Measuring the Value Added by Technical Pricing Techniques in Commercial Lines of Business

12-15 October 2010
Overview

- How do you measure the value added by technical pricing approaches?
- This can be very important to justify another study
- Or to support a request for an additional member of staff
- Or to support a study by consultants
What do we mean by "adding value"

- Increasing profit
- Increasing accuracy of loss cost estimate
- Satisfying requirements of regulators, reinsurers and rating agencies

Assumes that have organisational buy-in to technical pricing work and that inefficiencies exist in current (market) pricing
Where GLMs being used in Commercial Lines

- Marine P&I
- Marine Hull
- Yacht
- Professional Indemnity
- Employers Liability
- Libel & Slander
- Extended Warranty
- Medical Expenses
- Motor XOL Reinsurance
- Employment Practices Liability
- Sports Personal Accident
- Livestock
- Credit
- …any class with more than 1,000 claims

**Technical pricing doesn’t need to be GLM based**
Challenges

• Changes in:
  – Underwriting team
  – Broker
  – Underwriter philosophy

• Policy churn rates

• Technical pricing benefits from hindsight
  – when compared to premiums charged at point of underwriting
Commercial lines specific issues

- Catastrophes
- Uneven spread of large losses from year to year
- Subscription market
  - Limited ability to set price and conditions
  - Limited ability to control line size
- Stripping out market cycle
- Room for improvement on data
Problems with expected profit calculation

• At point of underwriting
  
  value added = \( \sum \text{profit new method} - \sum \text{profit old method} \)

  portfolio policy policy

• Don't have the same data before and after
• Volumes may be too small to allow sampling errors to be minimised
• Look at both 100% and own share
• May not get the price/share you'd like due to subscription market constraints
Definitions

• Old tool – rates used historically
  – In first instance, benchmark rates
  – But could be refinement of technical rates
• New tool – new rates based on technical pricing work
• Bound premium – contractually agreed premium
• Technical premium – estimated loss cost loaded for capital, expenses and profit
• Actual loss cost – observed losses from the policies
Example portfolio

- A simple benchmark pricing tool was put in place a few years ago based on underwriter judgement (old tool)
- You now have 1500 claims linked to policies with reasonable exposure and claim data
- Now fitted a predictive model which converges (new tool)

This is typical of many CL portfolios and is the type of portfolio where we want to measure value added
Method 1 – Dual ratebook solution

• Either:
  – Run two ratebooks (old and new) live and concurrently,
    – random switching; or
    – Run different teams on different ratebooks (old and new)

• Simple benchmark against new predictive model
  – Objectively measure performance difference between two over time
  – Picks up new business take-up rates and renewals / lapses
  – Insufficient volumes to do so in commercial lines
  – Inability of systems to handle this in commercial lines
  – Business may be very different by team
    – Especially if teams are in different locations
    – Exclude portions of portfolio by location to standardise risk mix?

• Dual solution unlikely to be practical for commercial lines
Method 2 – Cohort split

- Split portfolio into cohorts
  - Choose number of cohorts to maximise trends while avoiding lack of data issues
    - Compare different rating cohorts, pre and post technical pricing work
    - or after changing parameter estimates

- Show distribution of technical vs bound premium for each cohort
  - Show that the pricing adequacy of the portfolio is improving over time
  - As the portfolio matures show that the profitability improves
    - make allowances for unexpectedly good experience, cats & large losses
Chart for method 2

Premium Adequacy Assessment

Proportion of policies

Bound Premium / Technical Premium

Cohort 1
Cohort 2
Cohort 3

underpriced
overpriced
Method 3 – Implied bound loss cost

- Back derive an expected loss cost from the bound premium
- Use technical premium calculation algorithm for capital, expenses and profit to
  - Compare actual claims against the bound loss cost estimate
  - Do same against technical loss cost estimate
  - Aim to show that closer fit exists for technical loss cost estimate
  - Possibly also show negative bound loss cost estimates exist
    – I.e. fixed expenses not covered adequately in some cases
Chart for method 3

Expected Loss Cost Accuracy Assessment

- Technical LC
- Actual LC
- Bound LC

Loss Cost vs. Expected Loss Cost Band

0 - 1000, 1000 - 2000, 2000 - 3000, 3000 - 4000, 4000 - 5000, 5000 - 6000, 6000 - 7000, 7000 - 8000, 8000 - 9000, 9000 - 10000

