Price Optimization and the Role of Producer Behavior

2011 Ratemaking and Product Management Seminar

Alex Laurie, FCAS, MAAA

March 21, 2011

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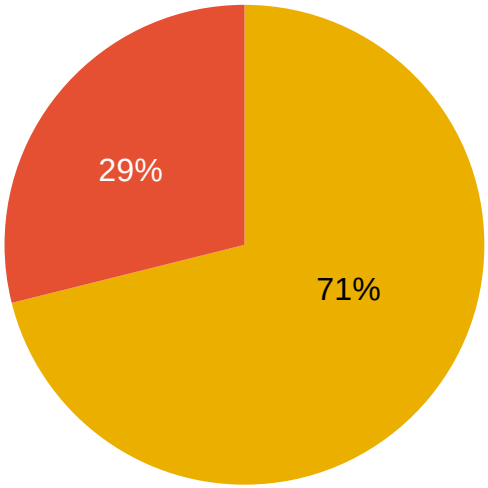
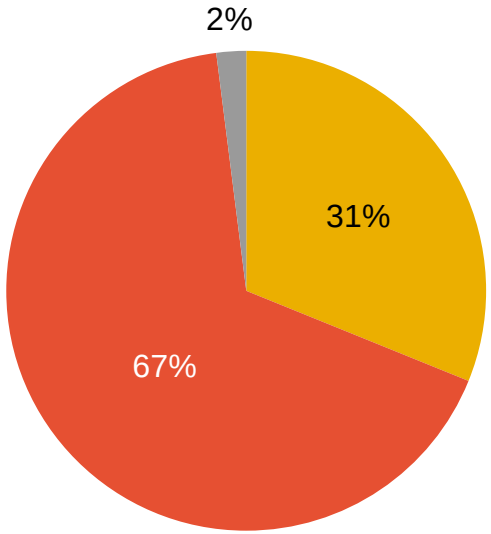
Different distribution channels need different elasticity models

Personal Lines Premiums, U.S. 2009



Commercial Lines Premiums, U.S. 2009



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

*Includes internet writers, direct response and affinity groups.
**Includes general agents and MGAs.
Sources: Insurance Information Institute, A.M. Best.

Contents

- Price optimization overview
- Elasticity model structure
  - Direct measurement of lapse/hit rates
  - Measuring components of lapse rates
  - Measuring changes in quote volume
- Data considerations

What is price optimization?

- Setting prices by customer segment so that
  - One attribute is maximized (or minimized)…
  - …Given constraints on other attributes
- For example:
  - Maximize underwriting profit, with the constraint that retention is no less than X
  - Maximize growth in written premium, with the constraint that profitability remains at current levels
  - Minimize lapse rate, with the constraint that combined ratio is no more than Y

Price optimization inputs

- Understanding of:
  - Actuarial, cost-based price (from traditional predictive modeling)
  - Elasticity of demand, by customer segment
  - (When possible) Competitor pricing in the marketplace (from competitive market analysis)

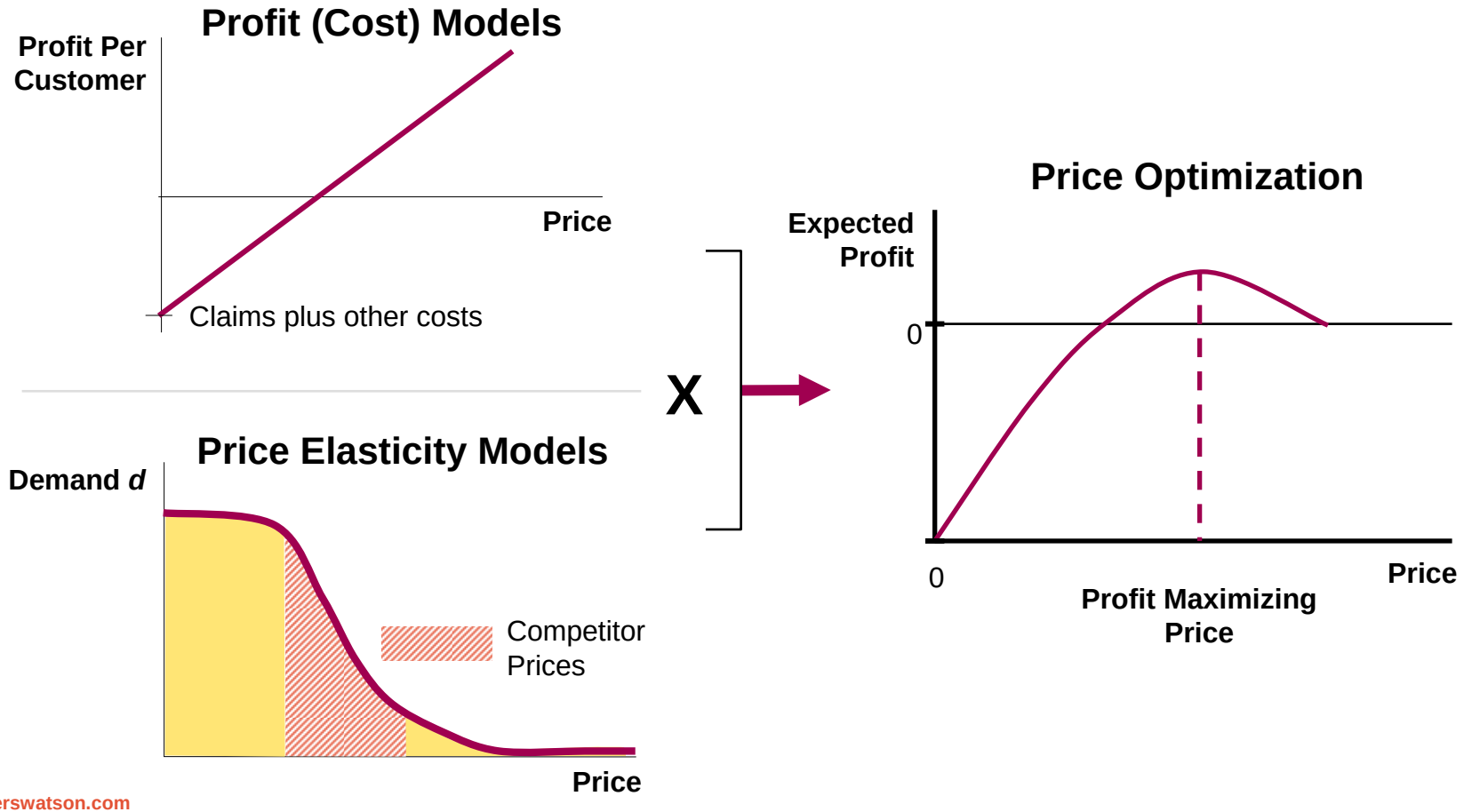
Why price optimization?

