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The Challenges Facing P&C Insurers in Implementing Price Optimization and the Basic Framework to Confront them

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Jun Yan, Ph.D
Peter Tomopoulos, ACAS, MAAA
Kelli Broin, FCAS, MAAA

Agenda

Why Price Optimization?

Price Optimization is Far Beyond a Mathematically Optimized Price

Price Optimization Framework

Challenges Insurers Face Implementing Price Optimization

Concluding Remarks

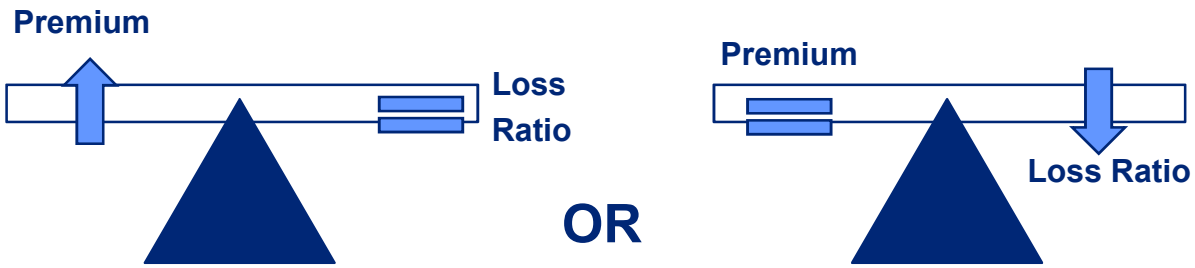
Why Price Optimization?

Balancing premium volume with target loss ratio

- Traditionally, insurance companies and actuaries have relied on the insured's expected claim cost along with claims history (experience rating) and underwriter judgment (schedule rating) to determine the appropriate premium.
- Price optimization integrates the risk's insurance price and the market demand for insurance. Market demand reflects:

Customer Behavior	Elasticity of Demand	Competitor Pricing

- Price optimization enables control of balancing premium volume and loss ratio
  - Can increase premium volume without impacting the target loss ratio, **OR**
  - Can decrease target loss ratio without impacting premium volume



Three levels of pricing sophistication

Insurance pricing can be classified in three levels of sophistication:

Basic Rating Plans, Underwriting Models, and Market Demand Models

Pricing Levels	1. Basic Rating	2. Underwriting	3. Market Demand
Components of Pricing Levels	• Loss cost (pure premium) model based on exposure and traditional rating variables • Rating variables driven by industry and regulatory restrictions	• Refinement of Level 1 (basic rating) loss cost estimate • Generally used to rationalize the process of assigning tiers, credits, debits and company placement • Predictive variables could be rating and non rating from internal and external data sources	• Reflects strategic, regulatory, and market constraints • Builds upon results from Level 2 (underwriting) and Level 1 (basic rating) • Applies customer price elasticity to optimize price

Current market capabilities

Insurers have instituted basic forms of price optimization techniques in recent years, but few have integrated them within a strategic and operations pricing platform needed to overcome challenges to successfully implement optimization techniques

- Very few companies have fully developed such integrated platforms
- Most companies have some level of competitive pricing insights but lack integration with customer and market demand behavior

Pricing Levels	1. Basic Rating	2. Underwriting	3. Market Demand
Current Market Capabilities	• Vast majority of companies have sufficient or leading practice capabilities in rating • Ability to rerate historical book (in-force and lapsed policies) varies by company	• There is a large degree of variability in approaches companies take in this area • Most companies have some capability but generally not integrated with customer behavior	• Some companies may have developed customer demand models • Very few companies have developed a well integrated platform for operation

Key concerns impacting implementation

As insurers attempt or have attempted to optimize their rates, key concerns have been identified that are becoming critical for companies to address to incorporate these price optimization techniques in their pricing structures.

Key Concerns	
Ignoring underwriter adjustments	By not reflecting the individual risk characteristics at a policy level, many of the characteristics are not reflected in base rating.
Large-scale effort to implement	Large amount of data to collect, store and analyze; and then, how do you react to all that information?
Difficulty to monitor and measure	As more characteristics are considered in an optimization model, the result will become a “black box” and hard to understand
Restrictions for commercial lines	Information on final price is limited

A different view to deal with the core challenges

When a strategic and operational pricing platform effectively integrates profitability, market demand and customer price elasticity, it will allow insurers to successfully manage future market cycles and dynamics

Evolving Practices

- Platform enables dynamic analysis of risk, profitability and growth simultaneously
- Platform allows for scenario testing to assist in operation and strategic decision making of price changes for highly segmented market

Pricing Levels	1. Basic Rating	2. Underwriting	3. Market Demand
Evolving Capabilities	• Well developed loss cost based rating that generate tens of thousands of individual market segments/price points • Companies can easily re-rate entire historical book for any rating change	• Reflect risks at the individual policy level in pricing a policy • Companies have ability to effectively generate and capture competitive rates for each policy and new business quote	• Data from rating and underwriting components along with new business and renewal data, and data from competitive markets can be used to develop customer price elasticity and market demand curves. • Curve is combined with segment/ tiering analyses to refine knowledge of customer behavior and to take appropriate actions

