



TIERING

History and Purpose

2014 CAS Ratemaking and Product Management Seminar

Agenda

- Definition
- History
- Relationship with Credit
- Historical methodology
- Modern methodology
- Tier as an interaction variable
- Tier to limit impact to existing rating
- Tier as a basis for selection
- Frozen tier
- Variables in tier



Tier

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

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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 declination

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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

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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

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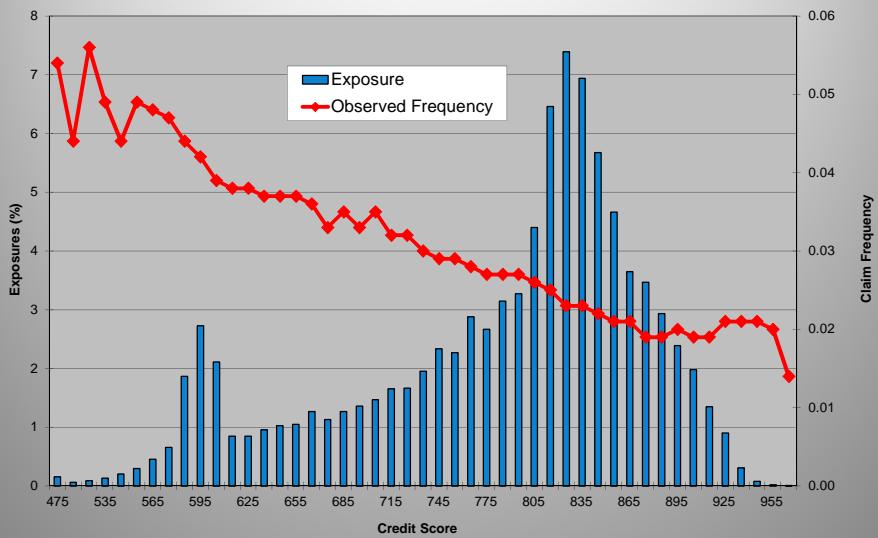
Catalyst for Change

- Circa 1990's
- Credit Score –
 - New variable
 - Highly predictive
 - Highly granular (200 to 850)
- 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

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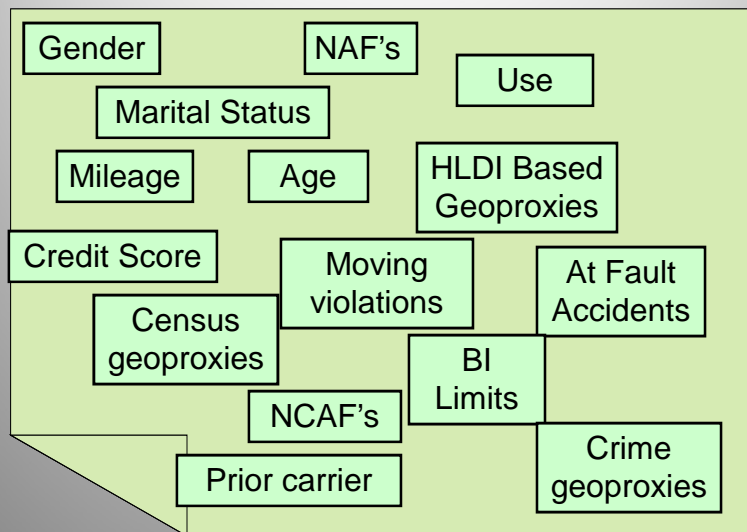
Modern methodology

- Multivariate Analysis
 - Balancing of tiering (and potentially class plan) variables
 - Integration of tiering and class plan variables
- Tier within Company
 - No limit to price points
- If possible, maintained as underwriting rules

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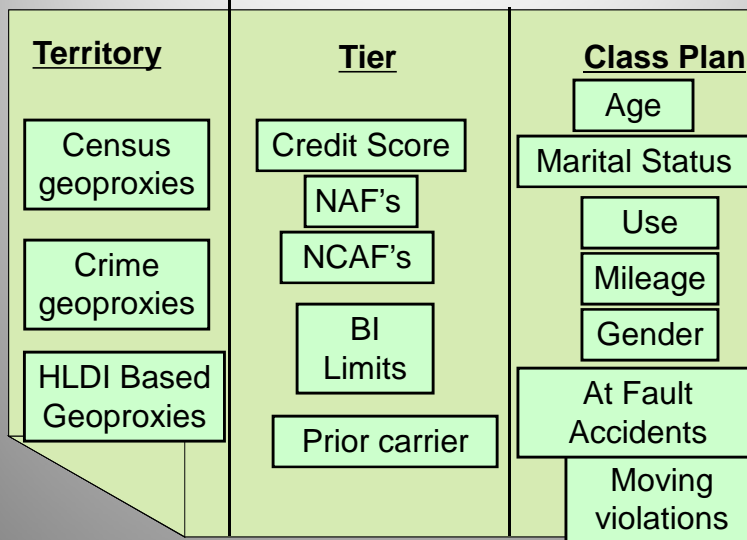


Modeling Soup



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Structured Output



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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.

