

CARe Seminar
Battlebots: Extreme Actuarial Pricing Challenge

June 2019
David Qin, FCAS, MAAA
Renaissance Re



1

Why I chose the black dragon?

- Father of all monsters
- Powerful
- Strong
- Magical
- Immortal
- Guardians of heaven
- Good Fortune
- Luck
- Longevity
- Fertility
- Wisdom



2



Mmmm... Toasty

3

What drives my pricing difference?


Global Financial Crisis

Weather Clash/SCA

Development Method Aggregation

Tail Mood Coffee Trend

Relationship Rate Data Quality



4

What drives my pricing difference?


Global Financial Crisis

Clash/SCA

Development Method Aggregation

Tail Trend

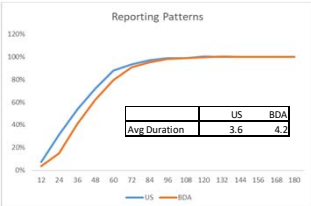
Rate



5

IBNR


Reporting Patterns



| | US | BDA |
|--------------|-----|-----|
| Avg Duration | 3.6 | 4.2 |

Considerations:
Tail
Volatility
Reserving Change
Actual vs Expected Emergence

- On average, it takes about 4 years for losses to be fully reported, slower for Bermuda
- ATA factors are selected based on recent 5 - 7 years, speed up in case reserving



6

Trend

Considerations:
 Goodness of Fit
 US Inflation
 Stanford SCA database
 Exposure Trend

Sev Trend

$y = 6535.3e^{0.0087x}$
 $R^2 = 0.0368$

Freq Trend

$y = 0.0663e^{0.0223x}$
 $R^2 = 0.0297$

- Constant Trend: Severity 2%, Frequency 0% for all years
- Varying Trend: Severity 0%/5%, Frequency 2%/-2%, 2015 inflection year

7

Rate

Considerations:
 Exposure Adjusted
 Projected Rate
 Rate Adequacy
 Market Cycle

Rate Index

- PL rates started to go up after 2017. I expect this momentum to continue.

8

Methods

2

Threshold

G-up
Large +

x

2

Aggregation

1 Segment
8 Segments

x

2

Trend

Constant
Varying

x

5

Weighted

All Years
L 8 Years
L 5 Years
L 8 + GFC
All/5

=

40

Indications

- Which method would you choose?

9


Methods

$2 \times 2 \times 2 \times 5 = 40$ Indications

- Threshold: G-up, Large +
- Aggregation: 1 Segment, 8 Segments
- Trend: Constant, Varying
- Weighted: All Years, L 8 Years, L 5 Years, L 8 + GFC, All/5

Any other methods?

- Large + Attritional: doesn't trend beyond policy limit
- 8 Segments: reflects portfolio mix change
- Varying Trend: reflects the volatility of trend
- All/5: blend of responsiveness and stability




10

Final ELR pick

| Trend | Segments | Threshold | 15 Year (04 - 18) | 8 Year (11 - 18) | 5 Year (14 - 18) | Weighted GFC d All/5 Yr |
|----------|-------------|-----------|-------------------|------------------|------------------|-------------------------|
| Varying | Total 8 LOB | G-up | 67% | 61% | 64% | 66% |
| Varying | Total 1 LOB | G-up | 67% | 64% | 65% | 69% |
| Constant | Total 8 LOB | G-up | 64% | 59% | 61% | 64% |
| Constant | Total 1 LOB | G-up | 65% | 61% | 63% | 66% |
| Varying | Total 8 LOB | Large + | 67% | 62% | 65% | 65% |
| Varying | Total 1 LOB | Large + | 67% | 64% | 66% | 68% |
| Constant | Total 8 LOB | Large + | 65% | 61% | 64% | 64% |
| Constant | Total 1 LOB | Large + | 66% | 63% | 65% | 66% |

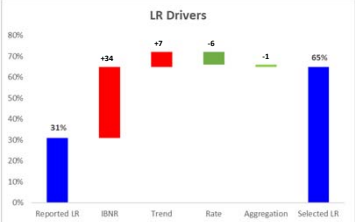
• Parameter Risk




11

LR Drivers

Considerations:
Reserve Adequacy
Rate Adequacy
Residual Trend



• The selected ELR is heavily driven by the experience of the most recent 5 years.



