Tutorial 4 - Trending

1. Given the following information:

No. of Claims	100,000
No. of Exposures	2,000,000
Total Loss	300,000,000
Total Premium	400,000,000

Determine the frequency, severity, pure premium, average premium and loss ratio.

2. Given that:

Accident Year	Earned Exposures	On-Level EP	Loss and ALAE as of 12/31/16	Rpt Claims Count as of 12/31/16	Losses CDF	Claims CDF
2014	400	100,000	90,000	60	1.00	1.00
2015	572	110,000	124,800	70	1.05	1.20
2016	680	120,000	88,300	70	1.80	1.40

By assuming trends are exponential, calculate the frequency and severity trends (up to 3 decimals).

3. Using result from Q2, find the average trended experience loss ratio. You are given that:

   - Rates will be in effect for one year
   - Rate change effective date is Oct 1, 2017
   - Policies are annual

4. Which of the following statements are true regarding loss trend?

   (a) When an exponential curve is used to pproximate severity, the assumption is a constant multiplicative increase in severity

   (b) Trend in claim severity is best approximated using a third-degree polynomial

   (c) Linear trends tend to underestimate future costs when inflation is increasing at a multiplicative rate

5. You are given the following information:

   - All policies are six-month policies.
   - The new rates are expected to be unchanged for all six-month policies written between June 1, 2014 and May 31, 2015.
   - The selected annual frequency trend is 1.2% and the selected annual severity trend is +5.8%.
   - The experience period is accident years 2012 and 2013.

   Calculate the pure premium trend factors for **each year** in the experience period.

6. Suppose that you are working as actuary in an insurance company and you are given the following information on the homeowner insurance:

Calendar Year	% of Type A	% of %Type B
2016	20%	80%
2017	40%	60%
2018	60%	40%
2019	80%	20%

   (a) Suppose that homeowner insurance has only two types and Type B's premium is 20% lower than Type A. Calculate the annual premium trend to account for changes in the proportion of homeowner insurance.

   (b) Given that the forecast trend is 2% and rates will be in effect starting Jan 1, 2021 (rates will be reviewed every year). Compute the calendar year 2016 earned premium trend factor.

7. Given the following:

   - Policies are annual.
   - Proposed Effective Date = July 1, 2005
   - Rates are in effect for one year.

Accident Year	EP at Curr. Rate	Loss and ALAE	Dev. Factor To Ultimate
2002	101,250	52,000	1.1130
2003	112,500	54,000	1.2800
2004	119,250	40,000	1.9200

   Compute the projected ultimate loss and ALAE ratio if the frequency and severity trend is 2% and 5%, respectively.

8. Given the following information:

   - Experience period is April 1, 2001 to March 31, 2002
   - Planned effective date is April 1, 2003
   - Policies have a 6-month term
   - Rates are reviewed every 18 months
   - Historical premium is earned premium

   Determine the written premium trend period.

9. You are given the following:

   - All policies are annual
   - The future policy period begins January 1, 2007
   - The future annual premium trend is 3% per year
   - The proposed rates will be in effect for one year

Calendar Year	Earned Exposure	Average WP s at Curr. Rate. Level	Average EP at Curr. Rate. Level
2003	1,000	3,777	3,605
2004	1,050	3,688	3,749
2005	1,100	3,998	3,899

Calculate the trended premium for each year, using the two-step trending method.

10. Given that:

    - 4Q2011 average written premium is $560
    - Effective date of the next rate change is Jul 1, 2012
    - Assume 5% annual premium trend for the projected period
    - Rate is being reviewed once every two years

Calendar Year	Earned Exposures	Earned Premium at Curr Rates
2009	10,000	5,000,000
2010	10,000	5,250,000
2011	10,000	5,512,500

Using two-step trending method, compute the projected earned premium for each calendar year.

11. Given that:

    - Experience period consists of calendar year premium from 2012 to 2014
    - Rate revisions are performed every year
    - Planned effective date of new rate is Jul 1, 2016
    - The historical annual trend is 5%
    - The future annual trend is 3%
    - All policies are annual

    Compute the trended premium for calendar year 2012 if the current level earned premium for calendar year 2012 is 42,500.

12. The following information of a line of business is given:

Calendar Year	Proportion of policy
1996	19%
1997	21%
1998	23%
1999	25%

    - The trend analysis is performed for rates to be effective Oct 1, 2000
    - Rates are reviewed annually
    - This LOB only offers two types of policies, Low Sum Insured and High Sum Insured
    - The proportion of Low Sum Insured policy has reached a steady-state position
    - Assume that no further change of portfolio mixture in the future

- Low Sum Insured policy has average premium of 20% lower compared to High Sum Insured policy.

Use average written dates to calculate the trend factor to be used for calendar year 1997 earned premium for the trending analysis.

13. The Increase Limit Factors and percent of earned exposures by policy limits of a liability line of business is provided:

Experience Period	500,000	1,000,000	2,000,000
2011	24.00%	52.00%	24.00%
2012	22.00%	52.00%	26.00%
2013	20.00%	52.00%	28.00%
Increased Limit Factor	0.90	1.00	1.15

Remark:
1. The percentages represent the business portfolio. For example, for year 2011, 24% of total earned exposures is from policies with limit 500,000.
2. Increased Limit Factor is multiplicative factors that are applied to rates or premiums for "basic" limits of coverage to determine premiums for higher limits of coverage.

(a) Explain the purpose of premium trend adjustments.

(b) Calculate and select an annual trend due to the shift in policy limits.

(c) You are conducting a ratemaking analysis for this liability line of business for rates to be effective Sep 1, 2014. The new rates are to be in effect for one year, with 67% of the policies written for an annual term and 33% written for a six-month term. Calculate the trend factor to be used for 2012 earned premium using the annual trend selected in previous part.
Hint: You can use interpolation between the two "Trend From" dates