November 3, 2014

Mr. Joseph G. Murphy
Commissioner, Massachusetts Division of Insurance
Chair of the Auto Insurance (C/D) Study Group
National Association of Insurance Commissioners

Transmitted via email to Joseph.G.Murphy@State.MA.US

Dear Commissioner Murphy,

Thank you for allowing Towers Watson the opportunity to present before the Auto Insurance (C/D) Study Group on July 28, 2014, concerning the use of mathematical optimization techniques in guiding the selection of insurance prices. This letter provides additional information in response to the questions the Study Group presented to Towers Watson in your letter to Serhat Guven dated September 5, 2014.

As many of the questions address a set of common themes, including some general misconceptions, we open this letter by explaining some fundamental facts. Also, for avoidance of doubt, our explanations and responses relate to the U.S. insurance marketplace and to Towers Watson's insurance consulting services unless stated otherwise.

First, Towers Watson has not maintained data or provided data to our clients for price optimization exercises. All data used in our optimization projects has been provided by the carrier. Also, we have not requested nor analyzed data from a U.S. client that identified a customer’s race, ethnicity or personal income.

Second, Towers Watson’s optimization software does not prescribe a pre-parameterized algorithm. Our software provides: a) an environment for a carrier to integrate its own models (e.g., loss cost models, expense assumptions, policyholder demand models) on customer data and b) mathematical algorithms that search the universe of rating structure parameters (i.e., relativities) to identify the set(s) that most closely meets the carrier’s corporate objectives, subject to its constraints. Each carrier specifies its own objectives and constraints, which will vary from carrier to carrier. Hence, each optimization exercise is unique.

Price optimization techniques do not replace the process of determining indicated cost-based premiums. In fact, expected costs are a necessary and key input to applying price optimization techniques. The output of an optimization exercise is meant to inform the carrier’s pricing decisions – much like a simple factor-by-factor competitive analysis has been used for decades to inform such decisions.

For lines of business that require a filed rate order calculation, it is not possible for two identical risks to be charged different premiums – with or without the use of price optimization in selecting prices. Additionally, price optimization does nothing to change the requirement that filed rates are in fact what the customer is charged (as required by state regulation).

Finally, our software has appeal in the insurance industry because it is efficiently programmed and well-tested and offers the user many benefits – e.g., speed, flexibility, highly visual output. However, many
generic software platforms such as Excel, SAS and R can be programmed by qualified resources to perform such calculations.

The next section addresses the specific questions asked by the NAIC. Questions of a similar nature have been clustered together and addressed in a single response.
Price Optimization Model and Usage

How does TW define price optimization? What items are modeled (e.g., retention, demand elasticity, etc.) and what variables do you incorporate from your model output?

TW defines price optimization as a systematic process for suggesting adjustments to theoretical cost-based prices that better achieve business objectives, subject to known constraints. The key objectives are embodied in portfolio-level key performance indicators such as volume, premium revenue, profit, lifetime value, etc. The adjustments to cost-based indications typically reflect price competitiveness, price responsiveness and long-term customer lifetime value considerations. Constraints include both internal constraints (e.g., brand considerations, ability of a policy administration system to program a certain rating plan) and external constraints (e.g., compliance with state regulations).

The foundation of a price optimization exercise is an integrated price assessment environment. Such an environment integrates various models or data on one or more customer datasets, which may be in-force customers, quotes or notional policies. Commonly these models estimate loss amounts, underwriting expenses and customer demand behavior. There may be several models of each type. For example, frequency and severity models by type of claim are often used to estimate loss amounts. Separate models are used to model different types of customer behavior – e.g., new business conversion, renewal, mid-term cancellation and cross-sell.

Towers Watson's optimization software provides an environment for integrated price assessment but does not prescribe any models, data, objectives or constraints. These are provided by the insurance carrier.

