Reading: Bailey.Simon
Model: 2012.Q6
Problem Type: Experience of a single car-year

Given An insurance company has a private passenger auto book of business with the following claims experience:

Territory	Years Since Last Accident	Earned Premium at Present Rates for Two Years Since Last Accident	Earned Car Years	Number of Claims	Incurred Loss
1	0	$15,000,000	15,000	5,000	$9,000,000
1	1	$125,000,000	125,000	41,000	$75,000,000
1	2+	$230,000,000	230,000	76,000	$138,000,000
2	0	$25,000,000	25,000	7,000	$16,000,000
2	1	$310,000,000	300,000	84,000	$187,000,000
2	2+	$550,000,000	535,000	147,000	$328,000,000
3	0	$10,000,000	10,000	4,000	$7,000,000
3	1	$80,000,000	100,000	35,000	$43,000,000
3	2+	$160,000,000	170,000	60,000	$100,000,000

Find Choose an appropriate exposure base for calculating credibility. Justify the selection.

Solution

There are two choices of exposure base which we could use: Earned Car Years or Earned Premium.
This question is testing the comments made by Hazam, that high frequency territories must be high premium territories and the differentials must be accurate.

We'll test the frequency requirement first.

Territory	(1) Earned Premium	(2) Earned Car Years	(3) Number of Claims	(4) Average Earned Premium	(5) Relative Earned Premium to Total	(6) Frequency	(7) Relative Frequency
1	$370,000,000	370,000	122,000	$1,000.00	1.003	0.330	1.085
2	$885,000,000	860,000	238,000	$1,029.07	1.032	0.277	0.910
3	$250,000,000	280,000	99,000	$892.86	0.896	0.354	1.163
Total	$1,505,000,000	1,510,000	459,000	$996.69	1.000	0.304	1.000

(4) = (1) / (2)
(5) = (4) / (Total 4)
(6) = (3) / (2)
(7) = (6) / (Total 6)

Observe Territory 2 has the highest earned premium relativity but the lowest frequency relativity. This contradicts Hazam's first point.

We now check to see if the territory differentials are appropriate.

Territory	Earned Premium	Incurred Loss	Loss Ratio
1	$370,000,000	$222,000,000	60.0%
2	$885,000,000	$531,000,000	60.0%
3	$250,000,000	$150,000,000	60.0%

Since all territories have the same loss ratio, the territory differentials are proper.
Thus, Hazam's second condition is satisfied.

Since Hazam's first condition is not met, it is more appropriate to use earned car years as the exposure base than earned premiums.

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Model: 2012.Q6
Problem Type: Experience of a single car-year

Given An insurance company has a private passenger auto book of business with the following claims experience:

Territory	Years Since Last Accident	Earned Premium at Present Rates for Two Years Since Last Accident	Earned Car Years	Number of Claims	Incurred Loss
1	0	$14,000,000	12,000	7,000	$7,700,000
1	1	$110,000,000	119,000	45,000	$60,500,000
1	2+	$219,000,000	214,000	70,000	$120,450,000
2	0	$29,000,000	30,000	12,000	$12,180,000
2	1	$337,000,000	316,000	81,000	$141,540,000
2	2+	$524,000,000	560,000	137,000	$220,080,000
3	0	$7,000,000	13,000	4,000	$5,670,000
3	1	$86,000,000	97,000	38,000	$69,660,000
3	2+	$170,000,000	152,000	62,000	$137,700,000

Find Choose an appropriate exposure base for calculating credibility. Justify the selection.

Solution

There are two choices of exposure base which we could use: Earned Car Years or Earned Premium.
This question is testing the comments made by Hazam, that high frequency territories must be high premium territories and the differentials must be accurate.

We'll test the frequency requirement first.

Territory	(1) Earned Premium	(2) Earned Car Years	(3) Number of Claims	(4) Average Earned Premium	(5) Relative Earned Premium to Total	(6) Frequency	(7) Relative Frequency
1	$343,000,000	345,000	122,000	$994.20	1.006	0.354	1.173
2	$890,000,000	906,000	230,000	$982.34	0.994	0.254	0.842
3	$263,000,000	262,000	104,000	$1,003.82	1.015	0.397	1.317
Total	$1,496,000,000	1,513,000	456,000	$988.76	1.000	0.301	1.000

(4) = (1) / (2)
(5) = (4) / (Total 4)
(6) = (3) / (2)
(7) = (6) / (Total 6)

By ranking columns (5) and (7) in descending order we verify Hazam's first point. Namely high premium territories are high frequency territories.

We now check to see if the territory differentials are appropriate.

Territory	Earned Premium	Incurred Loss	Loss Ratio
1	$343,000,000	$188,650,000	55.0%
2	$890,000,000	$373,800,000	42.0%
3	$263,000,000	$213,030,000	81.0%

Since the territories have different loss ratios, the territory differentials are **not** proper.
Thus, Hazam's second condition is violated.

Since Hazam's second condition is not met, it is more appropriate to use earned car years as the exposure base than earned premiums.