Price Optimization is Far Beyond a Mathematically Optimized Price

Questions for overall design

Before designing a price optimization model, there are leading strategic questions insurers need to consider

Leading Question	Expected Outcomes
Does price optimization have to be a software driven black box? Where does the Operations Research software kick in?	1) Demand modeling 2) Loss cost estimation or loss ratio estimation 3) Integration of loss cost and demanding for optimized pricing
What if a price optimization is a transparent process, but not a black box?	1) Price optimization process should be totally manageable and controllable 2) The performance of price optimization will be easily monitored 3) Price optimization will not be purely a mathematical result; it will turn to be a decision making tool for strategic pricing
How can we turn a software driven price optimization process to be a controllable open box?	1) Simplify the focus of price optimization 2) Create a simple segmentation specifically for price optimization

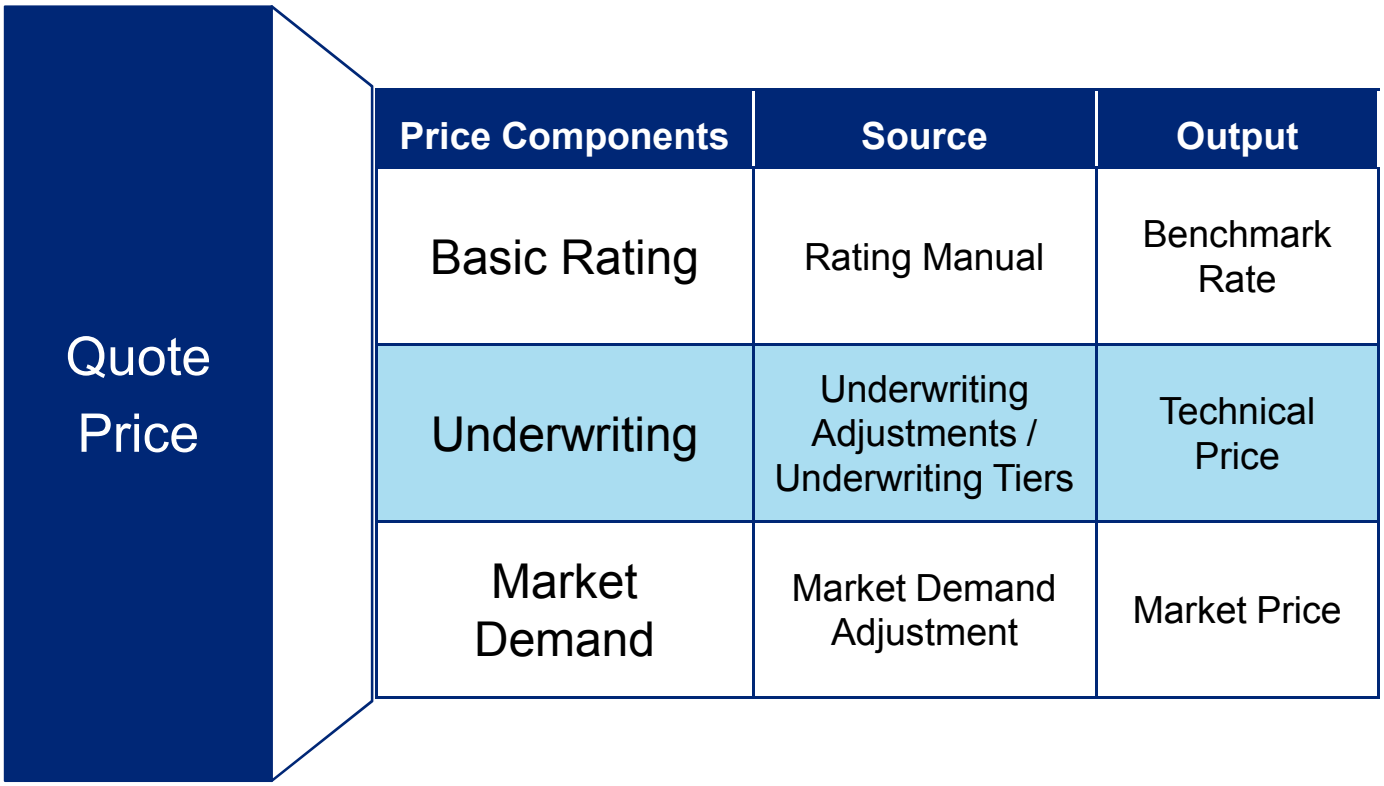
Questions for overall design - Continued

Before designing a price optimization model, there are leading strategic questions insurers need to consider

Leading Question	Expected Outcomes
What is the ultimate goal of price optimization?	1) Increase Profit (decrease loss ratio) 2) Increase premium volume
What are the major premium components?	1) Benchmarks 2) Underwriting adjustments 3) Market adjustment
What are the major components for price optimization?	1) Risk premium with expenses before market adjustment (>85%) 2) Premium adjustment based on customer demanding and market competition (<15%)

