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2012 CAS Ratemaking and Product Management Seminar, PMGMT-1

Discussion of Using “Tiers” for Insurance Segmentation
from Pricing, Underwriting and Product Management
Perspectives

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March, 2012



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Tier Rating History

- Tier rating originated from personal lines in middle 1990's
- One reason for tier rating application is to integrate a wider range of “non-traditional” rating variables to improve risk segmentation and increase pricing points:
 - **Credit**
 - **Liability symbol**
 - **Variable interactions. Specifically, interaction between traditional variables and non-traditional variables**
 - **etc**
- Another reason is for flexibility in managing state specific regulation requirements:
 - **Credit**
 - **Not-At-Fault Accidents**
 - **etc**
- Tier rating can also simplify the rating structure

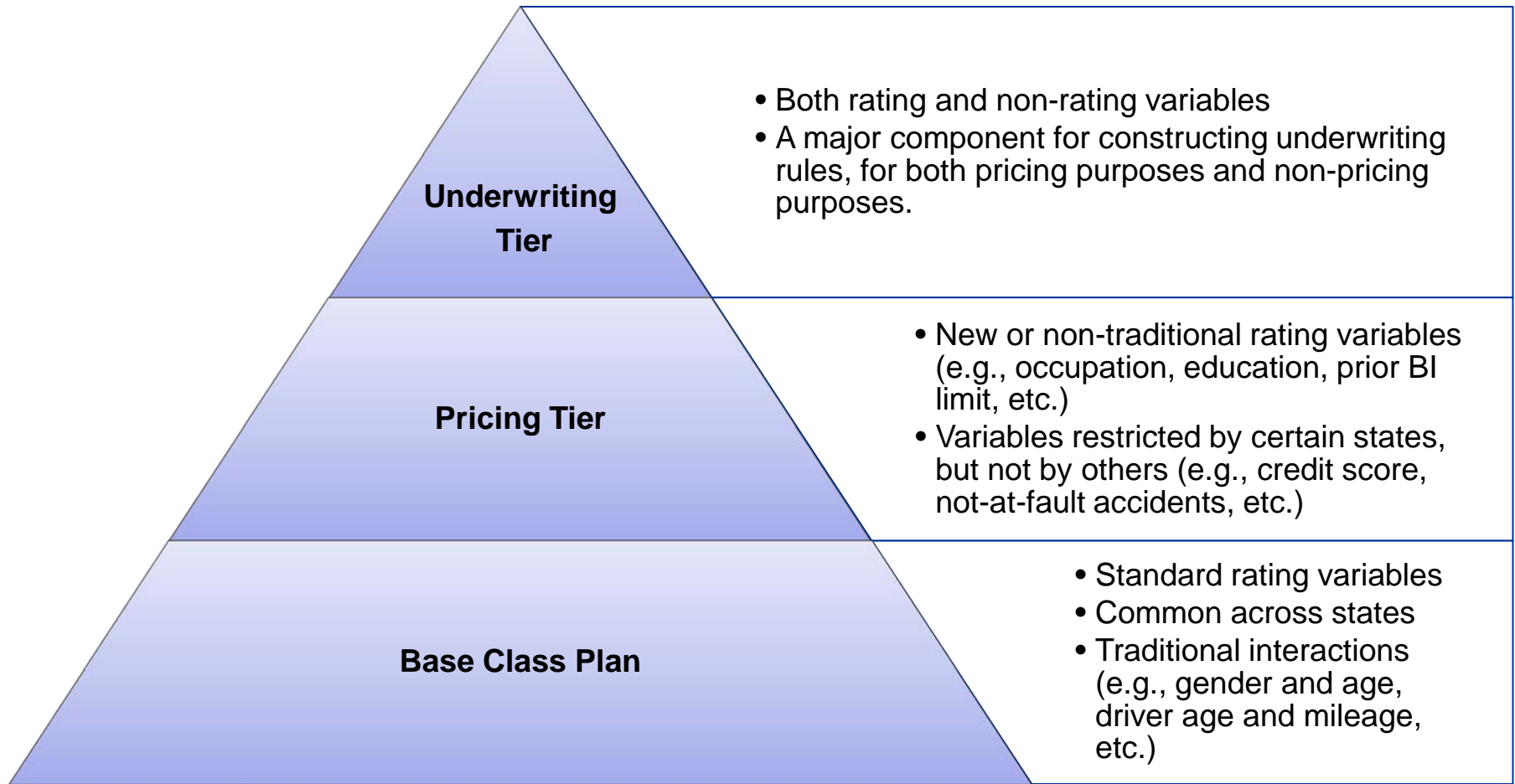
A Challenge for Personal Lines Product Management

