Price Optimization Overview

Casualty Actuarial Society, Price Optimization Working Party

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1. INTRODUCTION

Actuaries are a key part of the ratemaking process, and generally are responsible for determining the estimated costs of risk transfer. As risk transfer costs change over time, actuaries develop rate indications and determine how to update the rates and factors used to price risk transfer.

A rate indication represents a point estimate of expected future costs. Once a rate indication has been developed, the insurer passes on that indication to other functional areas within the company to obtain their input. The insurer also takes into consideration externalities such as legal and regulatory limitations. The final rates and rating factors used are then selected after reviewing these inputs and limitations.

This document is intended to provide information about the overall pricing process in the P&C insurance industry and how those practices have evolved into what is known today as Price Optimization. It is not intended to be an Actuarial Standard of Practice. First and foremost, Price Optimization as it's now known has always been and continues to be one component of the ratemaking process in how the business manager goes from actuarial rates to final prices. For purposes of this document and related discussions, we define price optimization in P&C insurance as the supplementation of traditional supply-side actuarial models with quantitative customer demand models. This supplementation takes place through a mathematical process used to determine the prices that best balance supply and demand in order to achieve user-defined business goals while simultaneously imposing business or regulatory limitations on how those goals are achieved. The end result is a set of proposed adjustments to the cost models by customer segment for actuarial risk classes.

2. HISTORICAL PRICING PRACTICE

Final premiums typically have been adjusted from the indicated premiums for many reasons. These adjustments were produced in a variety of ways, although they may not have explicitly used the terms "pricing optimization" or "optimized pricing." Traditionally, the adjustments made to the indicated rates to produce final rates were generally done without sophisticated techniques. Before sophisticated pricing models were introduced, insurers would examine competitors' rates, in addition to their own firm's retention ratios and new business growth, to understand customer demand for their product. The insurers' responses to the information gleaned from such analyses included an array of marketing, underwriting, and pricing actions, where the pricing actions were deviations from raw cost-based rates in pursuit of marketing objectives. The selection of the final rates is often explained by the term "actuarial judgment." That judgment typically gives due consideration to business objectives as well as internal and external constraints.

This historical discretion in rate and rating factor selection is the result of one or more types of adjustments to the indicated cost-of-risk transfer, for example:

- Simplification
    - Rounding rates and factors to convenient and easy to understand values, e.g. the nearest dollar for rates, the nearest 0.10, 0.05 or 0.01 for factors
- Consistency
    - Smoothing or averaging rating factors to reflect a simpler or more logical pattern
    - Capping the factors
    - Capping the relationships between factors
- Competitive
    - Using competitor data as a credibility complement to insure that the selected rates and factors are reasonable in the marketplace
- Disruption
    - Limiting the amount of change to a given factor, either to phase in large changes over more than one rating cycle or to actually cap the percentage change
- Marketing
    - Adjusting rates and factors to account for impacts to retention, close rates, new business production, etc.

- Regulation
    - Adjusting rates and factors to comply with the various laws and statutes

It should be noted that judgmentally selected factors are generally close to the indicated ones and within a reasonable range of analytic uncertainty. Furthermore, when rating plans are subject to regulatory review, the regulator retains the opportunity to determine if the difference between the final factors submitted and the raw indicated estimated factors is acceptable.

3. CURRENT PRICING PRACTICE

Until recently, companies had limited ability to quantitatively reflect demand in pricing. The inability to offer varying prices to individual customers prevents direct measurement of price elasticity as it is often measured in other industries or countries. Instead, the effects on customer demand of past filed and approved rate revisions are measured. With the advent of more detailed data and the statistical sophistication to handle very large data sets, actuaries now have the ability to provide quantitative information into some of the previously judgmental aspects of the price-setting process in lieu of anecdotal evidence. It is this process that has come to be referred to as "price optimization". The ability to collect detailed data on risk retention, defecting clients, quote data, and closure rates by numerous risk characteristics provides a wealth of additional information beyond point estimate indications of the cost of risk transfer. Management can use this additional information to suggest revisions in indicated rating factors that alter the prospective mix of business and thus better control the outcome of a rate revision. In using this additional information, management still must consider other subjective or unquantified aspects of the pricing decision (such as how the pricing actions could impact key customer segments or alter brand and reputation) before deciding on the final rates to submit as a part of their rate filing, where applicable.

In operation, price optimization involves first determining the "traditional" indicated rates and rating factors (the cost of the risk transfer). The insurer next examines their competitive position in the marketplace, under both current and the indicated changes, through the development of demand models for new and existing customers. The insurer then attempts to project what impact customers' collective responses to the preliminary changes will be on various business metrics. These may include total premium, average premium, policy count, combined ratio, total profit, retention rate, new business closure ratio, new quote count and new business volume, among other variables. In many instances, the insurer may consider more than one future policy period in these calculations; for example, "maximizing lifetime customer value" may be a goal. The insurer then selects any one or a combination of these business metrics and estimates the changes in the preliminary rates that might alter the customer responses and bring the insurer closer to its goal.