The integrated price assessment environment allows for financial projections to be undertaken policy by policy. For any given rate scenario included in the price assessment environment, a premium amount is calculated for the individual customer (commonly referred to as “extension of exposures” in the actuarial community). Integration of the aforementioned models enables calculation of metrics such as expected volume, profit and lifetime value. The metrics are produced for each individual customer and then cumulated to the portfolio level, which enables an assessment of whether the chosen rate scenario is helping the carrier achieve its objectives. Using this type of approach, carriers test a small number of rate scenarios during their rate selection process.

Mathematical optimization algorithms can be used to generate a much larger number of rate scenarios to run through the price assessment environment, and to identify which scenarios better achieve business objectives subject to known constraints.
How many U.S. auto insurance companies has Towers Watson provided services for? What percentage of the market does this represent?

Does Towers Watson know approximately how many auto insurance companies use price optimization for business written in the U.S.?

In addition to price optimization, does Towers Watson know how many auto insurance companies (and what percentage of the market) uses elasticity of demand in pricing and how many/what percentage uses competition in pricing?

Does Towers Watson know approximately what percentage of the auto insurance market uses price optimization in the U.S? Is Towers Watson able to split this percentage between personal and commercial auto?

Towers Watson does not know what percentage of the U.S. auto insurance market uses elasticity of demand, competitive assessment or price optimization in their pricing. However, Towers Watson conducts an annual survey to evaluate industry use of predictive modeling techniques across all personal and commercial products. In 2013, of the 59 U.S respondents, 5% indicated that they use price optimization today for some of their products and an additional 12% said they were likely to expand their price assessment capabilities to price optimization in the future. This was not a scientific survey and responses were not validated.

Do some insurers use Towers Watson tools before rates are filed while others use Towers Watson tools after the rates have been filed, i.e., to modify an individual insured’s premium using the insurer’s filed/approved rates? If so, please provide the numbers for each category.

What are the various methods insurers use to incorporate price optimization in determining the premiums that they charge? In what way do they vary between personal and commercial lines, and among the various types of personal and commercial lines of business?

What are the various methods insurers use to incorporate price optimization into their rate schedules, such as underwriting, marketing, claims, reserving?

In what ways, other than to determine premiums to be charged, do insurers use price optimization? Explain how price optimization is used in each. In what way do they vary between personal and commercial lines, and among the various types of personal and commercial lines of business?

For lines of business that require a filed rate order calculation (e.g., voluntary private passenger auto), price optimization provides one of many inputs that carriers synthesize to select rates to file. In our experience, insurers usually spend significant time and effort to ensure that the final rates meet their internal and external constraints, and this is true with or without mathematical optimization. Once selected and filed, these are the rates to be charged customers. Price optimization is not used to modify an individual insured’s premium from the otherwise applicable filed rate.

For lines of business that allow deviation from filed rates (e.g., commercial property), price optimization could be used to guide the underwriter’s judgment in how to deviate from manual rates.

The output of a price optimization exercise provides a data point – much like current premium, cost-based premium and competitor premium. Towers Watson is not fully aware of the extent to which our clients utilize this data point in applications beyond pricing. For example, the results could be used to develop target marketing strategies.
Does Towers Watson’s algorithm include an evaluation of consumers’ responsiveness to premium levels or premium changes? If so, how does Towers Watson determine consumer (or class of consumers) responsiveness to premium levels or premium changes? If market premiums are considered in evaluating consumer responsiveness, how is market premium information obtained and verified that it is current and accuracy?

Does Towers Watson maintain data on individual customer’s shopping habits?

How is the ‘degree of consumer responsiveness’ used in Towers Watson’s pricing algorithm? Would a consumer (or class of consumers) that is found to be less responsive to price changes be identified for upward adjustments in premiums?

What are the categories you use to identify who shops more or less than average?

Towers Watson has not distributed or licensed data on U.S. customers’ loss experience or shopping habits. All data has been provided by the insurance carrier.

Towers Watson’s optimization software provides an environment for integrated price assessment but does not prescribe any models, data, objectives or constraints. These are provided by the insurance carrier. The input models include policyholder demand models, which are often separate models for some or all of new business conversion, renewal, mid-term cancellation and cross-sell. These demand models do not describe which customers shop more or less but rather how likely a customer is to renew a policy or to accept an insurer’s quote.

