Limited Fluctuation - Example

- Calculate the expected loss ratio, given that the prior estimated loss ratio is 75%. Assume P=95% and k=10%.
- Scenario 1:
- Data: Observed loss ratio = 67%, Claim count = 600 - What is the standard for full credibility?
 - Does this data have full credibility?
 - What is the expected loss ratio?
- Answer:
 - For P=95% and k=10%, the number of claims needed is 584. Since we have 600, the data is considered fully credible.

Limited Fluctuation - Example (continued)

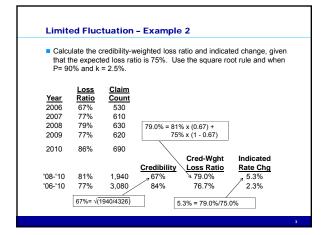
 Calculate the loss ratio, given that the prior estimated loss ratio is 75%. Assume P=95% and k=10%.

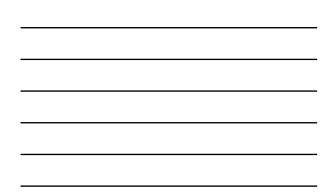
Scenario 2:

Data: Observed loss ratio = 67%, Claim count = 400 - Assuming Z = 0.72, what is the expected loss ratio?

Answer:

E2 = **Z*****T** + (**1**-**Z**)***E1 E2** = 0.72 x 67% + (1 - 0.72) x 75% **E2** = 69.2%





Limited Fluctuation - Example 3

| Given a current territory factor of 1.08, determine the indicated territory |
|---|
| factor with 5 years of data. Use the square root rule and the limited |
| fluctuation formula for pure premium. Assume a Poisson frequency |
| distribution and severity coefficient of variation of 1.5. |

| Year | Territory Exposure | Territory <u>Claim Count</u> | Territory Loss Ratio | Statewide Loss Ratio |
|---------|-----------------------|---------------------------------|-------------------------|-------------------------|
| 2006 | 3,000 | 330 | 125% | 78% |
| 2007 | 3,020 | 420 | 153% | 83% |
| 2008 | 3,030 | 630 | 269% | 85% |
| 2009 | 3,020 | 210 | 122% | 79% |
| 2010 | 3,050 | 190 | 108% | 72% |
| '06-'10 | 15,120 | 1,780 | 162% | 80% |
| | | | | |

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Limited Fluctuation - Example 3 (continued)

 $N = (z_p / k)^2 * (Var(N)/E(N) + Var(S)/E(S)^2)$

- Remember, with a Poisson distribution, Var(N) = E(N), so the second term is 1. The third term is the square of the coefficient of variation, which is 1.5². Now we just need to select the confidence levels.
- If we want to be within 5% of the true value 90% of the time, the value for $(z_p \ / \ k)^2$ is 1,082. Plugging into the formula:

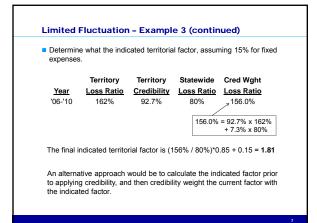
 $N_{claims} = 1,082 * (1 + 1.5^2) = 3,516.5$

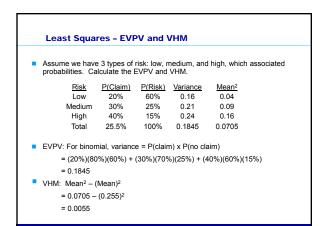
Assuming the 5-year statewide frequency is 0.2:

N_{exposures} = 3,516.5 / 0.2 = 17,582.5

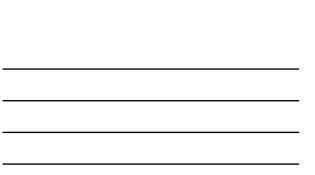
| claims sta | | r selection of an e | exposure stand | ard instead |
|------------|-----------|---------------------|----------------|-------------|
| | Territory | Territory | Exposure | Claim |
| Year | Exposure | Claim Count | Credibility | Credibility |
| 2006 | 3,000 | 330 | 41.3% | 30.6% |
| 2007 | 3,020 | 420 | 41.4% | 34.6% |
| 2008 | 3,030 | 630 | 41.5% | 42.3% |
| 2009 | 3,020 | 210 | 41.4% | 24.4% |
| 2010 | 3,050 | 190 | 41.6% | 23.2% |
| '06-'10 | 15,120 | 1,780 | 92.7% | 71.1% |







| Least Squares – Example | | | | | | |
|---|--------|----------|---------|----------|-------------------|---|
| Assuming that you have the following book of business, calculate the EVPV, VHM, K, and Z. The prior estimate of the frequency is 0.517. With 4 years of observations and an observed frequency of 0.75, what is the estimated future frequency? Assume the claims are binomially distributed. | | | | | | |
| | Risk | P(Claim) | P(Risk) | Variance | Mean ² | |
| | Low | 40% | 65% | 0.24 | 0.16 | |
| | Medium | 70% | 23% | 0.21 | 0.49 | |
| | High | 80% | 12% | 0.16 | 0.64 | |
| | Total | 51.7% | 100% | 0.2235 | 0.2935 | |
| EVPV: For binomial, variance = P(claim) x P(no claim) | | | | | | |
| = (40%)(60%)(65%) + (70%)(30%)(23%) + (80%)(20%)(12%) | | | | | | |
| = 0.2235 | | | | | | |
| VHM: Mean ² – (Mean) ² | | | | | | |
| $= 0.2935 - (0.517)^2$ | | | | | | |
| = | 0.0262 | | | | | |
| | | | | | | 9 |



Least Squares - Example (continued)

- To determine K, we use K = EVPV/VHM, which is K = 0.2235 / 0.0262 = 8.53
- Since we're told that we have 4 years of observations, n = 4. Therefore, $Z=n\,/\,(n+K) \rightarrow 4\,/\,(4+8.53)=0.319.$
- The prior estimate of frequency is the same as the mean calculated before, 0.517, and the observed data results in a frequency of 0.75. This observed data as 31.9% credibility, so...

E2 = Z * T + (1 - Z) * E1 \rightarrow 31.9% * 0.75 + 68.1% * 0.517 = 0.5913