How Individuals Purchase Insurance: Going Beyond Expected Utility Theory

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Abstract: For insurers to be successful in the long run, they need to put forward an attractive value proposition for insureds and price (sufficiently) for it. To facilitate this, it is best that insurers deepen their understanding of consumer behavior in situations that involve risk. This paper is intended as a survey of the developing economic literature concerning how individuals make choices in the face of risk. It will be shown and illustrated that there are primitives that drive the choice behavior of individuals faced with risk. With understanding of these primitives in mind, a practicing actuary should be able to rationalize observed portfolio profitability or unprofitability, as well as anticipate the effect of some pricing and product changes on the profitability of the affected portfolios.

Keywords: Behavioral Economics; Expected Utility Theory; Committed Consumption; Loss Aversion; Prospect Theory; Consolation Hypothesis

1. INTRODUCTION: THE NEED TO GO BEYOND EXPECTED UTILITY THEORY

To ensure their long-term survival, insurers must assure themselves that they continuously strive to respond to evolving demands of insurance consumers and their related stakeholders. For insurers, this focus on satisfying customer needs and wants is doubly important as insureds are the main source of capital for insurance companies, being the biggest contributor of debt financing (reserves) and a major contributor of shareholder equity (underwriting profit). A sign of potential for long-term survival of the insurer is sustainable and sustained above average profitable growth. Profitable growth can be thought of as the result of a process where, over time, the insurer puts forward an attractive value proposition and also charges enough for it to be profitable. The attractive value proposition leads to the insurer being able to sustain organic growth, or, because an insurer with an attractive value proposition can better leverage a portfolio being acquired, growth by acquisition. This double focus on sustainable growth and pricing leads insurers to consider insurance consumer behavior, so as to make the value proposition as relevant as possible and to capture, in premiums, as much of the consumer surplus as possible.

Over the last few decades, behavioral economists, both theorists and empirical researchers, have made significant headway into the problem of explaining how individuals make purchasing decisions in insurance and, more generally, in risky situations. Their theories take us beyond expected utility theory and move us into a realm of theories that better reflect the context of our daily lives and of our psychology.

Having a theory, or a consistent set of theories, of consumer behavior is important for the actuary as, without it, predictions of the effect of a supply policy change would become, at best, guess work that could easily lead the insurer astray. If the actuary does not rely on a set of behavioral primitives,[1] the actuary will be left with treating all choices with regards to insurance as entirely context dependent. If every individual's decision making with regard to insurance choice were entirely context dependent, it would be impossible to prepare forecasts of the actual effect of, for example, a rate change or the imposition of a minimum deductible.

This paper is intended to provide actuarial practitioners with a survey of recent developments in behavioral economics. In Section 2, we will start by reviewing the traditional argument for why individuals value insurance: the transfer of sizable risk and the associated prospective pricing. In Section 3, we will then show that the traditional expected utility framework cannot explain risk aversion for modest risk. In Section 4, a first alternative theory will then be explored: consumption commitments make individuals more risk averse over moderately sized downside risk gambles than would have been predicted by the expected utility framework. In Section 5, a second alternative set of theories will then be explored. All theories center on the understanding of loss aversion. We will need to explain violations of asset integration, the different nature of preferences over gains and losses, decision weights and other probability distortions, diminishing sensitivity to gains and losses, and reference dependence. In Section 6, we will then explore a third theory to explain risk aversion that goes beyond that predicted by expected utility theory: an individual's insurance choices are modified by whether or not he likes the "objects" being insured. The heart of that theory is the consolation hypothesis that implies that insurance indemnification is also seen as a consolation for the loss of the appreciated "object." In Section 7, we will also share the results of an empirical study that has found that individual insurance choices are highly correlated across similar coverages. Finally, in the Appendix, we will share some thoughts about how to conduct private research relating to insurance consumer behavior.

