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Report to Congressional Requesters

June 2019

INSURANCE MARKETS

Benefits and Challenges Presented by Innovative Uses of Technology

GAO-19-423

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GAO Highlights

Highlights of GAO-19-423, a report to congressional requesters

Why GAO Did This Study

The innovative use of technology by insurance companies (insurtech) is growing and offers the potential to improve customer experiences while also lowering insurer costs. Some stakeholders have raised questions about how certain uses of insurtech could create both risks for consumers and challenges for regulators, and whether some challenges might slow technological innovation in the insurance sector.

GAO was asked to provide information on insurtech activities in the property/casualty and life insurance sectors. This report (1) identifies new uses of technologies and potential benefits and challenges for insurers and their customers; and (2) discusses what stakeholders identified as key challenges that could affect the adoption of new technologies, and actions taken to address those challenges. GAO reviewed available literature; analyzed relevant laws and regulations; and conducted interviews with more than 35 stakeholders, including federal and state regulators, technology companies, insurers, and consumer groups (selected based on literature reviews and recommendations, and for relevance to the scope of GAO's review).

GAO is not making any recommendations in this report.

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What GAO Found

Insurtech companies (recently established companies bringing technology-enabled innovations to the insurance industry) as well as established insurers have begun to use technologies, including artificial intelligence (AI) and mobile applications, in an attempt to improve risk assessment and enhance customer experiences. For example:

- Consumers can purchase insurance products specifically tailored to their situation and needs, such as renters or auto insurance that can be turned on and off as needed using a mobile app.
- Some insurers have begun to use nontraditional data (such as from social media) to analyze policyholder risk, and use AI and complex algorithms to reduce costs by automating information gathering and risk assessment.

However, implementing these technologies can create potential challenges for insurers and risks for consumers, including the following:

- The use of AI to create underwriting models for determining premium rates can make it challenging for insurers to ensure that factors prohibited by regulation (such as race) are not used in models. Such models are often developed by data scientists who, unlike actuaries, may not fully understand insurance-specific requirements.
- Insurer collection and use of consumer data not provided by the consumer raise questions about data accuracy, privacy, and ownership.
- Some insurtechs sell coverage through nonadmitted insurers. As we have previously reported, nonadmitted insurers—unlike traditional insurers—are not required to be licensed in each state in which they sell insurance, and receive less regulatory oversight of their policies and rates. Also, if nonadmitted insurers became insolvent, state guaranty funds would not be available to help pay policyholder claims.

Stakeholders with whom GAO spoke identified challenges they said might affect adoption of innovative technologies. These include paper-based documentation requirements that do not accommodate online insurance transactions, and challenges for regulators in the evaluation of complex rating models. The National Association of Insurance Commissioners (NAIC) and state regulators have initiated a number of actions designed to address such concerns. For example:

- State insurance regulators, through an NAIC task force, have been examining regulatory areas that may pose obstacles for innovation, such as requirements for paper documentation or signatures.
- NAIC issued draft best practices for states to use when reviewing complex rating models.
- NAIC adopted a model law that creates a legal framework for states to use to require insurance companies to operate cybersecurity programs and protect consumer data.

Because many of these regulatory initiatives are still in development (or recently developed), the effect on innovation and consumer protection is unknown.

Contents

Abbreviations

AI	artificial intelligence
app	application
EU	European Union
insurtech	insurance technology
NAIC	National Association of Insurance Commissioners
Treasury	Department of the Treasury

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Congressional Requesters

The innovative use of technology by insurance companies (insurtech) is growing and offers the potential to reduce insurer costs while enhancing customer experiences. In recent years, both insurtech companies (recently established companies bringing technology-enabled innovations to the insurance industry) and established insurers have begun to use technologies, such as artificial intelligence (AI), to explore ways in which to improve operations and functions such as risk assessment, marketing, and product development. As consumers, and millennials in particular, have become well-versed in new technologies and taken a more hands-on approach to purchasing insurance, insurtechs have emerged to offer customized insurance products and streamlined customer experiences.[1]

At the same time, some stakeholders have expressed concerns that certain uses of technology could create risks for consumers, including potential misuse of data. Some stakeholders also have said the current insurance regulatory system slows technological innovation. As we noted in recent reports on data, analytics, and AI, the technologies have produced benefits such as reduced cost and increased accuracy in some areas of business, but also can pose privacy and civil liberties risks and their use could result in undesirable or unexpectedly biased outcomes.[2]

[1]According to Census Bureau estimates, by 2014 millennials outnumbered baby boomers as the largest living generation. The baby boomer generation consists of people currently ages 55–73 and the millennial generation of people currently ages 19–37.

[2]See GAO, *Data and Analytics Innovation: Emerging Opportunities and Challenges*, GAO-16-659SP (Washington, D.C.: Sept. 20, 2016); and *Artificial Intelligence: Emerging Opportunities, Challenges, and Implications*, GAO-18-142SP (Washington, D.C.: Mar. 28, 2018).

You asked us to provide an overview of insurtech activities in the property/casualty and life insurance sectors.[3] Specifically, this report (1) identifies uses of technologies and the benefits and challenges they might present for insurers and their customers, and (2) discusses what stakeholders identified as key challenges that could affect the adoption of new technologies, and actions that have been taken to address those challenges.

To address both objectives, we examined insurtech activities in the property/casualty and life sectors of the U.S. insurance market, including information on personal and commercial insurance where available. We did not include the health insurance sector because of significant differences between that sector and the property/casualty and life insurance sectors in terms of products offered and methods by which they are sold and regulated.[4] We conducted background research and a literature review to understand the most prominent, or key, technologies being used in the insurance industry and to identify any analyses of potential benefits and challenges that insurtech products and services may pose. Because insurtech is a fairly new field, we found few academic publications related to our objectives. We also conducted more than 35 semi-structured interviews with and reviewed documents provided by knowledgeable stakeholders to identify and obtain information about (1) current, in-development, and potential future uses of existing or new technology in the insurance industry; (2) stakeholder views on the potential benefits and challenges such technology presents to insurance companies and consumers; (3) which challenges may affect insurers' adoption of technology; and (4) actions the National Association of Insurance Commissioners (NAIC) and selected state insurance regulators

[3]Advances in technology and widespread internet and mobile device use also helped fuel the rise of fintech (the provision of traditional financial services by non-traditional technology-enabled providers). We issued a series of reports examining fintech and made recommendations to address areas including fintech regulation and use of alternative data sources in underwriting. See GAO, *Financial Technology: Information on Subsectors and Regulatory Oversight*, GAO-17-361 (Washington, D.C.: Apr. 19, 2017); *Financial Technology: Additional Steps by Regulators Could Better Protect Consumers and Aid Regulatory Oversight*, GAO-18-254 (Washington, D.C.: Mar. 22, 2018); and *Financial Technology: Agencies Should Provide Clarification on Lenders' Use of Alternative Data*, GAO-19-111 (Washington, D.C.: Dec. 19, 2018).

[4]Health insurance is the third-largest sector. It includes products from private health insurers, as well as government programs. Both the property/casualty and life sectors also write some health insurance.

have been taking or might consider to address these challenges.[5] The stakeholders included the Federal Insurance Office, NAIC, selected state insurance regulators, associations representing state agencies, academics, consumer groups, insurance providers and industry associations, actuarial professional associations, consulting groups, lawyers in the field, and technology providers.[6] We identified potential interviewees by conducting internet research, reviewing literature search results, and reviewing recommended interviewees from our initial interviews. Finally, we reviewed NAIC model laws and state laws to identify any relevant to the development and implementation of insurtech. See appendix I for more information on our scope and methodology.

We conducted this performance audit from April 2018 to June 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Insurance allows individuals and businesses to manage risk by providing compensation for certain losses or expenses, such as those from car accidents, fires, medical services, or inability to work. According to NAIC, as of December 31, 2017, there were 2,509 property/casualty companies and 852 life insurance companies in the United States and its territories. In 2017, premiums written for the property/casualty sector totaled $602.2 billion in 2017 and premiums written for the life and health sector totaled $683.2 billion.[7]

[5]NAIC is the standard-setting and regulatory support organization created and governed by the chief insurance regulators from the 50 states, the District of Columbia, and five U.S. territories (Guam, American Samoa, Puerto Rico, U.S. Virgin Islands, and the Northern Mariana Islands).

[6]For our discussion of stakeholder views on benefits and challenges in the primary areas they identified as being affected by technology, we define “some” as stakeholders from three or four categories and “several” as stakeholders from five or more categories.

[7]The life and health sector consists mainly of life insurance and annuity products. Most private health insurance is written by insurers whose main business is health insurance, which is not discussed in this report. Premium data are from NAIC. See National Association of Insurance Commissioners, *2017 Insurance Department Resources Report*, vol. II (Washington, D.C.: 2018).