- Price optimization methods allow carriers to:
  - Gain a better understanding of the marketplace
    - Collect extra premium when below market price
    - Price more aggressively to retain profitable business
    - Identify profitable niches for new business marketing
  - Gain insight into how prices impact performance
  - Quantifiably balance profits and market share
  - Establish stronger pricing governance framework
  - Ultimately, realize a sustainable increase in profitability

Local regulatory restrictions exist. In the U.S., pricing regulation is more influential for personal lines. Price optimization strategies are adapted to comply with local regulations.

Price optimization balances the trade-off between supply/cost and demand/revenue

By integrating profit (cost) models by customer segment and distribution channel with price elasticity models, prices can be set to optimize the trade-off between the contribution per policy and volume of business expected to meet given financial objectives and business constraints



A simple example will help illustrate how price optimization works

Base Scenario

	Segment A	Segment B	TOTAL
Premium	100	100	
Profit	25	25	
Volume	1,000	1,000	2,000 units
Total Profit	25,000	25,000	50,000
Elasticity	8	2	

Scenario 1: Prices that maximize the profit with the same volume

	Segment A	Segment B	TOTAL
Premium	95	120	
Profit	20	45	
Volume	1,040	960	2,000 units
Total Profit	20,800	43,200	64,000

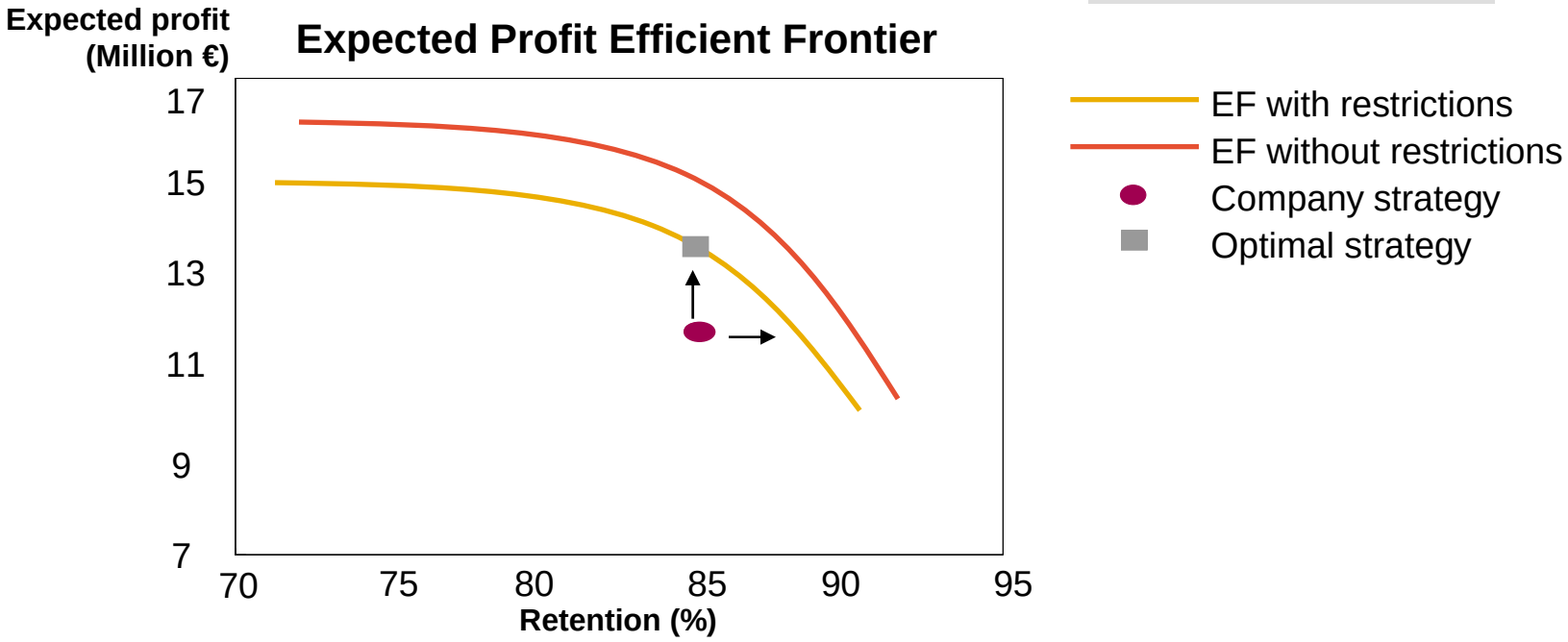
Scenario 2: Prices that maximize the volume with the same total profit

	Segment A	Segment B	TOTAL
Premium	85	115	
Margin	10	40	
Volume	1,120	970	2,090 units
Total Profit	11,200	38,800	50,000

Optimization

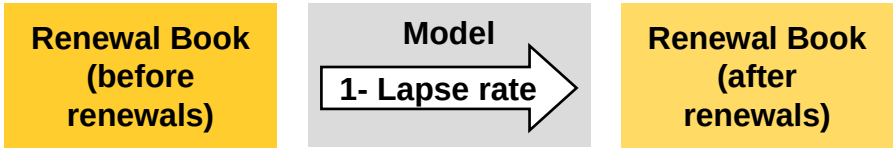
- This step involves combining the cost models (claims and expenses) and customer price elasticity models in order to determine the optimal price by customer type
- The optimal price will be the one that satisfies the company's objectives and constraints maximizing profitability subject to a certain volume of business

ILLUSTRATIVE EXAMPLE

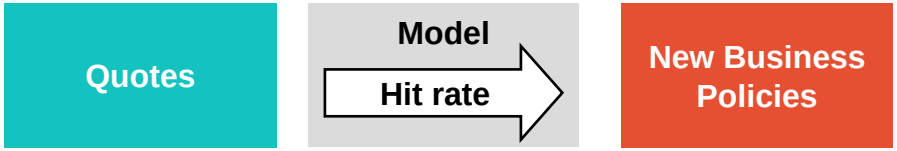


Elasticity models can directly predict:

- Probability of renewal (or lapse)



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



- With these simple model structures, producer behavior can still be considered
  - Via explanatory variables such as a producer's historical lapse rate or hit rate
  - Producer-related variables can be used by:
    - Insurers with independent agents
    - Insurers with exclusive/captive agents
    - Direct writers (if some sales representatives have better results than others)

Alternatively, elasticity models can measure components of lapse

- Any of these components can be modeled (if data exists).
- Simplified assumptions can be made for pieces where data does not exist.

