



cutting through complexity

Demand modeling for commercial lines: enhanced pricing, business projections, and customer experience

CAS RPM Seminar

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Agenda

- What is Price Elasticity?
- Why is Price Elasticity useful?
- How can Price Elasticity be measured?
 - Fundamentals
 - Model types
 - Producer behavior
 - Data
 - Validation
- How can this information be operationalized?
- What are the benefits?
- Questions and answers



What is Price Elasticity?

Textbook definition

Price Elasticity of Demand is:
the percent change in units sold that results from a 1% increase in price

Practically speaking:

- A measure of policyholder reaction to price changes
- A pricing tool that provides a competitive edge

What is Price Elasticity? (continued)

Example

- Suppose:
 - Construction companies have price elasticity of -0.5 (on average)
 - You write 100 policies of this business, at a premium of \$1,000 each
 - You increase rates by +10%



	Before	After
Premium per policy	\$1,000	\$1,100
Policy count	100	95
Total premium	\$100,000	\$104,500

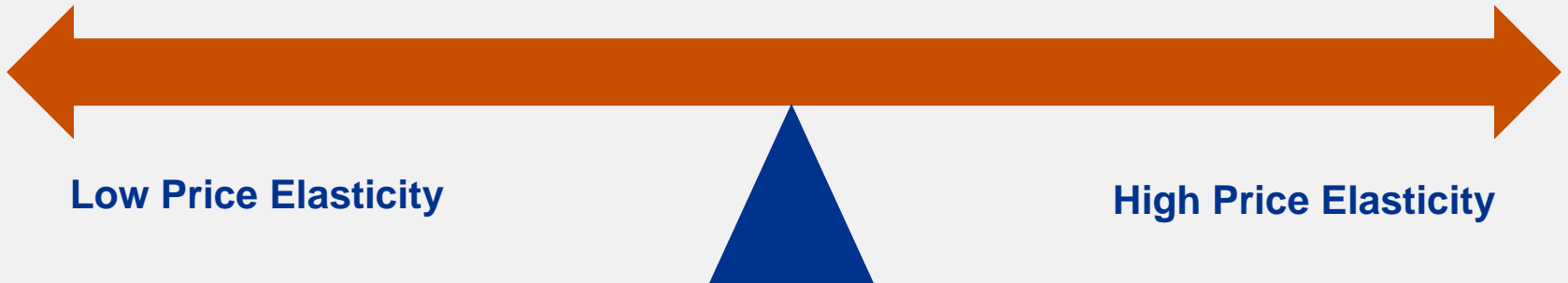
Why is measuring Price Elasticity useful?

Understanding customer preferences – which can vary widely from policyholder to policyholder

