TIERING
History and Purpose

2012 CAS Ratemaking and Product Management Seminar

Agenda

- Definition
- History
- Relationship with Credit
- Uses of Tier

Tier

- Definition:
  - One of a series of ranks, layers or stratum
- Synonyms:
  - Grade
  - Category
  - Level
  - Grouping
  - **Partition**

History

- Circa 1960's
- Agency Insurers – Private Passenger Auto
  - Bureau derived class plans
  - Competing with Captive Agency Insurers
  - Needed to further refine pricing
- Solution
  - Fleet of companies, each company is a tier
  - Each at a separate base rate
    - E.g. Preferred, Standard, Non-standard
  - Virtually same class plan (territories, I/L, etc.)
  - Set of underwriting rules that tiers new business into one of the companies or a decline

Underwriting Guidelines

		Preferred Company	Standard Company	Non-Standard Company
Driver Age		23-70 21-22 if clean	21-70 17-20 if clean	21-70 16-20 if clean
Driving Experience		5 yrs	3 yrs	No minimum
Driving Record	Per Policy	At Fault 0 Not At Fault 2 Minor Convictions 0	At Fault 0 Not At Fault 2 Minor Convictions 2	At Fault 1 Not At Fault 2 Minor Convictions 3
	Per Operator	At Fault 0 Not At Fault 2 Minor Convictions 0	At Fault 0 Not At Fault 2 Minor Convictions 1	At Fault 1 Not At Fault 2 Minor Convictions 2
	Maximum Incidents	2 per policy	3 policy	5 per policy 2 per operator

Observations

- Overlap with class plan
- **Underwriting rules – didn't have to be filed in most states**
- No multivariate analysis
- Virtually no reassignment at renewal
- **Rules adjusted as a function of appetite**
- **Exception**
- Level of success - questionable

Catalyst for Change – CREDIT SCORE

- Circa 1990's
- Credit Score –
  - New variable
  - Highly predictive
  - Highly granular (200 to 850) – see next slide
- Phase I
  - Added to existing underwriting rules

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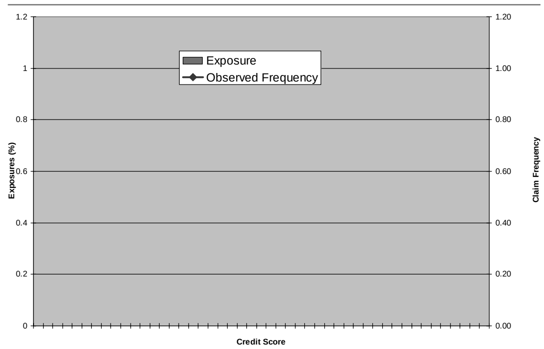
PD Frequency by Credit Score



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Underwriting Guidelines

		Preferred Company	Standard Company	Below Standard Company
Driver Age		23-70 21-22 if clean	21-70 17-20 if clean	21-70 16-20 if clean
Driving Experience		5 yrs	3 yrs	No minimum
Driving Record	Per Policy	At Fault 0 Not At Fault 2 Minor Convictions 0	At Fault 0 Not At Fault 2 Minor Convictions 2	At Fault 1 Not At Fault 2 Minor Convictions 3
	Per Operator	At Fault 0 Not At Fault 2 Minor Convictions 0	At Fault 0 Not At Fault 2 Minor Convictions 1	At Fault 1 Not At Fault 2 Minor Convictions 2
	Maximum Incidents	2 per policy	3 per policy	5 per policy 2 per operator
Credit		Superior or better (>800)	Average or better (>700)	Acceptable or better (>600)

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Observations

- Same as prior observations
  - no multivariate analysis
  - Credit score ranges adjusted with appetite
  - Exceptions
- Predictive power of credit underutilized
  - A handful of ranges were inadequate
- Number of pricing points inadequate
  - Expensive to file/maintain many companies

Modern Solutions

- Tier within Company
  - No limit to price points
- Multivariate Analysis
  - Balancing of tiering (and potentially class plan) variables
  - Integration of tiering and class plan variables

- If possible, maintained as underwriting rules

Why use tier?

- Relaxed filing requirements for underwriting guidelines
  - Use of variables that present filing hurdles
    - Prior carrier variables
    - Expanded driving record
    - Personal character variables
- Relaxed filing requirements shields from competitors' view
- Some DOI's require walling off particular variables, namely credit
- Simple way to add variables on top of existing rating plan

Disadvantages of tiers

- Added complexity
  - More models
  - Mapping of tier score to tiers
- Increasing DOIs are requiring filing of tiering rules, eliminating one of the advantages
- Potential large jumps from one tier to the next if number of tiers is small

Ground up Modeling Process

1) Model with all variables
2) Generate factors for all variables
3) Split variables into tier vs. class plan
4) Score data base and calculate a tier score for each risk
5) Review the distribution of tier score and establish tier score ranges
6) Determine tier factors by either of two methods