As we have noted in recent reports, advances in technology and widespread use of the internet have brought about significant changes in the financial industry.[8] For example, in recent years technology has changed consumer expectations and preferences, with younger consumers especially being well-versed in new technologies and looking to take a more hands-on approach to managing their finances. Similarly, over the last 5 years, established insurers and insurtech companies have used technology to offer simpler insurance products and streamlined customer experiences. Insurtech companies have been playing a variety of roles in the U.S. insurance market. Key players in insurtech include the following:

- **Insurtech companies (typically startups) that are licensed insurance companies.** Insurtech startups offer innovative products and services and are active in all major insurance products and all lines of business, with concentrations in the property/casualty business. For example, according to its website, Lemonade Insurance Company is a property/casualty insurer that sells products exclusively through mobile applications (apps) and its website. It offers renters, condominium, and homeowners insurance in several states. Another example is Root, which describes itself as an automobile insurance company that uses a smartphone app to understand individual driving behavior. Customers can download the Root app to their smartphones, obtain a personalized quote after a 2–3 week test drive, and purchase and manage their policy entirely within the mobile app.
- **Insurtech companies that do not provide insurance themselves, but offer technology solutions for insurers.** For example, according to the website for Groundspeed Analytics, they use AI and data science methods to provide information for the commercial property/casualty insurance industry to help identify potential areas of profit and enhance the customer experience. According to the website for Habit Analytics, they use real-time consumer data, sourced from smartphones and connected devices in homes, to create behavioral profiles that enable insurance companies to provide input for their risk models. Many established insurers have been acquiring such companies.
- **Established insurers that use technologies or partner with insurtech companies.** For example, the insurer Nationwide notes on its website that it created Nationwide Ventures to invest in startups,

[8]See GAO-17-361 and GAO-18-254.

pilot new technologies, and test new solutions and business models by exploring topics that range from analytics and automation technology to new insurance and financial services platforms.

According to analysis by the Deloitte Center for Financial Services and data collected by research firm Venture Scanner, as of mid-2018 there were more than 1,000 insurtech firms established in more than 60 countries, with more than half of those launched in the United States since 2008.[9]

State Licensing Regulation for Admitted and Nonadmitted Insurance Markets

Insurance companies are regulated principally by the states and are licensed under the laws of a single state, known as the state of domicile. Companies may conduct business in multiple states, but the state of domicile serves as an important regulator. State regulators license insurance agents, generally review and approve insurance products and premium rates, and examine insurers' financial solvency and market conduct. As we have previously reported, state regulators typically conduct financial solvency examinations every 3–5 years, while market conduct examinations are generally done in response to specific consumer complaints or regulatory concerns.[10] To help ensure that policyholders continue to receive coverage if their insurer becomes insolvent or unable to meet its liabilities, states also have guaranty funds (separate for life and property/casualty insurance), which are funded by assessments on insurers doing business in those states.[11]

Individuals who wish to sell, solicit, or negotiate insurance in the United States must generally be licensed as producers, a term including insurance agents and insurance brokers. Insurance agents typically represent only one insurance company. Insurance brokers represent multiple insurance companies and are free to offer a wider range of products to their clients. Brokers can search the market and obtain

[9]Deloitte Center for Financial Services, *InsurTech Entering Its Second Wave: Investment Focus Shifting from New Startups to More Established Innovators* (2018); and Venture Scanner web site https://www.venturescanner.com/insurance-technology, accessed on March 14, 2019.

[10]See GAO, *Insurance Reciprocity and Uniformity: NAIC and State Regulators Have Made Progress in Producer Licensing, Product Approval, and Market Conduct Regulation, but Challenges Remain*, GAO-09-372 (Washington, D.C.: Apr. 6, 2009).

[11]According to NAIC, all 50 states, Puerto Rico, the U.S. Virgin Islands, and the District of Columbia have a guaranty mechanism for the payment of covered claims arising from the insolvency of insurers licensed in their state.

multiple price quotes to fit their clients' needs. Producers must comply with state laws and regulations governing their activities. NAIC notes that as of September 2018, more than 2 million individuals and more than 200,000 business entities were licensed to provide insurance services across all lines of insurance in the United States.

Traditional insurers, sometimes referred to as admitted insurers, can be licensed to sell several lines or types of coverage to individuals or families, including personal lines—such as homeowners, renters, and automobile insurance—and commercial lines—such as general liability, commercial property, and product liability insurance. Admitted insurers can sell insurance in one or more states but, according to NAIC, must be licensed to operate in every state in which they sell coverage. To help ensure adequacy and fairness in pricing and coverage, state regulators oversee the insurance rates and forms of admitted insurers. State regulators also may require admitted insurance companies to maintain specific levels of capital to continue to conduct business.

The surplus lines insurance market, also known as the nonadmitted market, can provide insurance coverage for risks that traditional insurers are unwilling or unable to cover. The risks covered can include potentially catastrophic property damage and liability associated with high-hazard products, special events, environmental impairment, and employment practices.[12] In the absence of the surplus lines market, NAIC notes that some insureds in those markets would be unable to secure coverage.[13]

In most states, surplus lines insurers cannot write insurance coverage that is available from admitted insurers and only may write coverage rejected by a number of admitted insurers, according to NAIC. Furthermore, in those states, the surplus lines insurance broker must conduct a "diligent search" of the admitted insurance market to determine if comparable coverage is available. The broker can write coverage only if a specified number of admitted insurers have declined to offer such coverage.

[12]For more information on surplus lines insurers, see GAO, *Property and Casualty Insurance: Effects of the Nonadmitted and Reinsurance Reform Act of 2010*, GA0-14-136 (Washington, D.C.: Jan. 16, 2014).

[13]According to data from NAIC, as of year-end 2016 (the most recent available), surplus lines premium volume across all lines of insurance was $44.5 billion, which was 7.4 percent of the $602.3 billion in premium volume in the admitted market.

According to NAIC, new and innovative insurance products for which there is no loss history may be difficult to appropriately price. According to stakeholders we interviewed, the nonadmitted market is therefore a common entry point into the insurance market for insurtech firms that want to sell insurance products. NAIC notes that, after a new coverage has generated sufficient data, the coverage often eventually moves to, and is sold by, insurers in the admitted market. For example, private flood insurance was developed and first offered in the nonadmitted market but now also is offered in the admitted market.

The nonadmitted market is generally regulated somewhat differently than the admitted market. According to NAIC, surplus lines insurers are subject to regulatory requirements and are overseen for solvency by their domiciliary state or country, but surplus lines transactions are regulated through the licensing of surplus lines brokers. NAIC states these brokers are responsible for ensuring that the surplus lines insurer meets eligibility criteria to write policies in the state and is financially sound. Furthermore, NAIC notes surplus lines brokers and producers must be licensed to sell surplus lines insurance in each state in which they operate. State insurance departments may have authority to suspend, revoke, or not renew the license of a surplus lines broker or producer. Unlike admitted insurers, surplus lines insurers may not have access to state guaranty funds that are available to help pay claims in the event of an insurer insolvency. In addition, according to NAIC, surplus lines insurers generally have more freedom to change policy coverages and premium rates than admitted insurers. NAIC stated that state regulators require both nonadmitted and admitted insurance companies to maintain specific levels of capital to continue to conduct business. According to NAIC, most state insurance regulators also can use their authorities under state statues such as an unfair trade practices act to ensure consumers are protected (for example, to ensure that claims are paid and insurers or brokers do not misrepresent policy terms) and to remedy other bad conduct.[14]

[14]NAIC's model Unfair Trade Practices Act prohibits a number of specifically defined unfair trade practices if they are committed fragrantly and in conscious disregard of the Act or any rules implementing the Act, or have been committed with such frequency to indicate a general business practice. Under the model law, if, after a hearing, the state insurance commissioner finds a violation of the Act, the commissioner is to file a cease and desist order and may at their discretion impose a limited monetary penalty or suspend or revoke the insurer's license. See NAT'L ASS'N OF INS. COMM'RS, UNFAIR TRADE PRACTICES ACT, MDL-880-1, §§ 3, 8, 11 (2004).

Other Participants in the Regulatory Framework for Insurance

NAIC assists state regulators with various oversight functions. While NAIC does not regulate insurers, it provides services designed to make certain interactions between insurers and regulators more efficient. These services include providing detailed insurance data to help regulators understand insurance sales and practices; maintaining a range of databases useful to regulators; and coordinating regulatory efforts by providing guidance, model laws and regulations, and information-sharing tools.

The Federal Insurance Office was established in the Department of the Treasury (Treasury) by the Dodd-Frank Wall Street Reform and Consumer Protection Act.[15] The office is headed by a director appointed by the Secretary of the Treasury. The Federal Insurance Office monitors all aspects of the insurance industry (including by identifying issues or gaps in insurance regulation that could contribute to systemic risk in the insurance industry), and helps develop federal policy on international insurance matters, but is not a regulatory agency itself. The office also serves as an information resource for the federal government and coordinates with federal regulators, state insurance regulators, and NAIC. The Federal Insurance Office also represents the United States in the International Association of Insurance Supervisors and coordinates federal efforts in international insurance matters.