Probability of lapse = **Probability of customer-initiated lapse** +

Probability of producer-initiated lapse (if producer is independent agent / broker)

Probability of customer-initiated lapse =

Probability customer decides to shop*

Probability shopping customer decides to switch

Probability of producer-initiated lapse =

Probability producer recommends that customer shop*

Probability that customer agrees to shop*

Probability that shopping customer decides to switch

Quote volume matters, too

- Demand modeling isn't just about hit rates and lapse rates
- Especially for independent agents/brokers:
  - New business quote volume can be affected by (new or renewal) rate changes
  - Changes in new business quote volume differ by customer type and producer

Data implications

- An insurer does not always know:
  - When a producer recommends that a customer shop
  - When a customer shops (unless the customer uses the insurer's website or they lapse)
- Considering the components of lapse rates may help:
  - Guide decisions about how to structure elasticity models or which variables to use
  - Suggest new data fields to collect or store for future elasticity modeling
- Data gathered through surveys and focus groups may also yield insights about customer and producer behavior

CMA — An Essential Ingredient

2011 Ratemaking and Product Management Seminar

Jesús Catalán

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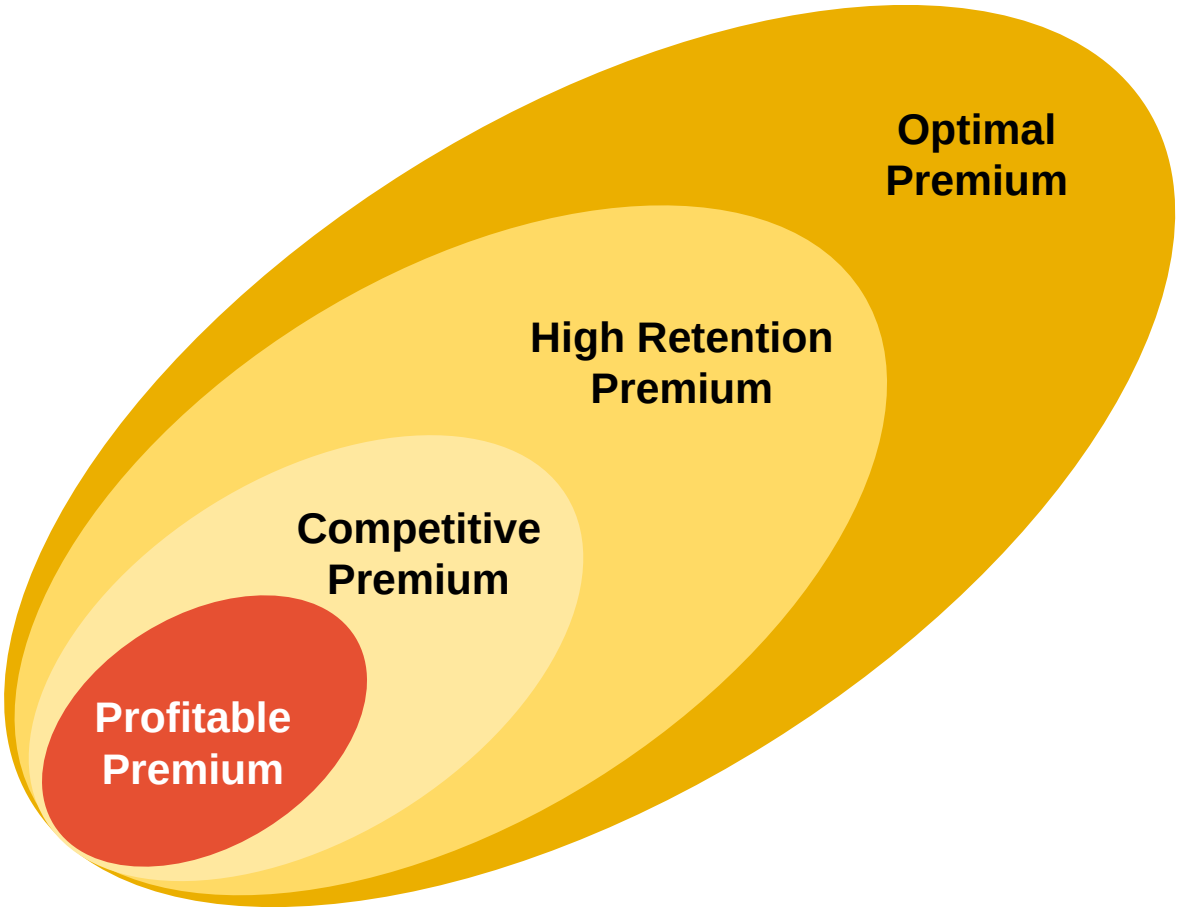
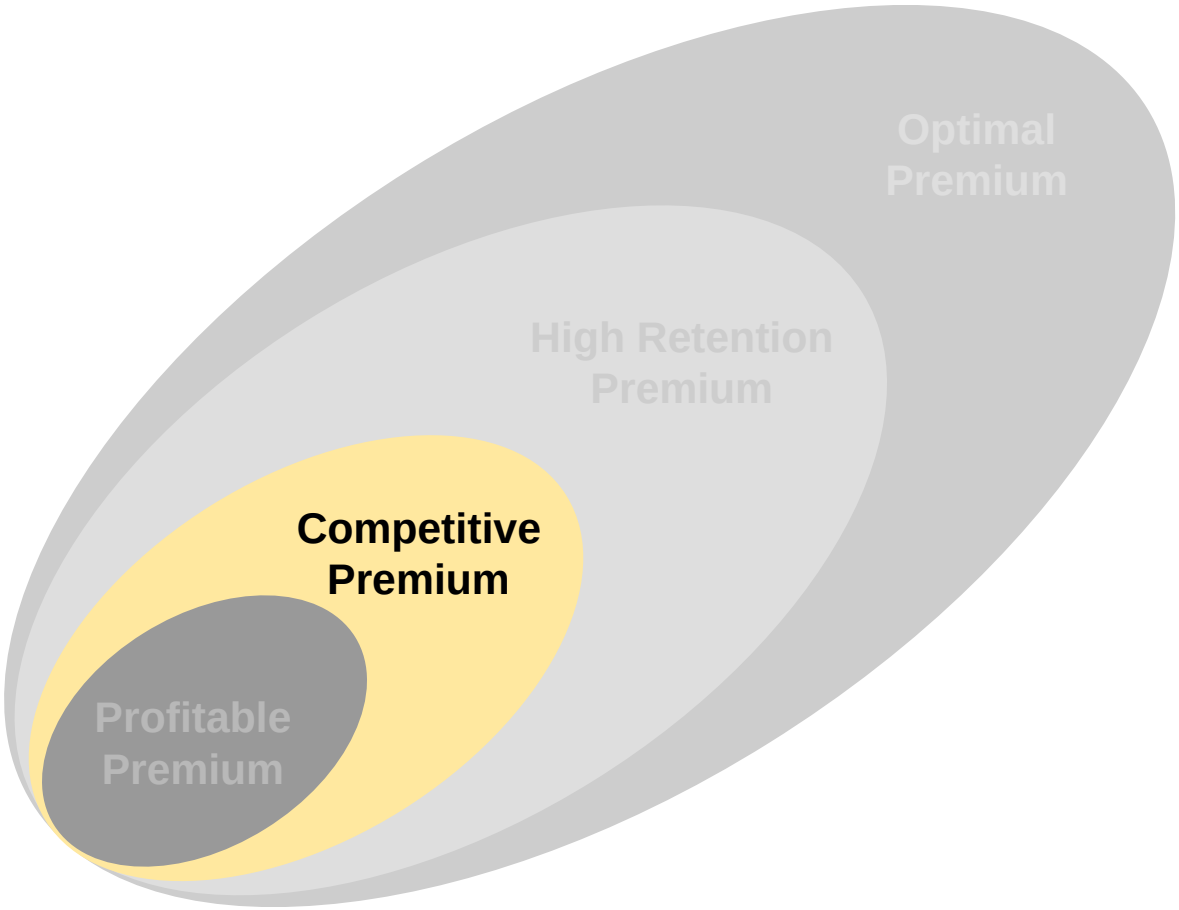
Introduction: An integral rating approach



