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Challenges for the Insurance Industry
in the Future

Jack E. Nicholson



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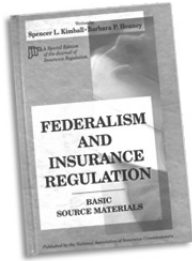
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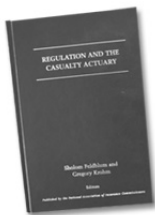
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Challenges for the Insurance Industry in the Future

Jack E. Nicholson*

Abstract

The author discusses several development and trends related to insurance that were presented in May 2019 at the Florida State University Future of Insurance Forum, including the role of technology and catastrophe exposures. Advances in technology are changing the insurance industry, and its future workforce will require new skill sets and greater flexibility. The growth of exposures in coastal states, flood zones and earthquake-prone areas will necessitate updated tools for state insurance regulators and rating agencies to monitor financial solvency. More needs to be understood about climate change, the climate models and whether man-made climate change can be linked as a cause of future disasters. Although the loss adjustment processes of insurers have improved over time, the settlement of catastrophic claims entails continuing problems. Insurance linked security (ILS) products are serving to provide additional capital and to stabilize the rapidly growing reinsurance market.

* Director of the Florida Catastrophic Storm Risk Management Center, Florida State University, jnicholson@business.fsu.edu.

I. Introduction

On May 8, 2019, the Florida State University College of Business held a conference entitled “FSU Future of Insurance Forum.” The author discusses six of the topics presented at the conference. The topics chosen are intended to challenge and stimulate thinking about the future of the insurance industry and its potential transformation. Business, as usual, may no longer be an option, and the speed of change—along with the development of new business models—may become the competitive norm.

A variety of factors are shaping the future of the insurance industry. This article attempts to provide insights into the future of the insurance industry based on recent ongoing trends and developments. Technology and consumer expectations have become driving forces that have heated up the competitive environment. The buildup of exposure in coastal states, flood zones and earthquake-prone areas has become a complex problem that will require sophisticated tools to enhance financial solvency oversight. The issue of climate change and its impact on the insurance industry is complex and needs to be better understood. Overall, insurer loss settlement processes have improved due to beneficial technological changes, but loss settlements also entail inefficiencies, delays, increased costs, fraud and litigation. Insurance linked securities (ILS) products backed by capital provided by the financial markets are supplementing traditional reinsurance capital, increasing market stability and transforming the structure of the world reinsurance markets.

II. Technology and the Insurance Market

Technology is driving innovation and efficiencies for traditional insurers. However, a growing number of newly formed insurers are focusing on consumers by offering them better products and services with new business models designed to disrupt the traditional market. Stephan Binder of McKinsey & Company characterizes the insurance industry as slow to change. He suggests that in the next 10 years, 40% of the jobs that exist today will be gone, and 20% of the jobs in the future will be new. He also predicts that there will be more change in the next 10 years than in the last 100 years (Binder, 2018).

Technology

Recent high-powered technologies such as blockchain, artificial intelligence (AI) and machine learning present the possibility of revamping the insurance system into a type of digital insurance platform. The future development of quantum computers and high-level quantum algorithms is likely to trigger an explosion of possibilities and restructure the entire insurance industry.

Developing technologies have resulted in numerous new tools that are achieving efficiencies and higher profitability for business. The term “InsurTech” is used to characterize the insurance industry’s adoption of recent technologies.¹ Numerous firms are supplying new technologies to the insurance industry (CIO Applications, 2019). Blockchain is one such relatively recent technological innovation. It has been reported that “... blockchain technology will become the foundation layer for a new way of doing insurance business,”² (Tinianow, 2019). The use of blockchain presents unlimited possibilities for insurers when combined with AI, the Internet of things (IoT) and machine learning.

B3i (Blockchain Insurance Industry Initiative) was formed by a consortium of 16 insurance market participants and involves more than 40 related entities as either shareholders, customers or insurance industry members. Its goal is to build a robust blockchain infrastructure.³ B3i will own the system and build products and services for its members that will automate tasks by addressing specific inefficient processes. B3i can be viewed as an aggressive industry attempt to initiate innovation “by the market” and “for the market” in order to “enable substantial gains in both efficiency and security, employing the latest technologies...” (B3i, 2019).

In the future, it is conceivable that a type of “Insurance Digital Platform” resembling the B3i concept (see Figure 1) could evolve and operate like Amazon or eBay by incorporating various insurance products and related transactions, thereby enabling competition over price, services and other factors. Consumers may enter through a portal (or gateway) to a “tunnel” consisting of blockchain technology, AI, computer learning, sophisticated algorithms and data sources (big data⁴). Insurers and reinsurers, as well as other service providers, would be positioned at the other end. The tunnel would consist of decision rules for the customer and decision rules for the insurers and related parties. Matching interests could be paired instantaneously at agreed-upon prices, terms/conditions and other relevant criteria. The participating insurers would be able to operate using many different business models to provide consumers with more choices. The overall goal would be to operate at a high level of efficiency, speed and convenience.

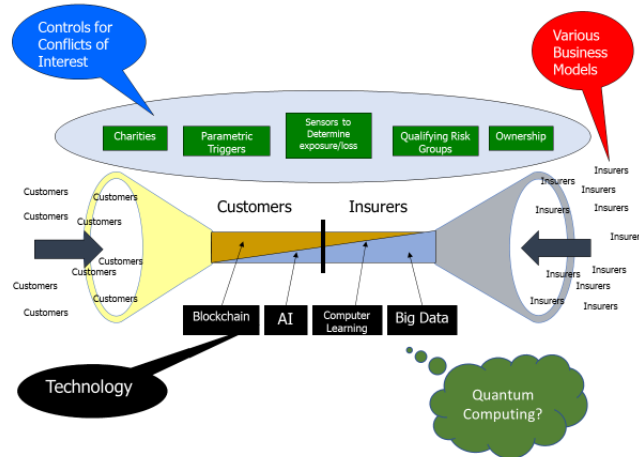
1. Investopedia defines InsurTech as “... the use of technology innovations designed to squeeze out savings and efficiency from the current insurance industry model.” See <https://www.investopedia.com/terms/i/InsurTech.asp> for more information.