12

Option 1: Pure \$50M QS

QS Considerations:
 Override
 Aggregate Distribution
 CV
 Discounting

\$50M Pure 50% QS Retention


ELR Cod B/Rg R/I Exp LR Cap
 CLR = 65% + 30% + 2.5% + 0% - 0% = 97.5%

Contract Profit/Loss (our line)

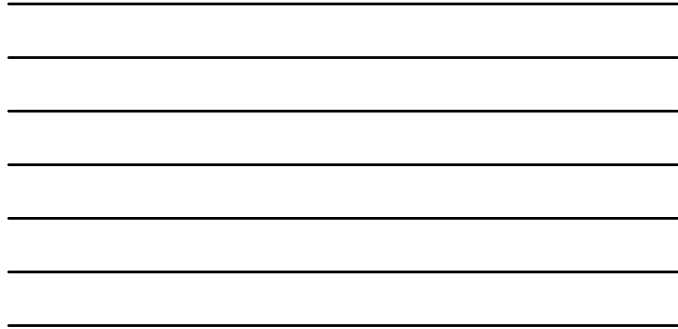
Upside = \$3.2M
 Downside = -\$2.0M

| Years | 0 | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 | Max |
|------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Profit \$m | 15.0 | 8.0 | -4.7 | -7.3 | -10.7 | -14.7 | -16.7 | -19.7 | -22.7 | -27.7 | -43.3 |
| CR% | 70.1% | 90.0% | 109.5% | 115.5% | 123.5% | 129.5% | 133.5% | 139.5% | 145.5% | 155.5% | 182.5% |

• QS – Ceding Commission 30%, LR Cap 200%, Line Size 5%



13



Option 2: QS & XOL

XOL Considerations:
 Rate (hat vs cession)
 Aggregate Distribution
 CV (QS vs XOL)
 Discounting (QS vs XOL)

\$50M \$40 xs \$10m Retention
 \$10M 50% QS Retention


ELR R/C B/Rg R/I Exp LR Cap
 CLR = 80.5% + 4.5% + 10% + 0% - 1% = 94.0%

Contract Profit/Loss (our line)

Upside = \$3.0M
 Downside = -\$1.9M

| Years | 0 | 2 | 5 | 10 | 20 | 50 | 100 | 200 | 500 | 1000 | Max |
|------------|-------|-------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Profit \$m | 10.7 | 2.7 | -3.3 | -7.6 | -12.1 | -18.9 | -22.8 | -26.8 | -29.8 | -33.8 | -55.8 |
| CR% | 46.1% | 65.1% | 117.0% | 142.4% | 167.4% | 204.8% | 230.0% | 255.0% | 270.0% | 270.0% | 270.0% |

• XOL – Rate 18% GWP, PC 30% after 20%, LR Cap 200%, Line Size 10%



14



Option 3: Aggregate XOL

Considerations:
 Aggregate Distribution
 CV
 Retention
 Max Downside
 Parameter Risk


Retention
 100% 25% AAL
 75% 75% AAD

ELR Cod B/Rg R/I Exp
 CLR = 73% + 0% + 10% + 0% = 83%

CR Matrix

| CV | 45% | 52% | 48% | 44% | 40% | 36% | 32% | 28% | 24% |
|-----|-----|-----|-----|------|------|------|------|------|------|
| 18% | 38% | 34% | 40% | 46% | 54% | 63% | 72% | 82% | 91% |
| 17% | 34% | 30% | 40% | 53% | 63% | 73% | 82% | 92% | 101% |
| 16% | 30% | 43% | 57% | 68% | 78% | 88% | 100% | 112% | 124% |
| 15% | 44% | 51% | 58% | 68% | 75% | 85% | 96% | 108% | 121% |
| 20% | 50% | 57% | 64% | 73% | 83% | 93% | 106% | 120% | 133% |
| 22% | 55% | 63% | 71% | 80% | 90% | 102% | 117% | 132% | 147% |
| 22% | 61% | 69% | 77% | 86% | 97% | 107% | 123% | 140% | 154% |
| 22% | 67% | 75% | 84% | 93% | 103% | 114% | 128% | 145% | 159% |
| 24% | 72% | 81% | 90% | 100% | 110% | 122% | 137% | 154% | 168% |

• Aggregate XOL – Rate 2.5% GWP, AAD 75%, AAL 25%, Line Size 10%



15





16