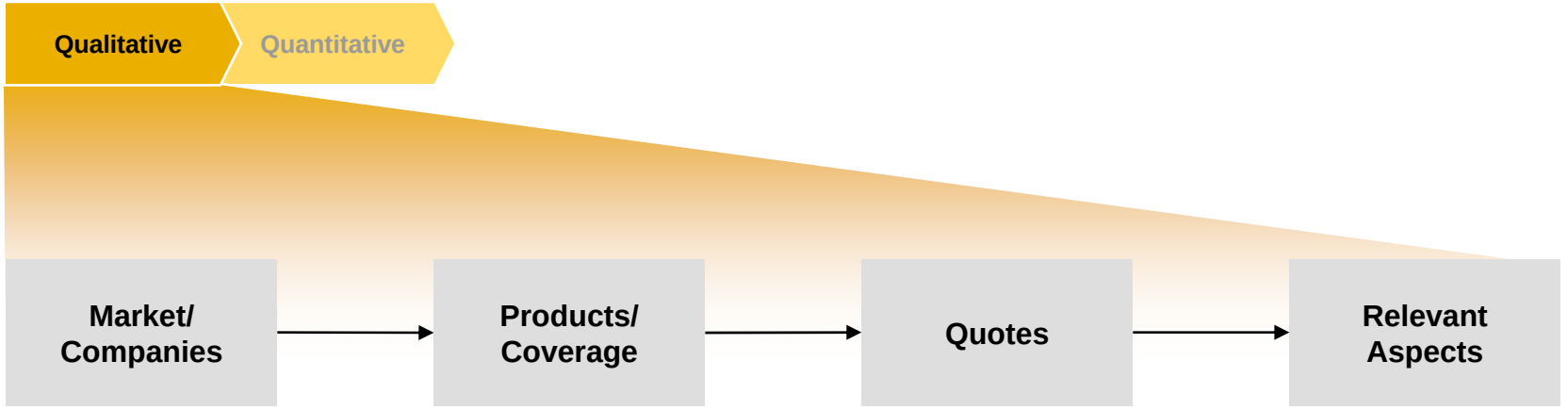
Introduction: An integral rating approach



Goals

- Entering in a new market
- Starting in a new line of business
- Knowing the competitiveness level of an insurance company
  - Globally and per profile
- Estimating the rating structure of competitors
- Producing predictors of elasticity/demand to optimize

Qualitative aspects



Market/ Companies

- Defining market:
  - Traditional insurance companies
  - Direct insurance companies
  - Aggregators
- Market measures
  - Weighted averages
  - The X cheapest companies, etc.

Products/ Coverage

- Defining products
- Auto:
  - Liability
  - Liability plus
  - Full coverage
  - Full coverage with excesses
- Homeowners:
  - Basic product
  - Complete product

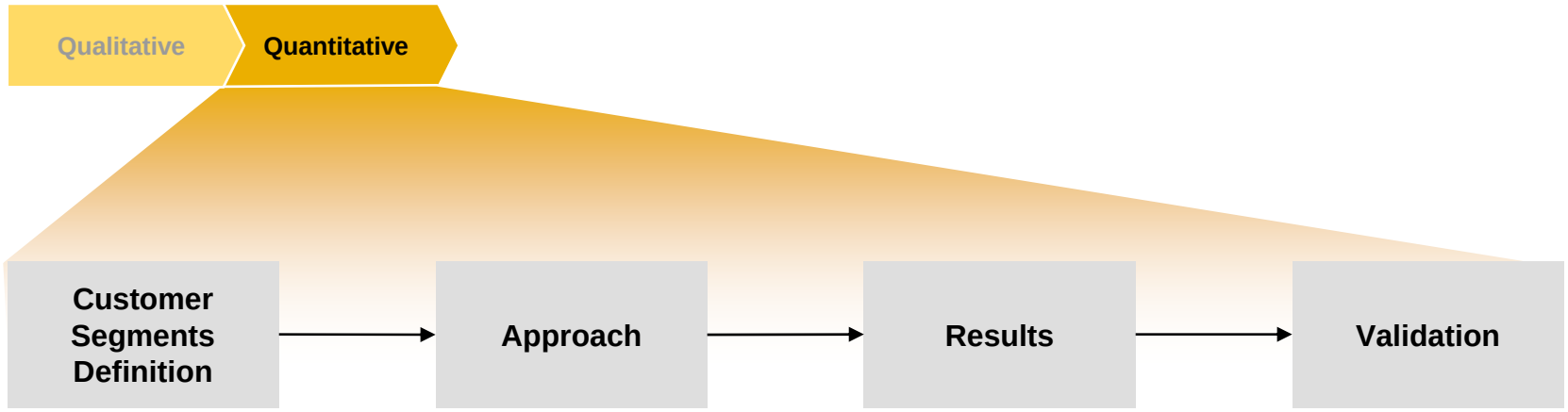
Quotes

- Pricing manuals (U.S.)
- Mystery shopping
- Telephone channel
- Brokers
- Internet

Relevant Aspects

- Coverage homogenization
- Excess treatment
- Claim history
- Periodical analysis
  - Three months
  - Six months

Quantitative aspects



Customer Segments Definition

- Portfolio of the insurance company
- Wanted portfolio
- Size of source
  - Limited
  - Unlimited
  - Very limited

Approach

- Univariate analysis
- Multivariate analysis (GLMs)

Results

- Market rating structure
- Each analyzed competitor rating structure
- Competitiveness index per profile (demand/elasticity model)
- Price optimization ingredient

Validation

- Test 75/25

Customer segments definition

- For several products (coverage levels)
- For several insurance companies (homogeneity)
- Amount and quality of available information