- Value shoppers vs. Price shoppers

- Value shoppers
- May rarely shop
- May not base decisions on price

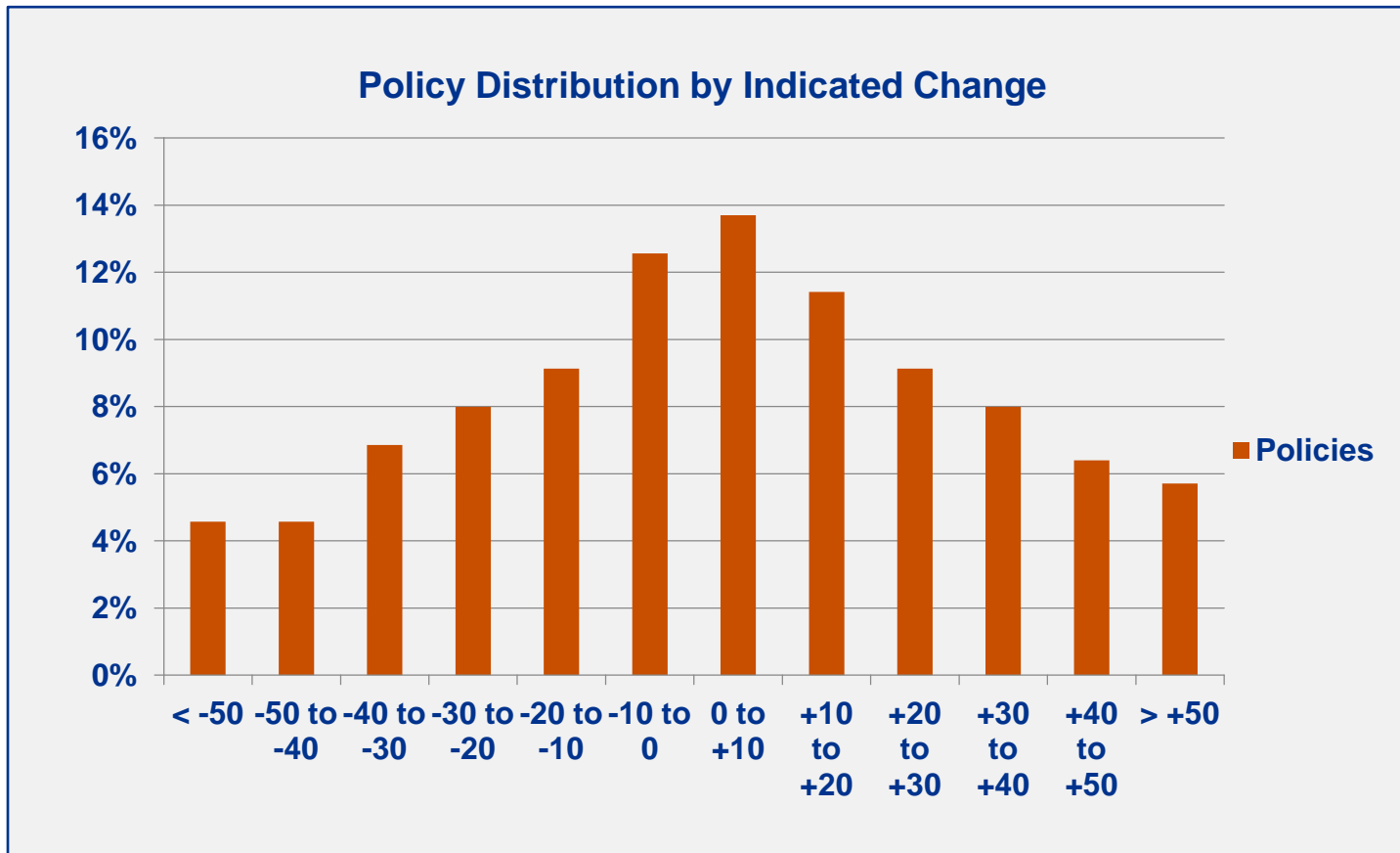
- Price shoppers
- May shop annually
- May base decisions largely on price



This information can be used to “optimize” price changes

Why is measuring Price Elasticity useful? (continued)

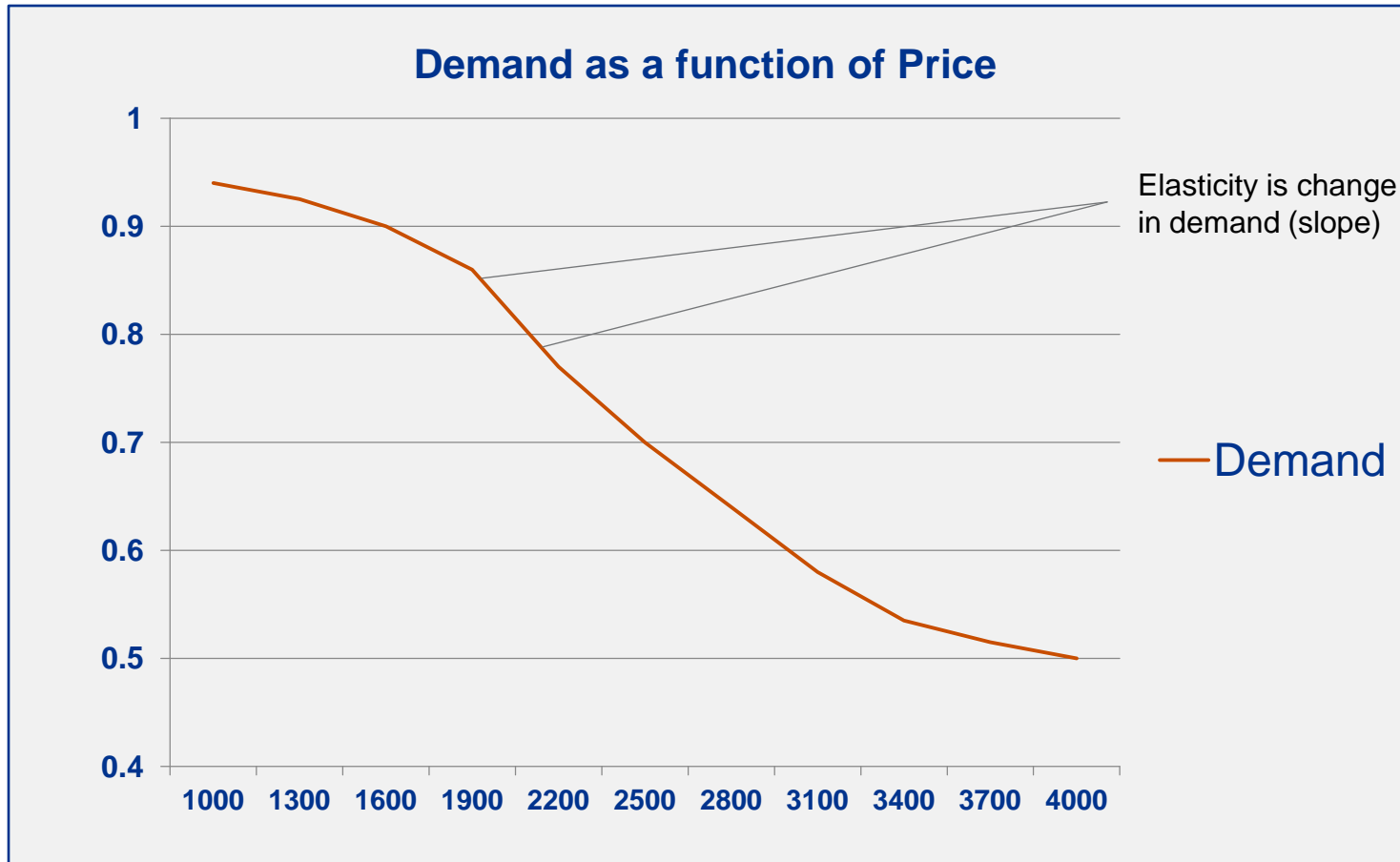
Cost-based predictive models can indicate a wide distribution of rate changes ...