[15]Pub. L. No. 111-203, § 502, 124 Stat. 1376, 1580 (2010), codified at 31 U.S.C. § 313. The Dodd-Frank Wall Street Reform and Consumer Protection Act also requires the Secretary of the Treasury to advise the President on major domestic and international prudential policy issues in connection with all lines of insurance except health insurance. *Id.* at § 502(b)(3), codified at 31 U.S.C. § 321(a)(9).

Emerging Use of Technologies Can Reduce Insurance Costs and Expand Product Choices but Creates Privacy and Other Challenges

In recent years, the insurance industry has begun to adopt several types of technology that are designed to provide a range of benefits to insurers and consumers (policyholders), including improved risk monitoring, reduced costs, and improved underwriting.[16] However, the use of these technologies also can create challenges for insurers and potential risks for consumers, including changed business models, pricing fairness, and privacy issues.

Insurance Industry Increasingly Using Mobile Apps, Big Data, and Other Technologies

Based on our literature review and interviews with stakeholders, we identified six key technologies that have seen increased use in the insurance industry in recent years and one technology (blockchain) that has seen limited adoption and which the industry has been exploring for wider use.[17]

- **Mobile apps.** A mobile app is software designed to run on a mobile device, such as a smartphone or tablet computer. Insurance industry stakeholders told us that several insurers have adopted mobile apps to make their products and services available on mobile devices. For example, insurers have adopted mobile apps that allow consumers to purchase products online. An increased number of insurers in recent years also have adopted mobile apps that allow customers to complete tasks online such as submitting insurance claims and turning on-demand insurance coverage on or off. Insurers also have been using mobile apps to capture consumer data and usage patterns (behaviors).
- **AI, algorithms, and machine learning.** AI is the development of computer systems to perform tasks and make decisions that historically have required human intelligence to perform. Machine learning is a subset of AI and focuses on the ability of machines to

[16]Insurance underwriting is the process of evaluating a consumer's risk using specific data and information provided by the consumer, as well as other relevant information, determining the rate associated with the risk, and deciding whether to accept the risk and insure the consumer.

[17]Insurance industry participants may be applying technology to other uses beyond those we identify in this report, but we focused on those that our interviewees and the literature we reviewed most often identified. For example, peer-to-peer lending utilizing block-chain technology was mentioned in some articles, but not by our interviewees.

receive a set of data and learn for themselves, changing algorithms as they learn more about the information they process. (Algorithms are sets of rules that a computer or computer program follows to compute an outcome.) In the insurance industry, AI includes applications that provide specific expertise or allow for task completion. For example, AI provides on-line "chatbots" (sometimes called robo-advisory services) that answer questions specific to an insurance product or service.[18] When a consumer communicates with a chatbot, the chatbot takes the information the consumer provided and enters it into an algorithm. Based on protocols outlined in the algorithm, the chatbot provides a response to the consumer's question. As the conversation moves forward, the chatbot will adapt to answer more questions using machine learning in real-time. According to insurance industry stakeholders, insurers have been using algorithms to analyze information obtained from other technology sources to determine what a consumer's risk profile is and then determine the consumer's premium rate based on their risk profile.

- **Big data.** Big data are large volumes of data (often aggregated from multiple sources to develop data sets). As we have noted in other work, big data are frequently analyzed using predictive analytics, machine learning, and data mining to identify trends, patterns and characteristics.[19] The insurance industry uses big data in several ways, including analyzing consumer information, identifying risk patterns and pricing risk, and analyzing information related to risk pooling. Insurers also use big data to streamline and more accurately underwrite products. For instance, an insurer may use big data to determine whether consumers are high- or low-risk based on factors identified from extensive datasets such as what they purchase online or how they shop for insurance online. This is similar to lenders' usage of big data. In a previous report, we noted that lenders were

[18]In a prior report (presenting results of a forum GAO held to discuss AI), we described a chatbot as a program that interacts directly with users through a natural language process in a free-form conversation. We also noted AI had no single universally accepted definition. For instance, researchers have distinguished between narrow AI (applications that provide domain-specific expertise or task completion) and general AI (applications that exhibit intelligence comparable to a human). See GAO-18-142SP. This report focuses on narrow AI applications.

[19]American Academy of Actuaries, *Big Data and the Role of the Actuary* (Washington, D.C.: 2018). We examined issues surrounding big data and the use of algorithms in decision making. See GAO-16-659SP.

using big data to evaluate risk and make lending decisions using real-time nontraditional information gathered from social media sites.[20]

- **Internet of things.** The internet of things refers to semi-autonomous and internet-capable devices (such as machinery, home appliances, thermostats, and smartphones) that have sensors that interact with the physical environment and typically contain elements for processing and communicating information.[21] Some insurers stated that the internet of things could be used in the insurance industry to track and reduce risk, detect problems, and mitigate potential claims. For example, a homeowner could have a smart home thermostat that sends alerts when the power goes off and indoor temperature decreases. With the homeowner able to address the issue in real time, the homeowner could mitigate the risk of frozen pipes bursting and potentially prevent a loss and an insurance claim. According to CBInsights, insurers have partnered with insurtech firms that provide this technology to offer real-time monitoring.[22]
- **Drones.** Drones are remotely piloted aircraft systems. Insurers have been using drones for a variety of purposes in the insurance industry. For example, insurers use drones to obtain aerial footage over a disaster area to determine the amount of damage to a house or crop field. Insurance companies also use drones to verify information submitted by a policyholder in a claim or help determine the risk presented by difficult-to-reach areas of a property, such as a roof.
- **Telematics.** Telematics combines telecommunications and information processing to send, receive, and store information related to specific items such as automobiles or water heaters. Telematics often uses sensors to relay information such as global positioning system location, speed, and water levels. For example, sensors in an automobile can provide data on a driver's behavior (such as speed, hard braking, and turning radius). The insurer may use that information to determine the driver's risk profile and help determine the premium rate for that driver.

These technologies can be used together. For example, a telematics device can be used to provide data to a mobile app, which can then send

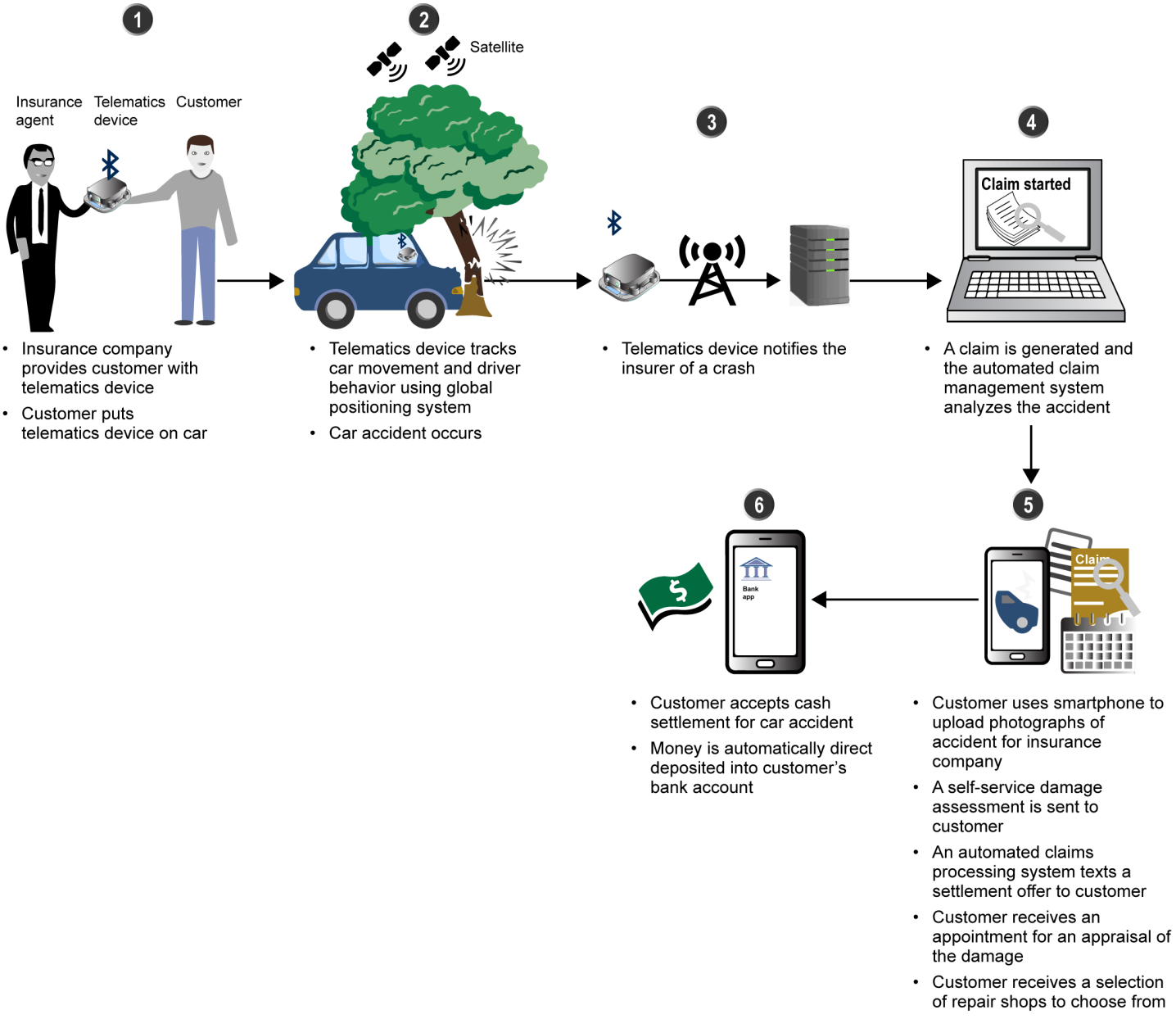
[20]See GAO-16-659SP.

