American Academy of Actuaries
Essential Elements
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Big Data, Big Changes for Insurance and Pensions

With the rapid growth in computing technology in recent decades, data is being generated in greater volumes and applied with increasingly greater complexity. At the same time, ongoing advances in data handling and processing capabilities are making data more readily available, with the proficiency to better analyze it. This evolving ability to more efficiently process and analyze large and complex volumes of data has led to the development of a new concept—"Big Data."

Because it involves the storage and analysis of large volumes of information, Big Data is creating new opportunities for efficiency and innovation in the insurance and pension sectors. At the same time, Big Data has the potential to disrupt the way insurance and pensions are traditionally marketed, designed, and sold to consumers. As advancements in data analysis and storage continue to evolve, actuaries will play an important role in helping insurers and pension plan sponsors navigate the opportunities and challenges posed by Big Data.

What Is Big Data?

While Big Data has become a hot topic of discussion, the term represents a broad and evolving concept. Consequently, it can be ambiguous and is interpreted differently by different people. In general, Big Data refers to the collection and rapid analysis of especially large and complex data sets, using advanced computational methods, in order to reveal trends and associations that can lead to efficiencies and improvements in sectors that rely on data analysis.

Big Data is not limited to data alone; it includes the technologies and tools that allow data to be processed in large volumes and at high speeds. Advancements in computational techniques—such as advanced algorithms and predictive analytics—as well as data handling capabilities have increased the capacity for using data and the speed of data analysis.

As computing technology continues to evolve, so will Big Data. New innovations, including machine learning, artificial intelligence (AI), and the internet of things (IOT) are continuing to change the ways in which data can be generated, analyzed, and used.

Using Big Data in Insurance and Pension Plans

Until recently, Big Data mainly has been used by property and casualty insurers. It is now increasingly being used by life and health insurers. As it continues to grow over the next decade, Big Data is expected to be used in pension plans as well.

To ensure that insurance products and pension systems are well-designed and responsibly managed, insurers and pension plan sponsors rely on actuarial analysis, which includes sophisticated analysis of statistics and probability, to measure and manage risk. Through Big Data, actuaries can draw on a wider

Big Data at a Glance

The Five "Vs"

Although it is broad and evolving, Big Data is typically characterized by five features:

Volume
Large amounts of data are collected.

Velocity
Data is available, and can be processed, at high speeds—almost instantly.

Variety
Different forms and sources of data are used.

Veracity
The reliability of the data being used is not uniform.

Value
Data can be used or monetized.

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range of data sources as well as new analytical tools to refine and improve their assessments of risk. Big Data is driving the increased use of predictive analytics—using data to model future behavior and outcomes—which can help actuaries develop a better understanding of behaviors that affect risk.

The use of Big Data and other innovative technologies in the insurance sector has generated a new industry, called InsurTech (a blending of the words "insurance" and "technology"). InsurTech mediates the relationship between insured and insurers. InsurTech involves the application of new technologies and innovations in insurance, resulting in new insurance products, new ways for consumers to obtain insurance policies, and new ways of handling insurance claims.

How Can Big Data Be Used? *One Example*

Insurers are using Big Data and predictive analytics to accelerate and customize their underwriting processes, and in turn consumers can obtain insurance in the same way that they buy other goods and products. For example, some companies are using Big Data-based algorithms to issue policies through an app, rather than requiring consumers to speak to an insurance agent and undergo a longer, traditional underwriting process.

The Future of Big Data: Challenges and Opportunities

The introduction of any new technology or innovation can raise important questions and concerns that must be addressed. This is true for Big Data, which is already evolving quickly and accelerating the pace of change in the insurance industry.

As Big Data continues to play a growing role in insurance and pensions, it holds potential benefits—and challenges—for insurers, regulators, and consumers:

- Insurers can benefit by gaining a better understanding of their risks, which may improve their reserving process and provide protections against adverse selection. At the same time, Big Data is disrupting traditional insurance underwriting and pricing practices.
- Regulators can use Big Data to prevent fraud and streamline the approval process for insurance rates and prices. However, they may face challenges when reviewing new and complex insurance models developed using predicative analytics, and when providing information to consumers who wish to understand how their insurance rates will be affected by such models. In addition, regulators will need to determine whether insurers are using new data as proxies for discriminatory variables that they are prohibited from using when setting insurance rates and premiums.
- The use of Big Data has the potential to increase competition in the insurance sector, which could result in more and better-fitting options for consumers who are seeking coverage. However, the complexity and range of data and analytics being used may make it difficult to understand the factors determining their suitability for certain insurance products and the prices they are charged. Consumers could also face data privacy concerns due to the use of increasingly varied forms of data by insurers.

Regulatory and professionalism concerns will be of critical importance for insurers, regulators, lawmakers, and consumers as Big Data continues to grow. Regulators are working to address these concerns through strategies such as education and training on new and evolving technologies, which can help them to protect consumers and improve their insurance review and fraud-detection practices. Other tools being used by regulators, such as regulatory sandboxes that allow companies to test new technologies in a regulatory environment designed to encourage innovation, can help insurers make the most of the possibilities that Big Data and other emerging innovations have to offer. As this field continues to gain traction, the American Academy of Actuaries will continue to monitor Big Data and its implications for the U.S. actuarial profession.

Additional Resources from the American Academy of Actuaries

Big Data and the Role of the Actuary (June 2018)
www.actuary.org/BigData.pdf