... but someone must decide how to implement these changes, how quickly, and for which policyholders

How can we measure Price Elasticity?

For each type of policyholder, measure how quickly demand (e.g., retention) changes as price changes.



How can we measure Price Elasticity? (continued)

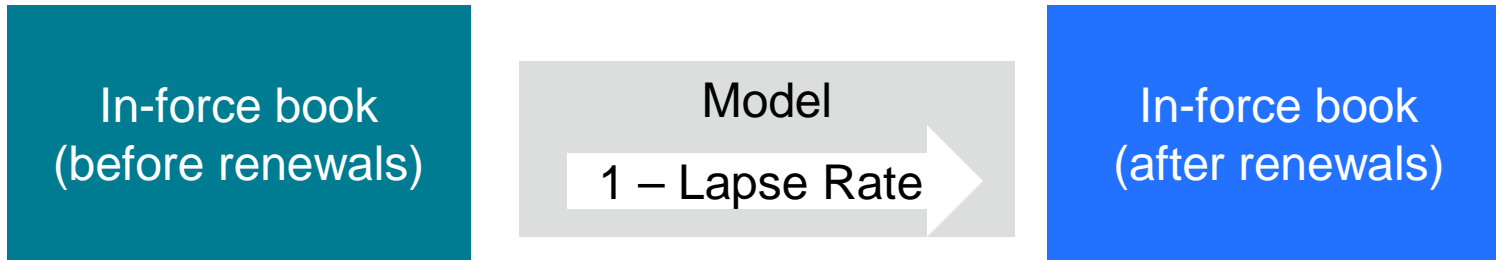
One method

- Use historical data on demand (e.g., who has renewed and who has lapsed)
- Predict demand using a model that includes:
 - Price-related variables: offered premium, premium change, etc.
 - Non price-related variables: the same information you use for modeling cost, other information about your policyholders and producers
- Since price elasticity is the change in demand (e.g., change in lapse rate) as price changes, model results can be used to calculate elasticity

