

Dynamic Auto Book Simulation

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 Nick Weltmann, FCAS
 Lijuan Zhang, FCAS

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Dynamic Auto Book Simulation Assumptions

Year 0 Market

Assumptions										
Age Territory	under 25			25-65			over 65			Total
	urban	suburban	rural	urban	suburban	rural	urban	suburban	rural	
Policy Count	5,000	3,000	2,000	35,000	20,000	15,000	10,000	6,000	4,000	100,000
Average Premium	700	650	600	500	450	400	400	375	350	468
LR Renew	.80%	.70%	.60%	.55%	.55%	.45%	.70%	.60%	.50%	.61%
SOE/R	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
ACQ/B	.15%	.15%	.15%	.15%	.15%	.15%	.15%	.15%	.15%	.15%
CR	115%	105%	95%	100%	90%	80%	105%	95%	85%	96.5%
Pure Premium(Renew)	560	455	360	325	248	180	280	225	175	
Pure Premium(New)	505	488	390	350	270	200	300	244	190	

NB LR relative to Renew

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Dynamic Auto Book Simulation

Instructions

1. Everyone review auto book data.
2. Everyone must decide what, if any, renewal rate change they want to offer their existing book for year 1.
3. Everyone turn in their actions to Commissioner Nick.
4. Time allotted = 5 minutes.

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Dynamic Special Account Simulation

WHO WINS?

For this model, the winner is determined by team that maximizes underwriting profit.

However, the winning formula can be customized to fit the needs of the modeler.

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Dynamic Auto Book Simulation

Goals									
Maximize UW Profit									
Rules									
1. In Year 0, all the companies have equal number of customers in each segment(Age, Territory)									
2. Year 1-5 Rate changes to be -20% ~ +20%									
3. The higher renewal rate, the more likely existing customers will leave. The lower renewal rate, the more likely the company will get new customers									
4. New business LR is 5%pts higher than Renewal									
Input									
Age	under 25			25-65			over 65		
Territory	urban	suburban	rural	urban	suburban	rural	urban	suburban	rural
Year 1	___%	___%	___%	___%	___%	___%	___%	___%	___%
Year 2									
Year 3									
Year 4									
Year 5									
Total									

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Dynamic Auto Book Simulation

LIJUAN TALKS

While team actions are being entered into simulation model, there is time for discussion tailored to fit audience.

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Ratemaking (Pricing)

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Topics

1. Ratemaking – what is it?
2. Basic rate level analysis – Overall Rate Adequacy
3. Customer Life Time Value (CLV):
 - Segmentation analysis
 - Retention/Conversion rate
 - Customer Life Time Value



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What is the ratemaking

Ratemaking: Look ahead, not back

- **It's a test**
- **A test of the current rates**
 - Test of overall adequacy of the rate level
 - Test of predictive accuracy of the rating plan (Generalized Linear Models or GLM or Machine Learning)



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Basic rate level indication

Compares a projected loss ratio to a target loss ratio to determine the need for a base rate adjustment

Projected Loss Ratio	Target Loss Ratio	Base Rate Level Adjustment
63%	65%	-3%
72%	65%	+11%
63%	61%	+3%

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Basic rate level indication

What is a projected loss ratio?

- Losses
 - Historical accident period losses
 - Losses developed to ultimate loss level
 - Trended to future period
- Premiums
 - Historical premiums
 - Adjusted to current rate level
 - Adjusted to reflect changes in the mix of business

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Basic rate level indication

Target Loss Ratio

What is a Target Loss Ratio?

Target Loss Ratio = 100% - expense ratio - profit margin

Example

	100%	100%
Expense Ratio	25%	32%
Profit Margin	10%	10%
Target Loss Ratio	65%	58%

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Customer Life Time Value (CLV)

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Segmentation Analysis

- Why do we need segmented rates?
- Considerations in segmentation analysis
- Basic methods and examples



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Segmentation Analysis

Why do we need segmented rates?

- **Individual Insured differ in . . .**
 - Accident frequency
 - Accident severity
- **With segmented rates . . .**
 - Each group pays its share of losses
 - We avoid anti-selection

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Segmentation Analysis

Why do you need segmented rates?

What is Anti-selection?

Anti-selection results when a competitor segments rates better than you do.

Example

	Actual	Rates		Distribution	
	Loss Cost	Co-A	You	Co-A	You
Male	\$300	\$600	\$400	20%	80%
Female	\$100	\$200	\$400	80%	20%
Average	\$200				
	Actual Loss Cost	140	260		
	Average Rate	280	400		
	Loss Ratio	50%	65%		

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Segmentation Analysis

Why do you need segmented rates?

What if you are smarter than the competition?

You get "Pro"-selection.