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Why use tier? Advantages

- 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

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Disadvantages of tiers

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

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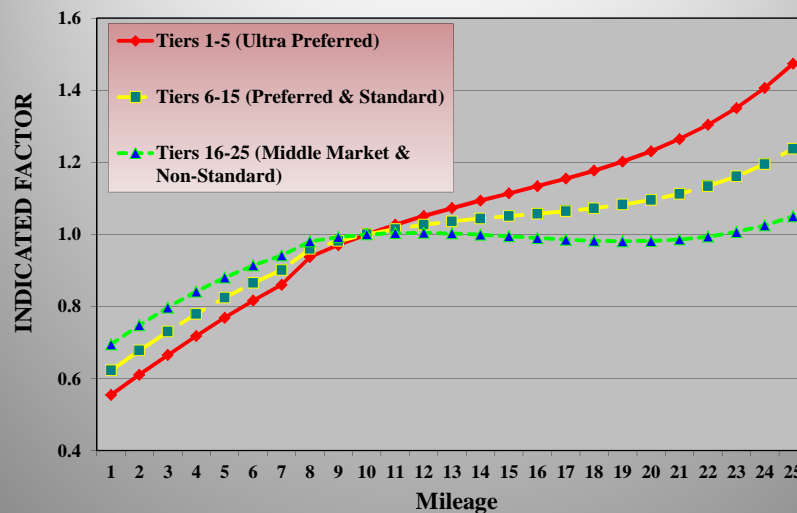
Other uses of Tier 1 – Tier as an interaction variable



- Defining “type of risk”
 - Use tier to partition the policy universe
 - E.g. Tiers 1 - 5 = Ultra-preferred
 - Tiers 6 – 10 = Preferred
 - Tiers 11 – 15 = Standard
 - Tiers 16 – 20 = Middle Market
 - Tiers 21 – 25 = Non standard
- Assumption – the strength and slope of some the “class plan” variables vary by type of risk
 - Interact the class plan variables the tier based partition
- Result – effectively separate class plans by type of risk or tier

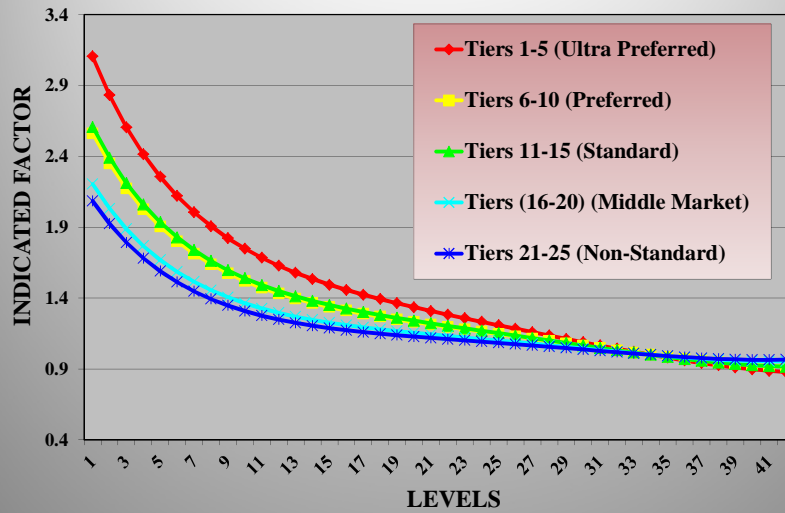
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Mileage Factors by Segment (Tier)



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Variable 2 Factors by Segment (Tier)



Other uses of tier - Limit impact to existing rating structure

Implementing a class plan change without impacting the underlying class plan

- No change to existing plan
 - Control dislocation to the existing book
 - Isolate changes to the policy writing system
- Methodology
 - Tiering variables = can be new variables or existing variables
 - Multivariate analysis
 - Independent Variable = Loss ratio using current class plan premium
 - Dependent Variables = Variable to be use in new tier
 - Use aggregate dependent variable score to establish tier

Other uses of 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.

Frozen Tier

Background: Several states require tier to be frozen at policy inception

- 1) Option – include variables not permitted in class plan
 - a. Driving record – NAF's, NCAF's, 4th & 5th year incidents
 - b. Prior carrier info – BI limit, tenure
 - c. Credit
- 2) Retiering – sometimes required and sometimes optional
 - a) Down tiering (premium decreases) - required by some DOI's
 - i. Not necessarily loss cost based
 - b) Up tiering (premium increases) – permitted by some DOI's but limited
 - i. Develop algorithm to detect adverse performers within frozen tiers



Variables used in Personal Auto tiers

Variable Type	Company X	Company Y	Company Z
Financial Responsibility	Credit	Credit; Credit X Age	
Prior carrier	Prior insurance; Prior BI limit; Prior carrier type	Current insurance status; X Age; Prior BI limit; Prior carrier tenure	
Driving record	NAF's; Omitted incidents; Comprehensive claims	NAF's; Number of incidents; Majors; Convictions; Months since	
Household composition	Number of drivers	Number of drivers; X Marital status; Number of drivers x Number of cars	
Others		Age; Education; Occupation; Distribution channel; Years licensed	



TIERING

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