2. This is a quote from Walid Al Saqqaf, founder of Insureblocks, which is an educational resource for the insurance industry.

3. The B3i organization proclaims, “Our vision is to see the insurance market deliver better solutions for end consumers through faster access to insurance with less administrative cost.” See <https://b3i.tech/home.html> for more information.

4. The term “big data” can be defined in several ways. Described very simply, “big data” is data that has greater variety and is increasing in volume at a very high rate of velocity. Thus, the three “V’s” of big data are variety, volume and velocity.

**Figure 1:
Digital Insurance Platform
(The Future of the Industry)**



Source: Nicholson, 2019

The growth of the internet and the connectivity of people with people, people with machines and machines with machines will likely continue with unprecedented speed. The access to data and the various ways of collecting it have already exploded with the concept of big data. Databases are growing and incorporate traditional structured data, as well as unstructured data. Unstructured data is not organized in a predefined manner and would include text, images, video, audio, keyboard clicks, dates, various facts and opinions.⁵ Reinsel, Gantz and Rydning (2018) note that “IDC predicts that the global datasphere will grow from 33 zettabytes⁶ in 2018 to 175 zettabytes by 2025”—five times what it is today. Highly sophisticated analytics are now possible, along with the expansion of complex algorithms.⁷ The implication for the insurance industry is that it will have access to a greater volume of data, and this will shape its operations in new and different ways in the future.

5. Seqrite (2018) notes that 80% of the data in organizations is estimated to be unstructured data.

6. One zettabyte is equal to a trillion gigabytes. If all the world’s data were stored on DVDs, the authors estimated that if stacked, the DVDs would reach the moon 23 times.

7. For a discussion of text analysis and sentiment mining using unstructured data, see Chakraborty and Pagolu (2014).

Innovation and Disruption – New and Creative Business Models

The terms “innovation” and “disruption” have relevance with regard to how the insurance industry is now evolving and will continue to evolve into the future.⁸ Traditional insurers are using technology to create certain efficiencies that lead to higher profitability or a more favorable competitive position, which may or may not involve a significant change in their basic business model. Traditional insurers may be at a competitive disadvantage due to their long-established business models and their high-value investments in infrastructure. Any change to a traditional insurer’s business model may be extremely difficult or nearly impossible for some insurers since a new business model may involve the cannibalization of the insurer’s existing business. However, new start-up insurers may have the flexibility to create a unique or different business model designed to exploit weaknesses in traditional insurers’ operations. Even with this advantage, many new start-up insurers may still not survive in the marketplace. Time, as well as consumer acceptance, will eventually determine their success or failure.

Impact on Insurers

Many traditional insurers are experimenting with new business models on a limited basis⁹ or are investing in other high-tech companies.¹⁰ Although their vision and goals may change, their business model may not change significantly from what they have been doing in the past. Today, we see insurers offering new smartphone apps, which include those designed to lower or determine premiums more fairly based on driving behavior, report claims faster, speed up and simplify the application process, or quickly compare prices with other providers.

In recent years, new start-up insurers are not only employing innovative technologies, but also they are developing disruptive business models. In 2018, global InsurTech investment spending was estimated at \$3 billion, with total spending more than \$8.5 billion during the previous five years. These investments included 599 deals, of which more than 50% were completed in North America (Fintech Global, 2019).

8. Bower and Christensen (1995) were some of the first to discuss disruptive technologies. Christensen (1997) authored a book on the subject several years later. Christensen, Raynor and McDonald (2015) discuss how the theory of disruption and its concepts have been widely misunderstood and misapplied over time.

9. State Farm is experimenting with a new business model for automobile insurance. The company has an app called HiRoad, where policyholders’ driving behaviors are tracked and are charged more or less based on how safely they drive. The app is fast and can provide quotes within five minutes. Additionally, claims can be filed using the app. State Farm cites increased competitive pressure from other insurers and InsurTech start-ups as the reason it is looking at new business models (Denham, 2018).

10. Prudential recently entered into an agreement with Hæth Tech to integrate its cloud technology with its PRUWorks platform (Osental, 2019).

One of the new InsurTech start-ups that has frequently made the news in the last couple of years is Lemonade Insurance Company. Its co-founders Daniel Schreiber and Shai Wininger started Lemonade in 2015, with the goal of creating a new kind of insurance company (Schreiber, 2018). They began the process by rethinking the insurance industry and imagining how it should be versus how it currently operates. Realizing that insurance is a \$1.3 trillion business, which fundamentally has not changed in decades, Schreiber and Wininger focused on ideas that would fix several problems with a system that is perceived as a “necessary evil” rather than as a “social good.” Lemonade’s focus is on both technology and behavior economics.¹¹ Their business model is based on technology where policyholders interact with cyber bots rather than with people. The company has reinsurance to protect its solvency and is willing to write a large volume of low premium lines of business, such as coverage for apartment contents. The company claims that it does not make money off its policyholders from insurance operations involving claims. It charges a flat 20% of premiums, and that is all the company takes. Any funds remaining after paying losses are contributed to a charity or cause designated by the policyholder, thereby removing a perceived conflict of interest. Critics of Lemonade contend that it is not unlike other insurers (Lamparelli, 2017). They suggest that the owners of Lemonade will eventually sell the company and move on to start other high-tech businesses. Additionally, the critics question whether Lemonade will be able to survive a catastrophic event. Moreover, they claim that the perceived conflict of interest is not fully resolved since reinsurers are involved, and they might not be satisfied with Lemonade’s overly trusting and simplistic policyholder claims settlement process. Several other InsurTech start-ups are described in the Appendix.

