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The Rise and Fall of Insurtech

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ABSTRACT

Insurtech, defined by the NAIC as "the innovative use of technology in insurance," has transformed the insurance industry and its approach to serving consumers. As a result of their success, a number of insurtech firms launched IPOs and began trading on public markets. Following the surge and subsequent plummet of insurtech share value from 2020 to late 2023, this thesis aims to identify the causes of this timeline. By analyzing a sample of public insurtech firms and their share price reactions following certain events, significance of different causal factors will be determined. Main topics include the application of artificial intelligence and machine learning, insurance and antidiscrimination regulation, and venture capital trends. As incumbent insurers and insurtech startups seek to maintain their value, expand their offerings, and raise capital, it is imperative that they learn from the mistakes of their peers and prepare for the challenges that lie ahead.

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Chapter 1

Introduction: What is Insurtech?

Insurance has long been an industry that lags behind technologically. Held back by outdated legacy systems, complex organizational structures, and a strict regulatory environment, it has not been historically friendly to transformation. Recently, however, the development of "insurtech", defined by the NAIC in 2023 as "the innovative use of technology in insurance," has changed this narrative. Today, insurtech often refers to the use of transformative technologies in insurance, including apps, wearable technology, big data, machine learning, artificial intelligence, and other means. This technology has enabled insurance companies to improve efficiency and develop better results for both stakeholders and consumers (Insurance Information Institute 2024).

1.1 The Emergence of Insurtech

Insurtech first emerged around 2010 following the popularization of "fintech", another portmanteau referring to financial technology (NAIC 2023). Fintech had a defining role in changing consumer expectations of financial products. Early fintech introduced mobile banking, digital transfers, and other features that enhanced user experience and empowered the individual consumer, shaping standards for the late 2000s and 2010s. The insurance industry has since grown and transformed in order to meet these changing expectations (Haigh). Today, insurtech often refers to a subset of insurance companies operating under a technology-centered model, or to companies which offer insurtech solutions for existing insurers. Within the last decade,

insurtech startups have garnered over an estimated $16.5 billion in investment capital (Deloitte 2019 6). Much of this activity around insurtech startups took place from 2019 to 2023, when many insurtech firms launched IPOs. Today, there are over 17 insurtech companies being publicly traded on the NYSE. Many of these companies operate entirely remotely with technology being the main driver behind revenue. 2017 saw the "world's first insurtech IPO" with ZhongAn Online Property & Casualty Insurance, a Chinese insurance company offering products only through a digital marketplace (Weinland). While insurtech startups have grown, incumbent insurers have also seen great success in their integration and deployment of insurtech and its capabilities. Due to their scale of operations and financial ability, incumbent insurers have been able to explore new opportunities in insurtech often before startups. The Covid-19 pandemic presented a unique opportunity for insurers to experiment with different forms of insurtech in order to meet the changing needs of policyholders, resulting in both the individual success and the partnering of incumbents and startups (Haigh).

1.2 Insurtech Capabilities

Insurtech refers to a wide variety of companies and technologies, but one of the most important enabling technologies is artificial intelligence (AI). AI has the potential to and is already transforming all areas of insurance, from front to back end. AI's greatest potential within insurance lies in 3 areas: underwriting, claims, and customer acquisition and experience.

Underwriting is defined by the International Risk Management Institute as "the process of determining whether to accept a risk and, if so, what amount of insurance the company will write on the acceptable risk and at what rate." Underwriting is essential to insurance companies

and is at the forefront of what is required to write policies. However, this process is traditionally tedious, expensive, and has a high exposure to many forms of human error. AI and machine learning can assist insurers in improving the accuracy, efficiency, and lowering the cost of underwriting. Techniques such as Optical Character Recognition (OCR) and Natural Language Processing (NLP) are forms of AI that are able to extract data from applicant information documents, eliminating time consuming work for underwriters and allowing them to direct effort towards more labor-intensive parts of the process that cannot presently depend on technology. AI-enabled risk assessment techniques permit underwriters to better identify an individual's risk quantifications and reasons for risk by using algorithms. From there, policyholders are grouped into more accurate risk groups, allowing the insurer to forecast their overall risk exposure. Further, these enhanced predictive models arising from the use of AI and insurtech are improving pricing in underwriting. The ideal cost of insurance is influenced greatly by consumer price sensitivity, which changes year to year. In order to adapt and offer competitive pricing, insurers can take advantage of enhanced predictive ability in order to plan for losses and adjust prices accordingly (AIQRATE). AXA, a large international insurer, explored the use of software company TensorFlow's Cloud Machine Learning Engine, a deep machine learning tool, in their models to boost the accuracy of large losses predictions from 40% to 78% ("AI Case Study"). Improvements like this can result in insurers offering more optimized pricing for members of all risk groups.

