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# A Peek Into the Future of Risk Transfer

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As software creeps further into our personal and professional lives, it's becoming a key driver impacting market dynamics in traditional industries. Although the use of software in industries that don't typically fall under the tech umbrella is nothing new, much of its deployment in the past was of a variety used to increase efficiency in existing processes. A business might have integrated software into its business practices, gaining efficiencies in their operations, for example, by digitizing paper-based processes, but the underlying processes and business models governing its operations didn't change. In this phase, it was important for every business in a modernizing industry to adopt new technologies lest it not realize the cost savings enjoyed by its competitors, but use of software hardly reshaped industries. The incumbents weren't displaced, market shares between firms held relatively firm and the old power dynamics held constant. With their fundamental operations left mostly intact, we shouldn't expect much of any upheaval in the relationships between companies and how risk is pooled and moved.

Today we'll focus on the prospect of deeper changes. An explosion of fresh data (including the emergence of novel sources), a shift to real-time analysis, demands for new kinds of insurance products and an increasingly machine-centric society will all test the contemporary infrastructure. It will be much harder for incumbents to navigate these next sets of changes, because they don't involve simply adopting new technologies to gain efficiencies in existing processes. What once looked like a neat division between tech companies and others is blurring, as every organization races to embrace software to gain an advantage over their competitors. Incumbents in businesses not historically associated with software, across retail, transportation, hotels and many other areas, are being challenged by software companies. In the most interesting cases, the threat didn't appear as a direct assault on their core business, but a result of past business models made newly irrelevant as software spreads. This has yet to happen in as dramatic a way in the risk transfer industry, but with so much in flux, it would be wise not to discount the possibility. There's no way to know for certain when or even if these changes will occur, but by thinking through the set of possibilities, we can try to imagine some possible futures. We can also think about changes in mindset that can be adopted regardless of which way the risk transfer industry moves as a whole, looking for better ways to operate in the context of a society of accelerating complexity and an ever-expanding role of software.

In discussing possible futures, it's always useful to consider what properties we can expect to hold as invariants. Luckily, actuarial studies are concerned with some of the most fundamental building blocks of risk transfer. We know, for example, that no matter how much the world changes, there will always be uncertainty and risk. In the insurance and reinsurance context, it will be useful to predict the probabilities of events given priors, and to price risks so they may be pooled and managed. The ability and desire to price risks isn't going away, and if anything, we're increasingly quantifying everything around us, hoping to make sounder decisions using data to reduce the element of subjectivity in our analyses. As a core discipline, actuarial studies will bear a greater responsibility for the smooth functioning of our society than ever before.

## AN EXPLOSION OF DATA

This leads us to one of the more obvious and now widely talked about changes we're seeing in the world. Having grown up in a relative scarcity of quantified data, it has become clear that the future will be one of data abundance. Already, we create 2.5 quintillion bytes of data daily. Ninety percent of all data created in human history appeared only in the last two years, and this rate is likely to accelerate with the appearance of new genres of data-generating devices. This will expose many opportunities to try different approaches to modeling.

One such advance could see us moving from purely analytical methods to statistical techniques requiring larger datasets to train models, and relaxing our demand for determinism, moving to nondeterministic models. The inclusion of predictive analytics in the upcoming Society of Actuaries (SOA) ASA exam shows how seriously this is being taken, but individuals should think forward and experiment with any novel methods that could make their way into the profession. Beyond applying new techniques for pricing, it pays to rethink what constitutes data amenable to actuarial modeling.

## RECONSIDERING WHAT MODELS CAN CONSUME

We can expect our software-heavy future to generate reams more of the kind of data already typical of actuarial models, but software advances will also be in a position to transform mediums that weren't previously considered raw data sources. Video is one source of data that deserves special attention—both because its supply is quickly ramping up, and because it's not something we've historically considered to be a source of useful data to drive pricing models. Video streams from a multitude of sources could soon saturate us with a real-time view of everything on earth, with implications for anyone interested in consuming new data sets. What we can derive from this newly important data source is instructive, because it is an example of the advance in the role of software that we might at first skip over or misattribute to something else. Streams of video aren't new, but technological advances will transform how useful they are in an actuarial context. The number of cameras being deployed in the world is on a sharp uptick, some reasons for which will be shortly discussed. Those streams alone aren't enough, however, as video data in a native form would be very difficult to use in a modeling context.