In addition to new start-up InsurTech companies, other well-established technology firms have indicated an interest in the insurance business. Simpson (2019) briefly reviews a few of these firms, including Google, Amazon and SoftBank. Additionally, J.P. Morgan, Berkshire Hathaway and Amazon have announced a joint venture for using technology to reduce health care costs for their employees (Henry and Humer, 2018). Many high-tech firms today have raised the standards for customer service and efficiency, and as they enter the insurance business, this may affect the industry. State insurance regulators can view technology as a facilitating mechanism that can help them better accomplish their overall mission of ensuring competitive and viable insurance markets. As with other parts of the industry, regulation is needed for solvency, ratemaking and market conduct activities. New approaches for reducing conflicts of interest between the insurer and the insured should be encouraged.

11. Dan Ariely, a behavioral economist at Duke University, has joined Lemonade as its chief behavioral officer. Dr. Ariely is the author of the book entitled *The (Honest) Truth About Dishonesty* (Baer, 2016).

Observations for the Future

The speed of technological innovation is accelerating at a rapid pace; insurers need to be able to identify future trends and developments to stay a step ahead. Opportunities exist for both traditional insurers and new start-up insurers for capturing market share by creating new business models or revising existing ones. Many new disruptive insurers are recognizing that insurance is a social good and are attempting to design programs that engage their policyholders in ways that reduce or eliminate conflicts of interest. In the future, the application process will be fast and efficient, and claims will be handled in ways that reduce or eliminate policyholder stress. From an insurance regulatory standpoint, state insurance regulators have an opportunity to encourage and take advantage of these types of ideas, which may also solve numerous other problems. For example, insurance business models that resolve conflicts of interest between the insurer and the insured may also lessen fraud, reduce lawsuits and eliminate excessive claims, thus lowering insurance premiums. The role of the state insurance regulator can be expanded by taking a broader view of the insurance system and developing a better understanding of the fundamental causes of its inefficiencies. The better regulatory approach is to determine ways to redesign the system that can avoid fraud and litigation rather than having to accept their consequences.

III. The Future Insurance Workforce

Over the last 10 years, the insurance industry has been viewed as facing a talent shortage resulting from the impending retirement of the “baby boomer” generation and the aging workforce. Cole and McCullough (2012) discussed the topic of the professional skill shortage in the insurance industry and the need to create a unified strategy for both retaining employees as well as attracting future executives. Working with 110 people at an insurance industry conference, Cole and McCullough identified the needed strategy to include the improvement of the insurance industry’s reputation, the need for coordination of resources and the enhancement of educational programs.

According to Canás and Burham (2017), many older employees have delayed retirement due to the market crash of 2008 and are working between the ages of 66 and 70. This delay in retirement may exacerbate the transition problem by creating a bigger and more sudden drop-off in insurance industry talent. The demographics show that 1 million millennials are now entering the U.S. workforce annually and are expected to comprise 40% of the workforce by 2020. The authors suggest that this will present challenges for the insurance industry to attract this new talent.

The problem of planning for the future workforce in the insurance industry is that the industry of tomorrow will not be the industry of today. Future employment for the insurance industry should be looked upon as a moving target. The talent gap may be of a much different nature than contemplated only a few years ago. A major

shift is occurring toward automation, and the industry needs employees with digital expertise. McKinsey & Company note that up to 45% of work activities in the U.S. insurance industry can be automated with current technology (Johansson and Vogelgesang, 2016).

For employees in the insurance industry, as well as most businesses today,¹² it will be important to be flexible and to continue to learn. The future will be disruptive not only to insurers but to their employees as well, and employees need to recognize trends and market shifts and be ready to take advantage of future opportunities.

Observations for the Future

The insurance industry workforce of the future is likely to be dramatically different from today. Many entry-level employees and middle managers are expected to be replaced with bots and AI. More and more underwriting will be accomplished with monitors and sensors and other feedback mechanisms tied to the concept of the IoT (Binder, 2018). Sales will likely be more internet-driven and could replace many agents. Innovative and simpler products custom-designed to meet individual needs will replace many of today's complex one-size-fits-all products, thus requiring both fewer agents and fewer claims adjusters (Schreiber, 2018, Tinianow, 2019, and Denham, 2018). From a regulatory standpoint, a more significant concern will be the qualifications and capability of software rather than focusing primarily on traditional licensing of agents. The workforce profile of the insurance industry is likely to evolve such that computers and computer-driven systems (bots and AI) will be doing much of the low-level work, while human engineers will be in high demand to design and enhance marketing, customer service and claims services. Top management will focus on innovation and how to provide customers with better and simpler products. The role of the state insurance regulator will still be to protect the consumer's interest. However, the review process will likely shift toward auditing computer systems and ensuring that they operate fairly and ethically to provide quality service and products for the consumer.

IV. Solvency Implications for Natural Disasters

A growing area of heightened concern is the solvency regulation of property insurers due to their exposure to the risk of natural disasters. The insurance industry, reinsurers, state insurance regulators and rating agencies rely heavily on one measure—the one in 100-year probable maximum loss (PML). Although the PML measure has certain benefits, it is not enough for a comprehensive understanding of

12. According to Dominique Barton, CEO of McKinsey Worldwide, the life expectancy of an S&P 500 company was 90 years in 1935, but today it is only 15 years (Barton, 2018).

an insurer's vulnerabilities to catastrophic losses. For models used in Florida,¹³ the PML can vary by a factor of almost two from the highest to the lowest model.¹⁴ This allows for "model shopping" and can influence an insurer's decisions about the amount of resources needed for solvency purposes. Therefore, other ways of viewing the aggregation of exposure are needed.