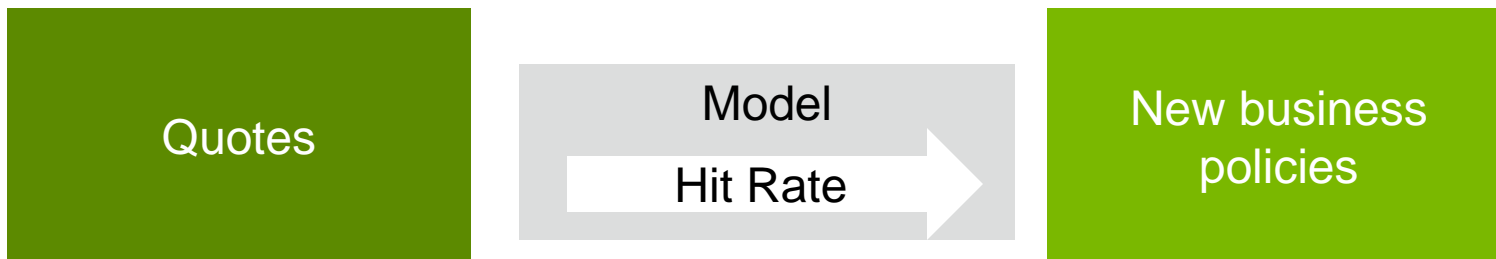


Two types of demand are popular to model

Probability of renewal (or lapse)



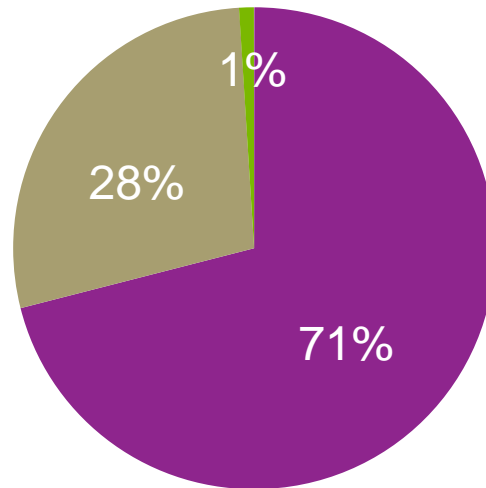
Probability of new business sale, given a quote was made (a.k.a., hit rate or conversion rate)



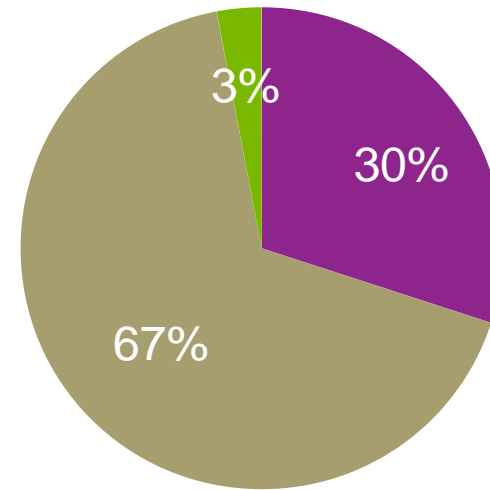
Producer behavior matters, especially for Commercial Lines

First, different distribution channels should have different elasticity models

Personal Lines Premiums, U.S., 2011



Commercial Lines Premiums, U.S., 2011



■ Direct & Exclusive Agents* ■ Independent Agents & Brokers** ■ Other

* Includes internet writers, direct response and affinity groups

**Includes general agents and MGAs.

Source: Insurance Information Institute

How can we account for producer behavior?

Option 1:

- Model overall lapse rates and hit rates, and add producer-related variables:
 - Producer's historical lapse rate
 - Producer's historical hit rate
 - Other information about the producer

Option 2:

- Model the components of lapse (to the extent data and/or assumptions can support):

**Probability of lapse = Probability of policyholder-initiated lapse +
Probability of producer-initiated lapse** (if producer is ind. agent/broker)

Probability of policyholder-initiated lapse =

Probability policyholder decides to shop *
Probability shopping policyholder decides to switch

Probability of producer-initiated lapse =

Probability producer recommends that policyholder shop *
Probability that policyholder agrees to shop *
Probability shopping policyholder decides to switch

Quote volume is important, too

- The number of quotes produced is an important component of aggregate demand
- Quote volume changes over time for many reasons:
 - Your rate changes, product releases, and other product changes and promotions
 - Competitors' rate changes, product releases, and other product changes and promotions
- Changes in quote volume over time can differ by policyholder type and by producer type



Data considerations for demand modeling

- Which historical price changes were also associated with exposure changes or other changes in risk characteristics?
- Which historical price changes may have been expected by the insured?
- Was the market hardening or softening during your experience period?
- How much rate activity have you initiated?
 - Number, size, and variety of price changes
- Have price changes have been made with a random component, to enable direct price testing?
- Do you have complete data for quotes that did not result in a sale?
- If multiple price quotes were made, for which do you have the price information? For which do you have the corresponding rating characteristics?