[21]GAO, *Internet of Things: Enhanced Assessment and Guidance Are Needed to Address Security Risks in DOD*, GAO-17-668 (Washington, D.C.: July 27, 2017).

[22]CBInsights, *How Major Insurers Are Teaming Up with Internet of Things Companies in One Infographic* (Dec. 7, 2015).

the information to an AI algorithm to determine whether a claim should be paid. See figure 1 for examples of the types of technologies that insurers may use to automate the claims process.

Figure 1: Examples of How Technology Can Automate the Automobile Claim Process



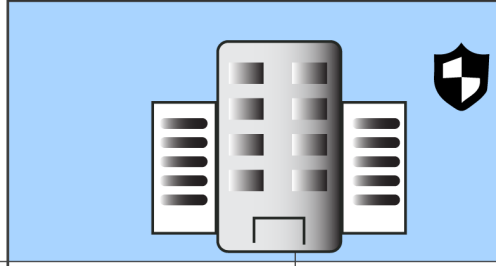
Source: GAO. | GAO-19-423

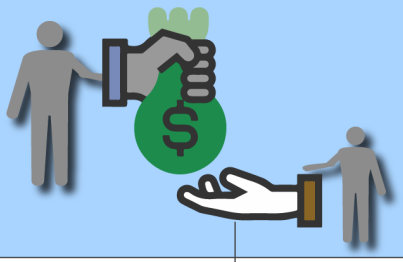
- **Blockchain/ distributed ledger technology and smart contracts.** The insurance industry has been studying whether blockchain technology could be used to improve insurance processes. Blockchain refers to a type of distributed ledger technology—in which multiple entities and locations share and synchronize datasets—that facilitates and permanently records virtual transactions. Information is uploaded and recorded in a series of secured blocks; the information uploaded cannot be modified or erased once uploaded into the blockchain (thus providing an accurate history of specific transactions and information). According to insurers, blockchain could be used by the industry to track insurance coverage history, expedite the claims process, provide an audit trail of insurance transactions, and address cybersecurity issues. For instance, a blockchain could expedite the claims process by allowing agents, policyholders, and repair companies immediate, secure access to certain data that are part of the claim only as the data are needed. “Smart contracts” include provisions for contract performance that can be executed by a computer algorithm (for instance, on a blockchain). For example, an insurer stated that a smart contract for homeowners insurance might stipulate that if an earthquake of a specific size occurred in a policyholder’s residential area, a claim payment for damage in a specified dollar amount automatically would be made from the insurer to the policyholder. According to NAIC, adoption of blockchain technology in insurance is limited at this time.

Technologies Can Create Benefits but Also Present Risks to Insurers and Consumers

According to stakeholders with whom we spoke and literature we reviewed, the use of technology in the insurance industry creates potential benefits but also can create risks for both insurers and consumers. We present stakeholder views on the benefits and challenges technology presents in the primary areas they identified as being affected by technology, which include (1) pricing and risk evaluation, (2) consumer protection, (3) business operations and risk monitoring, and (4) product offerings. See figure 2 for a summary of the potential benefits and challenges we discuss.

Figure 2: Potential Benefits and Challenges Technologies Present for Insurers and Consumers





Insurance area affected by technologies	Insurers: Potential benefits	Insurers: Potential risks	Consumers: Potential benefits	Consumers: Potential risks
Pricing and risk evaluation	✓ Increased underwriting accuracy ✓ More individualized pricing	✗ Validating consumer data and models	✓ More individualized, risk-based pricing	✗ Quality of data used in pricing ✗ Decreased pooling of risk
Consumer protection		✗ Protecting consumer data		✗ Consumer privacy concerns ✗ Consumer protection concerns
Business operations and risk monitoring	✓ Reduced costs ✓ Improved risk monitoring	✗ Connecting to legacy computer systems ✗ Changing roles for insurers and agents		
Product offerings	✓ Ability to offer on-demand products		✓ Increased convenience ✓ Increased consumer choice	

Source: GAO analysis. | GAO-19-423

Pricing and Risk Evaluation

According to stakeholders we interviewed and literature we reviewed, the use of technology for determining insurance pricing and coverages creates several benefits and risks for insurers and consumers:

- **Increased underwriting accuracy.** Insurers and others told us that insurers have been using technologies that provide enhanced analytic capabilities or data from previously unavailable sources to increase the accuracy of underwriting. These technologies allow insurers to make new connections between policyholder characteristics and risk. That is, insurers are using big data, AI, and algorithms to obtain and

analyze more information about consumers than they previously had been able to obtain. For instance, a property/casualty insurer could collect data on when consumers set their home alarms and use this and other risk information to refine risk determinations for those individuals. Another example is when insurers use data collected from telematics devices in automobiles to inform the insurer about the policyholder's risk of being involved in an accident. A better understanding of the risk presented by policyholders can help insurers more accurately and effectively price and manage risks.

- **More individualized pricing.** Insurers also have been using technologies to underwrite policies in a way that results in more individualized pricing, which benefits insurers and could benefit some consumers. That is, big data can allow an insurer to use factors for which traditional underwriting typically has not accounted.[23] According to stakeholders we interviewed, doing so allows an insurer to place an individual in a smaller risk pool than if traditional underwriting factors were used and to price coverage for that individual more in line with the risk that individual presents. This can help an insurer better manage its level of risk by offering lower prices to lower-risk customers, charging more for higher-risk customers, or even declining to offer coverage to consumers it considers high-risk.

Some stakeholders told us that technologies allow consumers to receive more individualized premium rates, based on their risk characteristics, than had been possible. For example, some insurers have been using telematics devices to obtain information on policyholder driving habits and the risk level they present and adjust premium rates based on this information. As a result, consumers who engage in safer driving practices receive the benefit of lower premiums. Policyholders also could use such information to take actions that will lower their risk level and therefore their premiums. For instance, consumers could seek to reduce specific driving behaviors, such as fast stops or starts, which negatively affect their premium rate. However, consumers with higher-than-average risks could end up paying more or perhaps be declined coverage.

[23]According to the World Bank, after identifying risks, an underwriter will classify the insured into the appropriate risk class. Classifying risk into classes allows the insurance company to determine the appropriate premium rate that should be charged. Not differentiating risk classes would result in some insureds being charged too much premium while others would be "cross-subsidized" (they would be charged less than the actual cost for insurance). In a competitive market, this cross subsidy creates a serious competitive disadvantage for the insurance company.

Stakeholders including an industry representative and a law firm in the field indicated that insurers also might use data to exclude high-risk consumers from marketing. For example, an insurer might not choose to market to high-risk consumers to discourage them from buying their insurance. This approach, in theory, helps insurers decrease the number of high-risk policyholders they insure but could create difficulties for some seeking coverage.

Two industry representatives and an academic in the field indicated that the potential for decreased risk pooling creates a difficult question about the minimum extent of pooling that is socially desirable. For example, these stakeholders stated that when insurance underwriting becomes too individualized, it might no longer serve an insurance function; that is, there is very little pooling of risk. They stated it may be a desirable social benefit to have a certain level of risk pooling to allow more people to effectively manage their risk. In a November 2018 issue paper, the International Association of Insurance Supervisors noted the potential effect of more individualized underwriting on the fairness of consumer outcomes. Among other findings, the paper noted the collection of more data on policyholders may enable a more specific risk categorization that could affect risk pooling principles and lead to issues around affordability of certain insurance products or even availability (the potential for exclusion).[24] The association noted that insurance supervisors should monitor whether such negative consumer impacts become a trend and, if so, raise awareness at the appropriate policy and political level(s).[25]

- **Validating consumer data and models.** Insurers and insurtech firms increasingly have been using AI and data collection algorithms to gather data through mobile, wearable, and other internet-connected devices and from online sites. According to two academics in the field, collecting consumer data in large quantities and from multiple disparate sources, including social media, poses challenges for insurers in relation to validating those data. Insurers and insurtech firms also face challenges associated with validating models that use the data. Although AI and machine learning can help insurers and agents underwrite risk more accurately, these stakeholders said that

[24]International Association of Insurance Supervisors, *Issues Paper on Increasing Digitalisation in Insurance and its Potential Impact on Consumer Outcomes* (Basel, Switzerland: November 2018).