Claims management is another vital function of an insurance company, handling the processing and resolution of claims submitted by policyholders (Mitchell). The claims process in particular presents a strong case for the use of insurtech technologies. Where insurers have historically used adjusters to inspect and determine actual losses sustained for a submitted claim,

AI has taken over much of this process for many insurers. Claims triage, requests for repair services, claim validity, and repair costs can all be assessed using machine learning, replacing most of the need for adjusters. Incumbent insurer Liberty Mutual's R&D branch, Solaria Labs, developed a technology using image analytics that policyholders can use to upload images of their car accident and assess approximate damage in real time. This not only serves to benefit the insurer, but also provides an attractive competitive advantage to consumers. Prediction of claims is also greatly improved through the use of AI. Claims prediction is very complex, with insurers using a number of different techniques to do so. Machine learning algorithms are used in insurtech to leverage data collected from clients to streamline this process and enhance predictive ability. Fraud is a common problem for insurance companies when processing claims, and AI can help identify links between suspicious activities, data, and patterns to recognize fraud schemes across all types of insurance. British health insurance firm Kirontech implemented a software, KironMed, which claims to use machine learning in order to process medical claims and detect health insurance fraud and waste (AIQRATE).

Lastly, insurtech is transforming the way that insurance companies acquire customers and interact with them. While insurance has lagged behind in its implementation of AI-driven customer service solutions such as chatbots, virtual agents, and mobile apps, recent consumer-side insurtech developments have progressed far beyond this. Since its inception, this has been one of the most attractive facets of insurtech, driving much of the optimism towards the industry's future. Customer acquisition can be costly for insurance companies (Cather 134). AI can and is currently being used to identify and sort individuals into target groups based on an interests and needs, resulting in insurer advertising reaching more susceptible audiences. Ant Financial, a Chinese financial and insurance products platform, collects a plethora of user data

points from their app, such as age, gender, and vehicle make and model in order to create customer profiles. These profiles are then funneled into a series of AI-powered algorithms to present customers with relevant insurance products based on their individual characteristics and risk profile. Using AI to simplify insurance offerings and recommend policies empowers consumers to seek out services directly, eliminating much of customer acquisition cost on behalf of the insurer. When marketing is necessary, AI can use similar data in order to enhance customer segmentation accuracy and improve advertising relevancy. AI-driven data collection and sorting also enables insurers to create more personalized products, improving user experience and customer retention. As personalized services become more commonplace as technology improves, insurtechs have adapted by implementing devices that offer real-time insights and savings for consumers and improve data-collection for insurance providers. For example, Indian tech startup GOQii Health partnered with Swiss Re and Max Bupa Health Insurance in 2018 to provide policyholders with wearable devices which provide health insights while collecting and analyzing valuable health data for insurers (AIQRATE). Many insurtechs have found that, as they enhance customer experience by implementing new offerings and technology, they gain access to more policyholder data that can be used to curb losses (Eling and Lehmann).

1.3 Advantages and Challenges

For all of the reasons above, insurtech and its solutions provide a both insurers and consumers with unique benefits that make it highly attractive for all parties, including investors. The largest advantage it provides insurers with is process automation, increasing operational

efficiency and eliminating the need for many third parties. The technological transformation of many incumbent insurers, along with the innovative approaches of insurtech startups, have not only increased predictive accuracy but have done so by enlarging the multitude of data already available to insurers. By expanding digital services and offerings, personal data and preferences of policyholders is more specific and timelier, giving insurers a holistic view of the individual and allowing them to classify their risk more accurately. Arguably more important than this, implementing advanced technology allows insurers, both established and new, to position themselves for success in a modern world. As technology develops across all industries, insurance needs are rapidly evolving, and insurtech firms will be best equipped to conform to these needs (Haigh).