An estimated 50 million networked CCTV cameras are deployed around the world. With a continually growing and difficult-to-measure install base, this represents a conservative estimate yielding 400 billion hours of video annually. Were we to task humans with reviewing this footage, close to 20 million people working year-round would need to be employed just to watch it, and many times more to document what they see. Luckily, what we can expect from video in the very near future, beyond the ability to record the world around us, is the ability to contextualize and understand what is being recorded, transforming it into data that can be integrated into future models. We might, for example, know at all times the height of a river bank at varying points along its length using the security footage from riverside properties. These same feeds are simultaneously capable of recording and understanding other factors useful for a natural disaster model, from precise temporal and spatial rainfall mapping to anything else that is visually perceptible. What's more, as years pass, the data we collect will become more valuable as we refine our models in response to unforeseen rare events and accumulate increasing historical data to price future risks.

## SOFTWARE AS A HIDDEN DRIVER OF CHANGE

We might wonder why we're tending toward a saturation in video data. An easy early insight is that camera technology is simply getting cheaper, so we can naturally expect to see more video being produced. Even this reason is strongly linked to advancing software when we dig deeper, which is surprising considering we're discussing what on the surface is just hardware. Much of what's driving down the cost of the constituent components in a modern camera is due to the proliferation of the smartphone. These have built-in cameras exposed to any app that finds a need for them. The smartphone itself is in such wide demand because it runs software that grants a person network access to the wider Internet, itself software with an expanding number of use cases, including those for processing video. Cameras so cheap that they can be attached to anything then start appearing in other peripherals, which, with the right software, can gain utility beyond simply taking photos and recording video. For example, potential future augmented reality uses cases that both serve to drive down the cost of producing cameras and increase the amount of the world being recorded in real time. Adding to this mix are autonomous cars, which by their nature need to see in every direction around them, and we can start safely assuming that we're approaching a future saturated with video.

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For privacy reasons, we can hope that much of this video should be safe from prying eyes, but even so, the decreasing cost of deploying imagining systems means we can expect to have a real-time feed of much of the visible world. With risk models thirsting for more useful data, we can expect widespread recording paired with smart systems to deliver in spades. When we can contextualize and quantify everything we record, and can record everything visible, our ability to price risks with this novel data could become crucial to the future of the field.

This signals another big change we can expect in how we model risks. Regardless of the source of the data, whether it be video, widespread sensing devices or autonomous machines roaming the earth, the data produced are available almost immediately. At the moment, risk models mostly use historical data to price risks. In a world of vast real-time data streams, it's only natural for models to start consuming and responding to data with the same dynamism.

## NEW RISKS DEMAND NEW PRODUCTS

Understanding the compounding effects of technological change is important for appreciating the coming deluge of data, as well as what we can now do with the data, but there's another important reason we've yet to discuss. This one is especially pressing for actuarial studies, as it will exert a lot of pressure on the risk transfer industry, demanding a sharp increase in the range of effective models. As the complexity of society increases, due mostly to exploding technological complexity, the range of quantifiable risks increases in tandem.

As a result, we can expect the range of insurance products for which there is latent demand to increase as well, leading to a need to accurately model and cover an exploding number of nascent risks. Integrating a brand-new product doesn't happen overnight, but if this scenario plays out, the industry will need to learn how to do so faster than is typical today. This will place unique demands on the actuaries of the future, from how well novel risks can be accurately priced, to how quickly these models are integrated such that new insurance products can be exposed to consumers.

## A MACHINE-TO-MACHINE FUTURE

As a final word on how interconnected all these possible changes are, we need to take a closer look at the primary cedent. Today, we mostly assume a person or human organization, but this assumption may be tested in the near future. In a world increasingly saturated by software and autonomous systems, many of the nascent insurable risks will be purely machine originated. In such a world, not only can we expect a swelling in the amount of real-time data we receive from machine systems, but we can also expect many machine systems to request insurance policies to guard against the risks they face. This possible future alone is important to understand when thinking about the future of the risk transfer industry, as much of it was built predicated on a very different notion of what a primary cedent is.

We've looked at a range of technology-related pressures that might appear over the coming years and decades, and how they might affect risk transfer and actuarial studies. This is a very exciting time to be in the field, as we can expect more change in our lifetimes than everything that preceded us. It's difficult to make accurate predictions, and we're sure to be surprised at what shows up, no matter how much we prepare or try to dream up possible futures. The most important thing to adopt is an attitude of relentless experimentation. ■

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