[25]International Association of Insurance Supervisors, *FinTech Developments in the Insurance Industry* (Basel, Switzerland: February 2017).

these tools and processes can increase risk because the collected information may be inaccurate or inappropriately used in determining premium rates. For example, while models may indicate that certain factors developed by AI from social media and other sources are associated with increased policyholder risk, it may be difficult or impossible for insurers to validate the accuracy of such data.

In addition, it can be a challenge for insurers to ensure that the use of such data and models does not result in the use of prohibited factors in determining premium rates, such as race or sex.[26] For example, several stakeholders told us that certain factors, while not specifically disallowed by insurance regulations, could end up serving as a proxy for a disallowed factor. One example cited by a stakeholder was the use of information on consumer magazine subscriptions, which are not prohibited on their own, but could serve as proxies for factors that are prohibited.

Finally, it can be a challenge for insurers to document and explain to regulators how rating models that use AI and machine learning work and provide assurance that the rates produced by the models are not unfairly discriminatory toward policyholders. [27] For example, some industry stakeholders we interviewed said that these models are often developed by data scientists and not actuaries, as had been the case in the past. Unlike actuaries, they said data scientists who develop rating models may not fully understand insurance-specific requirements, such as setting premium rates that are not unfairly discriminatory, and may struggle to measure the impact of new variables used in the models. Furthermore, data scientists may be unfamiliar with insurance rules and regulations and may not understand how to communicate their work to state insurance regulators. One regulator described to us how one insurance company was unable to explain how one of the factors that it entered into its advanced risk model—proximity of a home to a day care center—related

[26]For example, NAIC Model Law 880 defines unfair discrimination as, in part, refusing to insure, refusing to continue to insure, or limiting the amount of coverage available to an individual because of the sex, marital status, race, religion or national origin of the individual. See NAT'L ASS'N OF INS. COMM'RS, UNFAIR TRADE PRACTICES ACT, MDL-880-1, § 4 (2004).

[27]For an example of how insurance underwriting can lead to unfair discrimination against policyholders, see New York Department of Financial Services, *RE: Use of External Consumer Data and Information Sources in Underwriting for Life Insurance*, Insurance Circular Letter No. 1 (Jan. 18, 2019); accessed at https://www.dfs.ny.gov/industry_guidance/circular_letters/cl2019_01.

to the risk that a consumer posed. An actuarial group suggested a greater collaboration between actuaries and data scientists could provide greater assurance that such rating models meet regulatory requirements.

- **Quality of data used in pricing.** According to some stakeholders, insurers' use of nontraditional data and AI to develop insurance pricing models creates two potential risks for consumers that parallel some of the risks for insurers. First, as previously mentioned, insurer's use of nontraditional data and AI can create a risk that factors unrelated to the risk presented by a consumer could be used to set his or her premium rate. Stakeholders including a regulator said that algorithms or big data may allow insurers to correlate certain factors with higher claim rates, although the factors do not actually relate to risk and may even act as a proxy for a prohibited factor such as race or sex. As a result, some stakeholders noted that using such information to determine a premium rate could be unfairly discriminatory. Some stakeholders also said that such factors unintentionally could become proxies for prohibited rating factors—such as race. For example, using information on a consumer's purchase history could serve as a proxy for race.

Second, some stakeholders indicated that when insurers use AI to generate information on consumers, it is difficult to ensure these data are accurate. Because the data were not explicitly provided by the consumer, the consumer does not have a chance to correct or dispute the data. For example, if an insurer uses AI to pull data from a consumer's social media accounts, those data could be incorrect or outdated, but the consumer would not know the data were being used as a factor in determining his or her premium rate. This would prevent the consumer from correcting the information if it was wrong. Some stakeholders indicated that if an insurer has difficulty understanding the factors and algorithms being used to price the insurance product, the consumer most likely will not be able to understand them.

Consumer Protection

According to stakeholders with whom we spoke and literature we reviewed, some uses of technology can pose risks in terms of the protection of consumer data. In addition, the use of the nonadmitted market by insurtech companies and insurers may result in more limited financial protections for consumers.

- **Cost of protecting consumer data.** As noted earlier, insurers collect and use consumer data in large quantities and from multiple disparate sources, including social media, posing challenges for protecting those data. For example, according to representatives of one

property/casualty industry association we interviewed, it can be expensive to maintain the appropriate level of cybersecurity (including technical and organizational measures) to prevent any unauthorized access or use of the additional volumes and types of customer information used in recent years.

- **Consumer privacy concerns.** Stakeholders noted that insurers' expanded use of consumer data raises concerns about the privacy of such data. For example, an automobile insurer may collect data on a consumer using a telematics device installed in the consumer's vehicle. While an insurer may use data on the consumer's driving habits for the purpose of adjusting premium rates, the device also may collect information on where and when a consumer drives. This is information consumers may not wish others to possess.[28]

  One academic also said there is concern about the ownership of the data collected through telematics and other technologies, such as AI, for the purposes of insurance. For instance, if an insurer obtained data from a policyholder's automobile with a telematics device, a question exists about whether policyholders would have the right to take those data to another insurer if they switched insurers or whether the data belong to the first insurer. As we have described in other work, this presents a larger privacy issue as it may not be possible for a consumer to know exactly what is collected, or when and how the data are used.[29] This lack of knowledge reduces the consumer's control over their personal information and limits their ability to track what data belong to them.

  Some stakeholders mentioned concerns about insurers collecting information from social media and other sources that consumers did not explicitly consent to provide to insurers. The European Union (EU) General Data Protection Regulation, which includes regulations governing consumer consent, had an entry into force and application date of May 25, 2018.[30] According to an industry analyst, the General Data Protection Regulation applies to insurance companies around

[28]Consumers may not fully understand, anticipate, or consent to the end-user agreements or privacy statements related to data privacy or understand how the information collected from a telematics device could be used, shared, or sold. See GAO, *Vehicle Data Privacy: Industry and Federal Efforts Under Way, but NHTSA Needs to Define Its Role,* GAO-17-656 (Washington, D.C.: July 28, 2017): 24.

[29]GAO-17-656.

[30]See "Regulation (EU) 2016/679, Article 99, of the European Parliament and of the Council of April 27, 2016,"*Official Journal of the European Union*, L 119 (May 4, 2016).

the world, including those in the United States, that process the personal data of EU residents, regardless of the nationality of the person in question or the location of the company.[31] Furthermore, the analyst notes that the regulation strictly defines legal uses of individuals' data and requires companies to ensure individuals can explicitly and individually consent to other uses of their data.[32] In prior reports, we also noted data privacy concerns in relation to lender use of financial technology.[33]

- **Consumer protection concerns due to use of the nonadmitted market**. The nonadmitted market is a common entry point for insurtech firms because of that market's usefulness for innovative insurance products with little loss history. However, the sale of consumer insurance through nonadmitted insurers raised concerns among several stakeholders. As we noted in a prior report, nonadmitted insurers may face fewer regulatory constraints than traditional insurers in the prices they can charge and their ability to create and offer new products.[34] While data do not exist on the number of insurtechs using the nonadmitted market, industry representatives told us that because of this greater regulatory freedom, a number of insurtechs choose to operate as nonadmitted insurers or as brokers selling policies through nonadmitted insurers. As described in the Background, when consumers purchase insurance from nonadmitted insurers, they do not have some of the same consumer protections they would have if they purchased

[31]See Mitchell Wein, "GDPR for North American Insurers," *CIPR Newsletter* (NAIC Center for Insurance Policy and Research: January 2019): 7.

[32]See Regulation 2016/679. As stated in Article 6(1), "[p]rocessing shall be lawful only if and to the extent that at least one of the following applies: (a) the data subject has given consent to the processing of his or her personal data for one or more specific purposes; (b) processing is necessary for the performance of a contract to which the data subject is party or in order to take steps at the request of the data subject prior to entering into a contract; (c) processing is necessary for compliance with a legal obligation to which the controller is subject; (d) processing is necessary in order to protect the vital interests of the data subject or of another natural person; (e) processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller; (f) processing is necessary for the purposes of the legitimate interests pursued by the controller or by a third party, except where such interests are overridden by the interests or fundamental rights and freedoms of the data subject which require protection of personal data, in particular where the data subject is a child."

[33]GAO-19-111.

[34]To help insurers operate in this environment, regulators generally provide nonadmitted insurers with greater pricing flexibility. See GAO-14-136.

coverage from an admitted insurer. For example, regulators conduct limited reviews of the prices charged and the products sold by nonadmitted insurers. And as noted earlier, if nonadmitted insurers became insolvent, state guaranty funds may not be available to help pay policyholder claims.

As we previously reported, some regulations serve to push potential policyholders toward the admitted market because of the better financial protections it provides (such as rate approvals and access to state guaranty funds).[35] For example, as noted earlier, a broker placing coverage with a nonadmitted insurer generally must conduct a diligent search for available coverage in the admitted market every time a potential policyholder requests coverage in the nonadmitted market. This helps ensure coverage is purchased from an admitted insurer as often as possible.

