



## **An underwriting pricing optimization approach for Commercial Lines**

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## Abstract

Insurance pricing uses the Loss cost or exposure as the base mechanism. This is usually performed by actuaries as a point estimate to develop base rates and have follow up mechanisms to keep the rates updated as the cost of the risk transfer changes. Typically, the base premiums get adjusted to derive final premiums due to various internal and external factors. Price optimization is the process that describes the various techniques and factors that result in an amended premium<sup>1</sup>.

The process of optimizing the base rates/initial premium involves two broad categories of adjustment 1. Underwriting models and 2. Market demand models<sup>2</sup>. The Underwriting models bring in elements from the Individual policy level risks and the Market demand models bring in the competitive elements and customer behavior aspects. Technical pricing may suffer from bias due to input factors and typically get supplemented by market factors<sup>3</sup>.

This paper presents an approach to combine both underwriting and Market data models by using historical data along with a “What if” tool to assist Underwriters amend defined parameters to see the impact on premium. This approach also attempts to generalize the process across Lines of Business by identifying variables (both base and calculated) that can impact the premium optimization outcome.

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1. Price Optimization Overview, CAS, Price optimization working party, 2014, Morgan Bugbee FCAS MAAA, Bob Matthews FCAS, Sandra Callanan FCAS MAAA, John Ewert FCAS MAAA CPCU ARM ARe, Serhat Guven FCAS MAAA, LeRoy Boison FCAS MAAA, Christine Liao FCAS MAAA.
  2. The Challenges Facing P&C Insurers in Implementing Price Optimization and the basic framework to confront them, 2014 CAS RPM, Washington DC - Jun Yan PhD, Peter Tomopoulo ACAS,MAAA, Kelli Broin FCAS, MAAA.
  3. From Art to Science: The Future of underwriting in commercial P&C insurance, McKinsey, Feb 2019, Ari Chester, Susanne Ebert, Steven Kauderer, Christine McNeill.



## Price optimization process



The default pricing process including the optimization steps involve 3 categories 1. Base Rating 2. Underwriting models and 3. Customer impact elements.

Base rating is the default rate development process that's anchored by actuaries using predicted loss data using Risk Hazard grade, exposure and market segments.

Underwriting models including policy / Risk specific inputs that typically cover the following categories.

- ▶ Are there specific Losses that are considered as outliers which if used skew the rating and thus the premium outcome?
- ▶ Are there loss control elements that should be factored in either based on historical data or risk inspection outcome?
- ▶ Is there an opportunity for the Underwriter to revisit Hazard grades , loss rates or other parameters which are unique to the specific risk or policy context?

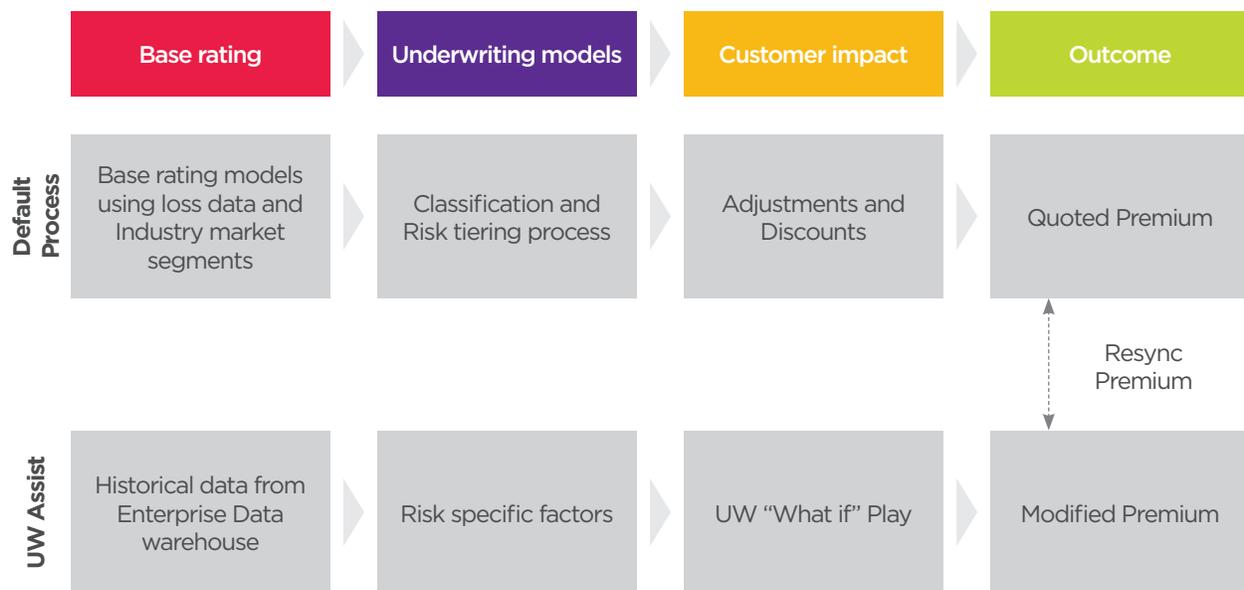
Customer impact elements are factors that are typically competition and consumption based. Are there factors that require?