Before the creation of computer models, various methods of estimation were used to calculate PMLs. Cummins and Freifelder (1978) considered the use of simulation approaches and approximation formulas to estimate PMLs. Aiuppa (1988) suggested the use of Pearson curves as an approximation of PML and concludes that such a method was better than other methods available at the time. Woo (2002) discussed the evolution of PML primarily concerning the earthquake peril and how catastrophe modeling software offered an improvement over the more simplistic deterministic methods in use. Vickery, Masters, Powell and Wadhera (2009) discussed hurricane modeling and its various uses, including the loss exceedance curve. They note that models have changed over time, but that very little attention had been given to assessing various model errors.

Characteristic event (CE) methodology¹⁵ is used by Nicholson, Clark and Daraskevich (2018) to evaluate the vulnerability of insurers and the insurance system in Florida. The CE methodology allows for the identification of "pockets of risk" for recognizing insurer vulnerabilities. The nature of CEs is that they represent specific event probabilities in various areas. The traditional PML approach simulates events to derive a one-number loss estimate. A distinction is that the CEs are designed to be hypothetical events (but not randomly generated events) similar to past hurricanes, with the main difference being the location of landfall and track. CEs are not single numbers. They are calculated for various event probabilities such as one in 20-year events, one in 50-year events, or one in 100-year events at various locations along the coast. The insurer exposure is matched with the wind speed from the various CEs to derive the insurer's loss at various locations along the coast.

Observations for the Future

Relying on a one-number PML approach provides limited information for managing catastrophe risk. State insurance regulators, rating agencies, investors, reinsurers and consumers need to understand the entire profile of an insurer's risk concentrations. Therefore, methodologies are needed to fully describe an insurer's risk exposure with measures for multiple locations. Additionally, there are benefits in modeling the various state insurance systems using the same framework. The insurance system would include various state insurance programs (such as guaranty

13. Based on the computer hurricane models found acceptable by the Florida Commission on Hurricane Loss Projection Methodology (FCHLPM) under the 2015 standards.

14. On June 13, 2019, the FCHLPM accomplished its final review of models for acceptability under its 2017 standards. Six models were found acceptable, which included one new model, the Karen Clark & Company model.

15. CE methodology is an approach developed by Karen Clark & Company in 2012.

funds, joint underwriting associations and state reinsurance programs), which are being relied on by insurers operating in the respective states and their policyholders. If a state program cannot fulfill its obligations, insurers may fail. Updated tools are needed to provide a better understanding of catastrophic risk exposure for monitoring insurer financial solvency and to recognize the vulnerabilities of the various state insurance systems.

V. Natural Disasters and Climate Change

For the past 40 years, the discussion and debate over climate change have been intense. In the last several years, frequent claims have been made that various natural and man-made disasters have been caused by or enhanced by climate change (American Geophysical Union Press Release, 2019, and [Keellings and Ayala, 2019](#)).¹⁶ However, a study of 197 U.S. landfalling hurricanes for the period 1900–2017 using normalized losses (adjusted for exposure growth) indicated no trend in hurricane frequency or severity (Weinkle, Landsea, Collins, Musulin, Crompton, Klotzbach and Pielke, Jr., 2018). A similar study normalizing Australian insured disaster losses from 1996–2017 found the same results (McAneney, Sandercock, Crompton, Musulin, Pielke, Jr. and A. Gissing, 2018).

According to a report by Evans (2019b), insurers and reinsurers are viewing climate change as an urgent risk and an increasing threat to their business. The recent natural disasters in 2017 and 2018 have increased the urgency for the insurance industry to deal with climate change as a short-term risk; previously, it was viewed only from a long-term perspective.

IPCC's Role and the Growing Controversy

The major authoritative force behind the modern science of climate change is the Intergovernmental Panel on Climate Change (IPCC).¹⁷ It does not carry out original research; rather, it produces reports based on both peer-reviewed and non-peer-reviewed sources. The reports represent agreements of leading climate scientists and the consensus of participating governments.

16. Bastardi (2018) reviews the history of past hurricanes occurring in the 20th and 21st centuries. He points out that history demonstrates hurricanes were destructive in the past and will be in the future and comments that nature is in control doing what nature does, which is to correct for imbalances.

17. The IPCC was formed in 1988 with its headquarters in Geneva, Switzerland. The parent organizations are the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP). The IPCC produces reports to support the work of the United Nations Framework Convention on Climate Change (UNFCCC). The IPCC's Fifth Assessment Report was a scientific contribution for the UNFCCC's Paris Agreement in 2015. In 2018, the IPCC released the "Special Report on Global Warming of 1.5°C" (IPCC, 2018). The Sixth Assessment Report is planned to be released in 2022.

Recently, government climate change policies around the world are being questioned (Burnett, 2019). Since the climate on earth has always changed, the term “climate change” often is used to refer to man-made climate change or the technical term “anthropogenic climate change.”

Christy (2019) summarizes the results of a study that questions the accuracy and the assumptions of climate models that are being relied upon by the IPCC. Using satellite data, which represented a time series of 37.5 years of actual temperature data from the global troposphere, the results indicated that the earth was warming per decade at a rate of .095°C. The climate models used by the IPCC indicated a warming rate of 0.35°C per decade or 3.68 times Christy’s findings. The study’s conclusion is that the sensitivity of CO₂ in the climate models tends to exaggerate the rate of global warming, implying that the world is warming at alarming levels. This raises serious questions regarding the accuracy of climate models over the next 30, 50 or 80 years and whether such models should be used as the basis for long-term global climate policy.¹⁸

Climate Change, Disasters and Legal Issues

Stott, Stone and Allen (2004) attempt to estimate the probability of anthropogenic contributions in extreme weather events compared to natural causes using global climate models. Their conclusion, based on a confidence interval of greater than 90%, is that more than half of the extreme weather in Europe in 2003 is attributable to human influences on the climate. The work of Stott et al. (2004) appears to be exploratory and calls for further research, including scenarios using other spatial and temporal events to better support a cause and effect relationship. Nonetheless, from a legal perspective, probability analysis might be enough to support a legal case¹⁹ against those that can be determined to be the probable cause of climate change in the future (Allen and Lord, 2004).