Benefits of a risk-based approach

An approach that directly incorporates underwriting adjustments into determining a price for insurance offers a number of key advantages



Price Components	Source	Output
Basic Rating	Rating Manual	Benchmark Rate
Underwriting	Underwriting Adjustments / Underwriting Tiers	Technical Price
Market Demand	Market Demand Adjustment	Market Price

Advantages of including underwriting components

The platform is built on a policy level where projected loss ratio, estimated conversion / retention rate, and estimated price elasticity are scored for each policy, which can then be segmented for further optimization

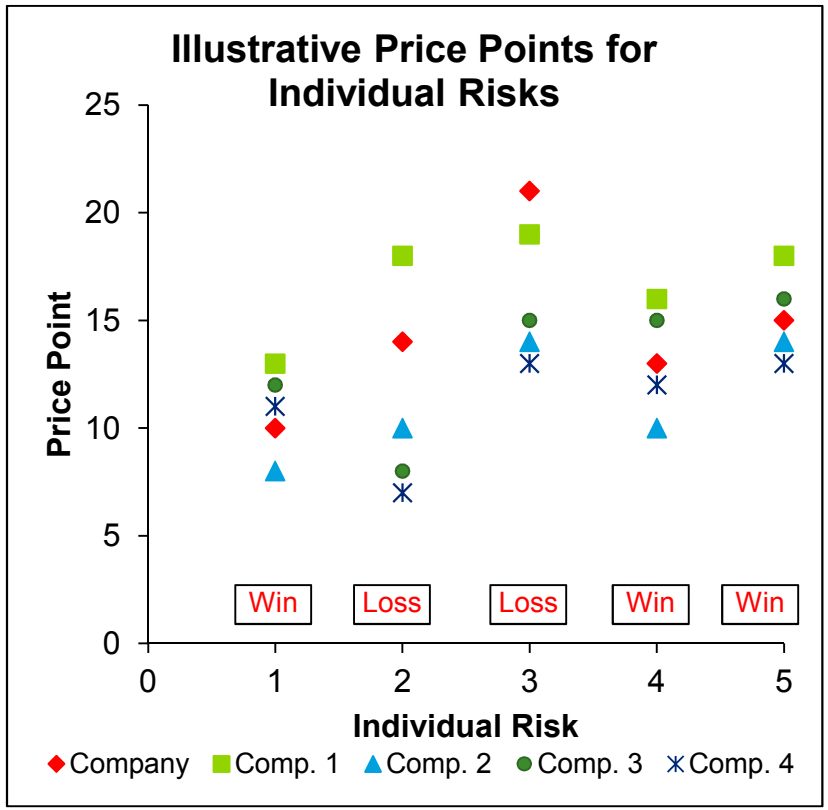
Basic Rating	Underwriting Pricing
• By coverage, on exposure level	• Rated on the policy level
• To be used in rating	• To be used to identify rating plan deficiency
• Target: Loss Cost	• Target: Loss Ratio based on manual premium
• Factor based point estimation	• Loss ratio ranking and lift curve based estimation
• Not separated by new business and renewal business	• Separated by new business and renewal business
• Only using regulated rating variables	• Much wider range of variables are applied
• Rating lookup tables are fixed in IT implementation	• Lookup tables are dynamically adjusted in IT implementation

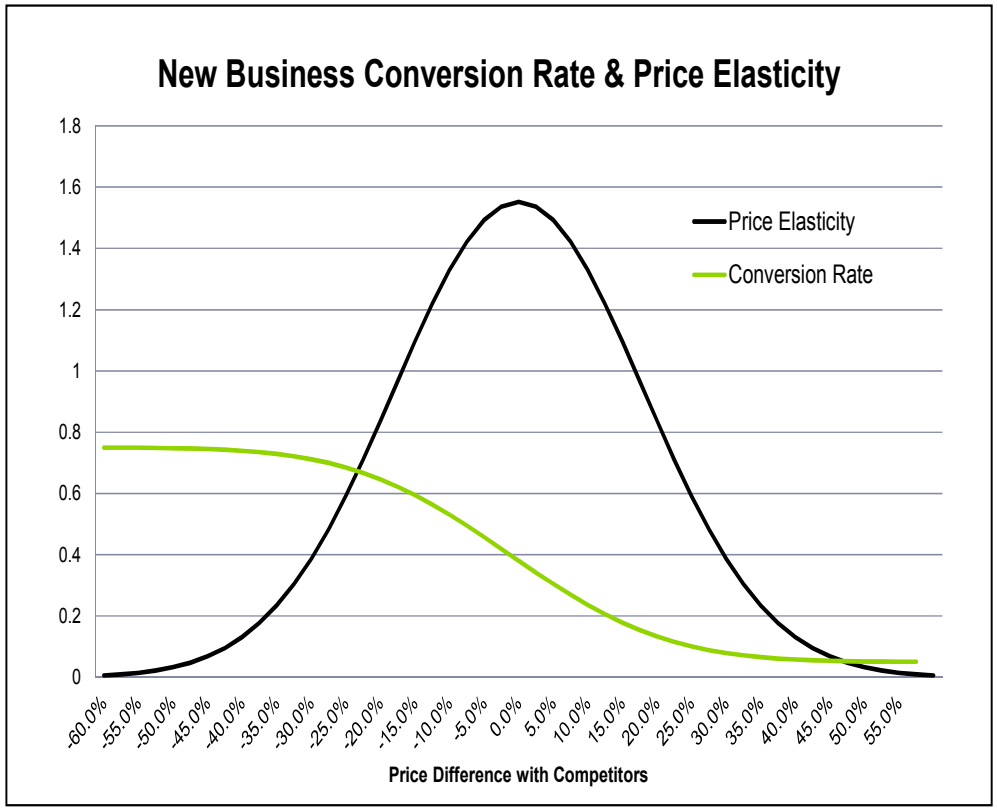
A key advantage of including underwriting components is that the insured's price elasticity and demand behavior is on the final price at the policy level and not the coverage and sub-component level. Optimizing price on the sub-coverage level creates a gap between the results and the insured's price behavior.