- ▶ A discount on the final premium
- ▶ Revisit of the rating due competitive or retention considerations

Given the above considerations, a generic approach has been devised to supplement the default rating process.



## Generic approach for pricing optimization



The UW assist which is a supplemental process has 3 elements

- ▶ Historical policy and claims data as far back as possible and practical to further refine the pricing parameters
- ▶ Identification of risk specific factors that can be either used as is or used in a calculation to assist in revised pricing
- ▶ A tool to assist underwriters in "What if" scenarios. Here the Underwriter gets to change the values for the predetermined parameters to see the impact on pricing
  - Underwrite can further assess premium pricing across policies of same premium value and decide whether to alter the quoted premium

# Data elements across Lines of business

A key component of this approach is the set of parameters that can be used in the “What if” tool. Our initial suggestion of such parameters is given below based on the “actor”. We have used Actuary, Underwriter and Broker/Agent as 3 possibilities.

	Common Factors across LoBs	LoB Specific Factors	Contingent Factors
Underwriter	<ul style="list-style-type: none"> <li>▶ Account Size</li> <li>▶ Claims Experience</li> <li>▶ Loss Limit</li> <li>▶ IBNR</li> <li>▶ Exclusions</li> <li>▶ Deductibles</li> <li>▶ Split Limits</li> <li>▶ Primary Loss Rate</li> </ul>	<ul style="list-style-type: none"> <li>▶ Driver Claim Experience</li> <li>▶ Vehicle model based rating</li> <li>▶ Location details</li> <li>▶ Large loss details</li> <li>▶ Risk inspection</li> <li>▶ Experience Mod</li> <li>▶ Industry rating</li> <li>▶ Hazard grade</li> <li>▶ Schedule rating</li> <li>▶ Audit compliance</li> </ul>	<ul style="list-style-type: none"> <li>▶ Quoted premium</li> </ul>
Actuary	<ul style="list-style-type: none"> <li>▶ Medical loss</li> <li>▶ Development factors</li> <li>▶ Indemnity -loss</li> <li>▶ Development factors</li> </ul>	<ul style="list-style-type: none"> <li>▶ Expense Constant</li> </ul>	<ul style="list-style-type: none"> <li>▶ Level of inflation</li> <li>▶ Frequency of large loss</li> <li>▶ Impact of economic downtime</li> </ul>
Broker/ Agent	<ul style="list-style-type: none"> <li>▶ Commission %</li> </ul>	<ul style="list-style-type: none"> <li>▶ Multi product discount</li> </ul>	<ul style="list-style-type: none"> <li>▶ Size of intermediary</li> <li>▶ Strength of relationship</li> </ul>

## Implementation considerations

### Pre-Implementation Considerations

- ▶ Historical data availability - This approach requires use of historical data typically beyond what is used by default. This covers policy, Claim, premium details in addition to the various actuarial factors used in rating. If an appropriate data warehouse or equivalent source is not available, that would become the first step in enabling this approach
- ▶ Configurable functionality to identify parameters that will be used in the “What if” pricing tool
- ▶ Pricing tool with
  - UI to enable underwriters to modify various parameters
  - Pricing integration to back end systems to get amended pricing using revised parameters
- ▶ Audit logs to store various underwriter amendments along with the rationale for future reference and regulatory needs
- ▶ Appropriate pricing notes to justify the need to apply new rates or retain existing premium by Underwriter is critical
- ▶ Risk Evaluation considerations - Consider premium and claims from below risks
  - Multiple policies with the same account holder
  - Related policies of the account holder with similar risks
  - Acquired business by the account holder

