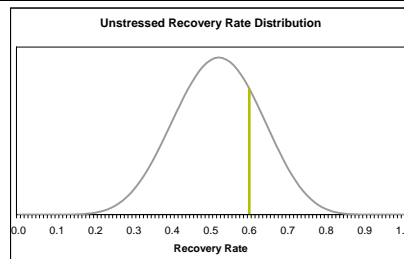
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

- **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

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



towerswatson.com

18

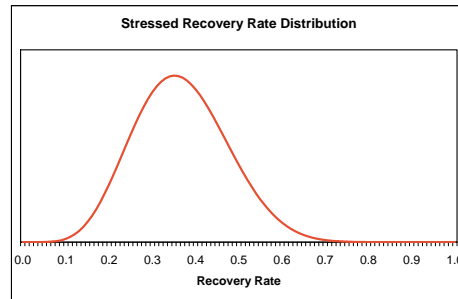
© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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%



towerswatson.com

19

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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

towerswatson.com

20

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

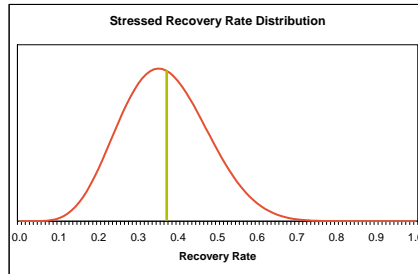
Reinsurance Counterparty Risk Analysis - Numerical Example (cont'd)

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



towerswatson.com

21

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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

towerswatson.com

22

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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

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

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

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

towerswatson.com

23

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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				Total	Uncollected % of Beg. Reserve
		Year 1	Year 2	Year 3			
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 based on this trial = 22% of reinsurance reserves
- Many trials create a distribution of expected uncollectible reinsurance
- Current Year expected/actual ceded amounts should also be considered

towerswatson.com

24

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

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

- Stochastic payment patterns
- Momentum-driven transition matrices
- 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”
- 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

- Stuart Hayes, FCAS, MAAA, CPCU
 - Consulting Actuary
 - 175 Powder Forest Dr. | Weatogue, CT 06089
 - Office: 860-843-7096
 - stuart.hayes@towerswatson.com

towerswatson.com



27

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.

Questions / Discussion



towerswatson.com

28

© 2010 Towers Watson. All rights reserved. Proprietary and Confidential. For Towers Watson and Towers Watson client use only.