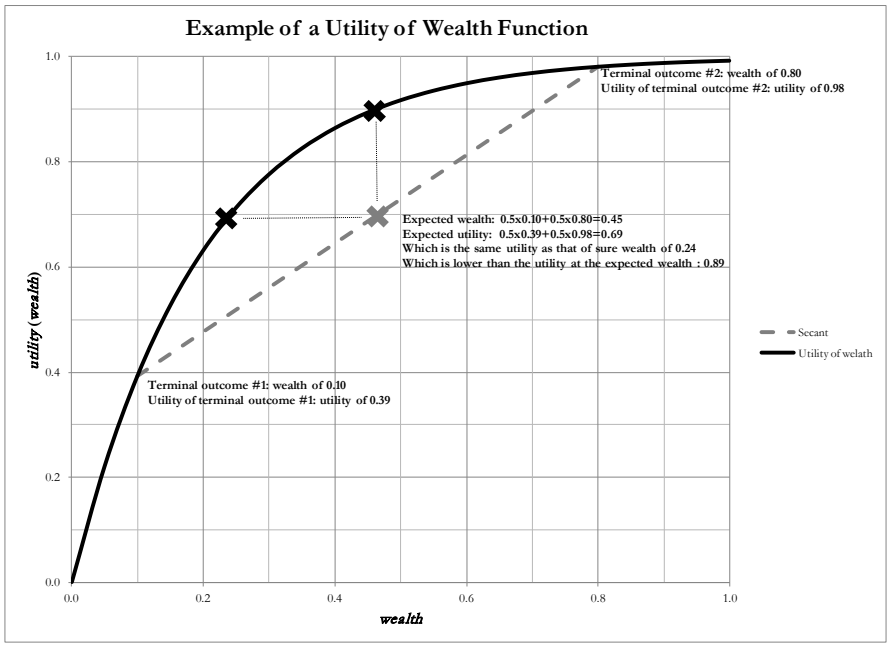
2. RISK TRANSFER, PROSPECTIVE PRICING, AND EXPECTED UTILITY

The most basic argument for why insurance is valuable to individuals comes from the risk transfer associated with prospective rating, assuming that individuals have decreasing marginal utility of wealth and maximize their expected utility.

Let's create a simplified scenario. Just as in the presentation of utility theory in *Actuarial Mathematics* (Bowers, et al. 1997), let's consider the case where an insured is facing a 1% probability

[1] By behavioral primitives, we mean context invariant components of behaviors, especially those elements relating to preferences and perceptions in risky situations.

of having an accident that will cost him $1,000,000 or a 99% probability of suffering no loss at all. The expected outcome for the insured is to suffer a $10,000 loss; that is, the $10,000 expected loss is calculated as 0.01 x $1,000,000 + 0.99 x $0. From experience, we know that many individuals are willing to pay more than $10,000 for this coverage. It must be the case that they are considering more than the expected value to make their decision. For example, they may be entertaining the consequences of facing the $1,000,000 loss and thinking of it as catastrophic. We can suppose that individuals have preferences over wealth that can be expressed as utilities. Generally, we demand preferences to be complete,[2] transitive,[3] and consistent.[4] For preferences relating to financial outcomes, we can always treat one wealth as having a utility of zero and another as having a utility of one, as utility-of-wealth functions are defined uniquely up to a linear transformation $u^*(w) = au(w) + b$, for $a > 0$. To discover the exact shape of the utility function, we can arbitrarily set $u(w_0) = 0$ and $u(w_1) = 1$, for some w_0 and w_1. As we generally think of people as preferring more wealth to less, w_1 should be greater than w_0. We can then ask people to provide us with the certain wealth w^* that would make them indifferent between having that wealth for sure and facing a $p\%/\ (1-p\%)$ chance of having w_0 or w_1, expressed as: $u(w^*) = p \cdot u(w_0) + (1-p) \cdot u(w_1)$. With enough of these points (by varying *p*), we can construct the utility of wealth function for the person. It may look like this.



[2] Completeness relates to the requirement that people can always say if they prefer or are indifferent to two outcomes they are presented with.

[3] Transitivity relates to the requirement that a person cannot have the following set of preferences: (1) preferring outcome *x* to outcome *y*, (2) preferring outcome *y* to outcome *z*, and (3) preferring outcome *z* to outcome *x*.

[4] In identical situations, a person cannot prefer an outcome *x* certain times and outcome *y* other times.

In the example above, the person displays decreasing marginal utility of wealth. We will call that person risk averse, because the person has a willingness-to-pay to eliminate the downside risk. Using Jensen's inequality, it can be generally proven that a person who displays decreasing marginal utility of wealth will always have a positive willingness-to-pay for insurance and a negative willingness-to-pay for gambling. We can think of the willingness-to-pay for insurance, or risk premium, as the vertical distance between the expected utility of wealth line (solid line) and the expected wealth line (dashed line). If we measure the risk premium this way, we are measuring it in units of utility. If the risk premium is measured as the horizontal distance between the expected wealth line and the utility of wealth line, then it is measured in units of wealth.