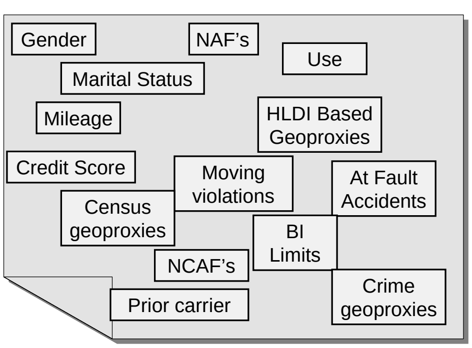
   a) Model

      i) Remove all of the tiering variables and replace with the tier number

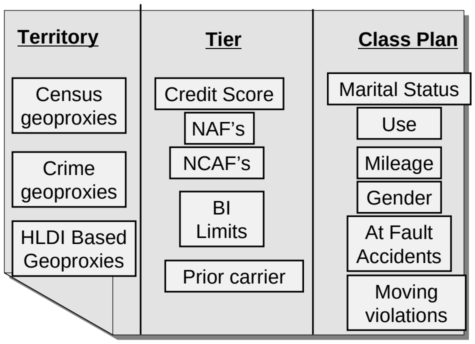
      ii) Refit the model to get the indicated tier factors

   b) Average Tier Score – For each tier, use the average tier score factor as the tier factor.

Modeling Soup



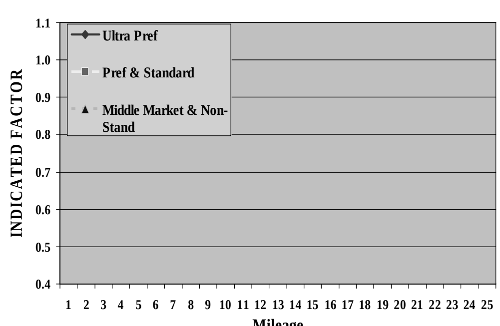
Structured Output



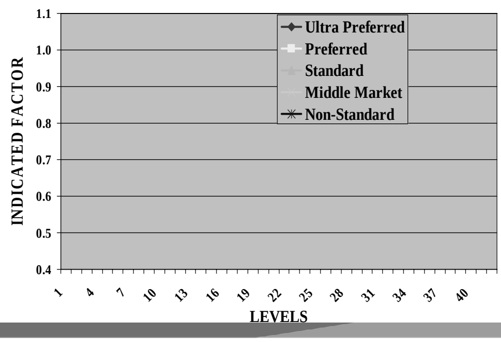
Other uses of Tier 1

- Tier can be used as a complex interaction
  - Assumption – the strength and slope of some the “class plan” variables vary by “type of risk”
  - Segment the universe by “type of risk”
    - E.g. Segments 1-5
  - Type of risk becomes tier
  - Interact the class plan variables with type of risk
- Result – effectively separate class plans by type of risk or tier

Mileage Factors by Segment (Tier)



Variable 2 Factors by Segment (Tier)



Other use of Tier

- Overlay new variables on top of an existing class plan
- No change to existing plan
  - Control dislocation to the existing book
  - Isolate changes to the policy writing system
- Methodology
  - Tiering variables = all new variables
  - Multivariate analysis
    - Independent Variable = Loss ratio using current class plan premium
    - Dependent Variables = new variables
  - Use aggregate new variable score to establish tier

Example

- Directly use the factors derived from analysis of the tiering variables
- Tier factors is a weighted average of the cumulative score.

	Variable 1	Variable 2	Cumulative Score	Tier	Tier Factor
Risk A	0.90	0.90	0.81	**1**	**0.85**
Risk B	0.95	1.00	0.95		
Risk C	1.00	1.00	1.00	**2**	**1.00**
Risk D	1.20	1.00	1.20	**3**	**1.27**
Risk E	1.10	1.20	1.32		
Risk F	1.20	1.20	1.44	**4**	**1.44**

Tier as a basis for selections

TIER	INDICATED FACTOR	SELECTED FACTOR
1	0.151	0.232
2	0.313	0.352
3	0.338	0.376.
5	0.363	0.401
6	0.388	0.426
7	0.413	0.451
8	0.438	0.476
9	0.463	0.501
10	0.513	0.526
47	1.439	1.367
48	1.464	1.390
49	1.489	1.417
50	1.514	1.438
51	1.589	1.509
52	1.614	1.533
53	1.639	1.447
95	4.716	4.900
96	5.213	5.500
97	5.730	6.200
98	6.321	6.800
99	7.411	8.000

Concerns with over discounting and leaving money on the table. Select higher factors (averaging).

Concerns with competitiveness. Select lower factors (5% discount).

Concerns with adverse selections in high pure premium cells. Select higher factors.

Other uses of Tier

- Objective: Use tier to establish new vs. renewal pricing
  1) Tier new business using standard criteria targeting new business losses performance
  2) Renewal tiering based on a change model
     a) Incorporate variables only available for renewal business
     b) Eliminate use of variables only relevant to new business
     c) Reduce reliance on variables that are more powerful for new business than renewal
     d) Control tier movement at renewal

TIERING

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