Example

	Actual	Rates		Distribution	
	Loss Cost	Co-A	You	Co-A	You
Male	\$300	\$400	\$600	30%	
Female	\$100	\$400	\$300	70%	
Average	\$200				
	Actual Loss Cost		160		
	Average Rate		390		
	Loss Ratio		41%		

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Segmentation Analysis

Considerations in segmentation analysis

- **Objective:**
 - To get the "best estimate" for freq, sev, pp, and L/R!!
- **Constraints:**
 - We want to include a lot of information in the model
 - We want to have a multiplicative structure
- **GLM (basic and popular)** -- has a knowledge to resolve our objective and constraints because:
 - GLM is a multivariate regression model
 - All variables are fitted simultaneously to account for the correlation and interaction.
 - The actuary can use the model output to test the significance of the variables in predicting the future losses.
 - The actuary can compare the predictive quality of different models and select the best model

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Segmentation Analysis

Considerations in segmentation analysis

- Ability to collect accurate data
 - Mileage – not good
 - Vehicle make/model and age – good
 - Age / Sex / Marital Status of driver – good
 - Territory – good
 - Use of Vehicle – difficult
 - Accident history – varies
 - Credit score-Varies
- Predictive Power
 - Vehicle make/model and age – good for OD, theft
 - Age / Sex / Marital Status of driver – good for all coverages
 - Territory – good for all coverages
 - Accident history – good for all coverages
 - Credit score: good for all coverages

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Retention and Conversion Rate

Retention Rate

- Definition: Number of renewed/Number of written
- Considerations:
 - a) Premium Change Factor
 - b) Renewal Premium Level Factor
 - c) # of Times Renewed Factor ("tenure")



Conversion Rate

- Definition: Number of written /Number of quotes
- Considerations:
 - a) Competitive Index
 - b) Offered Premium Level Factor
 - c) Driver Characteristics

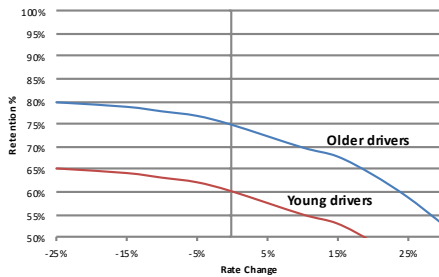
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Curves

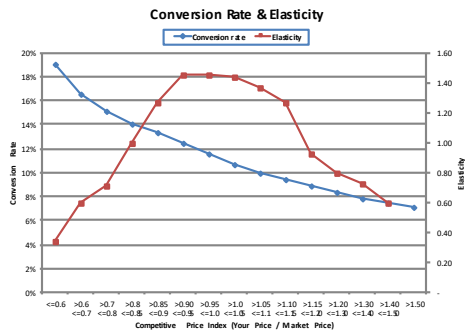
Retention Curve



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Curves

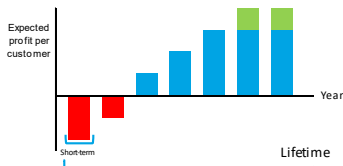


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Why Customer Lifetime Value?


Short-term vs. Lifetime




Customer Lifetime Value (CLV) is the net present value of the cash flows attributed to the relationship with a customer during their entire lifetime

CLV provides comprehensive understanding of the customers' profitability in terms of long-term perspective and cross-sell / up-sell opportunity.

Risky young driver

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→ *Safer and more profitable as the customer gets old*


→ *May purchase additional insurance - home, life, another car insurance*


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Dynamic Simulation Models

Objectives of Dynamic Simulation Model

1. Training midlevel managers.
 - a. Line of business model: personal auto.
 - b. Account-driven model: Special Accounts
2. Collaboration among teammates.
3. Plan in dynamic state.

Senior management mandate to us:

1. Can't spend money.
2. Must do it ourselves.

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Dynamic Simulation Models

**Did we accomplish
our objectives?**

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Dynamic Simulation Models

Training objective

1. Used different model for group in training.
 - a. Special Account model used with underwriters and managers.
 - b. Able to use auto model with all departments including new hires.
2. "Lijuan Talks" important training feature – easily varied for different groups. Examples include:
 - a. Actuarial discussion of ratemaking, trending, retention.
 - b. Manager discussion on profit goals.
 - c. How to measure the winner – great discussion!

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Dynamic Simulation Models

Collaboration objective

1. Pre-picked teams or random selection – each has pros and cons.
2. Every exercise we ran had successful collaboration whether pre-picked or random.
3. Lots of energy in room.
4. Lots of thinking in room.
5. Non-threatening atmosphere helped collaboration and participation.

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Dynamic Simulation Models

Plan in dynamic setting

1. Every year our company plan only involved our company's actions – never came true.
2. Model did meet objective but had limitations.
3. What about our competitors?
4. What drivers needed to be included?
5. How many drivers could model handle?
6. How many drivers could builder of model handle?

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Dynamic Simulation Models

Other benefits!

1. Simulation provided dynamic actions and results – no exercise ever was the same.
2. Debriefing of strategy of each team. How did it change after each year?
3. Interesting team dynamics – did leader emerge?
4. Great interaction!

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Dynamic Simulation Models

OKAY, LET'S SEE WHO WON YEAR 1!

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Dynamic Simulation Models

Conclusions

1. Simulation model very good in training situation.
2. In person sessions work best with 12-24 people.
3. Model can be built in-house.
4. Model can be tailored to fit individual needs.
5. Model can be online – I will be running one next week for a Masters Program at Columbia.
6. It's fun! There are prizes for the winning team!

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Dynamic Simulation Models

OKAY, QUESTIONS
AND/OR COMMENTS?

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