This model helps rationalize the demand for risks that create catastrophic financial consequences, such as fire insurance. The following are necessary to determine the willingness-to-pay for insurance in this model: (1) initial wealth (a richer person should be more risk tolerant), (2) frequency (the higher the probability of loss, the greater the risk premium), (3) severity (the higher the severity of loss, the greater the risk premium), (4) risk aversion, i.e., the concavity of the utility of wealth function (the more risk averse the person, the greater the risk premium). A consequence of this model is that the upper layer of coverage should always be valued more by the insured than the lower layers of coverage. It is important to note that the coverage can only be valuable to the insured under the condition that the insured can replace the risky prospect of a loss with a certain prospect of paying a premium for insurance. This can be thought of as prospective pricing: when the premium for insurance is determined prior to the period of time when the insured is exposed to loss. In this case, the coverage should be purchased if the price is less than the expected value of the coverage plus the risk premium.

If pricing was retrospective, that is, the insurer charged the total amount of the claims that occurred during the period (possibly taking into account the time value of money) at the end of the period, the insurance coverage would become, at best, a contingent financing agreement, and the risk transfer features of the insurance contract would be greatly diluted.

3. WHY EXPECTED UTILITY THEORY CANNOT EXPLAIN RISK AVERSION FOR MODERATE SIZED RISK

Unfortunately, expected utility theory,[5] with the associated decreasing marginal utility of wealth,[6]

[5] The usual tenets of expected utility theory include (1) linearity in the probabilities (that is, expected utility is the probability weighted average of the utility of the different possible outcomes), (2) asset integration (that is, the considered utilities are the utilities of terminal wealth), and (3) risk aversion (in this context, this refers to decreasing marginal utility of wealth).

[6] Coined risk aversion in this model.

cannot provide a good explanation for why individuals purchase moderate insurance. In fact, it can explain even less why insureds purchase small scale insurance. Suppose that the only reason that individuals purchased insurance is because pricing is prospective, individuals attempt to maximize their utility and individuals have decreasing marginal utility of wealth; then, the risk premium (the amount over zero profit they are willing to pay for coverage) they should be willing to pay for a small risk should be proportionately small compared to the risk premium they should be willing to pay for a substantial risk. In other words, we expect that the marginal loss ratio for the higher layers to be lower than that of the lower layers of coverage, as the higher layers of coverage are more valuable to the insured. Yet, Sydnor (2010) finds that insureds are willing to pay about $100 to decrease their deductible from $1,000 to $500, when the expected loss cost in the layer is about $20. The proportional risk premium in the layer is about 80% ((100 – 20)/100) and this is certainly much greater than the proportional risk premium people are willing to pay for more substantial coverage,[7] considering that the Personal Lines insurance market is roughly competitive.[8]

As Rabin (2000) puts it, "[a]ny utility of wealth function that doesn't predict absurdly severe risk aversion over very large stakes predicts negligible risk aversion over modest stakes." Given the empirical findings that individuals are willing to pay substantial risk premium for modestly sized insurance coverage, there must be other forces than decreasing marginal utility of wealth at work to explain why individuals find value in their insurance coverage.

4. CONSUMPTION COMMITMENTS CHANGE OUR DEMAND FOR INSURANCE

Chetty and Szeidl (2007) have demonstrated that, when individuals have committed consumptions[9] that are costly to adjust, they will exhibit risk aversion for moderate stakes downside risk that goes beyond that predicted by decreasing marginal utility of wealth. With committed consumption and costly adjustments in committed consumption, moderately sized adverse shock to income is absorbed only in non-committed consumption and the welfare loss associated with a moderately sized adverse shock to income is greater than in a setting where all consumption can be costlessly adjusted.[10]

Before going further, let's provide examples of committed consumption and adjustment expenses

[7] By this, we mean the upper layers of coverage.
[8] While there may be supply policy reasons for why the pricing the insurer is offering has the peculiarity that the marginal loss ratio for upper layers is higher than that of lower layers, it does not remove the mystery, from the point of view of expected utility theory, that individuals should actually pay a higher proportional risk premium in the lower layers than in the higher layers. Supply policy reasons for why an insurer may offer such varying prices by layer may have to do with risk signalling through deductible choice, competitive pressures, etc.
[9] They define "committed consumptions" as goods that involve transaction costs that are infrequently adjusted.
[10] Like in expected utility theory.

related to committed consumption. A simple way to classify committed consumption is consumption that is infrequently adjusted downward. Examples of committed consumption would then include housing, cars, furniture and, to a lesser extent, leasing arrangements and health care spending.[11] If we further analyze the case of housing, the costs associated with committed consumption may be better exemplified. Moving is associated with large transaction costs, such as broker fees, monetary and utility costs of moving, and potential capital loss associated with re-sale.[12] We can also think about non-committed consumption as consumption the level of which changes most in adverse income shocks. With that view in mind, it makes sense to treat food and entertainment consumption as non-committed.