Neil Beresford, a partner at Clyde & Company in London, observes that climate change litigation has given rise to interesting problems of causation. Products that are deemed harmful to the environment are causing some companies, such as petrochemical and energy companies, to be targeted. For example, a manufacturer having a 10% market share may be found to be liable for 10% of the alleged damages (Beresford, 2019).

18. According to the world-renowned theoretical physicist and mathematician, Freeman Dyson, professor emeritus from Princeton (McNish, 2015), “... models do a good job of helping us understand climate, but they do a very poor job of predicting it.”

19. Two litigation databases related to climate change have been created in a joint effort by the Sabin Center for Climate Change Law at Columbia Law School and the law firm Arnold and Porter. One database includes 1,045 U.S. cases, and the other includes 287 non-U.S. cases. See <http://climatecasechart.com/>.

Insurance Regulatory Concerns and Climate Change Policy

The National Association of Insurance Commissioners (NAIC) has a Climate Risk and Resilience (C) Working Group, which was initially created in 2006 and originally named the Climate Change and Global Warming (C) Task Force. In 2008, the NAIC created a white paper (NAIC, 2008) to assess global warming and thus mitigate its impact on the insurance industry.

The NAIC adopted its Insurer Climate Risk Disclosure Survey in 2010, which was in response to its 2008 white paper. Insurance regulatory concerns about climate change are based on insurers identifying their climate change risk whether related to their investments or their potential liability from catastrophes caused by climate change. The purpose of the disclosures is for policymakers to gain insights for public policy changes.²⁰ The premium threshold for insurer reporting is \$100 million in direct written premiums. The disclosures are provided in an online survey instrument. The survey results are public and maintained in a database administered by California, which leads a multistate effort to gather information about what insurers are doing to address climate change. (Not all states participate.)

On an April 12, 2019, conference call, Dr. Gerald Geernaert, the director of the Climate and Environmental Sciences Division of the U.S. Department of Energy (DOE), presented²¹ a report to the NAIC's Climate Risk and Resilience (C) Working Group (NAIC, 2019). The conclusions of the presentation are definitive and leave no room for doubt that global average temperatures are much higher than modern civilization has ever experienced and are rising, and that human activities are the cause. Various charts illustrate other relationships for projected temperature, precipitation, sea level rise and air quality, as well as the projected impact on delays to transportation, outdoor labor hours worked, coral bleaching and 22 types of economic damages to expect by 2090 due to various warming scenarios. The report illustrates the observed and projected changes due to fossil fuel and industrial emissions of CO₂ arising from human activities.

Comments on the Future

Climate change is contentious, and the topic has divided the scientific community. As a result, determining liability in climate change cases is of importance to state insurance regulators, rating agencies, insurers, reinsurers, policyholders and investors. Given the mixed evidence, this may be an issue of correlation—not causation. Determining liability in climate change cases will be an important issue for state insurance regulators, rating agencies, insurers, reinsurers, policyholders and investors in the future.

20. For more detailed information, see <http://www.insurance.ca.gov/0250-insurers/0300-insurers/0100-applications/ClimateSurvey/> and https://www.naic.org/cipr_topics/topic_climate_risk_disclosure.htm.

21. The presentation can be found at https://www.naic.org/documents/cmte_c_climate_190412_attach_b.pdf?80.

There is a need to review and evaluate climate models based on sound principles using comprehensive and rigorous standards. Climate models need to be validated using actual data. The assumptions of the models need to be identified and justified based on the appropriate peer-reviewed scientific literature, and limitations should be clearly identified. The principles and standards need to be developed by an independent nongovernmental body without conflicts of interest in order to have valid, meaningful and reliable models. The process should be nonpolitical and non-emotional, and it should follow scientific principles. The standards should have input from interested parties, but a separate body as described above should be required to ultimately determine the standards and how they will be used to evaluate climate models. An independent multidisciplinary team of scientists and other experts would be necessary to review each climate model in detail based on rigorously developed standards used to determine whether the model would produce unbiased and scientifically appropriate results. Climate models should not be calibrated after the fact to force-fit the desired result. Data should be justified as appropriate and made available for further scientific testing, and all assumptions should be identified and thoroughly explained. The computer code should be documented and should meet accepted software engineering practices, including security requirements, component design, changes to the model and version numbers.²² State insurance regulators in the U.S. should take an active role and lead the world in promoting scientific inquiry.

VI. Loss Adjustment Process – Problems and Improvements

The catastrophe loss adjustment process has undergone many changes over time with the development of new technologies. Losses arising from catastrophes are unusual in that they tend to inundate the insurance system in ways that are difficult or impossible to prepare for in advance. For example, insurers cannot afford to employ the number of in-house catastrophe claims adjusters needed at the time of a major event. The best they can do is to enter into contracts with claims adjusting firms, but there is no guarantee that such adjusters will be trained to the level needed or that they will be able to deal with complexities and still adjust claims timely.

Loss Adjustment Following Hurricane Andrew

The catastrophe claims-paying process in 1992 was a manual one involving paper files, manuals, polaroid cameras and address books (St. John, 2019). Before

22. Although climate models are highly complex and incorporate numerous academic disciplines, a process such as that used by the Florida Commission on Hurricane Loss Projection Methodology can serve as a guide as to how to create a credible, scientific and unbiased process for complex model review. See <https://www.sbafla.com/Methodology/>.

Global Positioning System (GPS) units, adjusters faced a major challenge, even finding the location of a property when street signs were blown away. The magnitude of Hurricane Andrew's damage was unanticipated. The state of Florida's building codes were inconsistent and haphazard. Additionally, the state had not recognized the potential risk that it faced from a catastrophic hurricane.

Catastrophe Loss Settlement Today

Today, the situation has improved. Technology now provides for better communications to assist with advance alerts, improved ways to locate policyholders and their property, and digital tools to assist with reporting and settling of claims.