Competitive Market Analysis — Auto insurance — Spain (Variables and customer segments)

Age	Gender*	Marital Status	Driving License Age (Yrs)	Vehicle Model	Fuel Type	Vehicle Age	Vehicle Use	Horse-power	Territory (Province)	Bonus malus (Tenure and Claims)	Garaged	Insurance Company
20	Male	Married	1	Mercedes E320	Diesel	0	Work/ Commute	60 – 75	Barcelona	0%	Yes	A
25	Female	Unmarried	4	BMW 320	Gasoline	2	Pleasure	76 – 100	Madrid	10%	No	B
30			10	Volkswagen Golf		4	Business	101 – 120	Valencia	20%		C
35			>15	Renault Scenic		6		121 – 150	Bilbao	30%		D
40				Ford Kuga		8		151 – 200	Malaga	40%		E
45				Audi A4		>10		201 – 250	Galicia	50%		
50				Opel Corsa				>251	Guipuzcoa	60%		
55				Volvo XC90								
60				BMW 740								
65												
70												
75												
80												

*Gender is a current discussion topic in Europe, following a recent European Court of Justice ruling prohibiting gender-based discrimination in calculating insurance premiums.

Approaches to estimate rating structures

GLMs (Multivariate Techniques)	Access to unlimited information about competitors
GLMs + Univariate Techniques	Access to a high amount of information about competitors, but limited
Univariate Techniques	Access to a very limited information

Using GLMs

- More traditional areas:
  - Claims models
  - Retention (lapses) and conversion (new business) models
  - Price Optimization processes
- Other models:
  - Competitive market analysis
  - Producer behavior
  - Satisfaction
  - Other industries (supermarkets, etc)

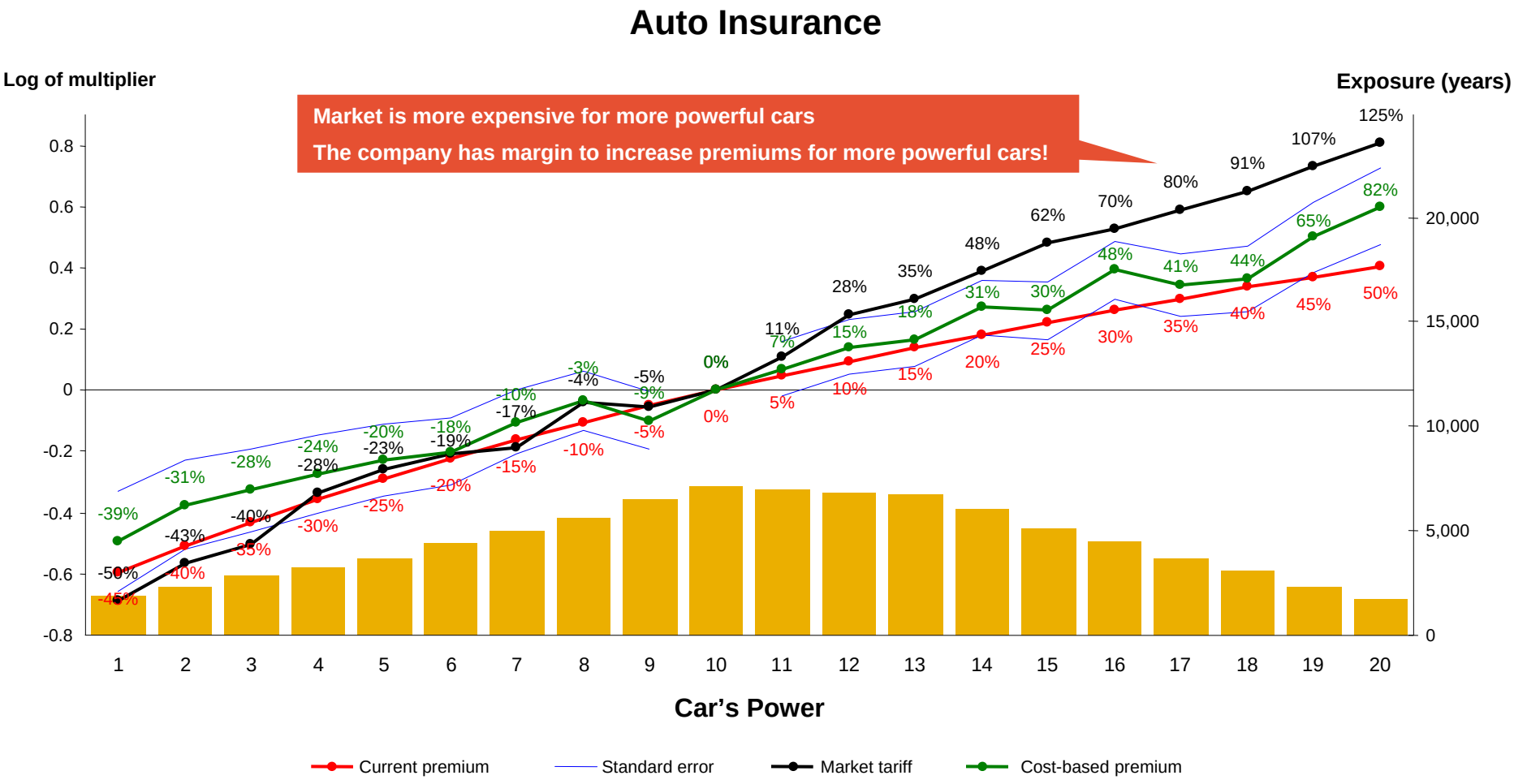
Example of factors

Claims Models		Retention Models (Auto)	Producer Behavior Models	Satisfaction Models (Homeowner)
Auto	**Homeowner**			
• Drivers age • Drivers gender • Years licensed • Type of car • Geographical area	• Size of house • House age • Family members • Geographical area • Security measures	• Premium change • Drivers age • Number of claims • Number of products • Age of the policy	• Type of producer (e.g., captive agent, broker) • Commission level • Number of products • Years in the company	• Quality of the service • Punctuality • Days used to repair • Treatment received

Average premiums by product

Insurance Company	Liability only	Liability and Comprehensive	Full Coverage
Client — Portfolio	350	500	900
Client — New business	300	400	850
Market — New business	325	450	950
% Market and client	**8%**	**13%**	**12%**
Company 1	310	420	900
% Company 1 and client	**3%**	**5%**	**6%**
Company 2	360	450	990
% Company 2 and client	20%	13%	16%
Company 3	340	430	910
% Company 3 and client	**13%**	**8%**	**7%**
Company 4	330	410	850
% Company 4 and client	**10%**	**2%**	**0%**
Company 5	290	380	825
% Company 5 and client	**-3%**	**-5%**	**-3%**