Chetty and Szeidl also find that borrowing constraints make individuals appear even more risk averse over moderate downside risk. With borrowing constraints, adjustments of non-committed consumption have to be even more dramatic in moderately sized adverse shocks. To contrast, a person with access to credit may use credit to smooth over a dry spell by using credit as a temporary source of funds.

In many ways, Chetty and Szeidl provide us with a way to explain the results generally associated with good (bad) credit scores in Personal Lines insurance. Suppose that an individual has consumption commitments and has decreasing marginal utility of wealth; then, other things being equal, the individual should take more precautions to avoid positions in which they will not be able to satisfy those commitments. Therefore, that individual is more likely to take more precautions to avoid a loss, assuming that the loss is not fully insured. Also, other things being equal, the individual is more likely to value insurance coverage more than an uncommitted individual or an individual that is not risk averse. This leads to the double prediction that individuals that deal better with their commitments (commonly exemplified by their having a better credit score) should have a lower loss cost (holding constant other risk characteristics) and a lower loss ratio (as, other things being equal, the risk premium they are willing to pay should be higher). While having commitments does not automatically lead to people handling them well, those individuals that started out as more risk averse before they took on commitments should see their risk aversion magnified because of their commitments, be extra motivated to avoid losses, and have increased willingness to pay for insurance.

Another relevant prediction of Chetty and Szeidl's theory is that: "commitments create a force toward providing more insurance for short-term, moderate-stake shocks relative to long-term welfare programs" (Chetty and Szeidl 2007, 861). The P&C analog of that prediction is that the

[11] More generally, [non-small] contracts that include penalties for early termination.
[12] In a soft market, at least.

relative willingness to pay for catastrophic coverage (like fire coverage) may be lower than the willingness to pay for more modest coverage (like crime coverage).

5. LOSS AVERSION AS A DRIVING FORCE FOR BUYING SMALL SCALE INSURANCE

The consumption commitment theory for why individuals display higher than expected[13] willingness to pay for insurance was built without ever appealing to the particular psychology of individuals. With Prospect Theory, developed in *Prospect Theory: An Analysis of Decisions under Risk* (Kahneman and Tversky, 1979), it becomes necessary to delve into the psychology of gain/loss perception. Prospect Theory is the first theory that provided an explanation of the rationality of small scale insurance purchasing at a premium for individuals.

5.1 "A Bird in the Hand Is Worth Two in the Bush"

One of the underlying assumptions of expected utility theory is that individuals consider risks by examining their net wealth given the risk; that is, they integrate the risk to their assets. This is commonly called asset integration. One of the first psychological phenomena that Kahneman and Tversky demonstrated was that people don't always consider gambles using asset integration. The flip side of that statement is that individuals very often consider gambles using a gain/loss perspective. For the moment, let's not address the issue of how the zero point is determined in the individual's psychology[14] and focus on the differential treatment of gains and losses in terms of the individual's preferences. With many, easily repeatable experiments, they have been able to identify that individuals are about twice[15] as sensitive to losses as they are to gains: the expression "a bird in the hand is worth two in the bush" captures that phenomenon well.

The preceding phenomenon could help to explain why individuals would be willing to pay to eliminate their deductibles. Like Johnson, et al. (1993) note, insureds can react quite strongly to mandatory increases in their deductibles. They explain this phenomenon as follows: insureds perceive the deductible payment as a loss to which they are quite sensitive. The product design that they propose to help insureds avoid feeling the loss associated with deductible payments and yet avoid moral hazard is to offer rebates; that is, they propose to incorporate the deductible charge in the premium while at the same time offering insurance rebates to insureds that remain claim-free.[16]

[13] Under expected utility theory.
[14] The treatment of the determination of the zero point is left to Section 5.4.
[15] 2.25 in many calibrations.
[16] Said otherwise, the design they propose is to offer clients a policy with no deductible. Compared to usual policies that incorporate a deductible, these policies will be surcharged. To maintain incentive compatibility and to keep the client

Unfortunately, there has been little research to attempt to explain why it is that individuals are loss averse. Clearly insurance product design and pricing can exploit the phenomenon, but, until such time as the effect is understood, it will make it difficult for insurance practioners to fully exploit the opportunities associated with loss aversion.