0 - 1000, 1000 - 2000, 2000 - 3000, 3000 - 4000, 4000 - 5000, 5000 - 6000, 6000 - 7000, 7000 - 8000, 8000 - 9000, 9000 - 10000

Loss Cost

Expected Loss Cost Band

Technical LC
Actual LC
Bound LC
Method 4 – What-if portfolio

- Build retention model to predict portfolio
- Based on:
  - Technical premium estimate
  - Bound premium values
  - Estimates of retention ratios
    - Can be based on change in premium or on underwriter view
  - Future loss inflation
- Can directly predict portfolio size and profitability from rating assumptions
- Reference – estimating value added before writing anything.
Method 4 calculation

• Data for each policy:
  – Last year’s bound premium
  – Last year’s expected and reported claims
  – Historical retention ratio for policy (or type of policy)
  – Underwriter view of rate increases for this year

• Modelled for each policy:
  – This year’s estimated loss cost
  – This year’s technical premium
  – Retention ratio (based on rate change between last year’s bound and this year’s technical premium)
  – Price elasticity is a key assumption

• Apply historical retention ratio to this year’s bound premium and expected claims to get standard renewal book

• Apply adjusted retention ratio to this year’s technical premium and expected claims to get enhanced renewal book
Method 4 example
Impact of technical pricing

• In this example we have a softening market and expect less profit in the coming year
• Estimate renewing portfolio based on past experience & old model
• Estimate renewing portfolio using new technical pricing
• Compare the differences and monitor the outcome

<table>
<thead>
<tr>
<th>Policy year</th>
<th>Total premiums</th>
<th>Total claims</th>
<th>ULR</th>
<th>Total profit</th>
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<tr>
<td>Current portfolio</td>
<td>£ 1,282,550</td>
<td>£ 772,500</td>
<td>60%</td>
<td>£ 510,050</td>
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<td>Standard renewal book</td>
<td>£ 1,010,008</td>
<td>£ 674,044</td>
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<td>Enhanced renewal book</td>
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<td>£ 406,895</td>
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<td>£ 417,020</td>
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<td>Benefit of enhancement</td>
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<td>£ 81,056</td>
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• Only method which provides a prospective financial measure
Portfolio monitoring during transition towards technical rates

- **Step 1 – analyse historic portfolio**
  - Understand where claims are coming from
  - Are rating actions being taken supporting this
    - Growth of account, rate changes, etc
    - Are we growing into poor areas?

- **Step 2 – monitor emerging portfolio**
  - Compare actual vs expected
    - Mix and premium changes come through first
      - Testing new business and renewal assumptions
    - Then claim frequency as notifications are made
    - And finally severity and burning cost as claims settle
  - Refining view of the value added from method 4
### Comparing actual to modelled losses

#### Modelled types

<table>
<thead>
<tr>
<th>Risk Group</th>
<th>Size</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total Over All Groups</th>
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<td>71%</td>
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<td>113%</td>
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<td>122%</td>
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<td>57%</td>
<td>110%</td>
<td>-</td>
<td>98%</td>
</tr>
</tbody>
</table>

**Total Over Type & Size Groups**

- <80%: Under Estimation
- 80% to 120%: Appropriate rates
- >120%: Over Estimation

**Grand Total 105%**
An aside – underwriter risk selection

• Look at signed share of risks
  – Does underwriter take bigger share on average of better risks, or of poorer risks?
  – How would account look if wrote 100% line on all risks?
    – Better or worse?

• Assess underwriter risk selection
  – Be aware of subscription market constraints
    – better priced risks can be oversubscribed
Technical pricing work and reserving

- Technical expected loss cost can be initial reserving estimate for immature years
  - For Bornhuetter-Ferguson method
  - For IELR method
- Instant estimate at point of underwriting
- Meet regulatory requirements
  - For Lloyd’s now and SII later?
Discussion starter

• Which methods might work for the example portfolio?
• What methods have you tried?
In summary

- You should be able to do something
- Although significant assumptions may need to be made
- Longer tailed lines will be more difficult
- Diminishing returns mean the value added will reduce over time
Questions or comments?

Expressions of individual views by members of The Actuarial Profession and its staff are encouraged.

The views expressed in this presentation are those of the presenter.
Contact details

• Jonathan Broughton, EMB
  Jonathan.broughton@emb.com

• Tom Jowett, Swiss Re
  Tom_jowett@swissre.com