Price Optimization Framework

Rely on comparative raters to provide insight into insurers' rates and relative position to your own rates

Using competitor rates relative to your own and tracking win/loss rates, a price elasticity / demand curve can be created





- Examine company's price versus competitor prices on individual risks and win/loss
- Plot win rate versus price position to determine basic price elasticity curve
- Can be segmented by customer type, sales channel (e.g. on-line, agent), income, region, etc.

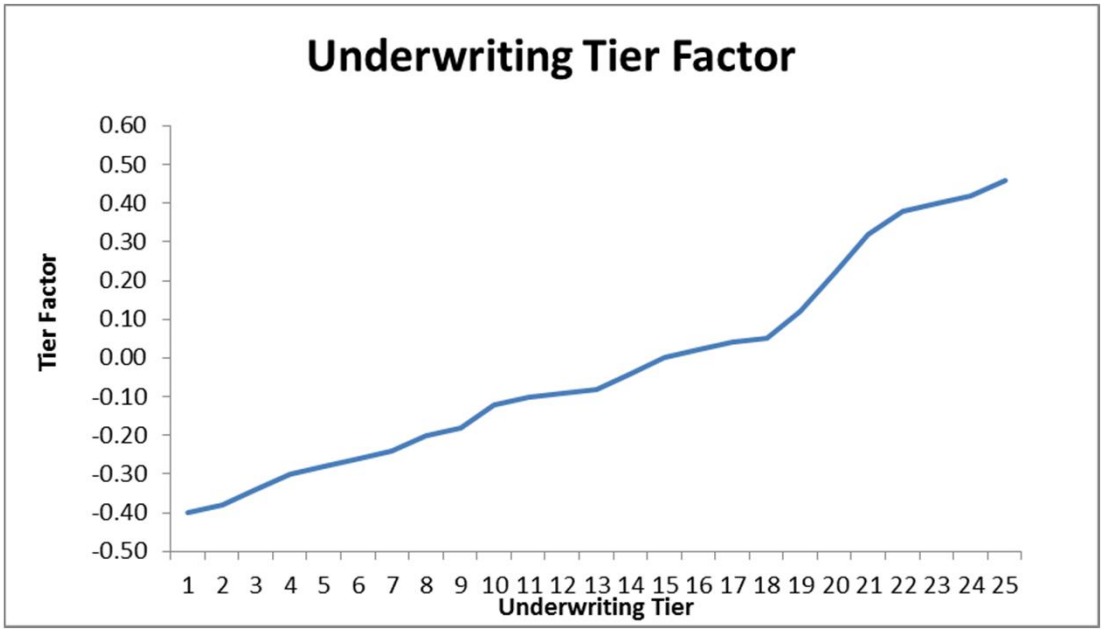
Optimize pricing decisions based on UW tier groups

Integrating output from an UW predictive model with the demand curve yields a platform for insurance companies to make and optimize their pricing decisions based on underwriting tier groups.

Integrate risk-based approach using output from Underwriting scoring engine

- **Incorporates variables that are predictive of risk and cost but that cannot be used in traditional ratemaking**
- **Analyzes risks at the policy level, not coverage level**

Tier	Tier Factor
1	-0.40
2	-0.38
3	-0.34
4	-0.30
5	-0.28
6	-0.26
7	-0.24
8	-0.20
⋮	⋮
19	0.12
20	0.22
21	0.32
22	0.38
23	0.40
24	0.42
25	0.46



Pricing lab for scenario testing

The pricing lab provides a simple framework for companies to perform scenario analysis and to drive business decisions that align with the company‘s strategic goals, while balancing profit and growth

Inputs

By dimension (profitability & elasticity):