5.2 Decision Weights as Opposed to Probabilities

While in expected utility theory the expected utility is computed using probability weights, Kahneman and Tversky have found that people generally overweight very low probabilities. In essence, they have found that the subjective value of gain/loss prospects are not weighted together using probability weights, but rather with decision weights that are greater than probability weights when the probabilities involved are small, and less than probability weights when the probabilities involved are large. When individuals are considering loss prospects with a low probability of occurrence,[17] they tend to attach a decision weight that is greater than the probability weight, and thus exhibit a willingness to pay a risk premium for insurance. This can help explain why the risk premium associated with coverages with very low frequency can be higher than the risk premium associated with coverages that have much greater frequency (e.g., individual theft insurance vs. auto collision coverage).

Yet, it is important to distinguish between decision weights and probability mis-estimation. One example of a heuristic that individuals apply, and presumably actuaries too, leading them to incorrect probability assessments, is when the representativeness heuristic leads to misconception of chance biases such as the gambler's fallacy.[18] The insurance equivalent of the gambler's fallacy is when an insured, or an actuary, effectively assumes that an insurable event will occur because the last insurable event was a long time ago. If there is evidence that the processes leading to insurable events are memoryless (like the claim count being appropriately modeled by a Poisson or an over-dispersed Poisson random variable), the time since the last insurable event doesn't influence when the next event will occur. In this case, the heuristic can be thought of as the person starting from an

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prudent before and after losses, the policy would offer a discount for those insureds that remain claim-free. One design for the discount that the authors mention involves providing a refund to clients that didn't make a claim, a form of retrospective rating. If the discount is carried forward to the next contract (like a claim-free discount), presumably the discount would be greater for the policy without the deductible than it is for the policies that have a deductible.

[17] A low probability of occurrence generally corresponds to probabilities less than 10%.

[18] The following Wikipedia source conveniently describes what I refer to as the gambler's fallacy. "The gambler's fallacy (...) is the belief that if deviations from expected behavior are observed in repeated independent trials of some random process, future deviations in the opposite direction are then more likely. (...) The gambler's fallacy implicitly involves an assertion of negative correlation between trials of the random process, and, therefore, involves a denial of the ex-changeability of outcomes of the random process. In other words, one implicitly assigns a higher chance of occurrence to an event even though from the point of view of nature or the experiment, all such events are equally probable (or distributed in a known way)." (http://en.wikipedia.org/wiki/Gambler%27s_Fallacy).

estimate of the long-run frequency of insurable events, and thinking about when the next event needs to occur for the observed claiming process to follow its long-term average. If the time between insurable events is exponentially distributed, then the waiting time is not influenced by the time since the last event, and the reasoning leads the person to the wrong conclusion. The person is putting too much emphasis on the representativeness of the long-term average. Other examples of common mis-estimation of probabilities have also been documented and the footnote below indicates a source of information on that topic. [19]

For coverages where individuals may have some difficulty in forming an accurate assessment of their level of risk (e.g., fire peril, frill-type coverages, etc.), probability mis-estimation could play a significant role in explaining why individuals are willing to pay a risk premium. In the case of rare events, the insurer is in a much better position to evaluate the likelihood of losses than the insured is. For example, Gallagher (2010) finds that the flood insurance take-up rate materially increases after a flood occurs in a community. Assuming that the long-term probabilities of flood occurrence are relatively constant,[20] the availability bias[21] could push up their risk premium and induce them to purchase insurance. (The biases arising out of the availability heuristics may be difficult to isolate from another psychological effect that we'll explore in Section 6: individuals tend to have a higher willingness to pay for insurance for objects they like than for objects they don't care for.)

5.3 Gambling and Diminishing Sensitivity to Losses

According to Prospect Theory, the utility of gains increases at a decreasing rate and similarly for losses; in effect, the theory postulates that people become gradually less sensitive to gains or losses as they become greater in absolute value. The theory assumes that our perception of gains/losses functions like our senses in that it becomes more difficult to distinguish between values as the magnitude of those values increases.

With this assumption, we can attempt to explain the "long-shot bias" in end-of-the-day betting when a gambler has been losing overall in a day. Suppose that an individual's reference wealth is morning wealth. As the individual becomes less sensitive to losses as they grow bigger, the

[19] In *Judgment under Uncertainty: Heuristics and Biases* (Tversky and Kahneman 1974), the authors explore three families of heuristics that tend to induce individuals to mis-estimate probabilities:

(1) the representativeness heuristic, exemplified by the following biases:
    (a) insensitivity to prior probability of outcome, (b) insensitivity to sample size, (c) misconception of chance, e.g., gambler's fallacy, (d) insensitivity to predictability, (e) illusion of validity, and (f) misconception of regression [towards the mean];
(2) availability heuristic, exemplified by the following biases:
    (a) biases due to the retrievability of instances, (b) biases of imaginability, and (c) illusory correlation; and
(3) adjustment and anchoring heuristic, exemplified by the following biases:
    (a) insufficient adjustment, (b) biases in the evaluation of conjunctive and disjunctive events, and (c) anchoring in the assessment of subjective probability distribution.