While applying price optimization, the insurer must incorporate constraints on the process. These can include external constraints such as legal or regulatory requirements as well as internal constraints such as technical and operational limitations, the range of reasonable estimates around the indicated price changes, and the level of confidence that the firm has in their optimization model.

Once a desirable scenario is selected, the optimized revisions to the rates and factors are then filed and implemented, subject to applicable filing laws and regulations.

The rate selections which an individual company makes may depend upon their particular new business vs. retention focus and what the price optimization analysis shows. Customers on the books for a long time may have better loss experience or retention numbers, and a reduction in rates could be a cost-based move appropriate for this group. This approach, however, could be detrimental to new business acquisition if the increased discount to long term policies needs to be offset by increased rates for new policies. Thus two companies, even given the same data, could choose different actions based on their different corporate goals.

3.1 Current Examples of Price Optimization

Rates may be adjusted for:

- *Groups of customers who are expected to have high persistency*. These customers may have lower long-term expense costs, justifying a reduction in premium. This example could fall within the current definition of "cost-based" rate adjustments.
- *Groups of customers where the competition is noticeably distant from the insurer's rate.* This situation often suggests the possibility that the insurer's own data is missing some important risk aspect that other companies have used in rating these risks. In essence, the insurer is making the decision that its own rates may not be sufficiently credible for that risk, based on the market comparison. The competitors' rates are being used as an after-the-fact complement of credibility to the insurer's own rates. This example can be cost-based when determined in a technical manner; however it can be also be done informally.
- *Groups of customers where some risk factors are not yet fully quantified into rigorous rating variables by predictive models or other methods*. In essence, this is changing a rate based on something that may be a rating variable at some time in the future. Often this is an item which is currently an underwriting variable in the process of being reviewed in a more rigorous manner to change it into a rating variable. This type of example can be fully or partially cost-based, depending upon how it is determined and how it is implemented.
- *Marketing strategy*. A discounted rate is provided to customers where the insurer's rate is

just above those of its major competitors to more closely match the competition. This reduces the chance of the customer's leaving or increases the chance of acquiring new customers. This example is a non-cost-based adjustment to the rate, however, this has long been historically considered in the pricing process based on marketing analyses.

The above are examples of pricing optimization currently used in property-casualty insurance pricing. Again, the two main differences from the historical price optimization are:

- Market demand and customer behavior are quantified instead of being subjectively determined; and
- The effect of the rate deviation from the loss cost on business metrics is mathematically measured.

Price optimization also enhances the insurers' financial strength by having considered long-term customer relationships while providing discounted rates due to market competition.

To better understand the implication of price optimization, the following section provides a discussion of the implications on regulation, companies, customers and public perception.

4. POINTS OF CONSIDERATION

When customer value is correctly modeled, price optimization can recognize customers who steadily bring long term value, and insurers can set prices to ensure they remain loyal. Optimization may remove bias from the selection process since such discounts are based on customer characteristics rather than an underwriter's or an agent's judgment.

Actuaries should always be prepared to explain the rationale behind their choices if there are significant differences between the indicated factors and the selected ones. With price optimization, actuaries should also be prepared to discuss their selection reasoning if there are a large number of small differences that could be compounded to become significant for individual customers.

It is possible for some price optimization modifications to be implemented in ways other than through filed rates (where filing is required), such as within schedule rating plans or as a part of the instructions or restrictions given to underwriters for exercising price flexibility as the final rating step. This would not differ from current practice in application; only the rigor with which the modifications were developed would have changed.

4.1 Pricing for Low-income Customers

Much of the recent criticism of price optimization has focused on low-income customers that are purported to be less price sensitive than medium- and high- income customers. The impact of price

optimization on such customers is both difficult to determine and variable from insurer to insurer for several reasons:

- Price Optimization operates at the rating factor level. Since income is not a rating variable, those variables that are used will contain a mixture of income levels.
- Low-income customers do not all have the same price sensitivity; some will be more sensitive than higher-income customers, other less, according to their circumstances and mindsets.
- For a given company, the price sensitivity exhibited by customers in response to said company's rates is highly dependent on the company's competitive position in the market for each customer segment. As a result, a customer segment that appears highly price sensitive to one company can have low price sensitivity for another company.

4.2 Evaluating Rate Change Impacts

Rate change impacts have typically assumed that the overall distribution of risks will remain unchanged. In practice, the rate change itself may produce shifts in risk distribution since there is significant asymmetry regarding which customers will accept the new pricing and which customers will choose to leave. Since the prospective experience is more likely to resemble the indication if a large portion of risks renew, it is usually in the interests of the actuary and their company to take steps to maintain or improve the retention ratio. That goal is aided if they can determine the expected retention implications of rating changes, that is, the impact of supply and demand on their customer's choices.

5. CONCLUSION

Price optimization is not a new concept for insurers, but the application of analysis and modeling to guide judgments beyond expected costs is a recent development. Modern price optimization is merely a more sophisticated and accurate means of making the kind of final rating adjustments that have been taking place for decades, subject to regulatory approval where applicable. To the extent that these adjustments are now more data-based and less judgment-based, it represents an improvement over past practice that will benefit both insurers and their customers in the long run by reflecting the value of customer loyalty back to the customer.