Policyholder demand models are generally fit to recent, customer-level, historical data that contains information about the customer as well as what purchase decision the customer made (e.g., did the customer renew – yes/no, did she or he accept this quote – yes/no). Predictors in such a model include premium-related information (e.g., premium charged, change in premium, competitor premium or some comparison to competitor premium) as well as non-premium information (e.g., distribution channel and many risk characteristics commonly used in ratemaking – e.g., multi-product indicator, insured’s age).

In our experience, insurers collect competitor premium information in one of three ways:

Licensing comparative rating software from a third party vendor

Integrating data from broker quotation systems

Programming competitor rate order calculations (obtained from public filings or rules/rates manuals) and then applying the calculation to the policies contained in the customer data

Many factors contribute to suggested upward or downward price adjustments in an optimization exercise. These include price competitiveness, price responsiveness, volume considerations, long-term customer value considerations, internal constraints (e.g., brand considerations or operating constraints) and external constraints (e.g., compliance with state regulations).
Has Towers Watson ever tested its model against variables that may be correlated with race, ethnicity, credit history or income? If yes, what were the results? Is race, ethnicity, or income considered in Towers Watson’s algorithm? Does your research show the degree of shopping for categories of consumers based on these categories?

Towers Watson’s software does not have a prescribed algorithm for price optimization. The carrier directs the optimization exercise by specifying inputs (e.g., models predicting expected cost, expense, policyholder demand), targets (e.g., portfolio-level profit and volume) and constraints.

We have not maintained data or provided data to our clients for price optimization exercises. All data used in our optimization projects is provided by the client.

We have not requested nor analyzed data from a U.S. client that identified a customer’s race, ethnicity or personal income; consequently, we have not tested any price optimization output on those variables.

Please identify all risk attributes that are incorporated into price optimization models that are not currently recognized in traditional cost based rating plans.

Please identify the source of the risk attributes information used in price optimization models that are not customarily used in traditional cost based rating plans.

The insurer specifies the individual risk attributes to be considered in a price optimization exercise. These are generally considered via the predictors retained in the insurer’s underlying models for expected loss costs, underwriting expenses and policyholder demand. Loss cost models typically include traditional rating variables (e.g., deductible, model year, prior claims experience) as well as underwriting criteria (e.g., insurance-based credit score, payment plan, prior lapse). Some of these traditional variables are obtained from third party data providers (e.g., ISO vehicle symbols, TransUnion insurance-based credit scores).

Policyholder demand models generally incorporate these same traditional rating variables but may also include premium-related information (e.g., premium charged, change in premium, competitor premium or some comparison to competitor premium). As discussed previously, competitor premium information may be obtained from third party vendors or from the carrier’s own efforts to collect competitor rate filings or rules/rates manuals.

Please explain how consumer propensity to shop for insurance is consistently related with their driving behavior.

The demand models generally used for price optimization do not describe which customers shop more or less but rather the likelihood of a customer accepting a renewal offer or a quote at a given price. These models are calibrated on recent, historical customer response data.

Similarly, loss models predict insurance losses at the individual risk level, based on historical policy and claims experience.

In the U.S., many of the same variables are present in both types of models. The relationship between the likelihood of a customer accepting an insurance offer and the customer’s expected insurance losses varies by variable.
How stable are the variables in a price optimization model, and how would insurers be able to keep their models current?

The stability of variables in a price optimization exercise is a function of the stability of variables in each of the underlying input models. Sound practice in building models to predict costs or policyholder demand is to examine the stability of each variable over time and/or random subsets of the data.

Towers Watson believes that most insurers validate their cost models at least annually – and in doing so, investigate any discrepancies in how the model fits the new data. Demand models are generally validated or re-fit more frequently in recognition of the dynamic nature of the competitive environment.

How, if at all, does Towers Watson’s price optimization algorithm vary by state?

Towers Watson's price optimization software does not contain a prescribed algorithm nor does it specify the variables to be used in any of the underlying input models. The insurer controls the inputs, targets and constraints in a price optimization exercise and would specify how those elements need to vary from state to state.