- Underwriting Tier & Corresponding Tier Factor
- Manual Premium
- Target Loss Ratio
- Estimated Loss Cost
- Competitor Pricing Information
- Price Elasticity and Demand Models

Applications

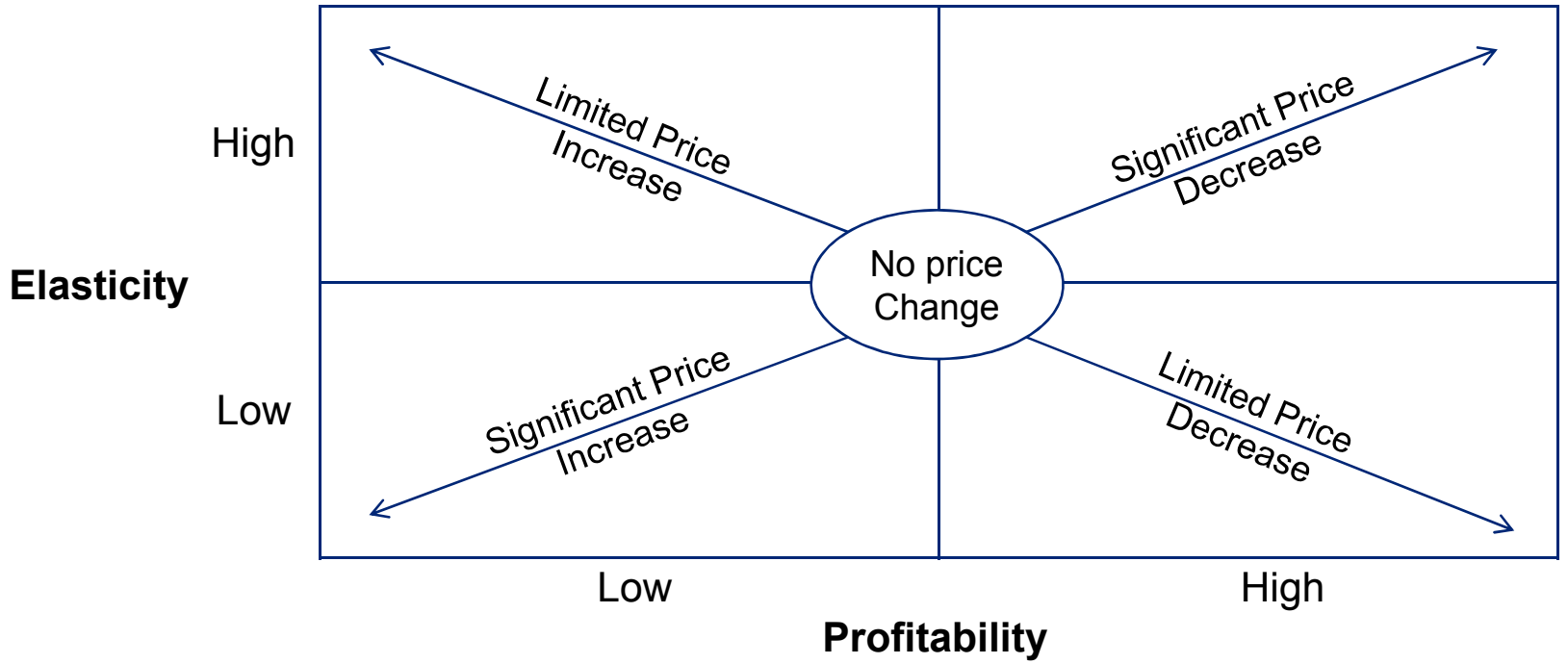
- Testing and comparing pricing strategies
- Optimizing pricing related underwriting rules

A pricing lab will produce a matrix for each scenario showing the premium and loss ratio impacts for each combination of dimensions.

Tier optimization strategy

A tier optimization strategy simplifies the decision making process by evaluating only 2-3 dimensions, which then allows for ease of evaluating the impact of changes post-implementation. Pricing is adjusted through a re-placement of the underwriting tier.

Actions to increase profitability/volume



- **Decrease price for profitable risks; increase price for unprofitable risks**
- **Give more favorable change for risks with high elasticity (more sensitive to price), less favorable change for risks with low elasticity (less sensitive to price)**