[20] Thus, even if people undertook Bayesian updating of their probability assessment, their probability assessments could not change so much.

[21] An occurrence that they can easily retrieve and imagine.

possibility of finishing the day "in the black" outweighs the potential cost of finishing the day deeper "in the red."[22] The flipside of this predicted phenomenon is that the theory should also predict risk seeking for small-scale downside risk. This is a prediction that insureds may not take up coverages that are sold at a loss for the insurer. This phenomenon may help rationalize why people who suddenly became less wealthy may forego purchasing insurance in some situations. If a person already suffered a disastrous loss, then paying an insurance premium to protect against a not-so-much-more-catastrophic situation may be unattractive. However, as we will see next, further reflection about how the reference point is set is required to rationalize small scale insurance purchasing.

5.4 Not All Money Spent Is Perceived as a Loss

In *Reference Dependent Risk Attitudes* (Koszegi and Rabin 2007), a theory is developed to help us predict the reference point against which gains and losses are measured. The authors propose that different types of situations command different ways of setting the reference point for individuals.

In the case of a surprise choice (that is, a choice that an individual needs to make but where the individual did not anticipate having to make that choice), a person will appear risk neutral if the risk is small and the person is already endowed with a significant amount of risk. Said otherwise, if an individual is given the possibility of insuring on a small scale when the person is already facing significant risk, the person will not be willing to pay a risk premium to insure, if the choice of purchasing insurance comes as a surprise. For example, suppose an individual went to a ski resort, rented skis and was offered the possibility to insure the skis against responsible damages when the person wasn't aware that choice was going to be offered. The theory predicts that the willingness to pay a risk premium for insurance would be next to nil. In effect, what is happening is that the person does not have the time to form plans that influence the formation of the reference point and thus is led to use the current wealth as the reference point. When that happens and the person is already endowed with risk and when the marginal risk is small, the risk is dwarfed by the existing risk, and, for the person to be attracted to purchase insurance, the insurance has to be fair or favorable.

When the person envisions purchasing insurance for a risk, even if endowed with risk, the person should be willing to pay a higher risk premium than when the insurance purchasing option comes as a surprise. The individual has the chance to anticipate the gain/loss "sensation" that will arise if the individual purchases (or not) insurance contingent on a loss happening. In that anticipation, the individual has the chance to consider the case where a loss happens and insurance was not

[22] The expression "in the red" refers to the individual having suffered a net loss; while, the expression "in the black" refers to the individual making a net gain.

purchased, using the initial wealth diminished by the premium as a reference point. In that situation, the prospective insured should be comparing the "sensation" of gain that he could experience when a loss doesn't happen but he paid an insurance premium to the "sensation" of loss he would experience when a loss event occurs but when he didn't insure. Given the greater sensitiveness of potential insureds to losses than to gains, this induces the potential insured to be willing to pay a risk premium to insure. A way to think about the above prediction is that the willingness to pay for small-scale insurance should be greater when the individual can foresee the availability of the coverage. This aspect of the theory can help rationalize cell phone insurance, which is admittedly small scale.[23]

People can appear even more risk averse when insureds evaluate starting from a situation where they have coverage, whether or not they would prefer to not be covered. In that case, an insured is left to compare whether he prefers a world where he isn't covered regardless of a loss happening and a world where he is covered. The narrowing of the considered scenarios with insurance makes the individual prefer to be covered over a greater range of prices: that is, the willingness to pay for insurance appears greater in that case. Thus, the title of this sub-section: "not all money spent is perceived as a loss," and this could help rationalize why existing customers are more willing to accept higher prices than customers who are actively shopping.