How would Towers Watson describe the quality of competition in countries where price optimization is prevalent?

The most notable example of a market for which price optimization is prevalent is the U.K. personal lines market. This market is widely viewed as being highly competitive. The degree of competition is driven by many factors, including the prevalence of price comparison websites.
Regarding confidence intervals:

Does Towers Watson believe that there is a range of reasonableness, or confidence interval, around the rate calculated in the traditional actuarial (cost-based) way? If so, are insurers free to charge whatever they want in that range? Is the range submitted to the regulator in the filing?

If the range is used to alter the price through price optimization, should the insurer be required to tell the regulator what it did and submit the range and how it was calculated as part of the filing?

Does the range vary from class to class? Does a class with a lot of credibility to the data have a narrow range and a class with low credibility have a wider range?

If an insurer increases the number of classes, dropping the credibility in each class, does that give the insurer the right to raise rates more through price optimization than an insurer with a more stable rate system? If a class has zero credibility, can the insurer pick any price it wants?

First, we would like to clarify that our response refers to the confidence interval of parameter estimates (i.e., the indicated relativities for each variable, not the indicated loss cost for a given risk).

Confidence intervals of parameter estimates, among other statistical diagnostics, are commonly used to guide the building of a predictive model. For example, confidence intervals can aid in identifying for elimination those variables that do not have a systematic effect on the metric being modeled (e.g., loss costs) or in simplifying variables that contain levels that are not statistically different from one another. The size of the parameter estimate’s confidence interval depends on such influences as the strength of the predictive power, the stability of the metric being modeled, the homogeneity of risks and the volume of the underlying data.

Each carrier incorporates different input models, targets and constraints in its process to select final premiums to charge. If a carrier desires that final rates be reasonably close to cost-based premium estimates, it may use confidence intervals of the cost-based premium estimate as a guide or restraint in selecting final rates (irrespective of using or not using price optimization to inform the selection). Using confidence intervals is the sole decision of the insurance carrier and is not an implicit or fixed assumption within a price optimization algorithm.
Regulatory Aspects

Is it possible for two otherwise identical risks that would have been charged the same premium before applying price optimization to be charged different premiums after applying price optimization? If so, does Towers Watson believe this practice to be unfairly discriminatory given the classic definition of unfairness: being charged different prices to identical (from a cost-based perspective) insureds?

Can two consumers, identical in every way according to the class definition used by insurers to price risk, pay different prices due to price optimization, either by pricing itself or by underwriting, tiering, company placement or other means?

For U.S. lines of business that require a filed rate calculation, it is not possible for two identical risks to be charged different premiums. This is true whether or not price optimization techniques were used to inform selection of filed rates. Additionally, price optimization does nothing to change the requirement that filed rates are in fact what the customer is charged (as required by state regulation).
Is Towers Watson aware of any insurer that has used price optimization to charge a premium that is higher or lower than the actuarially indicated premium? If yes, does Towers Watson find such premiums to be excessive or inadequate?

Does Towers Watson believe that any insurer that incorporates price optimization should explain and detail its use to insurance regulators? If yes, does Towers Watson advise its clients to disclose to regulators that its products have been used to optimize the rates being filed? And, if yes, what level of detail does Towers Watson believe insurers should provide to regulators about its price optimization product and how it is used?

Explain how the use of price optimization is described (what words or terms are used) and detailed in a rate filing.

If insurers are using Towers Watson tools to modify filed/approved rates for individual risks, has Towers Watson allowed any insurers to file its algorithms/models with insurance regulators?

Is Towers Watson aware of any insurer that has incorporated price optimization in determining the premiums that it charges, explained and detailed its use of price optimization in a rate filing submitted to regulators U.S regulators? If so, can Towers Watson provide an example of the explanation and support provided by such an insurer? Is Towers Watson aware of any regulator approving the use of price optimization; if so, what was the form of price optimization that was filed with the regulator?

Has Towers Watson ever been asked by any of its clients to explain or support its price optimization product to a U.S. insurance regulator? If so, how detailed was Towers Watson’s explanation/support and what was the outcome?