Stakeholders offered differing assessments on the extent of any related risks to consumers resulting from insurtech use of the nonadmitted market. For example, an industry representative said the nonadmitted market is not appropriate for most consumer products because of the lower consumer protections as compared with the admitted market. Two insurtech firms also have raised questions about the ability of insurtech companies and other market participants to properly comply with diligent search requirements. For example, an industry representative told us it does not seem possible to satisfy the diligent search requirement when products are sold on-demand through a mobile app. Furthermore, the representative raised the question of how a broker could legitimately search the admitted market for coverage in cases in which an insurer offers immediate coverage as soon as consumers complete applications on their smartphones.

Conversely, some insurers, regulators, and NAIC said that nonadmitted insurers are appropriately regulated and consumers are not necessarily at any greater risk than when purchasing coverage from admitted insurers. Also, several states have eliminated the diligent search requirements. However, a consumer advocate noted that such deregulation raises further consumer protection issues in a market where less regulation is already a concern for consumers.

Business Operations and Risk Monitoring

[35]GAO-14-136.

According to the literature we reviewed and stakeholders we interviewed, insurers have been using various technologies to reduce their operating costs but may face risks that affect their operations and business models.

- **Reduced costs.** Stakeholders described how adopting various technologies has led to reduced costs in four operational areas for insurers:

  Communicating with customers. Insurers have been using mobile apps and chatbots to reduce the cost of providing information to potential customers. For example, a consumer might be shopping online for an insurance policy late in the evening. The insurer can use a chatbot to interact with that consumer and answer questions about insurance products. In the past, this might not have been possible if an agent was not available to work nonstandard business hours or insurers might have needed to hire and retain more agents to work evenings and weekends.

  Underwriting. Insurers have been using technology to reduce the cost of underwriting insurance. For example, according to two insurtech firms and one industry representative we interviewed, some insurers review multiple sources of data with AI to automatically review the information in a consumer's insurance application, rather than incurring the costs of hiring staff to do so. Through the industry article review and stakeholder interviews, we found that insurers also use the internet of things to obtain data from smart home alarms to monitor consumer usage of alarm systems and thereby assess consumer risk levels. This reduces the costs associated with determining and analyzing risk factors.

  Claims processing. According to some stakeholders we interviewed, insurers now have the capability to digitally collect and automatically analyze claim evidence, thereby reducing staffing needs and realizing cost savings. For example, consumers can use their smartphones to take photographs of their vehicles after an accident and send the photographs and other information to their insurers through mobile apps. On receipt of the photographs, insurers can use AI algorithms to verify the damage shown—decisions that historically required human intelligence to perform—and automatically start the claims process for the consumer.

  Fraud. Insurers are able to detect fraud, or decide which claims need to be investigated further by employees, with information verified

using big data, the internet of things, and telematics.[36] For instance, an insurer may verify information provided in a claim against information obtained from a smart device to determine if the information provided by the policyholder was accurate. An insurer also might identify a false burglary claim by verifying whether an alarm was set during the time frame identified in the claim and reviewing video from home security cameras.

- **Connecting to legacy computer systems.** Some industry stakeholders and association representatives we interviewed stated that established insurers face significant challenges using new technologies because they first have to replace legacy computer systems or customize their systems to interface with new technologies properly. According to industry stakeholders, legacy computer systems were, in some ways, built around satisfying regulatory requirements rather than enhancing the consumer experience or providing more desirable products. They noted it can be costly and difficult to replace such systems or to modify them to interface with more consumer-centered systems, such as those being developed by insurtech companies.
- **Changing roles for insurers and agents.** According to some insurance industry stakeholders, emerging uses of key technologies and innovative business models could lead to changes in insurers' roles and products. For example, with the advent of self-driving vehicles, the liability for accidents could shift from the driver to the vehicle maker or the company that produced the self-driving system. In such cases, they said insurance coverage primarily would be sold to those entities rather than the consumer, and the demand for and amount of consumer automobile coverage sold could decrease substantially. This could cause a shift in demand for products from consumers to commercial lines, resulting in the potential loss of business for some agents and insurers. Some industry stakeholders we interviewed also told us that as more technologies (such as telematics or other smart devices) were adopted to help consumers mitigate risk, insurers likely would have to shift their business model. That is, they would have to move from a model focused on sales of policies, in which agents play a central role, to a model focused on

[36]Fraud can occur when policyholders provide false information to their insurer when making a claim. According to the Federal Bureau of Investigation, the estimated total cost of insurance fraud (for nonhealth insurance) is more than $40 billion a year. Federal Bureau of Investigation, *Insurance Fraud*, accessed December 31, 2018, https://www.fbi.gov/stats-services/publications/insurance-fraud.

providing consulting services to consumers to help them prevent and mitigate risk and loss.

- **Risk monitoring.** Insurers have been using big data with data aggregation and mining to improve monitoring of insured risks. More specifically, several stakeholders told us that these tools and analytical methods can help insurers quickly analyze volumes of data from many sources in or near real time. For example, several stakeholders gave the example of an insurance company using sensors or other devices to continuously collect verified data on movements of insured ships and their cargo. Such data can be useful to insurers for understanding the risks associated with providing insurance coverage and even can be used to provide the ship carrying the cargo the appropriate insurance documentation required for the port of entry. Several stakeholders also told us that some insurtech companies have been using telematics to collect real-time data on driver behavior, which they combine with other information such as credit scores, to develop a fuller and more accurate picture of the risk presented by a given policyholder. Insurers then can use these risk profiles to determine whether to change a policyholder's rates or continue to insure them. Several stakeholders indicated that such real-time information is likely more accurate than previous risk-assessment methods.

Product Offerings

According to stakeholders we interviewed and literature we reviewed, the use of various technologies to create new product offerings has created several benefits for insurers and consumers.

- **Ability to offer on-demand products**. Technologies have been helping insurers tailor products to specific consumer needs and expand offerings to niche markets. Some insurtech companies have started offering on-demand insurance (insurance that policyholders can turn on and off as needed). For example, one regulator and an academic said that market research data demonstrated that consumers want to be able to turn on insurance for their drones when the drones are in use and turn it off when the drones are idle. Insurers also have been developing similar on-demand products for drivers working for rideshare companies such as Lyft and Uber and for Airbnb and VRBO rentals (to cover the gaps that traditional homeowners insurance, which generally provides coverage on a long-term basis, might have in relation to short-term rentals of homeowners' properties). On-demand products allow insurers to diversify their product lines and attract more consumers, which is discussed later in this report.

- **Increased convenience.** With some insurers providing mobile apps and chatbots, consumers are able to access insurance products and information 24 hours a day. For example, consumers can use mobile apps to get immediate quotes and underwriting decisions from some insurers. In the past, consumers likely would have had to visit an insurance agent or fill out a lengthy application and wait much longer for an underwriting decision. And as previously discussed, some insurers allow their policyholders to submit claim information and photographs of damage through a mobile app without speaking with an agent.
- **Increased consumer choice.** According to NAIC and an insurtech firm, consumers can benefit from the increased choice that comes from insurers using technology to offer additional products and services. For example, consumers obtain the ability to purchase insurance for certain time periods for certain items such as drones and action cameras, home sharing, or mile-based automobile insurance. NAIC and the insurtech firm said that some insurers that offer insurance to rideshare operators allow the policyholders to turn the coverage on when they are working and off when they are not. This can reduce premium rates for policyholders who only occasionally work as rideshare drivers.

According to the industry articles we reviewed and the stakeholders with whom we spoke, insurers' use of technology also has benefitted consumers by leading to the development of aggregator websites that bring together quotes from multiple insurers and allow consumers to comparison shop for insurance products. Some insurers said technology may soon give consumers the added ability to further customize their insurance policies by allowing them to select among various available coverages and terms and essentially create a policy that best suits their needs.

NAIC and State Regulators Initiated Actions to Address Challenges That Stakeholders Said Could Affect Adoption of Technologies

NAIC, state regulators, and others have initiated a number of actions intended to monitor and address industry and regulator concerns associated with insurtech, including any insurance rules and regulations that could affect insurers' adoption of technologies. These actions address challenges in areas including (1) evaluation of underwriting methodologies, (2) approvals for new insurance products, (3) customer notification methods and time frames, (4) anti-rebating laws, (5) cybersecurity, and (6) regulator skillsets and resources.

NAIC and State Regulators Have Taken Actions Designed to Monitor Insurtech Concerns and Maintain Insurer Oversight and Consumer Protection

NAIC and state regulators have initiated a number of actions intended to monitor concerns that regulations could affect insurers' adoption of innovative technologies while maintaining oversight of consumer protection issues. First, to monitor technology developments that may affect the state insurance regulatory framework and to develop regulatory guidance, as appropriate, NAIC created an Innovation and Technology Task Force. According to NAIC, this task force provides a forum for regulator education and discussion of innovation and technology in the insurance sector. For example, the task force has held discussions on the collection and use of data by insurers and state insurance regulators—as well as new products, services, and distribution platforms—to educate the regulators on how these developments affect consumer protection, privacy, insurer and producer oversight, marketplace dynamics, and the state-based insurance regulatory framework. In addition, the task force has held forums on emerging issues related to companies or licensees leveraging new technologies. Areas discussed included developing products for on-demand insurance purposes, reviewing new products and technologies affecting the insurance space, and potential implications for the state-based insurance regulatory structure.