In reviewing the catastrophe claims settlement process, St. John (2019) described how during the last 20 years, the process has changed from one of paper to electronic processing. The resulting improvements have accelerated the time needed to settle claims. Insurers work around the clock after a disaster to settle claims by providing greater access for policyholders. Technology has made it possible to file claims online, many companies have created their own claims apps, and the telephone lines are monitored 24 hours a day, seven days a week. Companies are contacting policyholders if they suspect the policyholder has a claim. This type of aggressive action is possible because insurers can now take advantage of computer modeling, satellite imagery and the use of drones. Policyholders can use their smartphones to take pictures of their damaged property and, in some cases, save the expense of an adjuster having to examine the damage on-site. Insurance companies are also able to use drones to inspect roof damage instead of requiring an adjuster to climb up on a roof. What used to take weeks in settling claims is now done in a matter of a few days. Communications with email and text messages are also helpful, as well as the insurers' ability to electronically transfer loss settlement payments to a policyholder's bank account. According to St. John, the expectation for the future will be for claims to be processed quickly using virtual adjusting services and settled in a matter of hours.

Loss Creep

The term "loss creep" is a situation where losses after first reported unexpectedly deteriorate. (This may also be known as adverse loss development.) From an insurer's standpoint, loss creep can create problems with reinsurance coverage and may result in the insurer failing to have adequately booked sufficient loss reserves. If loss creep occurs as a result of excessive claims filed due to fraud or abuses of the legal system, the problem should be recognized and remedied by legislation if necessary. In the past, such problems have been found with claims associated with mold damage, sinkhole damage and water damage. From a loss adjustment perspective, insurers need to understand the type of claims they are

insuring, and after an event, they need to be able to reasonably estimate their obligations and liabilities.

According to a report by Gallin (2018), due to 2017 losses, Lloyd's of London experienced the problem of loss creep, which was found to be significant following Hurricanes Irma and Maria. The problem was also recognized as occurring in other parts of the world. Typhoon Jebi's initial losses in Japan were estimated at \$13 billion, but the number was later raised to \$15 billion. The reason for the loss creep may not be readily apparent. For Typhoon Jebi, Swiss Re found it necessary to increase loss reserves due to several reasons, including demand surge and business interruption losses. Swiss Re speculated that ongoing construction in anticipation of the 2020 Summer Olympics in Tokyo might have exacerbated the impact of Typhoon Jebi's loss totals. Another reason for loss creep could be the way insurers are using catastrophe models. The model that an insurer uses to evaluate its PML for solvency and reinsurance purchasing purposes may not be accurate at predicting the loss from single landfalling hurricane events (Aon Benfield, 2019). Some models may be more appropriate for some situations than others. There is also a concern raised by Robert Bentley of the reinsurance broker Guy Carpenter that catastrophe models need to be recalibrated to account for loss creep as well as climate change (Evans, 2019a). He notes that underwriting assumptions regarding global diversification are being reassessed and that virtually every major loss sustained in the last couple of years has involved loss creep.

Observations for the Future

Technology has been beneficial for the insurance industry in dealing with many types of claims. The speed of loss settlement has improved over time, but the overwhelming magnitude of catastrophic events will always result in complex problems and issues.²³ Too often, litigation is involved over a claim dispute.

The insurance consumer would benefit from more education, and the insurance system is also in need of simplification. One simplification idea could be to include special contract provisions to standardize the catastrophic loss settlement process. Also, laws should be revised to reduce the incentives for third parties to benefit from the system. After a loss settlement, additional data should be collected so that each part of the insurance premium dollar can be traced to how it was used and who benefited.

State insurance regulators, rating agencies, reinsurers and investors should be aware of which catastrophe models are being used by insurers and how they are using them as this could result in inadequate reserves. State insurance regulators may need to learn more about how insurers are using catastrophe models in estimating their losses and whether such usage is in any way contributing to the loss

23. O'Connor (2019) reports that more than 21,699 Hurricane Michael claims are still open, while 126,208 have been reported closed nine months following the storm. According to O'Connor, Commissioner Altmaier noted that the opened claims were a "discouraging statistic," and some open claims are either new or more difficult to close.

creep problem. Additionally, catastrophe modelers may need to examine whether loss creep is a factor that is unaccounted for in their models and, if so, what is the best way to incorporate it to accurately reflect future losses.

In addition to catastrophe modeling issues, loss adjustment expense (LAE) has recently surfaced as an area of concern. With improvements in technology, it would be reasonable to expect the cost of adjusting claims to have declined over time. However, this does not appear to be the case. During the 2019 Florida legislative session, there was significant concern about the recent increase in insurers' LAE related to catastrophe claims. As a result, legislation was passed²⁴ that increased the Florida Hurricane Catastrophe Fund's (FHCF) loss adjustment coverage for its participating insurers. In an era of technological advances, the insurance industry and its policyholders are not seeing cost savings due to other cost drivers. The overall level of LAE and how they are trending may need to be monitored and studied.

VII. Convergence of Alternative Capital with Traditional Reinsurance

The reinsurance market has been rapidly changing in recent years. ILS products, which include catastrophe bonds,²⁵ fully collateralized reinsurance,²⁶ sidecars²⁷ and other such products have evolved since the first catastrophe bond was issued in 1996 (Bhatia and Syroka, 2019).²⁸ A comprehensive listing of ILS products issued since their inception is provided by Artemis in its "Deal Directory." As of mid-year 2019, Artemis reported the issuance of \$6.4 billion of new ILS products, bringing the total outstanding to \$39.2 billion and total assets under management held by 51 managers to \$103.2 billion (Artemis, 2019).

24. On June 18, 2019, Governor DeSantis signed HB 301, which increased the Florida Hurricane Catastrophe Fund's loss adjustment expense paid to their participating insurers from a flat 5% of reimbursable losses to a flat 10%. The effective date of the law was June 1, 2019. Source: Florida House of Representatives. See <https://www.myfloridahouse.gov/Sections/Bills/billsdetail.aspx?BillId=63195&SessionId=87>.

