'Laws of Nature' and the Insurance Multiverse

By Rade Musulin

READERS WHO FOLLOW science reporting may recall recent coverage of the concept of the "multiverse," a prediction of string theory that states there exist many other universes, each having its own laws of nature. The concept addresses a conundrum in physics that certain conditions must be *just right*—such as the mass of the Higgs boson (elementary particle in physics) or the relative strength of electromagnetism—for the universe as we know it to exist. For example, if the value of something known as Sommerfeld's constant (the measure of the strength of the electromagnetic force that governs how electrically charged elementary particles [e.g., electron, muon] and light [photons] interact, equal to the numeric value of 0.00729735257) were slightly different, stars could not form. In a multiverse, ours would be just one random outcome among many, making it easier to accept that all these things just happen to be right in the only universe we can observe—but things could be different elsewhere.

The concept of multiple systems having different "laws of nature" is useful in helping us to understand various types of insurance frameworks.

Insurance actuaries who have been trained and spent their careers in the private-sector insurance universe, have worked under generally accepted "laws of nature," including insurers must have sufficient premium, capital, and reinsurance in place before an event to pay potential claims; premiums from a group of policyholders have to reflect the expected claims, expenses, and the full cost of risk transfer; or that significant cross-subsidies among classes of risks are difficult to maintain in a competitive market. There are well-understood actuarial standards and financial accounting rules that govern this universe. But many mistakenly believe that it is the only universe in the insurance ecosystem, or that its laws must apply broadly to all.

Yet there also exists a government program insurance universe in which many "laws of nature" of the private-sector insurance universe fail to apply. For example, government entities generally do not prefund losses, do not charge policyholders the full cost of expected claims or risk transfer, and can have large cross-subsidies. In fact, some programs provide coverage without charging any upfront premium at all (the federal terrorism risk program and many state guaranty funds are examples), something that would be as impossible in the private sector as time running backward is in our known universe.

Many of these differences arise because governments, for public policy reasons, can violate several key private-sector "laws of nature." They can run large deficits (negative surpluses wherein liabilities exceed assets) because they have sovereign power to compel future policyholders to pay taxes (sometimes called surcharges or assessments) for past claims. In fact, they can force one group of people pay such charges to cover claims from another group of people. We see this when a property wind pool pays claims in coastal areas and places assessments on inland policyholders. We also saw this when Congress forgave tens of billions of dollars in debt held by the National Flood Insurance Program (NFIP) in 2017 following huge losses from several hurricanes, notably Harvey, effectively transferring losses from NFIP policyholders to taxpayers.

Unlike the cosmic multiverses, which cannot observe each other, parts of the private-sector and government insurance universes are not only observable to one another but also interact—or even compete—with each other, sometimes leading to strange phenomena. In the 1990s, for example, there was concern that Florida's Property Joint Underwriting Association (JUA) might act as a black hole, consuming the private market due to its competitive premiums and with its assessments only being applied to private-sector policyholders. The Florida Legislature acted to stop this by mandating its premiums not be reduced-priced (they were set by law at the highest among the top 20 insurers by county) and that its assessments apply to all, regardless of whether they were in the private market or the JUA.

In 2012 the Academy published a public policy special report, *Actuarial Soundness*, which in part discussed the "laws of nature" of actuarial science. It covered major concepts applicable to both private insurers and government programs, but its focus was mostly on private systems, noting that government programs often have special considerations.

In 2018 the Casualty Practice Council is undertaking a project to specifically examine the government insurance universe, including how various actuarial "laws of nature" may need to be adapted to the different realities of government programs. We expect to produce a report by the end of the year, and this topic is one of our casualty breakout sessions at the Academy's Annual Meeting & Public Policy Forum in November. We hope you will attend both the meeting and this session.

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