In addition, in 2012 the EU-U.S. Insurance Dialogue Project was formed, in which EU and U.S. insurance regulators discuss emerging technology issues in the international insurance industry.[37] During the project's sixth

[37]The EU-U.S. Insurance Dialogue Project began in early 2012 as an initiative by the European Commission, the European Insurance and Occupational Pensions Authority, the Federal Insurance Office, and NAIC to enhance mutual understanding and cooperation between the European Union and the United States for the benefit of insurance consumers, business opportunity, and effective supervision. The Board of Governors of the Federal Reserve System has since joined the project.

forum in November 2018, the regulators and representatives from industry and consumer organizations discussed challenges and opportunities relating to issues including cyber risks, the use of big data, and AI. According to a project publication, the dialogue project enhanced mutual understanding of respective regulatory frameworks and initiatives between the United States and European Union, which will help ensure effective coordinated supervision of cross-border insurance groups for the benefit of policyholders.[38] In 2018, the project published an issues paper on big data.[39] The paper discusses data collection, portability, quality, and availability and how insurers and third parties use data in marketing, rating, underwriting, and claims handling. Future work by the project may include discussion of insurers' use of third-party vendors, disclosures to applicants, and insurers' use of AI models.

NAIC and State Regulators Initiated Actions to Address Specific Insurtech Challenges

NAIC and state regulators have initiated a number of actions intended to address industry and regulator concerns about certain insurance rules and regulations that a number of them said could affect insurers' adoption of technologies.

Evaluating Underwriting Methodologies That Use Technology

Stakeholders, including regulators, told us that regulators can face challenges in assessing new underwriting methodologies, such as those that use predictive analytics or AI. Reviewing predictive analytics can be a challenge for regulators because of the amount of data used to develop a model, the complexity of techniques, and limited staff resources (discussed in more detail later in this section). In addition, insurers employ different technological approaches, and their documentation and explanation of the methods and approaches differ. Finally, the data and models insurers use dynamically change and may have to be re-submitted for review even before regulators have an opportunity to review the original submission.

One state regulator and an industry stakeholder also told us that while an insurer may know the universe of factors from which an AI system pulls, the insurer may not know, or be able to describe for regulators, how the

[38]EU-U.S. Insurance Dialogue Project, *New Initiatives for 2017–2019: Focus Areas for 2018* (2018).

[39]EU-U.S. Insurance Dialogue Project, *Big Data Issue Paper* (Oct. 31, 2018).

system uses those factors to determine a premium rate. In turn, this may prevent regulators from understanding the system or validating the insurer's assertions about the system. For example, one state regulator told us that after presenting a rate scheme based on nontraditional factors, an insurer was unable to provide assurances or explanation to the regulator that the resulting premium rates were not unfairly discriminatory.

In 2018, NAIC's Casualty Actuarial and Statistical Task Force began developing a white paper on best practices state regulators can use when reviewing predictive models and analytics filed by insurers to justify rates and guidance they can use for their review of rate filings based on predictive models. NAIC officials told us the Casualty Actuarial and Statistical Task Force will receive comments on the white paper and then evaluate how to incorporate best practices into the Product Filing Review Handbook and recommend such changes to other NAIC working groups.

Approvals for New Products

Insurtech firms and other stakeholders told us that working through other regulatory processes, such as the insurance product filing and approval process, often can be inefficient and time consuming because insurers must file in every state in which they wish to sell a product and state requirements can vary. We have noted such difficulties in the insurance market in general.[40] These challenges can be exacerbated by rapid technological evolution in insurer products and risk models. In addition, some stakeholders noted that a lengthy product approval process can be challenging for technology-oriented products. For instance, an insurtech firm may develop a new product quickly to meet consumer demand but might not be able to get the product to market quickly. Some also said that products might become obsolete before the filing approval process was completed. Some stakeholders told us that such challenges can motivate insurtechs to sell insurance through nonadmitted insurers because such insurers have more freedom in altering and selling new products. As we have noted, doing so can bring risks for consumers.

In December 2017, the American Insurance Association proposed the Insurance Innovation Regulatory Variance or Waiver Act (Proposed

[40]See GAO, *Financial Regulation: Complex and Fragmented Structure Could Be Streamlined to Improve Effectiveness*, GAO-16-175 (Washington, D.C.: Feb. 25, 2016).

Model Law) to NAIC.[41] The proposed model law would urge allow regulators to create regulatory "sandboxes," wherein certain regulatory requirements would be waived for insurers seeking to pilot innovative products.[42] Specifically, the proposed model law would authorize insurance regulators to grant variances, waivers, or no-action letters with respect to statutory or regulatory requirements that make it more difficult to introduce new insurance technologies, products, or services. Under the proposed model law, regulators also would be authorized to attach terms and conditions meant to protect consumers to such variances or waivers.[43] Some stakeholders with whom we spoke believed that regulatory sandboxes would not work in the U.S. state-based regulatory framework. For example, some stakeholders told us it would be inappropriate for a state to change legal or regulatory requirements for some but not all insurers or grant exceptions to laws passed by a state legislature to some insurers and not others, as it would no longer be a level playing field.

State regulators generally told us they believe that the current regulatory framework provides state regulators with enough flexibility to allow for technology-based innovation. Accordingly, some states have been promoting the use of innovation in the insurance industry by hosting technology sandboxes, where technology companies meet regularly with state regulators to improve companies' knowledge of insurance regulations and also educate regulators about how the technologies work. According to stakeholders, these technology sandboxes are not the same as regulatory sandboxes that have been established in other nations, as they do not allow waivers of laws and regulations for insurtech companies to test their products.

Paper Notification Requirements

Insurtech firms we interviewed told us that regulations that require paper notifications and U.S. mail delivery for certain processes can make it difficult or more costly for them to offer products with features such as immediate underwriting or on-demand policies. For example, according to

[41]As of January 1, 2019, the American Insurance Association and the Property Casualty Insurers Association of America merged to form the American Property Casualty Insurance Association.

[42]Any model laws adopted by NAIC must be passed by individual state legislatures to be effective in a given state. State legislatures also may pass modified versions of model laws.

[43]As of May 2019, NAIC had not adopted the proposed model law.

insurers and other industry stakeholders, some state laws require that insurance policy cancellation notices be sent by U.S. mail rather than by email. One insurtech firm told us that it would be very costly to meet requirements for mail delivery of insurance policies and cancellation notices because they would have to set up another delivery mechanism (in addition to their electronic notification system).

Industry stakeholders also told us that certain laws and regulations that require a minimum period of time before a consumer-initiated policy cancellation takes effect can present challenges for products designed to allow consumers to immediately turn certain coverage on or off. For instance, if consumers used a mobile app to indicate they wanted to turn their automobile insurance coverage off temporarily, it could be unclear if this constituted an actual policy cancellation. Some stakeholders are concerned that states may require an insurance company to give the policyholder a written notice of cancellation at least 30 days before the end of the policy term. Similarly, industry stakeholders told us that some current state regulations could impede on-demand coverage because policies usually must indicate that coverage begins at 12:01 a.m. on the day after a policy is signed and approved. For instance, for on-demand policies that allow on/off subscription at the consumer's request, it can be unclear whether they are covered the minute that they initiate the coverage, or if they must wait until the following day for coverage to be effective.

According to NAIC, many states have taken steps to work within or modify existing laws and regulations to adapt to the increased use of technology in the insurance industry. For example, to address concerns that insurers are required to provide customers with a written, 30-day notice of a policy cancellation, NAIC conducted an analysis in 2018 that found that many states instead require "adequate" notice and that approximately 44 states allow notices to be provided electronically. However, some stakeholders in the insurance industry told us that state cancellation notice requirements are still a barrier to innovation.

