

Actuarial Methodologies for Developing Premium and Incorporating Experience

**Eric Anderson, FCAS, MAAA
GPW Actuarial Services, Inc.**

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Captive Policy Examples

- Commercially Available/Deductible Reimbursement Policies:
 - Auto Liability
 - General Liability
 - Workers' Compensation
 - Cyber Risk?
- Alternative Risk Policies:
 - Loss of Key Talent
 - Regulatory Changes
 - Reputation
 - Supply Chain Interruption

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Approaches for Estimating Claims

- Average dollar amount
 - Simplest method
 - Difficult to determine effect of changing deductible/limits
 - Harder to incorporate actual experience
- Split into frequency and severity
 - Easier to adjust for differences between insureds
 - Can better estimate effect of different deductibles/limits
 - Easier to incorporate actual experience

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How do We Estimate Frequency and Severity?

Possible methods:

1. Own historical data
2. Industry data
3. Premium quotes from commercial insurers
4. Rate filings for similar coverages
5. Research

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Methodology

- Develop base assumptions for frequency and severity
- Adjust base assumptions for specific characteristics of insured, such as:
 - Type of industry
 - Location
 - Number of employees
 - Loss history of the insured
- Multiply frequency and severity to estimate loss cost
- Load up loss cost for expenses, risk margin, profit, etc.

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What's next?

- Over time, a captive manager will build a portfolio of experience for each policy type
- The actuary can and should incorporate this experience into the pricing
- How does an actuary do that?

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Hypothetical Example

- An actuary is updating the pricing on a policy for a captive manager
- The captive manager supplies the actuary with their historical data
- **50 policies** were issued
- Expect 10 claims (20% **expected** frequency)
- **5 claims** were actually filed (10% **actual** frequency)

What should the expected frequency be for the policy?

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Hypothetical Example

Options:

- Ignore experience – keep using 20%
- Accept experience – use 10%
 - This is likely to generate swings in premium from year to year
 - What if there are no claims?
- Somewhere in the middle? If so, what is the right number?

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Credibility

- Significant mathematical theory behind the concept
- Quantifies the amount of trust placed in the experience
- Credibility increases as the experience increases, but at a decreasing rate

– “Square Root Rule”:
$$\text{Credibility} = \sqrt{\frac{\text{Experience}}{\text{Standard}}}$$

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Credibility

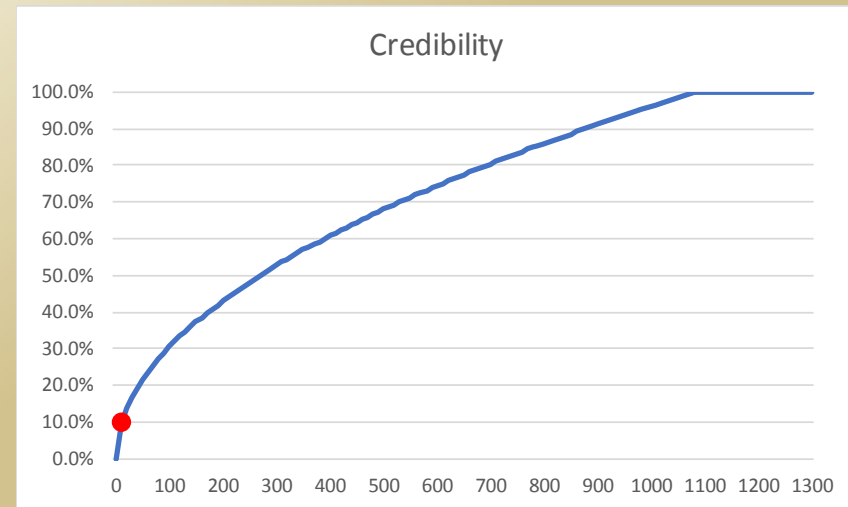
- Traditional full credibility standard for frequency is 1,082 expected claims

- Credibility = $\sqrt{\frac{\text{Experience}}{1,082}}$

- For our example:

- 10 expected claims

- Credibility = $\sqrt{\frac{10}{1,082}} = 10\%$



Example: Now What?

- Let's review our facts:
 - 50 policies
 - 10 expected claims
 - 10% credibility
 - 5 claims filed
- How do we adjust our frequency?

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Example: Adjustment Factor

- Credibility is a weight used to average experience and expectation:

$$5 \times 10\% + 10 \times (1 - 10\%) = 9.5$$

Actual Claims ————
Credibility to Actual ————
Weight to Expected ————
Expected Claims ————

- New expectation for 50 policies is 9.5 claims, or 19% $\left(= \frac{9.5}{50} \right)$
- Frequency adjustment factor of 95% $\left(= \frac{9.5}{10} \right)$

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How many policies would it take?

- Assuming same expected and actual frequencies of 20% and 10%, what if we had more policies?

# of Policies	Expected # of Claims	Credibility	New Frequency
50	10	9.6%	19.0%
100	20	13.6%	18.6%
500	100	30.4%	17.0%
1,000	200	43.0%	15.7%
2,500	500	68.0%	13.2%
5,000	1,000	96.1%	10.4%

Final Notes

- Creates a mathematically sound method for incorporating experience
- Premiums determined using this method will respond to experience
- Also prevents the swings up-and-down that would result from always using the prior experience
- This process should be done periodically

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QUESTIONS?

Eric Anderson, FCAS, MAAA
GPW Actuarial Services, Inc.

602.200.6900

eanderson@gpwa.com

www.gpwa.com

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