## Post Implementation considerations – Measurement and optimization

Suggested metrics for measuring effectiveness of the price optimization approach

- ▶ Premium differences between the default pricing approach and the optimization for all policies impacted in a specific timeframe to determine the revenue impact
- ▶ Loss ratio across the impacted policies to determine the overall underwriting profit/loss
- ▶ Around 10-20% of the entire book of premium are expected to undergo pricing optimization approach. Within that, Comparison across policies with same premium range is conducted. This is to ensure that one policy does not have an adverse premium and to make sure that the pricing tool recommendation can be applied. The policy premium, historical data availability and risk complexity can be used as a criterion to decide on the policies that should go thru the pricing optimization tool.

## Regulatory, market and social considerations on price optimization

While use of historical data and associated price optimization techniques are gaining ground and have wide implications, there are multiple impacts from loyal customers to Low income clients to regulatory authorities<sup>4</sup>. Some broad areas are indicated for follow up.

- ▶ Unhealthy Market segmentation
- ▶ Potential underground use of prohibited rating factors
- ▶ Regulatory limitations around
  - Access to data
  - Potential lack of visibility on factors behind underlying models
- ▶ Loyal customers Vs the one who threatens to switch
- ▶ State regulations
- ▶ Privacy considerations

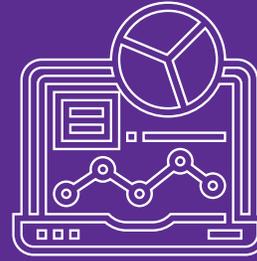
## Areas of application

### Beyond price optimization transactions, this tool will aid

- ▶ To perform or review a risk evaluation of an account as part of merger and acquisition activity
- ▶ To perform or review a risk evaluation of a portion of an organization's business as part of a decision to buy/sell this portion of the business
- ▶ To perform or review a risk evaluation as part of an audit or an investigation
- ▶ To perform or review a risk evaluation by a rating agency as part of its rating process
- ▶ To perform or review a risk evaluation of an organization's strategic plans and goals

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4. Big data and pricing optimization in General Insurance, Oct 2016, SOA Annual meeting, Moderator Ann Weber, Presenters – Amy Bach JD, Angela Nelson, Mark Smith, Mary Jane Wilson-Bilik JD



## Illustrative scenarios for consideration with relevance to Workers' Compensation Line of Business

### Scenario 1 : New Business Application

Policy Term	Policy Period	Class Code	Basis	Quoted Premium	Prior term data
Annual	07/01/2020 to 07/01/2021	5551	60,000	29,123.00	Nil

In the below data set tables, the grey column headings are input values and blue column heading are calculated values derived from the Underwriting Assist tool algorithm.

**Loss Rate:** It is the rate to be applied based on the claim experience. It can be defaulted to 1 if there is no change needed to the Potential premium calculated out of the algorithm. Based on the claim experience, this can be altered as in the table.

**Loss Limit:** It is the value at which the claims can be capped. Individual claims of each policy term, including the historical claims for the past years will be capped to this limit.

**Hazard Group:** It is the Hazard category which helps to assign the correct Excess loss factors based on the loss limit. It is a manual selection by the underwriter, and here they are named between 'A' to 'G'.

**Schedule Rating Factor:** This factor allows to offer a credit or a debit to the quoted premium based on specific factors that the insurer believes will affect the risk. This is a summation of multiple factors.

**Potential Premium and Quoted Premium:** They are the calculated values arrived based on the Underwriter Assist algorithm and the regular rating process respectively.

## Underwriting Assist Tool – Play around data set

Loss Rate	Loss Limit	Hazard Group	Potential Premium	Schedule Rating Factor	Quoted Premium
0	25,000	G	20,277.33	1	29,123.00
0	30,000	G	19,820.73	1	29,123.00
0.95	30,000	G	20,539.77	1	29,123.00
0.98	30,000	G	20,562.47	1	29,123.00
1.2	30,000	G	20,728.99	1	29,123.00
1.2	30,000	G	20,728.99	0.95	27,706.55
1.2	30,000	G	20,728.99	0.85	24,873.65
1.2	30,000	G	20,728.99	0.75	22,040.75
1.2	30,000	G	20,728.99	0.70	20,624.30