Profitable business



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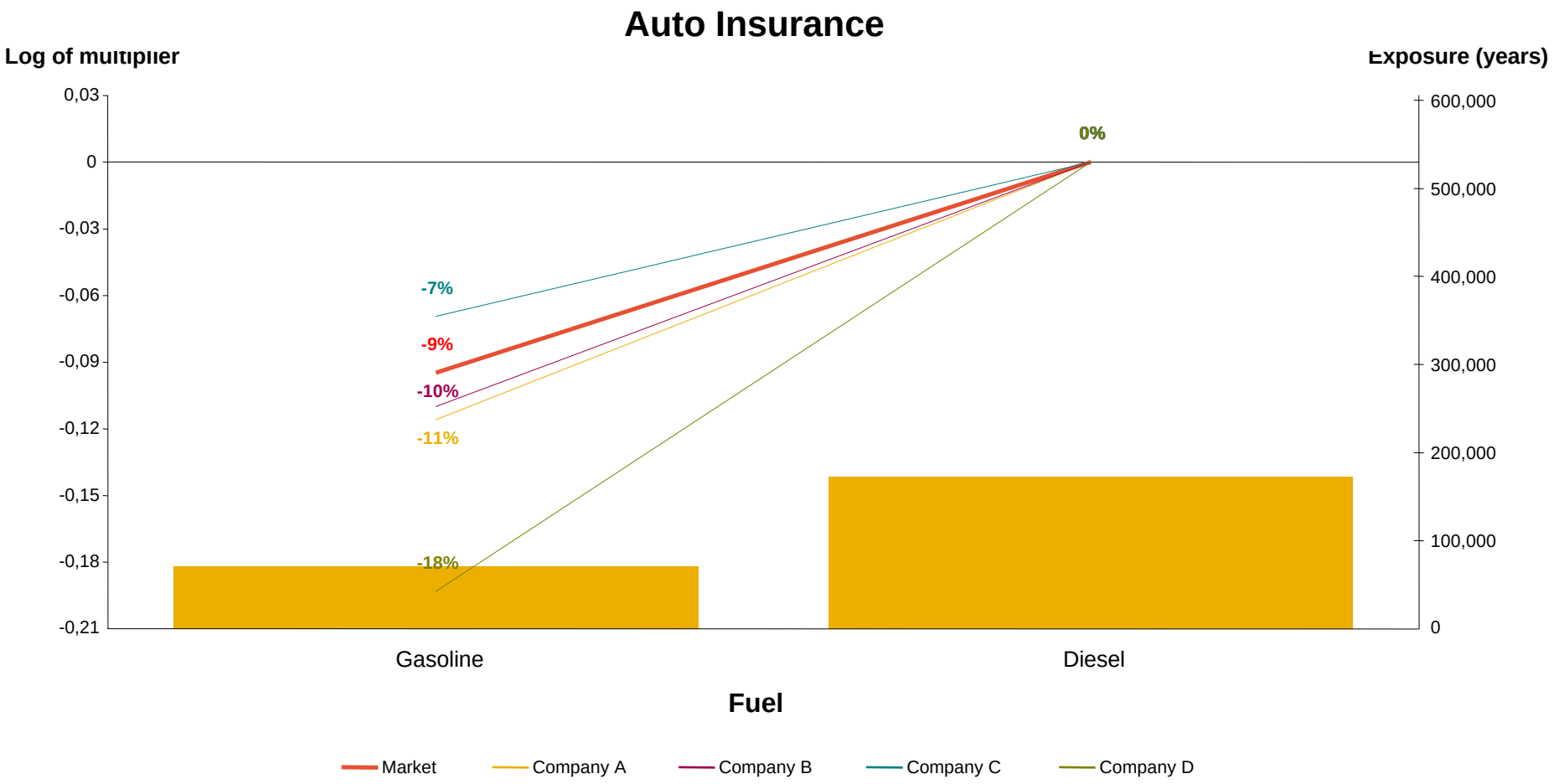

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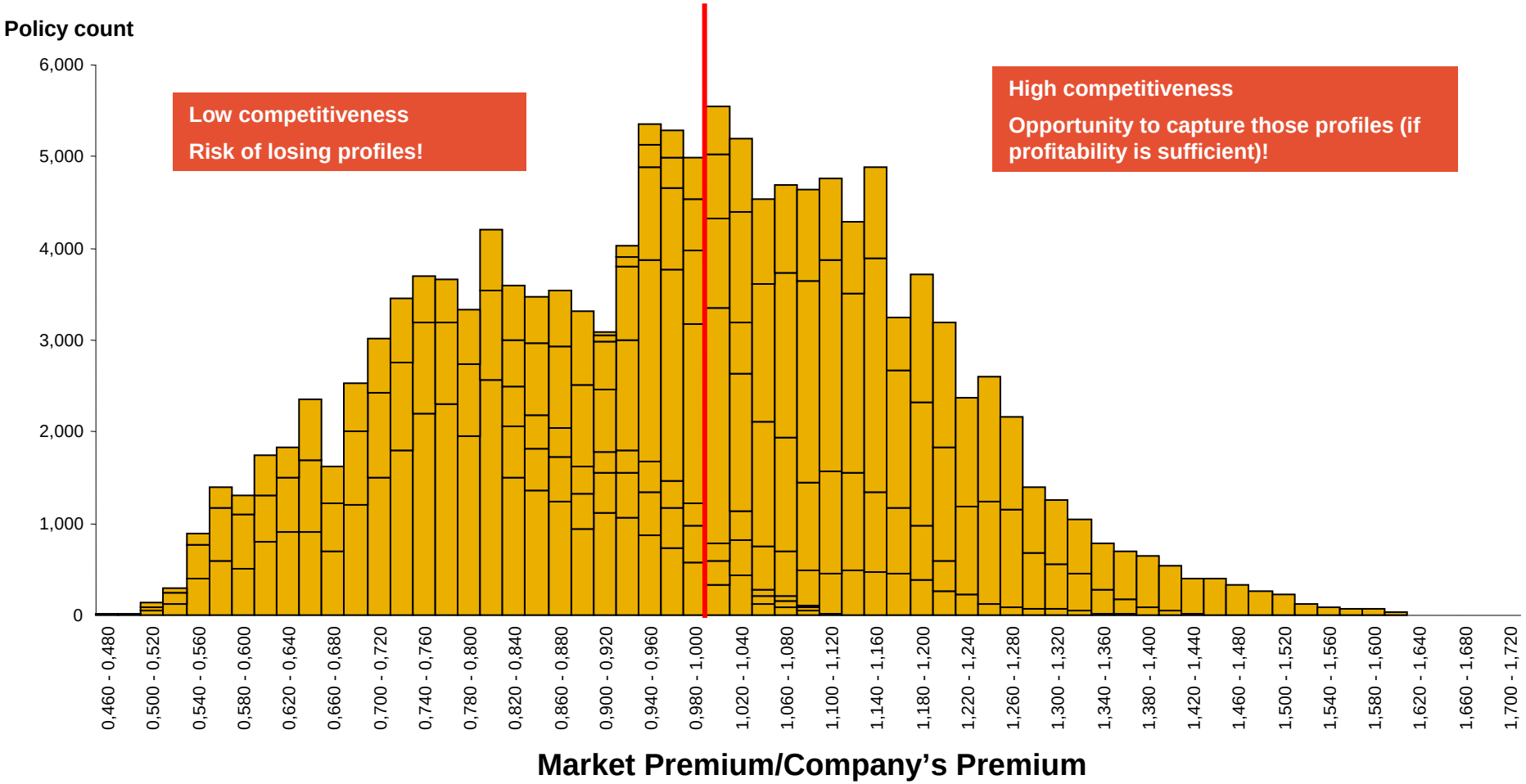