Most insurers have the right data to model lapse; few have complete data to model the components of lapse

- Do you know when a producer recommends that a policyholder shop?
- Do you know when a policyholder shops?

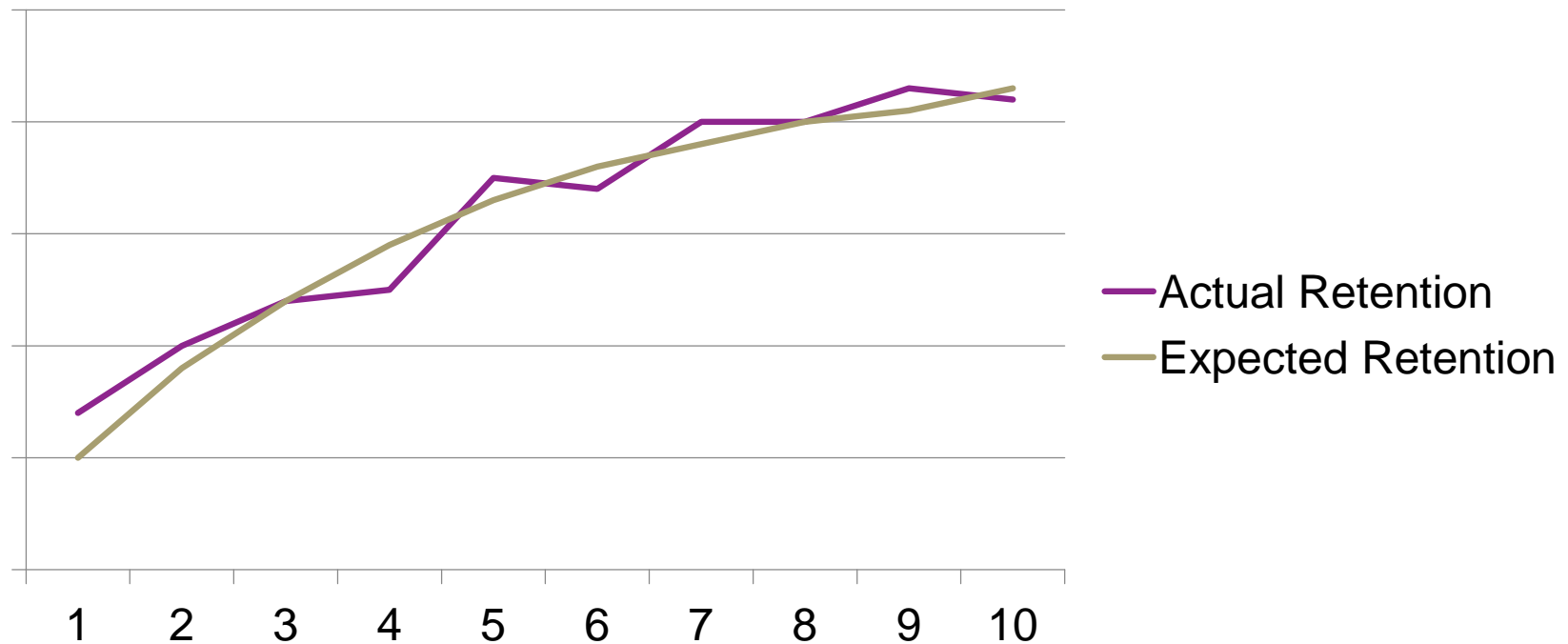
Even if data limitations exist, consider the components of lapse may help:

- Guide decisions about how to structure elasticity models or which variables to use
- Suggest new data fields to collect for future elasticity modeling

Data gathered through surveys and focus groups can also provide additional insights about policyholder and producer behavior

Model validation is (always) important

- Testing your models on:
 - Randomly-defined holdout samples is good
 - Holdout samples from a different time period is better
- Market conditions can change faster than insurance risk
- Timing of training and holdout data is crucial for demand/elasticity modeling (perhaps more crucial than for cost modeling)



How can we operationalize Price Elasticity information?

