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Behavioral Finance Concepts for Actuaries

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In our work as actuaries, we have always embedded assumptions about the behavior of people and firms, often implicitly. These assumptions range from the effects of cost sharing on consumer-purchasing behavior to how a sales force will market a new product. As the behavioral finance literature becomes better known and understood, we will have to make our behavioral assumptions more explicit—and change some of our beliefs.

A good example is adverse selection. Traditionally, actuaries have assumed people purchase health insurance that best suits their needs by calling on their superior knowledge of their physical and emotional well-being. This has led us to explicitly consider this selection and price richer products much higher than their cost-sharing differences. However, considering the complexity and the difficulty in truly understanding the richness of benefit design and the significant costs of health benefits, does this concept hold up? Should we assume consumers can choose the best product—and that they can afford it? If consumers need a rich product but cannot afford it, then they will choose a lower benefit product. This can result in a risk pool of members whose health is poorer than our standard adverse selection theory suggests. Similarly, if consumers do not comprehend the products available to them, they may choose more randomly than we anticipate, resulting in risk pools different than those assumed in pricing the products.

Wellness and disease management programs provide additional examples. The goal of these programs is to change behavior in order to have a healthier risk pool, thereby improving member health, reducing claims cost and potentially reducing product prices. Actuaries are asked to help design these programs (including participant incentives), to assess potential program effectiveness, and to determine how the programs affect pricing and financial results. A critical part of the actuary's job is to understand how people learn and what motivates them to make changes in their lives, and then to incorporate these behaviors into program design and potential effects. For example, if a program that requires participants to make significant lifestyle changes uses mailings and gift card incentives as the vehicle for change, the actuary may decide the program will fail or will

take much longer than anticipated to achieve the desired results.

To improve the explicit recognition of behavior in our work, actuaries can learn much from the relatively new field of behavioral finance. In the remainder of this article, I will describe seven results from behavioral finance that actuaries may find useful: heuristics, the endowment effect, loss aversion, prospect theory, satisficing, strategic thinking and agent-based modeling.

Heuristics

In his book *Thinking, Fast and Slow*, Daniel Kahneman discusses heuristics and a related concept called substitution: If we cannot answer a hard question quickly, we will identify an easier question and answer that one (i.e., substituting one question for another). He calls the simpler question, the heuristic question. Kahneman defines heuristic as “a simple procedure that helps find adequate, though often imperfect, answers to difficult questions.” If consumers are trying to make a decision about something as hard to understand as health insurance, would this be a fair representation of the way they might choose a policy? Information about consumer heuristics could help actuaries design materials and processes to aid consumers in choosing appropriate policies. Also, such information would help actuaries ensure that pricing assumptions are reflected in marketing strategy.

Endowment effect

Richard Thaler coined the term “endowment effect” to describe the phenomenon that people do not want to give up assets—or relationships—they possess. This phenomenon is a type of inertia, and may apply when people have to decide whether to change insurance coverage or change physicians. If actuaries and network managers could measure this effect, they would have a better understanding of how members would respond to policy changes, and how such behavior might affect risk pools, physician reimbursement and premiums.

Loss aversion

It has also been found that the anxiety associated with losing a given amount of money is generally



greater than the enjoyment derived from winning the same amount. This phenomenon is called “loss aversion.” When considering alternatives with the same expected value, it makes people desire the status quo. This is another measure of inertia. Interestingly, people begin to take risks only when all options are bad. Thus, it is important for actuaries to assess situations in which people must make choices and to understand how they may perceive the alternatives.

Prospect theory

In response to problems they found when trying to explain behavior using classical utility theory, Daniel Kahneman and Amos Tversky developed prospect theory. Their seminal paper, “Prospect Theory: An Analysis of Decision under Risk,” gives many insights into different aspects of risk. Prospect theory describes how people decide between alternatives when the probability of each alternative is known. The theory also describes how decisions are based on relative amounts (i.e., gains or losses) as opposed to final outcomes. These decisions are based on heuristics rather than detailed review of the information.