While the fast development of modern rating plans significantly improves the rating accuracy and rating complexity, it also causes challenges for insurance industry:

- Disruption challenges
 - New rating plans may cause a significant book disruption for renew business
 - Capping the price change within x%, but some states may not allow such capping
 - Before the capping is fully un-winded, new rating plans may kick in
 - Difficult to explain to policyholders for the causes of price change
 - Difficult to track changes
 - It is fairly common that new rating plans are implemented for new business only
- Version control and maintenance challenges
 - Different states may require different rating variables according to the state regulations.
 - Version control challenges for IT production, filing, rating manuals, etc

A Double Tiering Approach

A three layers pyramid structured approach is applied for improving pricing accuracy and underwriting efficiency



Rating Tier Vs. Underwriting Tier

Rating Tier

- By coverage, on exposure level
- Target – Loss Cost or Loss Ratio
- For improving point estimation accuracy
- Same for both new business and renew business
- Only using rating variables
- Implementation – for building rating tiers and directly used in rating manual

Underwriting Tier

- On policy level
- Target – Loss Ratio
- For UW profitability segmentation
- Different between new business and renew business
- Using both rating and non-rating variables
- Implementation (PL) – further segment base rates with flexible tier placement to improve UW efficiency.
- Implementation (CL) – incorporating with schedule mod to balance UW efficiency and pricing flexibility

Tier Applications in P&C Insurance – Rating & Underwriting

4 Major Categories

Personal Lines Rating Tiering

Personal Lines Underwriting Tiering

Commercial Lines Rating Tiering

Commercial Lines Underwriting Tiering

Commercial Lines Rating Tiers: An Example for BOP

4 Tier Variables

Number of Losses:

- None
- 1
- 2
- 3+

Years in Business:

- 0-1
- 2-4
- 5-15
- 16-20
- 21+

Account Size Threshold:

- Apartment - 2.4M
- Condo - 4.1M
- Office – 1.5M
- Commercial Condo- 4.3M
- Contractors – 0.1M
- Business -1.2M
- Religious-2.2M
- Garage – 0.469M
-

Size of Losses:

- $\leq \$5,000$
- $> \$5,000$

Commercial Lines Rating Tiers: An Example for BOP

- Loss ratio was used as the target to calculate tier relativities
- 3 interactive variables are constructed using 4 tier elements
 - Interaction of number of losses and size of losses – 10 interactive values
 - Interaction of years in business and number of losses – 10 interactive values
 - Interaction of years in business and account size by industry group - 44 interactive values
- 40 rating tiers are defined using the loss ratio relativities of the 3 interactive variables
- The tier factors are widely spread from 0.52 to 2.85

Commercial Line Rating Tiers: An Example for BOP

- Since loss ratio is used as the target for tier creation, the rating tiers are created through the residual of the other rating variables
- Different from PPA, the number of losses in the tier structure is not normalized by exposure
- Size distribution is also different by industry group.
- The tier distribution could be biased by industry group, resulting in a wide spread for tier factors
- Need to have a large amount of data to build the rating tiers for a commercial package program

Commercial Line Underwriting Tier Score

- An underwriting scoring system can be generated based on a linear scoring model:

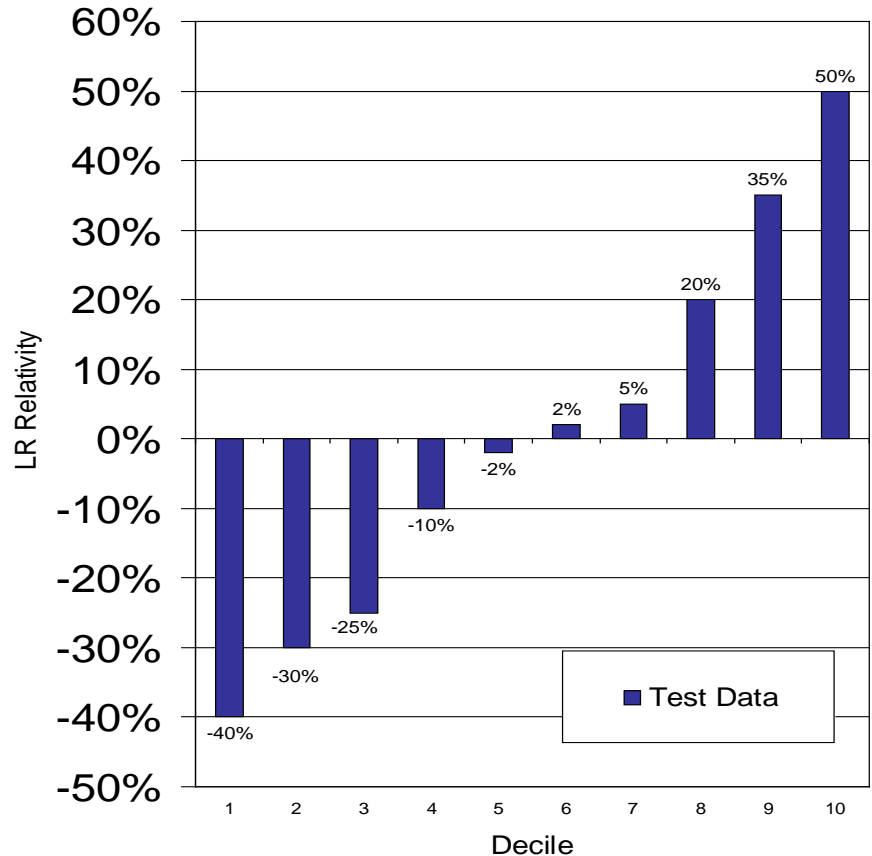
$$\text{Underwriting Score} = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N,$$

Where $X_1, X_2 \dots X_N$ are selected underwriting variables

- An underwriting score is applied to differentiate profitability that goes beyond a given commercial line rating plan. Therefore, loss ratio is an appropriate target variable for the creation of the score.
- For commercial line operations, loss ratio lift curves are computed based on underwriting scores to support schedule modifications and underwriting tiers.

Commercial Line Underwriting Score: A Lift Curve Sample

- Sort data by the underwriting score
- Break the data (test or validation) into 10 equal pieces
 - Best “decile”: lowest score
 - Worst “decile”: highest score
- In each decile, compute the *actual* loss ratio
- The spread in actual loss ratio is the “lift”.
- Lift measures predictive power of the model



Commercial Line Underwriting Scoring

- Tier Score Elements
 - Loss experience variables in multi dimensions
 - ✓ Claim Frequency = Number of Losses / Earned Premium
 - ✓ Loss Ratio = Incurred Loss / Earned Premium
 - ✓ Claim Frequency of No Loss Claims
 - ✓ By different prior year
 - ✓ Claim Reporting Lag
 - ✓ Indicator for Claim on Weekend or Holidays (Significant for WC)
 - Other frequently selected tier score elements
 - ✓ Policy variables
 - ✓ Agency variables
 - ✓ **Weather** variables
 - ✓ Demographic variables
 - ✓ Credit **or financial** variables

Two Types of Underwriting Tiering Variables

The algorithmic solution score is calculated by analyzing a variety of risk characteristics about each individual policy. These risk characteristics span a variety of different dimensions and are, in large part consistent with factors used in the underwriting process today.

Typically In
UW Model

- Loss history (Renewal only)
- Zip code demographics
- Billing experience (Renewal only)
- Agency experience
- Policy age (Renewal only)
- Financial experience
- Vehicle characteristics (Auto)
- Building information (Property)
- Policy limits (Liability)
- Exposure complexity (WC)

There are a number of predictive variables that are not used in the models but which could influence the decision process. It is not possible to list all of the variables, however consideration should be given to these factors.

Typically
Out of UW
Model

- Loss Control Reports
- Market Conditions
- What other insurers are likely competing for this risk
- **Cause** of historical losses
- Exposure to catastrophic losses
- Unique business characteristics
- Recent or emerging industry trends

Frequent Asked Questions on Commercial Lines Tiering

- Why the spread of underwriting model lift curves are not as wide as the spread of rating tier factors?
- Should including rating variables in underwriting scoring?
 - **from a pricing perspective**
 - **from business implementation and state filing perspective**
- How to choose number of underwriting tiers based on underwriting scores and lift curves?
 - **Lift curve consideration**
 - **Tradeoff between pricing flexibility and low-touch/no-touch underwriting**
- How to handle writing companies and underwriting tiers?
- How to make the underwriting score based tiering to be harder for competitors to follow?