25. Catastrophe bonds are considered securities and require the setting up of a special purpose vehicle (SPV) using a reinsurance agreement with a counterparty or sponsor. For more details, see <https://www.artemis.bm/library/what-is-a-catastrophe-bond/>.

26. A reinsurance contract or program that is fully collateralized can be simpler to implement than catastrophe bonds for investors interested in ILS products. For more details, see <https://www.artemis.bm/glossary/collateralised-reinsurance/>.

27. A sidecar is a situation where a financial entity invests limited funds with a reinsurer used to take reinsurance risk. See Artemis for more details and examples at <https://www.artemis.bm/reinsurance-sidecars/>.

28. Bhatia, representing Raymond James and Associates, and Syroka, representing Fermat Capital Management, teamed up in developing their presentation for the FSU Future of Insurance Forum held on May 8, 2019.

The reinsurance markets have been evolving rapidly with alternative capital supporting ILS products to complement traditional reinsurance in recent years. Doherty (1997) discussed various innovations in the 1980s and 1990s, which included experiments with new instruments such as catastrophe bonds. Cummins (2008) provides market information on the early development of the ILS market. Although the ILS market has existed for 23 years, ILS products have now evolved to the point of providing similar terms and conditions to traditional reinsurance, and for some, risks and regions have been competitive based on price, especially during the last five to seven years. The expectation is that in the future, alternative capital will represent a larger and larger share of the total reinsurance market capital.²⁹

ILS Market Investors

Large investors such as pension funds,³⁰ sovereign wealth funds, family offices and wealthy individuals (Bhatia and Syroka, 2019) are attracted to the ILS market since it involves securities with returns driven by insurance or reinsurance loss events considered to have a low correlation to financial market assets. As such, ILS products have the benefit of increasing potential returns for the same level of overall risk when added to an investment portfolio made up of stocks, bonds, real estate and other financial assets. From the insurance and reinsurance market standpoint, the diversification aspect offered by the ILS asset class can be beneficial in lowering prices and result in a more competitive and stable reinsurance market over time by tapping the deeper pockets of the capital markets.

Test of the ILS Market

Hurricane Katrina provided an early test for the resiliency of ILS products; however, the hurricane events of 2017 and 2018 were the latest test.³¹ Insured losses in 2017 reached \$140 billion, and insured losses in 2018 totaled \$80 billion (I.I.I., 2019). Over these two years, insured losses totaled \$220 billion. The ILS market was undeterred. The Artemis catastrophe bonds and ILS directory³² indicate healthy issuance for the early part of 2019 and a market that is continuing to grow.

29. Detailed information on the ILS market is found on the Artemis website at <https://www.artemis.bm/>.

30. The State Board of Administration of Florida (SBA), which administers the Florida Retirement System, is the fifth largest public pension plan in the U.S. The SBA has invested \$490 million in ILS products since January 2018. See State Board of Administration (2019).

31. Artemis reports catastrophe bond losses at <https://www.artemis.bm/cat-bond-losses/>.

32. See <https://www.artemis.bm/dashboard/catastrophe-bonds-ils-issued-and-outstanding-by-year/>.

Growing Exposure, Limited Reinsurance Capital and the Disaster Gap

In the future, due to exposure growth and increased demand for reinsurance, the ILS market will be needed to meet the growing demand that will exceed the traditional reinsurance market supply for some regions and risks (Seo, 2018). John Seo of Fermat Capital Management notes that in the largest peak risk zone, the U.S. coastal states have an exposure to hurricanes that has historically doubled every 10 years, while traditional reinsurance capital has increased only 33% in the same period. Thus, there is a growing “disaster gap” or a difference in insured and reinsured risk. According to Fermat Capital Management’s research, the total global reinsurance capacity available for a single peril, such as hurricane risk in Florida, is limited to approximately \$40 billion. A Category 5 hurricane directly hitting Miami could exceed \$250 billion in insured losses, which illustrates the reinsurance industry is not adequately capitalized to withstand such an extreme event. Seo estimates that the underinsured risk has created a growing disaster gap exceeding \$500 billion. The ILS market offers a solution since competitive pressures are not conducive to new reinsurer capital formation. Expectations are for ILS capital to gradually grow to and exceed \$300 billion in the coming years.³³

Bhatia and Syroka (2019) illustrate that the global dedicated reinsurance capital in 2017 was \$432 billion, with \$87 billion coming from the ILS market and \$345 billion provided by traditional reinsurers. They estimate that in 2018, this number increased to \$95 billion for ILS and remained at \$345 billion for traditional reinsurance. They also estimate the compound annual growth rate of global reinsurance capital from 2012 to 2018 is 7.2% overall, with the ILS market growing at a compound annual growth rate of 38% over this period and with the traditional reinsurance market capital at only 3.4%. The \$440 billion of global reinsurance capital will not be enough in the future, given the expected rapid growth of exposure. ILS capital will be more and more critical in the future to provide catastrophe protection. As the demand for catastrophe coverage grows, it will be difficult for traditional reinsurance capital to keep up given limited new capital formation within the sector.

Bhatia and Syroka (2019) point out that ILS capacity comes from the global capital markets, which dwarf the global reinsurance capital base; equity markets total more than \$70 trillion, the global bond markets account for more than \$92 trillion, and pension fund assets are more than \$40 trillion globally. Compared to dedicated reinsurance capital of only \$440 billion, the global capital markets represent a large potential source of future catastrophe risk capacity. The nature of the reinsurance industry is rapidly changing, and ILS market capital is expected to

33. See <https://www.artemis.bm/news/industry-leaders-on-what-can-drive-ils-to-300bn-beyond/>.

continue to grow in the future and will be needed to keep up with reinsurance demand.