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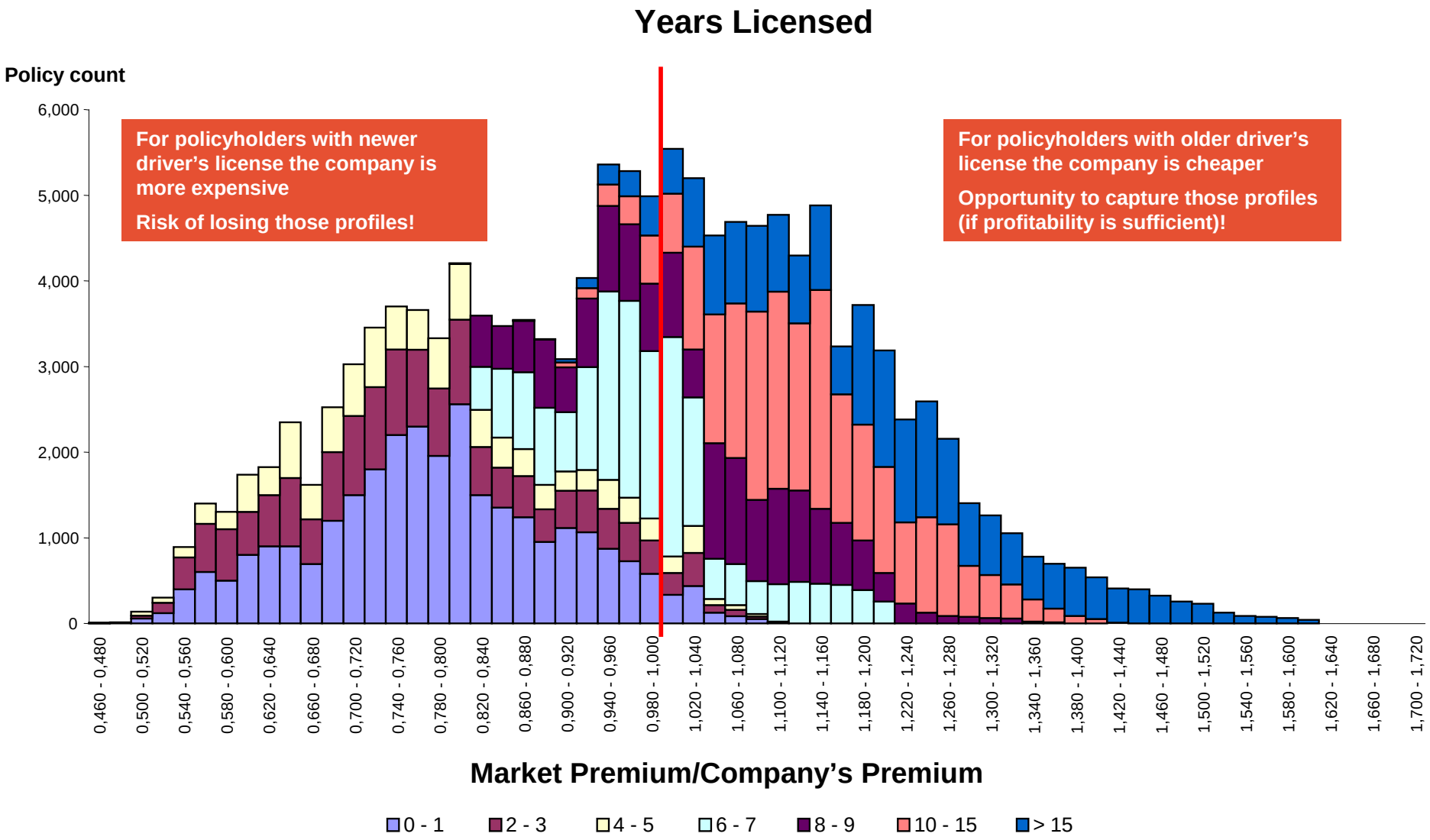
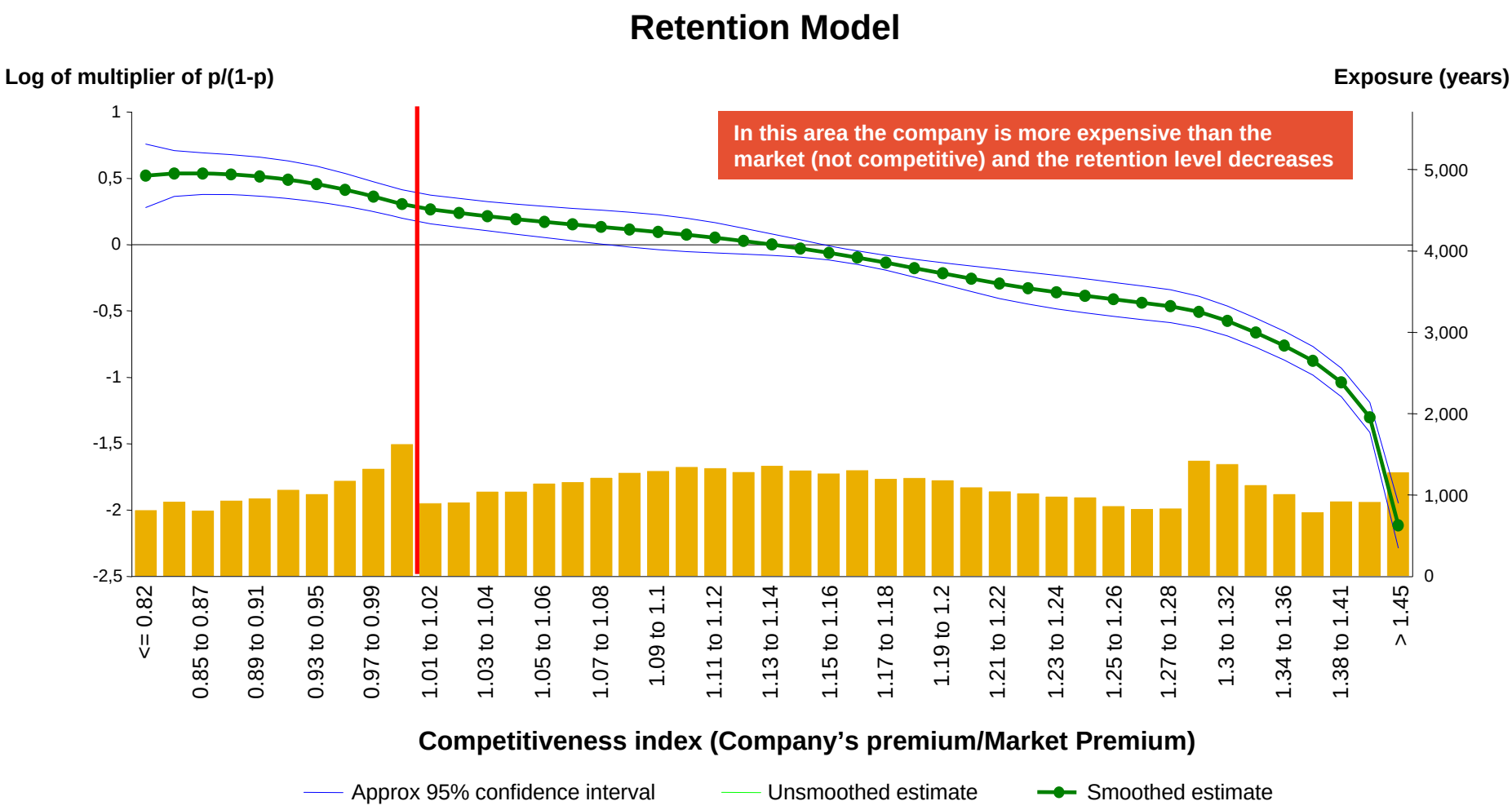