Has Towers Watson ever advised insurers not to explain and detail their use of price optimization to insurance regulators? If so, why?

Insurers commonly select rates that deviate from a cost basis for many sound business reasons – e.g., to improve competitive position, spur growth in target markets, improve customer lifetime value or avoid large premium swings on in-force risks. The actual selection of how much to deviate and for what types of risks is often a best guess – or the outcome of testing numerous scenarios to see which best achieves overall objectives, subject to constraints. The use of mathematical algorithms incorporates the business goals objectively rather than subjectively and can expedite this search and provide useful information to the carrier.

Towers Watson’s software does not have a prescribed algorithm for price optimization. The carrier directs the optimization exercise by specifying inputs (e.g., models predicting expected cost, expense, policyholder demand), targets (e.g., portfolio-level profit and volume) and constraints.

Just as the carrier defines and guides the optimization exercise, the carrier also selects the final rates to file. The carrier owns the responsibility to demonstrate that its selected rates are in compliance with laws and regulation.

Towers Watson has not been asked by a client to provide an explanation of price optimization techniques for use in a rate filing.
How does Towers Watson show the effect of price optimization on the traditional rate indications based on expected losses?

Price optimization is used to provide an additional input to inform a carrier’s selection of final rates. As with any approach to select final rates, a comparison of cost-based premiums to selected premiums can be shown.

Has Towers Watson changed its price optimization model due to the rating laws for a particular state? If so, what changes were made?

Towers Watson does not have a prescribed model. Each carrier customizes their price optimization exercise to consider its inputs, targets and constraints – including universal or state-specific constraints.

Does Towers Watson believe that small rate increases (above risk-based levels) meet regulatory standards but large ones, using the same methods, would not? Does this vary based on the credibility of the class being price optimized?

Does Towers Watson intend to file price optimization type models on behalf of its clients, or will Towers Watson provide regulatory support when their client insurers file their models?

Does Towers Watson believe vendors of price optimization products should be regulated as advisory organizations since the tools directly alter prices consumers pay for auto insurance, or does Towers Watson believe its role is more similar to companies who develop credit history rating models?

Each optimization exercise is bespoke to the carrier – it relies on the carrier’s data, assumptions, input models, targets and constraints. As such, there is no industry “model” to file with regulatory bodies.

Price optimization exercises are not similar to insurance-based credit scoring models, which are designed to develop risk classifications to be used in rating. Price optimization is used to guide selection of final rates in order to best achieve corporate goals, subject to constraints.

Towers Watson's price optimization software is meant to facilitate the building of a price assessment environment – including the use of mathematical algorithms. Our software has appeal in the insurance industry because it is efficiently programmed and well-tested and offers the user many benefits – e.g., speed, flexibility, highly visual output. However, many generic software platforms such as Excel, SAS and R can be programmed to perform such calculations. As such, it does not seem equitable to regulate a subset of all available software packages.

Would the value of price optimization applications in insurance rating be enhanced or diminished if regulators required insurers to disclose that at the point of sale?

If insurance regulators made the public aware that price optimization models might affect their insurance prices along with the impacts that might have on their premiums, does Towers Watson believe their assumptions about consumer shopping behavior would change? If yes, in what ways?

The demand models generally used for price optimization do not describe customer shopping behavior but rather the likelihood of a customer accepting a renewal offer or a quote at a given price. Customers consider many things when choosing whether or not to accept an insurer's offer. This includes the need for insurance, the availability of coverage, the price offered by the insurer, the price offered by competing insurers and the perceived quality of each carrier’s products and service. To the extent these considerations and their relative importance in decision-making are dynamic, the likelihood of accepting a
renewal offer or quote at a given price can change. It is not feasible for us to estimate how mandated
disclosure of pricing techniques would change consumer purchasing decisions.

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Thank you again for the opportunity to respond to the Study Group’s questions. We hope our responses help explain how optimization techniques help inform individual carrier’s pricing decisions in a dynamic, competitive marketplace.

Regards,

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