Pricing lab example

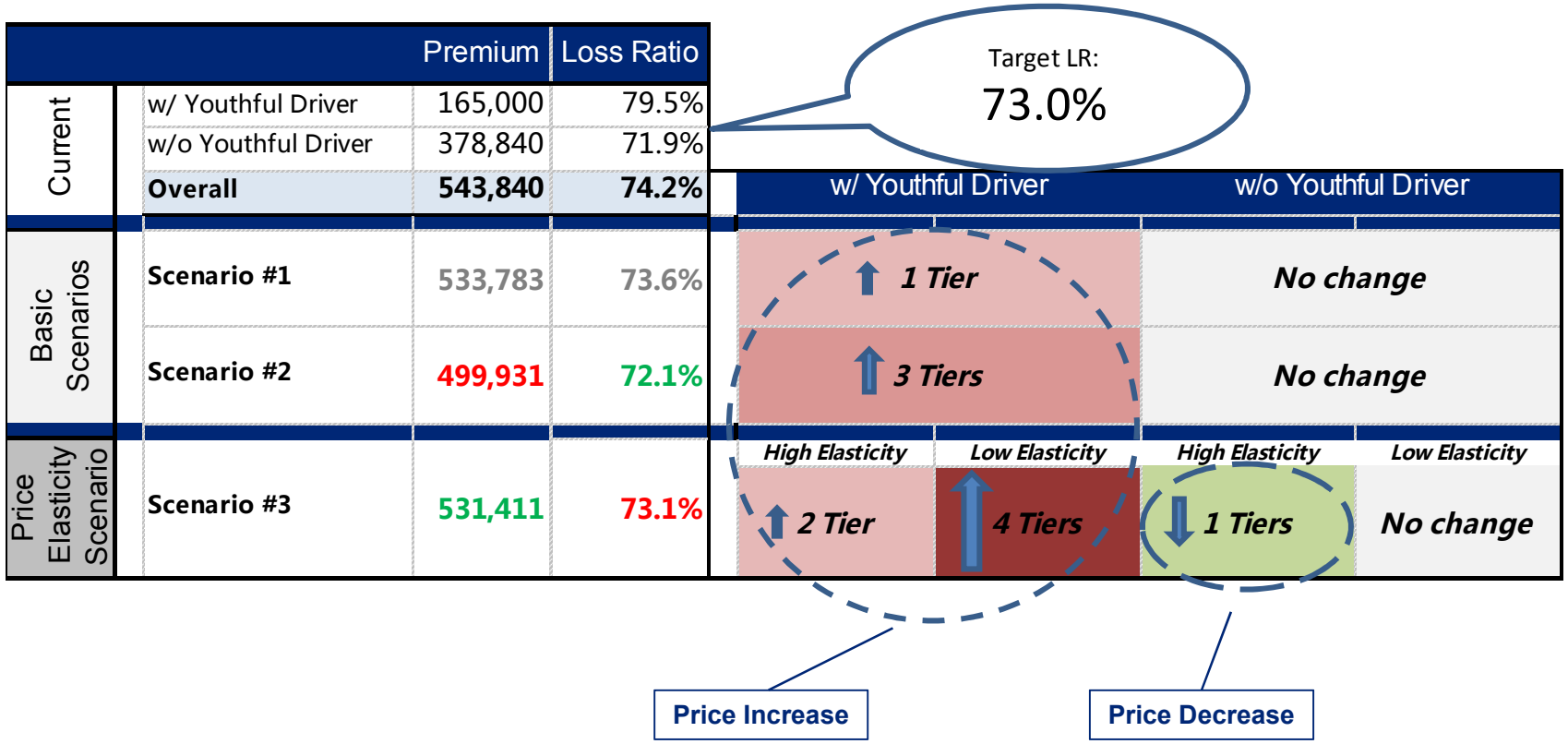
The following example demonstrates the pricing lab for a 2 x 2 matrix

			Profitable Segments		Unprofitable Segments		Overall
			High Elasticity	Low Elasticity	High Elasticity	Low Elasticity	
Platform	Manual Premium	(1a)	1,000	1,200	2000	2500	
	Target Loss Ratio	(1b)	0.68	0.68	0.68	0.68	68.0%
	Underwriting Tier Adjustment	(1c)	-0.30	-0.26	0.22	0.32	
	Number of Quotes	(2)	2,000	1,000	1500	1200	
	Price elasticity	(3)	90.0%	75.0%	10.0%	5.0%	
	Loss Cost per Policy	(4) = (1a)*(1b)*(1c)	476	604	1,659	2,244	
Current Strategy	Underwriting Tier	(5a)	***4***	***6***	***20***	***21***	
	UW Tier Factor	(5b)	***0.70***	***0.74***	***1.22***	***1.32***	
	Price differentiation w/ competitors	(6)	***1.00***	***1.10***	***1.15***	***1.20***	
	Conversion rate	(7)	22.0%	20.0%	10.0%	8.0%	15.5%
	Converted customer number	(8)=(2)*(7)	440	200	150	96	886
	Average Premium charged	(9)=(1a)*(5b)	700	888	2,440	3,300	
	Premium revenue	(10)=(8)*(9)	308,000	177,600	366,000	316,800	1,168,400
	Loss Ratio	(11)=(4)*(8)/(10)	68.00%	68.00%	68.00%	68.00%	68.00%
New Strategy	Adjusted UW Tier	(13a)	***3***	***5***	***21***	***25***	
	Adjusted UW Tier Factor	(13b)	***0.66***	***0.72***	***1.32***	***1.46***	
	Premium differentiation w/competitors	(14)=(13)/(5b)*(6)	***0.94***	***1.07***	***1.24***	***1.33***	
	Projected Conversion Rate	(14)/(6))*(3)	27.1%	22.0%	9.2%	7.5%	17.4%
	Converted customer number	(16)=(2)*(15)	543	220	138	90	990
	Average Premium charged	(17)=(1)*(13)	660	864	2,640	3,650	
	Premium revenue	(18)=(16)*(17)	358,286	190,314	363,541	327,173	1,239,313
	Loss Ratio	(19)=(4)*(16)/(18)	72.12%	69.89%	62.85%	61.48%	66.25%