6. INCREASED WILLINGNESS TO PAY TO INSURE AN OBJECT WE LIKE

Hsee and Kunreuther (2000) further explored the psychology underlying insurance purchasing. What they found is that there are other factors, other than *monetary* factors, that affect the way we purchase insurance and make a claim when we suffer a loss. For one, they find that individuals are more likely to make a claim if they feel that the party that insures them has wronged them. This can be thought of as the reprisal motive for claiming. This phenomenon should normally not affect insurers, as they are generally not responsible for causing the insurable event, but it may lead to claim inflation if clients are dissatisfied with the service of the insurer, prior to or during the claim settlement. Interestingly, in the claim filing process, the way the coverage is framed in the insured's mind affects the willingness to claim. "If the money is construed as compensation for the lost object, then his willingness to collect the money will depend on his affection for the object. If the money is construed as unrelated to the lost object, then his willingness to collect the money will be independent of his affection" (Hsee and Kunreuther 2000, 146). They provide an example where the compensation for an appreciated object takes the form of a payment from the insurer or a discount on an unrelated object: people were less likely to make a claim if the compensation was a discount

[23] At the very least compared to homeowners or car insurance.

on an unrelated object.

More importantly, the authors found that, when individuals experience affection for the objects insured, controlling for actual and perceived market value, the risk premium that individuals are willing to pay to insure the objects increases. Now, insurers are unlikely to be able to influence the affection an insured has for the insured goods, but the insurer may be able to anticipate the attachment an insured has for different goods insured and adjust pricing so as to capitalize on the increased willingness to pay for insurance. For example, it might be that people that have red cars care more for their cars than people that have blue cars. By collecting the car color information, the insurer could adjust pricing accordingly.

Returning to the case of increased flood insurance purchasing after a flood, the affection theory for increased willingness to pay for insurance can also help explain why flood insurance take-up increases after a disaster: "this occurs because people who have just experienced a disaster know what it feels like to have lost things they love and want to avoid some of the pain by being protected in the future." (Hsee and Kunreuther 2000, 154). Another way to think about this is to suppose that we place insureds in one of two situations: (1) they face a purely financial risk with very low probability of occurrence such that, when an event occurs, insureds are reminded that the risk exists and suddenly become more willing to pay for coverage, and (2) they face flooding risk. The presumption is that the insureds in the second category will be more willing to pay for coverage and to make a claim when a flooding event occurs, because they care more about their house and belongings than about a purely financial interest. A related prediction is that individuals are more likely to file a claim for losses just above a deductible for insurable interests to which they feel a connection.

Another example of coverage choice that can be best rationalized using the consolation hypothesis is the purchase of large-scale life insurance on young children, as young children are not income earners whose salaries need to be replaced at their death. The consolation hypothesis may also be exploited in P&C insurance marketing. For example, an advertising campaign may thoughtfully illustrate situations where people are surrounded by goods and people they care for, and are reminded about how their life would be if an insurer were not there to help them get back on their feet. This can be contrasted with a marketing campaign that does not directly or indirectly appeal to the affection to the insured objects, such as a marketing campaign that would only be aimed at establishing name recognition and brand identity.

7. HOW THE WILLINGNESS TO PAY FOR A COVERAGE IS CORRELATED WITH OTHER COVERAGES

Before concluding, we would like to share the results of a study that finds that willingness to pay for insurance tends to be correlated across coverages. While the study focused on private health and disability insurance and pension choices of individuals, there is no a priori reason to believe that the effect is not present in other insurance markets. In particular, "[the study] find[s] (…) that one's choices in other insurance domains are substantially more predictive of one's choice in a given insurance domain than either one's detailed demographic characteristics or one's claims experience in that domain" (Einav, et al. 2010, 1)

The findings of this study are consistent with the idea that there exists some behavioral primitive that allows for the forecasting of insured behavior in a given context, using information developed in another context. It is important to note that the finding is not that people's behaviors in insurance choices are entirely context insensitive, but that there seems to be some context invariant component to insurance choice behavior.

Unfortunately, at this point in time, an equivalent study has not been conducted for P&C Personal Lines insurance. That being said, the finding provides insights about thoughtful elements that could be included in a well-designed insurer database. If the result also applies in the P&C world, then the risk premium that people are willing to pay for their auto insurance should be correlated with the risk premium they are willing to pay for their homeowners' or renters' policies. Insurers will not be able to measure and capitalize on that phenomenon unless they build client databases that allow them to connect the auto policy with the other policies of the client.

8. CONCLUSION

We've explored recent developments in behavioral economics and attempted to show that these developments could be instrumental in assisting the actuary in forming more reliable theories about how insurance consumers could react to changes in the supply policy. We have also attempted to demonstrate how a solid understanding of behavioral economics could help the actuary rationalize observed insured behavior, such as in portfolio profitability/unprofitability, claim reporting patterns, reaction to marketing campaigns, etc. Clearly, private research will need to take place to allow actuaries in the industry to refine the basic theories presented here, as well as to develop new ones. It is best not to underestimate the R&D challenge of deepening the actuarial understanding of consumer behavior, but it is also important to keep in mind that actuaries have access to highly relevant data that is generally not available to public researchers: field actuaries have a sizable

competitive advantage over their academic counterparts to explore the behavior of consumers but, more importantly, to operationalize these findings into product design, marketing campaigns, strategic pricing, etc.