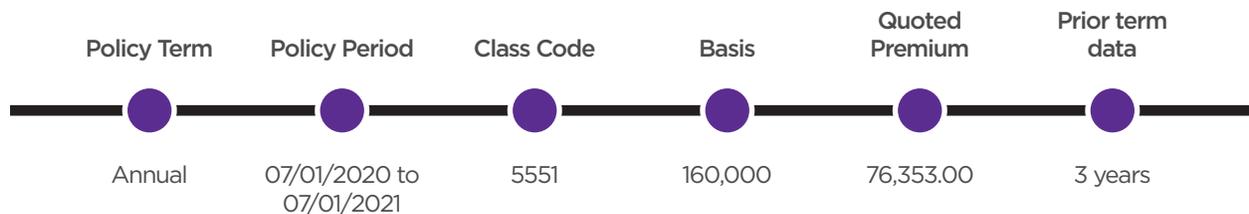
In the above table, the underwriter has done a what-if analysis by changing the values of Primary Loss Rate, Loss Limit and retained the Hazard Group as-is to arrive at an indicated premium of 20729.99 using the Underwriter Assist tool.

Now, having decided that is the optimized premium for this insured, the underwriter alters the Schedule rating factor to different values to ensure the initiate quoted premium reaches the indicated premium approximately.

Thus at a schedule rating factor of .70, the quoted premium was optimized from 29,123.00 to 20,624.30.



### Scenario 2 : Renewal Policy



### Underwriting Assist Tool – Play around data set

Loss Rate	Loss Limit	Hazard Group	Potential Premium	Schedule Rating Factor	Quoted Premium
0	100,000	G	42,452.03	1	76,957.35
0	75,000	G	45,484.26	1	76,957.35
0	75,000	F	41,585.67	1	76,957.35
1	75,000	F	43,604.03	1	76,957.35
1.2	75,000	F	44,007.70	1	76,957.35
1.2	75,000	G	47,906.28	1	76,957.35
1.2	75,000	G	47,906.28	0.9	69,342.51
1.2	75,000	G	47,906.28	0.8	61,727.68
1.2	75,000	G	47,906.28	0.70	54,112.84
1.2	75,000	G	47,906.28	0.65	50,305.42
1.2	75,000	G	47,906.28	0.60	46,498.01
1.2	75,000	G	47,906.28	0.61	47,259.50

- ▶ Here, in the above table, there are variations on 1 of the parameters which has led to the change in indicated premium.
- ▶ Initially, Loss limit was updated from 100,000 to 75,000 as the benefit of 1 large claim to not impact the premium was given. Hence the loss limit is capped to 75,000.
- ▶ Next the Hazard grade was improved from G to F to check the impact which reduced the indicated premium to 41,585.67
- ▶ Next the Primary loss rate was changed to see the impact of indicated premium. The values were changed from 0 to 1 and then to 1.2.
- ▶ Later on a better judgement, the Hazard group was again moved to 'G' and the indicated premium was finalized and highlighted in green. So that is the final set of values which say an underwriter wants to consider for the optimized quoted premium.
- ▶ Now to match the quoted premium to the indicated premium, schedule rating factor is varied from 1 till it reaches .61, at which point, the quoted premium is almost at sync with the indicated premium.
- ▶ Now this is issued as an optimized quote for the insured.



## Conclusion

While pricing optimization is a complex function, the suggested approach provides a balanced way to achieve optimum premiums while addressing many of the concerns around transparency and regulatory needs. Since all underwriter actions are recorded and can be made available for future reference, this presents an effective tool to support efforts to improve UW results. This can also be implemented as a coordinated workflow that's used as a controlled supplement to the existing pricing process. Once sufficient usage statistics are obtained, there is an opportunity to implement rule based AI recommendations to the Underwriter.

## About the Authors



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Ranga comes with 30 years of experiences across the entire Insurance spectrum, from multiple IT roles, Solutions covering both technology and operations, as well as being a CIO for an Insurance TPA. He has diverse experience across Insurance covering Life and Annuities, Property and Casualty and Reinsurance. As part of this experience, he was involved in large legacy modernization/digital transformation, conceptualizing and guiding As a service solutions and providing end to end solutions across technology and operations. Ranga has also setup technology practices geared towards servicing Insurance organizations .

Based out of New York, Ranga is actively involved in creating and guiding clients in their transformation journeys focusing on New business, Underwriting, Loss control and Claims. Ranga drives HCLs insurance propositions by coordinating across technology practices and partner eco system.



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