Pricing rule comparison

The pricing lab also allows companies to compare strategies for targeted segments of business

		Premium	Loss Ratio
Current	w/ Youthful Driver	165,000	79.5%
	w/o Youthful Driver	378,840	71.9%
	Overall	**543,840**	**74.2%**
Basic Scenarios	**Scenario #1**	533,783	73.6%
	Scenario #2	499,931	72.1%
Price Elasticity Scenario	**Scenario #3**	531,411	73.1%



The pricing lab allows the company to understand what the impact of pricing alignments are in coordination with goals for marketing, product and actuarial

Challenges Insurers Face Implementing Price Optimization

Key considerations to implement price optimization

The challenges to implement price optimization techniques will vary in complexity and significance based on specific key considerations

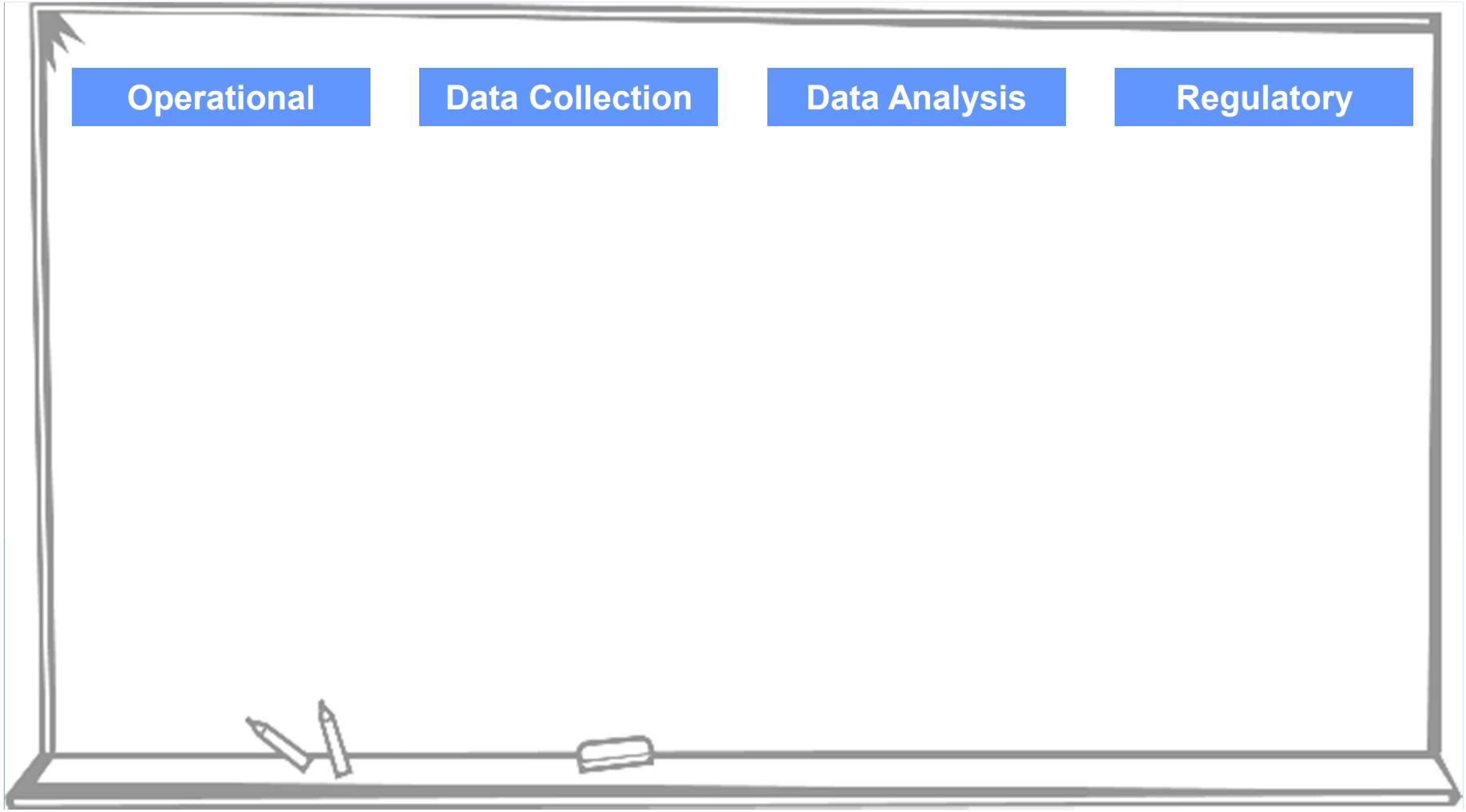
Challenges

Operational	Data Collection	Data Analysis	Regulatory

Key Considerations

Strategy: Premium Volume vs. Loss Ratio	• What is the insurer's strategy? Are they looking to implement price optimization in order to decrease loss ratio or to increase premium volume? • Insurers will need to find the right balance between premium volume and loss ratio that fits their strategy
Lines of Business: Personal vs. Small to Mid-Sized Commercial	• While more internal and external (and credible) information is available to personal lines insurers, commercial lines insurers face fewer external constraints from regulators and customers. • Commercial lines pricing also provides more flexibility in rating a policy through underwriter judgment
Customer Segment: New Business vs. Renewals	• Important to model separately the renewal business vs. new business as customer preferences vary between the two groups. • It is important to understand how customers react to price changes for renewal business and monitor how changing rate levels affect new business

Whiteboard – what specific challenges have you faced or are facing to implement price optimization?



Operational challenges

Operational | Data Collection | Data Analysis | Regulatory

	Key Challenges	Potential Solutions
Alignment with Strategic Objectives	• Actuarial, Product, Marketing, Sales and IT will need to be aligned on strategy to incorporate into existing pricing platform • Price optimization strategies must align with the broader strategic objectives on profit and growth goals	• Use a pricing lab to monitor the impact of rules and rate changes on customer segments
Technology Integration	• Insurance companies are still transitioning from legacy systems that may not be able to support price optimization techniques • Many systems will be impacted by price optimization:	• Use existing underwriting predictive modeling techniques • Rely on third party data from competitive raters • System must be able to integrate competitor data while your tracking historical win/loss statistics
Training and Knowledge Transfer	• Sales force and customer service representatives have to learn a new approach to selling and servicing a policy • Staff needs to be able to understand the basics of the optimization techniques	• Use price optimization as another underwriting tool under existing techniques such as underwriting tier group re-placement

Data challenges

Operational | **Data Collection** | **Data Analysis** | Regulatory

	Key Challenges	Potential Solutions
