University of California, Los Angeles
Bruin Actuarial Society Information Session

Property & Casualty Actuarial Careers
November 14, 2017

Adam Hirsch, FCAS, MAAA
Oliver Wyman

Binbin Xing, FCAS, MAAA
Farmers Insurance
Agenda

1. Introductions
2. Insurance & Consulting
   - Introduction to Actuarial Pricing
3. Property and Casualty Insurance & Self-Insurance
4. Introduction to Actuarial Reserving
Introductions

Adam Hirsch

• UCLA alumni (2001-2005)
• B.S. Mathematics/Economics
• Analyst with Actuaries Unlimited, Inc. 2006
• Analyst – Manager with Deloitte Consulting 2006 - 2015
• Principal with Oliver Wyman 2015 - Current

Binbin Xing

• UCLA alumni (2007-2011)
• B.S. Mathematics Applied, B.A. Business Economics, Accounting Minor
• Retirement consulting analyst with Willis Towers Watson 2012
• Analyst – Associate Actuary with Farmers Insurance Group 2012 – Current (personal lines pricing and reserving)
What is Property and Casualty (P&C)?

• The **property** component encompasses coverages which will protect against property risk, such as damages to structural entities.

• The **casualty** component encompasses coverages which protect against loss (liability) resulting from various factors including injury, negligence, errors, malpractice, etc.
What is Property and Casualty (P&C)?

• P&C insurance can be divided into two distinct categories: personal lines and commercial lines.

• Personal lines include coverages you may already be familiar with, such as your personal automobile insurance or homeowners insurance.

• Commercial lines protect businesses against loss, or liability, deriving from injury, negligence, or property damage. Examples of commercial lines include workers’ compensation and commercial automobile liability.
What is Self-Insurance?

• Insurance represents a transfer of risk

• Deductible and limit concepts

• Financially stable companies may elect a high deductible, below which they are comfortable retaining the risk and below which the risk may be relatively predictable.

• Many large companies self-insure P&C risks up to a large deductible. Some entities truly self-insure P&C risks, but this is rare.

• Insurance is a fixed expense for the insured. Self-insuring (up to a deductible) adds a variable component to the expense.
Insurance & Consulting

• Many P&C actuarial positions are with either a P&C insurance company or a consulting firm.

• Insurance positions support the products/coverage sold by the insurance company.

• Consulting firms serve insurance company clients as well as non-insurance companies with P&C risks (often with self-insurance).

• Both environments offer pricing, reserving, predictive modeling and other actuarial roles, varying by company.
Introduction to Actuarial Reserving (credit: casstudentcentral.org)
How this training fits in the big picture
How this training fits in the big picture – Self Insurance

Claims Reported

Loss Reserving

Decision to Self Insure

Estimated Reserve Balance

Financial Statement
Importance of accurate reserves for an insurance company and its stakeholders

Accurate reserves are crucial to the following 3 groups:

**Internal Management**
- Inadequate estimate of unpaid claims → rate reduction → insufficient to pay the claims that will arise from the new policies → future solvency of the insurer is at risk.
- Redundant estimate of unpaid claims → rate increase → loss of market share → negatively impact the financial strength of the insurer.

**Investors**
- Inaccurate reserves → misstated balance sheets and income statements for the insurer → key financial metrics used by investors could be misleading.

**Regulators**
- Inaccurate reserves → misstatement of the true financial position of an insurer → for a struggling insurer, a regulator may not become involved until too late in the process to help the insurer regain its strength.
**Loss Reserve**

- **What is a loss reserve?**
  - Amount necessary to settle unpaid claims

- **Why are loss reserves important?**
  - Accurate evaluation of financial condition and underwriting income

- **Case reserves**
- **Incurred but not reported ("IBNR") reserves**
  - Claims incurred but not yet reported
  - Claims reported but not yet recorded
  - Future increases in case reserves
  - Closed claims that reopen in the future

- **Policy was sold in early 2017**
  - Claim may not be fully paid until years later
  - How does the company know if its business is profitable?
  - How does a self-insured company budget for the future payment?
## Loss Development

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## Factor Selection

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## Implied Results

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<td>22,887</td>
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The “Tail” Factor

• Loss development beyond the oldest age observed in the historical data

• Several approaches
  – Insurance industry benchmarks – may vary by state
  – Curve fitting / extrapolation
  – Other mathematical / statistical models
Loss Development Assumptions

Paid
- Volume of historical loss data is large enough to be credible
- Future payment patterns will be similar to historically observed patterns
  - Changes to insurers operations
  - Changes to judicial / legal environment
  - New types of claims not seen before

Incurred
- Volume of historical loss data is large enough to be credible
- Future reporting patterns will be similar to historically observed patterns
  - No change in case reserving practice / philosophy
  - No changes in data processing procedures
  - No changes in risk exposure
  - No new types of claims not seen before
## One of Several Methods