Price elasticity can be used for pricing, book projections, marketing, and customer and distribution management:

Pricing

- Updates to rating and tier algorithm relativities, rate change capping, and tier movement rules
 - Rate changes and rate change capping can vary by type of policyholder
- Underwriters can use elasticity “scores” to judge how fast to change an account’s rate, and which policyholders will be likely to accept an increase without lapsing

Book Projections

- Based on a given rate change proposal, demand/elasticity estimates can be used to forecast renewal rates (by policy, by segment, or for your book as a whole)
- Your cost models give you profitability projections for your book
- Policyholder Lifetime Value can also be determined based on cost and demand

Marketing

- Tailor marketing efforts based on whether the policyholder is motivated by price or by your service and value proposition

Customer Management

- Tailor service strategy based on customer preferences, also

Producer Management

- Attract and retain producers with the right characteristics (beneficial to company, value the brand)
- Identify relationships that need to be improved or terminated

Example #1 – Using elasticity to manage rate decreases

	Account A	Account B
Rate Indication	-15%	-15%
Price Elasticity	High	Low
Service Strategy	Price-based	Value-based
Pricing Action	Take full -15%	Take -5%
Result	Attract and retain more business at target profitability	Maintain stronger profit margin

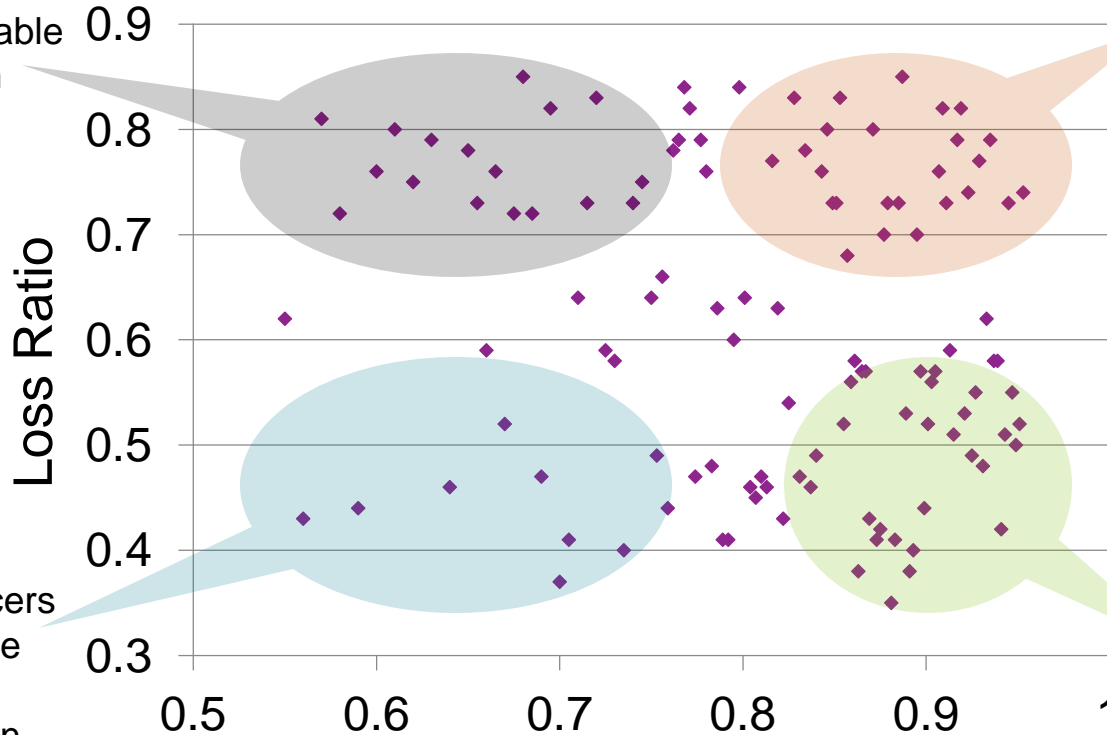
Example #2 – Using elasticity to manage rate increases

	Account C	Account D
Rate Indication	+15%	+15%
Price Elasticity	High	Low
Service Strategy	Price-based	Value-based
Pricing Action	Take +5%	Take full +15%
Result	Move towards target profitability, while limiting impact on retention	Restore profitability quickly, with minimal impact on policy count

Demand and cost information allow you to evaluate producers objectively

Loss Ratio and Retention

These producers write unprofitable business with low retention



Adverse selection may be affecting these producer's books

These producers have profitable books. How could retention be increased?

These producers have profitable books with high retention

What are the Benefits?

- Enhanced growth and profit
 - A pricing strategy informed by cost and elasticity information can:
 - Reduce lapses by 10%, without reducing profit margins
 - Reduce loss ratio by 2-4 points, without reducing policy volume
 - Demand modeling results are also powerful marketing tools
- Improved customer satisfaction
 - Tailor service based on an enhanced understanding of policyholder preferences





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