Data Collection & Storage	• Companies may not be collecting the relevant information at application or quote needed for price optimization • Capturing data an underwriter can't readily access or view • Data may be stored in many systems and databases	• Databases need to be created to capture relevant data at quote and renewal at a detailed level in a central location to create and modify demand curves
Price Elasticity Data	• Insurers are increasingly using complicated algorithms and tier structures which are difficult to reverse engineer • Historical data on quotes and customer behavior may be difficult to obtain • Competitor data not available (for commercial lines, typically only know manual premium)	• Rely on comparative raters to provide info on insurers' rating plans and your relative competitive position • When competitor data not available focus on renewal business to start • Begin building and storing data on quotes and W/L to use going forward
Actuarial Analysis	• Insurers may not have expertise and tools in place to allow for powerful analysis • How do you extract additional value from information that has already been collected? • Advanced technology and analytical tools are needed through large data sets to transform the risk selection and ratemaking processes	• Rely on existing UW predictive models to price risks at the individual policy level and not coverage level to fully optimize premiums in aggregate • Develop a pricing lab to be monitor and measure impact of rate changes

CAS Statement of Ratemaking Principles

Operational	Data Collection	Data Analysis	Regulatory

"A rate is an estimate of the expected value of future costs."

"A rate is reasonable and not excessive, inadequate, or unfairly discriminatory if it is an actuarially sound estimate of the expected value of all future costs associated with an individual risk transfer."

Regulatory challenges

Operational | Data Collection | Data Analysis | **Regulatory**

	Key Challenges	Potential Solutions
Regulatory Acceptance	• Regulators will be concerned that the rates being offered should be within the filed rate plans and not inadequate, excessive or unfairly discriminatory • Regulators will be concerned with understanding how price optimization may affect solvency (if discounts too high)	• Simplify the approach such that method is not a black box • Involve regulators early in the process to work out issues and create a positive working relationship • Consider price optimization as just another underwriting tool
CAS Principle Adherence	• Certain aspects of price optimization may be in violation of CAS Ratemaking principles • Actuaries need to understand and feel comfortable from a professional perspective that subsidizing within sub-classes is actuarially justified	• Integrate price optimization techniques with existing tier groups, rather than applying pricing or class factors or relativities • Tier groups are more widely accepted among regulators

Concluding Remarks

Concluding remarks

A framework that directly incorporates underwriting adjustments into the rate, by relying on underwriting tier placement achieves certain advantages when implementing price optimization

- **Optimize pricing decisions while considering the true cost of a risk**
- **Ease of implementation**
- **Monitor and measure changes through scenario testing**
  - Predict impact of rate changes on specific segments
  - Can select pricing strategy to deal with market cycles
  - Identify risk segments with lower target loss ratios
- **Overcome certain regulatory changes using existing underwriting techniques**
  - Transparency of method
  - Treat as just another underwriting tool
  - Underwriter judgment is less regulated

Any questions?