Anti-Rebating Laws

According to industry stakeholders, many states have anti-rebating laws that generally prohibit insurers from providing consumers with anything of value as an inducement to purchase insurance. NAIC Model Law 880 states that unless expressly provided by law, no insurer may knowingly pay any rebate or incentive to an insured to induce them to purchase a

specific product.[44] Insurers, industry stakeholders, and regulators (including NAIC's Innovation and Technology Task Force) told us that anti-rebating laws can be a barrier to innovation because they could preclude insurers from offering devices that could be used to help insurers and consumers monitor risk. For example, if an insurer offered a policyholder free use of a telematic device (to help insurers collect real-time data and potentially help the policyholder make driving habits safer), it could be considered an inducement and violate anti-rebating laws. The same possibility exists if an insurer were to provide a policyholder with a device to monitor the operating conditions of a boiler to prevent potential water damage should a problem arise. As a result, anti-rebating laws may make it difficult for insurers to make use of certain technologies that could benefit both insurers and policyholders.[45]

In contrast to the consensus on the legitimacy of electronic communications, there is little consensus among states on addressing insurers' concern that anti-rebating laws are a barrier to innovation. According to NAIC, states vary widely on the types of items insurers are allowed to provide for free to customers, with some states having dollar limits on allowable items or allowing items that are specifically linked in a policy. In other cases, it is unclear what is allowable. At NAIC's fall 2018 meeting, participants noted that some of the NAIC bulletins related to the anti-rebating model law have not addressed whether technologies such as telematics that provide benefits to consumers are considered rebates. According to NAIC, others noted that states typically have taken the position that if a rebate or incentive reduces risk that is the most important issue for all parties involved. NAIC officials noted during the fall 2018 meeting that they will continue to monitor the issues involved.

Cybersecurity

NAIC adopted a model law and states have passed new laws governing cybersecurity and data protection to safeguard the increasing amount of personal data used by insurers. In 2017, NAIC approved the Insurance Data Security Model Law, which creates a legal framework for requiring insurance companies to operate cybersecurity programs.[46] The law

[44]NAT'L ASS'N OF INS. COMM'RS, UNFAIR TRADE PRACTICES ACT, MDL-880-1, § 4 (2004).

[45]Telematics and other devices typically involve investment on the part of insurers, consumers, or both. Cases of consumers having to make the investment to benefit from these technologies could raise the issue of insurance affordability, especially for low-income consumers, or potentially create a dual or segmented insurance market that could advantage high-income consumers.

[46]NAT'L ASS'N OF INS. COMM'RS, INSURANCE DATA SECURITY MODEL LAW, MDL-668-1 (2017).

outlines planned cybersecurity testing, creation of an information security program, and incident response plans for breach notification procedures. The NAIC model law is only a guideline until adopted by individual states, but NAIC noted that in 2018 and 2019, Michigan, Ohio, Mississippi, and Alabama adopted laws based on the NAIC model and additional states have pending legislation. In an October 2017 report, Treasury endorsed the model law and recommended that Congress consider preempting the states if the law were not adopted over the next 5 years.

At the state level, New York's Department of Financial Services noted it was the first state agency to establish cybersecurity regulations, which became effective March 1, 2017. In May 2018, South Carolina enacted the South Carolina Department of Insurance Data Security Act, which NAIC has characterized as an adoption of the model law. In December 2018, Michigan adopted a similar law. Separately, in June 2018 California passed a law giving consumers more control over their personal information.[47] California's law generally requires companies to report to customers, upon their request, the categories of personal information they collected about the customer, the business or commercial purpose for collecting and selling such personal information, and what categories of third parties received it.

Hiring and Retaining Staff with Technical Expertise

According to industry and regulatory stakeholders, the complexity and evolving nature of the models and approaches used by insurers may outpace the rate at which regulators can educate themselves on those models and approaches. For example, regulators trained in the current rating models may need to acquire new skills to understand and validate advanced and evolving models.

In addition, stakeholders told us that new technologies used by insurers can pose significant challenges to regulators partly because of the resource requirements. For instance, regulators and other stakeholders told us that regulators often do not have enough staff with technical expertise, such as data analytics skills, and find it challenging to hire and retain such staff due to limited resources.

NAIC has initiated actions to address concerns that state insurance regulators may not have staff with the knowledge or skill sets to address

[47]The California Consumer Privacy Act of 2018 is scheduled to take effect on January 1, 2020. See CAL. CIV. CODE § 1789.198(a) (2018).

more complex predictive models. For example, in 2018 NAIC management conducted a survey of states regarding the appropriate skills and potential resources NAIC membership may need to deal with big data. Subsequently, in April 2019, NAIC management made recommendations to its Big Data Working Group to hire a technical staff resource to provide technical support for state insurance regulators in the review of actuarial models; develop a tool for state insurance departments to share information on model reviews; and develop a training and education program. NAIC officials told us they also plan to develop a white paper to provide state regulators with guidance on the use of chatbots and AI in the distribution of insurance and the regulatory supervision of these technologies.

As many of the regulatory initiatives that NAIC and states have undertaken to address challenges associated with the implementation of new technologies are under development (or recently developed), the impact of these actions on innovation and consumer protection is unknown. It will be important for NAIC and state insurance regulators, as well as the Federal Insurance Office, to continue monitoring developments in these areas.

Agency and Third Party Comments

We provided a draft of this report to Treasury and NAIC for review and comment. Treasury and NAIC provided technical comments that we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of the Treasury, the Chief Executive Officer of the National Association of Insurance Commissioners, and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions concerning this report, please contact me at (202) 512-8678 or ortiza@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix II.

Anna Maria Ortiz
Acting Director, Financial Markets and
Community Investment

List of Requesters

The Honorable Patrick McHenry
Ranking Member
Financial Services Committee
House of Representatives

The Honorable Rick Allen
House of Representatives

The Honorable Earl L. “Buddy” Carter
House of Representatives

The Honorable Michael McCaul
House of Representatives

The Honorable Scott Tipton
House of Representatives

The Honorable Ann Wagner
House of Representatives

The Honorable Rob Woodall
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report (1) identifies uses of technologies and the benefits and challenges they might present for insurers and their customers, and (2) discusses what stakeholders identified as key challenges that could affect the adoption of new technologies, and actions that have been taken to address those challenges.

While insurance technology (insurtech) does not have a standard definition, for the purposes of this report we defined it as the use of emerging technologies by insurance companies. We focused on insurtech activities in the property/casualty and life sectors of the U.S. insurance market, including information on personal and commercial insurance where available. We did not include the health insurance sector in our scope because of significant differences between that sector and the property/casualty and life insurance sectors in terms of the types of products offered and the methods by which they are sold and regulated.

To identify technologies being used in the insurance industry and gain insights about their (potential) benefits and challenges for insurers and customers, we conducted a literature review of scholarly and peer-reviewed material, trade and industry articles, government reports, conference papers, general news, association, nonprofit, and think tank publications, hearings and transcripts, and working papers that described these technologies and their uses. We conducted searches of the ProQuest and HeinOnline databases to identify studies published from January 2015 through June 2018 that were relevant to our research objectives. Because insurtech is a fairly new field, we found few academic publications related to our objectives. We also conducted background research for examples of technologies being used in the insurance industry and their associated benefits and challenges.

We also conducted semi-structured interviews with cognizant stakeholders and reviewed documents provided by them to obtain information on and descriptions of current, in-development, and potential future uses of existing or new technology in the insurance industry. We also obtained their views on the benefits and challenges experienced or expected by insurance companies as well as the (potential) benefits and challenges for consumers. We conducted more than 35 interviews with representatives of regulatory organizations, including the Federal Insurance Office; National Association of Insurance Commissioners (NAIC); state insurance regulators in Arizona, California, Connecticut, and Michigan; and the National Council of Insurance Legislators. We also interviewed three academics, representatives of one consumer group, 13 traditional insurance and reinsurance providers and industry associations,

two actuarial professional associations, four consulting groups, two law firms in the field, and seven insurtech firms. We identified potential interviewees by conducting internet research, reviewing literature search results, and reviewing recommended interviewees from our initial interviews. We selected interviewees based on their relevance to the scope of our review. Based on our literature review and interviews with stakeholders, we identified seven recently used and emerging technologies in the insurance industry: (1) mobile applications; (2) artificial intelligence (AI), algorithms, and machine learning; (3) big data; (4) internet of things; (5) blockchain/ distributed ledger technology and smart contracts; (6) drones; and (7) telematics.

To obtain information about challenges that could affect the adoption of innovative technologies, we identified relevant laws and regulations pertaining to insurance technology innovation by reviewing prior GAO reports on financial regulation, interviewing regulators and industry participants, and analyzing relevant documents, including relevant NAIC model laws and state laws and regulations. We also conducted semi-structured interviews with and reviewed documents provided by the key stakeholders identified in the first objective to identify (1) any actions NAIC and selected state insurance regulators were taking on new insurance technologies, and what challenges, if any, insurers' use of new technologies creates for regulators; (2) what is known about the impact of any actions taken by NAIC and state insurance regulators on innovation among insurance companies and on consumer protection; and (3) stakeholders' views on the applicability of foreign regulatory actions for U.S. insurtech markets.

We conducted this performance audit from April 2018 to June 2019 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: GAO Contact and Staff Acknowledgments

GAO Contact

Anna Maria Ortiz, (202) 512-8678 or ortiza@gao.gov

Staff Acknowledgments

In addition to the contact named above, Patrick Ward (Assistant Director), Deena Richart (Analyst in Charge), Gina Hoover, Hadley Nobles, Akiko Ohnuma, and Tyler Spunaugle made key contributions to this report. Also contributing were Emei W. Li, Barbara Roesmann, Jena Y. Sinkfield, Frank Todisco, and Helen Tulloch.