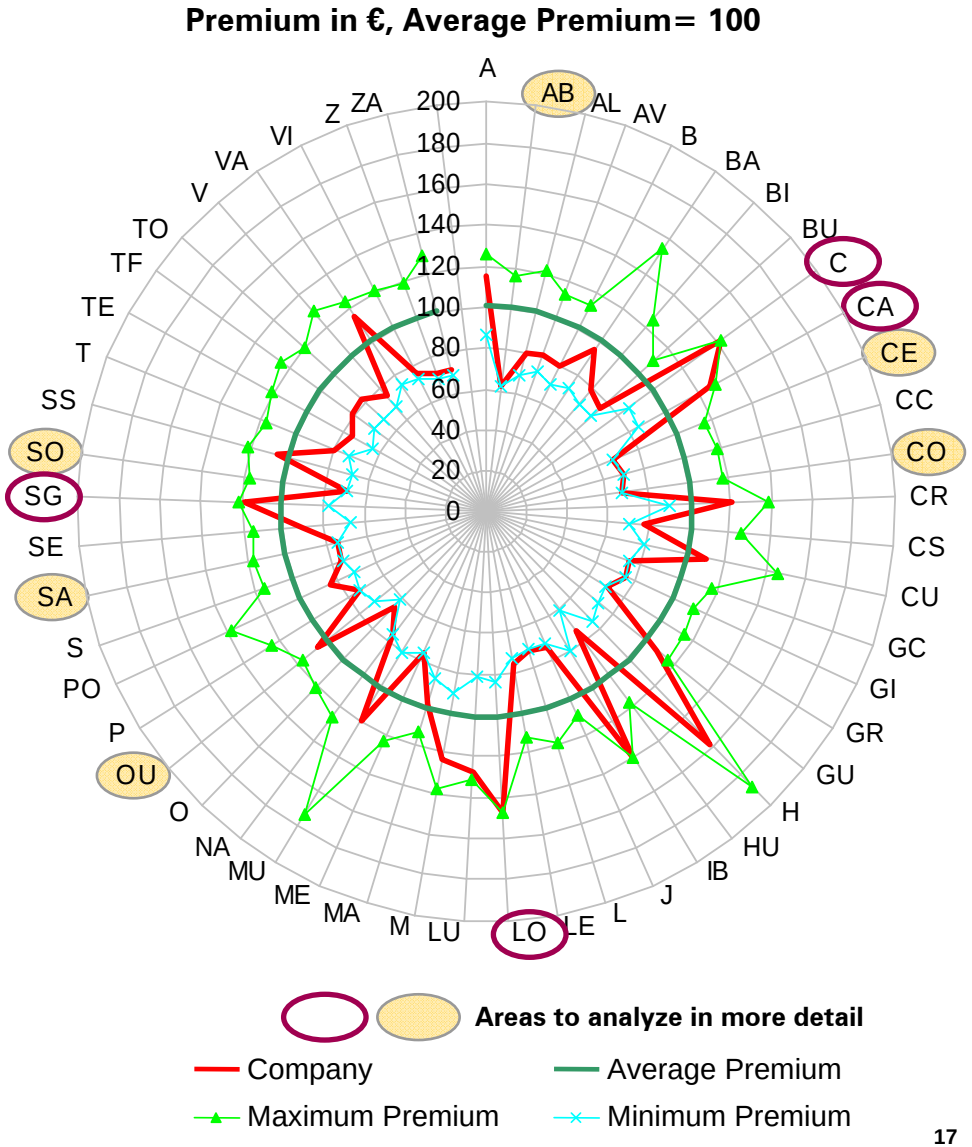
An ingredient for retention models



Geographical CMA

Geographical CMA

A = Alicante-Alacant	LO = Logroño (La Rioja)
AB = Albacete	LU = Lugo
AL = Almería	M = Madrid
AV = Avila	MA = Malaga
B = Barcelona	ME = Melilla
BA = Badajoz	MU = Murcia
BI = Bilbao-Bilbo (Bizkaia)	NA = Navarra-Nafarroa
BU = Burgos	O = Oviedo
C = Coruña	OU = Ourense
CA = Cádiz	P = Palencia
CE = Ceuta	PO = Pontevedra
CC = Cáceres	S = Santander (Cantabria)
CO = Córdoba	SA = Salamanca
CR = Ciudad Real	SE = Sevilla
CS = Castellón-Castelló	SG = Segovia
CU = Cuenca	SO = Soria
GC = Gran Canaria	SS = San Sebastián-Donostia (Guipuzkoa)
GI = Girona	T = Tarragona
GR = Granada	TE = Teruel
GU = Guadalajara	TF = Tenerife
H = Huelva	TO = Toledo
HU = Huesca	V = Valencia-València
IB = I. Baleares-I.Balears	VA = Valladolid
J = Jaén	VI = Vitoria-Gasteiz (Araba)
L = Lérida-Lleida	Z = Zaragoza
LE = León	ZA = Zamora



Competitive position map