Given a set of assumptions for a given risk, using prospect theory may give unexpected results. For example, during provider negotiations, how is a change in an offer by an insurer viewed? If the providers make decisions based on the incremental

change of the offer and the insurer assumes they are only interested in the final aggregate result, the negotiations could drag out and cause disruptions for both parties.

Satisficing

In 1956, Herbert Simon coined the term “satisficing.” His intent was to capture the fact that we as humans do not have the cognitive resources to optimize when making decisions. As a result, a person may select the first option that satisfies a need or may choose the option that appears to satisfy most of the decision criteria. As a product design team considers how prospective buyers will make decisions, it is good to keep this concept in mind.

Strategic thinking

Strategic thinking takes actuaries into the realm of game theory. Game theory could be especially helpful for actuaries working in the areas of provider negotiations and the design of provider incentives.

The four main components of a game are the players, payoffs, strategies and information.

As insurers enter into talks with providers over new reimbursement schedules, actuaries can actually map out different strategies and analyze them using game theoretic concepts. Determining how the four

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components apply can be useful and enlightening. For example, there are cases where the payoffs are not only monetary but can be reduced medical management. Actuaries are uniquely qualified to blend these qualitative and quantitative components.

Classical game theory suffers from the fact that it depends on concepts which use classical ideas of rational behavior that behavioral finance has called into question. However, Colin Camerer’s *Behavioral Game Theory: Experiments in Strategic Interaction* compares theoretical game theory results to experimental results in areas such as bargaining. Actuaries who want a basic understanding of game theory should read *Game Theory for Applied Economists* by Robert Gibbons.

The table below is a simple two-person game in which players choose their strategies simultaneously. The entries are pairs where the first element is the payoff for Player 1 and the second is the payoff for Player 2. Also, the row and column headings represent the strategies for each player.

Since the payoffs for Player 2 are always higher for strategy N, he/she will always play that strategy. This is a dominant strategy and Player 1 will have to pick the strategy that gives him/her the best result when Player 2 plays N. In games where the moves are sequential, it is important to know how far ahead players think. For example, if players must think five moves ahead to reach the theoretical equilibrium, experiments show they can think only three moves ahead. Thus the real-world solution becomes very different from the theoretically optimal solution.

		Player 2		
		Strategies	L	M
Player 1	A	1, 1	-1, 2	3, 3
	B	-2, 3	2, 1	-1, 4
	C	2, -4	3, 4	-3, 5

Agent-based modeling

Agent-based modeling (ABM) is an excellent tool for actuaries to use to analyze complex situations involving a variety of agents that must interact to attain their goals. ABM has been around for many

years and has an established track record. Agents can be individuals or organizations and the model allows the user to establish behaviors and goals for each agent as well as how the agents interact. For more information on this topic, and how it can be applied in health care, see the recent Society of Actuaries’ (SOA) research project from Alan Mills, “Simulating Health Behavior: A Guide to Solving Complex Health System Problems With Agent-Based Simulation Modeling.”

ABM is a tool that can be used to analyze many of the items discussed above. In Mills’ research project, there are examples of ABM applied to adverse selection and provider network dynamics. These models contain a wealth of detail and include the behaviors of a wide variety of stakeholders including members, insurers, providers and regulators.

As a first step to improve our recognition of behavior, actuaries can document the behavioral assumptions that they use. Next, see if there are ways to track the validity of these assumptions, as we track the validity of other parameters such as trends. Also, becoming familiar with behavioral finance concepts will lead actuaries into more fertile, non-traditional areas.

In conclusion

Actuaries are well-versed in the study of different types of risk and in the design of risk management systems. Human behavior in the face of risk is a crucial factor that we should try to include in our work. Looking back over some of the financial crises of the past several decades, we see there were certain behaviors associated with each one. Being able to detect risky behaviors and to determine how they affect our organizations, our society and our financial systems would be an important next step in the evolution of actuaries. Behavioral finance contains valuable tools we can use to further this goal. ■

Additional resources about these topics can be found on the Behavioral Finance portion of the Health Section webpage.