Observations for the Future

State insurance regulators need to realize the dynamic changes going on in the reinsurance markets. Not only are ILS products playing a more prominent role in the overall reinsurance market, but more types of risk are using this alternative. Such risks would include coverages related to life insurance, mortgage insurance, floods, thunderstorms, winter storms, terrorism, medical claims, automobile third-party liability, wildfires, temperature risks, extreme mortality, lottery winnings and credit reinsurance (Artemis, 2019). The reinsurance market landscape is continuing to grow and evolve, and ILS products are positioned to provide additional coverage, as well as act as a stabilizing factor for the market.

VIII. Conclusions

Technological change along with strong competitive forces are transforming the insurance industry. Traditional insurers are being challenged by new start-up insurers, who are designing new business models to take advantage of inefficiencies to disrupt the traditional market. The future insurance industry workforce will need to be flexible and creative, continue their education, think broadly about the global business environment and prepare for rapid change.

The insurance regulatory system needs new measures to monitor insurer solvency for catastrophic losses. A supplementary methodology is needed that can identify and measure pockets of risk that have the potential to cause insolvencies if ignored.

Numerous legal cases have been filed seeking damages against parties that are deemed responsible for climate change. This type of litigation will affect risk management practices, the insurance industry, investors and consumers, and will have global economic considerations. Although the IPCC is viewed by many as the world authority on climate change, the various climate models that have been relied upon for determining global climate policy are being questioned. The NAIC may need to take an active role in establishing or supporting a scientific, transparent and unbiased review process for climate models rather than passively accepting the IPCC's recommendations and conclusions.

The catastrophic loss adjustment process has improved over time. Recent technology has streamlined the claims payment process; however, the volume of claims following disasters can still overwhelm insurance companies. Claims can be complicated, which leads to policyholder hardships and unnecessary lawsuits, underscoring the fact that the insurance system is complex and needs to be simplified. Although technology has benefited the catastrophe loss adjustment

process, other factors are causing overall loss adjustment expenses to increase for many insurers and reinsurers.

The ILS market is converging with the reinsurance market. The expectation for the future is that there will be a growing demand for reinsurance, and new capital will be needed. The ILS market has enormous potential, given that the financial markets represent deep pockets and are becoming more and more interested in the benefits that ILS products have to offer. State insurance regulators need to understand the importance of the role that the financial markets will play in capitalizing the insurance industry in the future.

Appendix A

InsurTech Start-Up Companies with Innovative Business Models

Friendsurance

Friendsurance is a type of peer-to-peer insurance broker whose objective is to make insurance more consumer-friendly. It has around 150,000 customers and operates as a digital broker involving 175 insurance companies. Friendsurance operates internationally out of Berlin, Germany, writing small groups of people consisting of generally 10 to 16 people who have some connection or know each other personally. At the end of their contract period, members of the group benefit from the money left over in the pool. Policyholders can receive up to 40% of their premium back if the group is claims-free. The larger the group, the higher the potential return of premiums. Thus, Friendsurance provides the incentive for the group to keep claims low in order to reduce its cost.

Besurance Corporation

Besurance Corporation offers a peer-to-peer risk-sharing platform that attempts to bring the concept of community back to insurance. The company's headquarters are in Calgary, in the Alberta Province of Canada. It facilitates risk-sharing with software that serves as a tool for various community groups to employ for marketing, distributing the risk of loss and adjusting claims. The firm helps connect groups and assists people in creating their group, which can be open to the public or private. The idea is that an existing community can help control its claims and benefit from premiums being returned if there are no claims or if claims costs are low. Besurance uses actuarial software for rating, and claims are processed with the approval of community members.

Teambrella

Teambrella is a blockchain-based insurance platform that uses Ethereum smart contracts with headquarters in St. Petersburg, FL. Teambrella is a peer-to-peer network in which participants discuss each claim and vote to determine a consensus on whether a claim is covered. If a claim is approved, each participant shares a part of the premium with the participating member who has incurred the loss. The company's website states the following, "Not insurance. A lot better. You and your teammates cover each other. If you submit a claim within your team, your teammates pay it." The company describes itself as "a social app that is destined to replace insurance." In addition, it says, "Teambrella is what insurance has always strived to be: a tool for sharing risk with peers and helping those in need. But this time, we don't just declare the absence of conflicts of interest, we align interest of all parties and make the whole process provably fair."

Hippo Insurance

Hippo Insurance is an InsurTech company, reinsured by Topa Insurance, which is rated as A- by AM Best. The company's headquarters is in Mountain View, CA. Hippo's purpose is to change the way people purchase homeowners insurance. Additionally, it is able to assist with the purchase of flood coverage given its relationship with Neptune Insurance (Hurst, 2019). Hippo offers options for homeowners to cover their roof on either a replacement cost or actual value basis.³⁴ The company represents that its coverage is modernized by offering equipment or appliance breakdown coverage for items like home electronics and smart electronics appliances or devices. It also focuses on preventive measures by providing free water leak sensors with each policy, and it intends to add new preventive loss tools in the future. The application process is streamlined by providing an innovative way to backfill information automatically. It can provide a quote to potential customers online within 60 seconds, and its premiums are reported to be 25% lower than traditional insurers.

Additional InsurTechs

Haven Life, Sherpa Insurance, Pie Insurance, Neptune Insurance and Guevara Peer to Peer Car Insurance are other InsurTech start-ups. Although not discussed in detail, they represent other examples of disruptive insurers that operate in various lines of insurance in unique ways to compete with traditional insurers.

34. For a more detail review of Hippo's coverage see the following review: <https://simplyinsurance.com/hippo-insurance-review/#tab-con-4>.

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References to published literature should be inserted into the text using the “author, date” format. Examples are: (1) “Manders et al. (1994) have shown. . .” and (2) “Interstate compacts have been researched extensively (Manders et al., 1994).” Cited literature should be shown in a “References” section, containing an alphabetical list of authors as shown below.

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