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APPENDIX: TYPES OF DATA AND DATA ELEMENTS

In this appendix, we will share some thoughts about how to conduct private research relating to insurance consumer behavior. We will share some considerations relating to potentially useful data elements for the actuary to gather.

- When the actuary is attempting to understand consumer behavior, what sources of information can the actuary attempt to access? The information can be quantitative or qualitative. The information can come directly from clients or be obtained indirectly (e.g., through brokers, agents, or underwriters). The data can be a sample or cover the entire population. The data can be generated in-house or it can be outsourced. The possibilities generate a grid of possibilities all of which have advantages and disadvantages.

  For example, the actuary can gather the comments of a regional branch manager that regularly discusses on-going issues with brokers. While the gathered information may not be as reliable as when gathered from consumers, information obtained in this manner tends to be obtained at low marginal cost. Another example is when a direct writer directly surveys its clients. The campaign could become quite expensive, but this would allow the insurer to obtain direct feedback from its clients. In this example, the survey campaign could be done in-house or be outsourced to a marketing firm.

Fortunately, the actuary can begin analyzing consumer behavior using information which is generally readily available. One potential starting point for a consumer behavior analysis can be common statistics like the retention ratio, the new business ratio, closing ratios and quote activity. When analyzing these ratios, it is important for the actuary to take into account the effect of confounding factors. An example of this is an increase in quote activity can arise due to a competitor's rate becoming less attractive or because the insurer has undertaken a marketing campaign to attract quotes. When analyzing these ratios, controlling for seasonality and trends is crucial for the identification of action-reaction effect of a supply policy change, as the ratios of interest could be changing without the supply policy changing. A key family of confounding factors that arise when examining retention relates to nonsupply-related reasons for why the insured hasn't renewed, e.g., they have ceased to exist, they do not have an insurable interest anymore, they lost access to their agent/broker, the product/service/experience does not meet their needs/expectations, etc.

A series of questions could guide the actuary in deciding which variables in the available data could be used for further exploration. In no particular order these questions are:

- Who's the client? Who decides? Who pays? Who influences the client?
    - Is it the head of a household? Is it a property manager?

  The person who decides may not be the person who has an insurable interest.
- What is the customer's level of risk aversion?
    - Is the customer willing to assume more of the risk to reduce the premium involved (e.g., high deductible policies)?
    - It is worthwhile to keep in mind the different variations upon the theme of risk aversion that we have explored in Sections 1 through 6.
    - Is the client more likely to take risk (as can be suspected by known information)? Does the client have a history of accidents and violations? Are there coverages required by the client that entail higher risk-taking behaviors (like insuring a motorcycle)?
- Is the customer "naturally" price sensitive?
    - For example, is it the case that the insured is already near bankruptcy and attempting to save every penny on insurance purchasing?
    - Is the industry of the insured in danger (e.g., small farms)?
    - Are economic conditions unfavorable to the insured?
    - Is the client showing signs of financial difficulty to the insurer? Are there many reinstatements or mid-term transactions? Did the client miss payments with the insurer already?
    - Is the client selecting coverages/options in a pattern that indicated higher price-sensitivity (like purchasing reduced limits, increased spreading of payments, etc.)?
- What are the insurance alternatives available to the customer? What are the substitutes to insuring with you available to the client?
    - Does the insured have a history of [relevant] claims?
- Is the decision emotional? Automatic? Rational?
    - Will the customer move for a small premium increase?
    - Is the customer unwilling to shop around unless a problem arises?
    - Will the customer explore thoroughly all the available alternatives at each renewal?
    - What is the dollar amount in play? What is the relative amount in play compared to the customer's revenues?
    - Are there related contracts in play also?
- How valuable are services, extra protection, etc. to the customer? Is the comparison of value between your products/services/experiences and those of alternatives difficult to do for the client?

- Are there signs that the client sees great lifetime value in its relationship with the insurer? How long has the client been with the insurer? What are the costs for the client to switch insurers?
- How much money is the client already spending with you (in $ or in %)?
- Does your pricing appear fair to the client?
    - How does your price compare across time? Across insurance alternatives? Across clients?

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