<table>
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<tr>
<th>Accident Year</th>
<th>Paid Loss Development</th>
<th>Incurred Loss Development</th>
<th>Incurred Bornhuetter-Ferguson</th>
<th>Expected Loss Rate</th>
<th>Selected Ultimate Loss as of 12/31/17</th>
<th>Paid Loss as of 12/31/17</th>
<th>Estimated Loss Reserve as of 12/31/17</th>
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<td>20,615</td>
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<td>19,237</td>
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<td>143,573</td>
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### Client XYZ

**Workers’ Compensation**

**Selected Ultimate Losses & ALAE - Limited to $100,000**

**Based on Data as of June 30, 2015**

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**Notes:**

1. from Client XYZ
2. = Exhibit E, Page 7, Column (12) - Closed Claim Counts
3. from Client XYZ
4. from Client XYZ
5. from Exhibit E, Page 1, Column (4)
6. from Exhibit E, Page 2, Column (4)
7. from Exhibit E, Page 3, Column (10)
8. from Exhibit E, Page 4, Column (8)
9. from Exhibit E, Page 5, Column (7)
10. from Exhibit E, Page 6, Column (7)
11. from a previous Oliver Wyman study
12. selected
Considerations

- Seasonality
- Line of Business
- Claims speed up/slow down
- Inflation
- Industry Trends
- Case reserve adequacy
Introduction to Actuarial Pricing
(credit: casstudentcentral.org)
How this training fits in the big picture
What is a Rate?

CAS Statement of Principles of Ratemaking:

1) A rate is an estimate of the expected value of future costs.

2) A rate provides for all costs associated with the transfer of risk.

3) A rate provides for the costs associated with an individual risk transfer.

4) A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer.
How is a rate calculated?

Rate = Base Rate * Factor₁ * Factor₂ * …. * Factorₙ

Factors are your rating characteristics while the base rate assures we achieve our target overall premiums.

Let’s say we rate on the following characteristics:

- Whether or not the policy is cross sold
- Limit of Insurance

Rate = Base Rate * X-Sold Factor * Limit of Insurance Factor
How is a rate calculated (cont.)?

Our factor tables may look like this:

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<th>Base Rate</th>
<th>X-Sold Factors</th>
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</table>

If someone is cross sold w/ limits of 300K, then their rate is:

Rate = $500 * .90 * 2.00 = $900

In practice, n can be over 50 with many interactions and complex variables.
Exposures

Basic unit of risk underlying an insurance premium – varies by type of insurance:

- **Auto**: Car-Years
  - One car, insured for one year

- **Fire**: House-Years
  - One house, insured for one year

- **Workers compensation**:  Payroll

- **Commercial Multi-Peril**:  Revenues / Sales
The Ratemaking Equation

$$E(P) = E(L) + E(Exp) + \Pi$$

P = premiums

L = losses

Exp = expenses

\Pi = profit
Adjustments to Premiums

• Current Rate Level
  – Brings all premiums to today’s rates

• Premium Trend
  – Accounts for shifts in the population (i.e., deductibles)
Adjustments to Losses

• Loss Development
  – Ultimate paid losses are not known right away

• Loss Trend
  – Review trends in frequency and severity

• Catastrophes
  – Remove actual and load in expected

• Loss Adjustment Expenses
  – Costs associated with settling a claim (not just the indemnified amount)
Expenses

• Fixed Expenses (same per policy)
  – General
    - Salaries, rent, etc.
  – Other Acquisition
    - Advertising, postage, etc.

• Variable Expenses (varies by premium)
  – Commissions
  – Taxes
Rate Level Indication

- Recall: $E(P) = E(L) + E(Exp) + \Pi$
  - Assume the following for Personal Auto in Illinois:
    - $E(P)$ is $909$
    - $E(L)$ is $600$
    - $E(Exp)$ is $300$
    - $\Pi$ is $100$

- The equation above does NOT balance meaning that the expected premiums in the future are not enough to cover expected losses, expenses and the profit target.

- This would imply that premiums need to go up by 10%, across the book, to balance the equation.

- In other words, there is a +10% rate level indication.
Spreading the Rate Increase

• One way to achieve increasing premiums by 10% is to do so by raising every policyholder’s premium by 10%.

• Actuaries are equipped with skills to understand how to spread the 10% rate increase to those customers who are driving the rate need.

• Assume the actuary discovered that rates for drivers in Chicago need to go up by 20% and that drivers in the rest of the state do not need a rate increase. Assume a 50/50 population split.
  – Spreading the rate in this way still balances back to 10% overall.
Spreading the Rate Increase: Additional Distinctions

• 10% Overall Rate Need:
  ▪ 20% Rate Need for Chicago Drivers:
    ▪ 15% Rate Need for Married Chicago Drivers
    ▪ 25% Rate Need for Single Chicago Drivers
  ▪ 0% Rate Need for Rest-of-State Drivers:
    ▪ -10% Rate Need for Married Rest-of-State Drivers
    ▪ 10% Rate Need for Single Rest-of-State Drivers

• The rate change can be spread by numerous other rating variables. The rate spread can get very complicated, but actuarial techniques help identify where the rate change should be spread.
Rate Change Decision

• Rate Indication
• Segment level indications
• Competitors
• Regulatory Constraints
• IT Constraints
• Strategy
• ...

...
Questions?

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