Policyholders see the cascading effect of these advantages through decreased costs (Eling and Lehmann). AI's ability to increase predicted loss accuracy, eliminate customer acquisition costs, identify fraudulent claims, process tedious and complex data, and better organize policyholders into risk groups takes costs away from the insurer and thus lowers the cost of insurance products to the customer. To many consumers, cost is the most important factor in an insurance policy, while others value the advantage of ease-of-use that insurtech brings. While the claims process and choosing a policy as a whole can be extremely complicated for someone with little knowledge of insurance, insurtech products are designed to be user-friendly for consumers and make these processes simpler and easy to understand. Personalization of these products assists in making them navigable and exciting for users.

While insurtech does have a long list of use cases and success stories, there is also a unique set of challenges insurtech companies and users face. For insurers, the nature of the industry makes it difficult to implement change, especially technological. Many large insurers

still rely heavily on legacy systems, of which many processes and other systems are designed around, making it difficult to bring in new technology compatible with those systems. This transitional difficulty is further exacerbated by the complexity of insurance firms. Developing an insurance product and operating as an insurer requires multiple layers of a firm, each complex in their own way, to work together to produce and be able to offer products. Due to this complexity, a change in one functional area likely requires a change across the entire firm, which can be difficult, costly, and time consuming. This partly explains why the insurance industry often lags behind other industries when it comes to innovation (Haigh). One of the largest hurdles hopeful insurtech firms must overcome in order to grow is regulation. Insurers' use of sensitive information and extremely complex pricing models and methodologies requires that the industry be heavily regulated in order to protect consumers. Insurtech and enabled companies, as they grow in size and traction, have come under increasing scrutiny from state insurance departments, forcing them to constantly adapt to new policies and rules. In 2019, the New York Department of Financial Services circulated a letter to life insurers prohibiting the use of external data sources, algorithms, and predictive models used for rating or underwriting processes. Insurers can only continue their use if they can prove to regulators that there is no bias, intentional or not, towards any protected class (Deloitte 2023 9). For a small insurtech company, a regulation like this can potentially halt operations for a period of time or indefinitely. This can be costly and creates a large obstacle for new startups looking to enter the space.

Consumers face new challenges as well with the emergence of insurtech, including data privacy concerns and the potential for discrimination. As insurers roll out new forms of data collection, such as vehicle telematics (often in the form of speed and mileage monitoring devices), who has access to this data, how this data is being stored, for what reasons, and the

implications of doing so are called into question. In a review of a sample of insurance apps, most apps shared data with the insurer's marketing partners, service providers, state insurance departments, and other affiliates. Some even shared user data with other insurance companies, reinsurance companies, insurance agents, third-party claims administrators, consumer reporting agencies, and financial institutions ("Managing Risks"). According to the Insurance Information Institute, insurers are legally required to protect customers from breaches of privacy and bias, but users of insurance apps and technologies will likely never know the extent of how their data is used. Another consumer concern around this issue is the potential for machine learning systems to inadvertently use data in a discriminatory way. In 2021, the NAIC published their opinion that regulations at the time were not strong enough to properly monitor AI-enabled systems to prevent this. The use of characteristics directly relating to a protected class, or those used to identify members of a protected class are illegal forms of discrimination, however, AI systems display the potential to learn to use proxy characteristics that are nondiscriminatory at face value but serve the same purpose (Filabi and Duffy 6). This issue is most relevant for life insurers, where inadvertent discrimination is most likely to occur (Sayre 5). However, it can occur in all different lines of insurance. In January of 2023, Louisiana insurance commissioner at the time Jim Donelon released a bulletin reminding property insurers to follow antidiscrimination laws. This was done following an incident in which a property insurer utilized a database that was found to be improperly calculating crime scores used for underwriting purposes. The database reported a score of "F" for St. Francisville, LA due to its inclusion of a state penitentiary with a high rate of inmate-related crimes. This had a discriminatory effect on the residents of St. Francisville, which otherwise had a low crime rate, and their ability to obtain property insurance (Deloitte 2023 8). Insurtech is an exciting, constantly evolving field that provides a multitude of

benefits for both businesses and consumers. There is no question why investors are drawn to insurtech, but those same investors are quick to overlook the risks and challenges it creates. As a result, the market value of insurtech firms has fluctuated greatly over the past 5 years.

Chapter 2

The Rise, Fall, and Stabilization of Insurtech: A Timeline

2.1 Overview

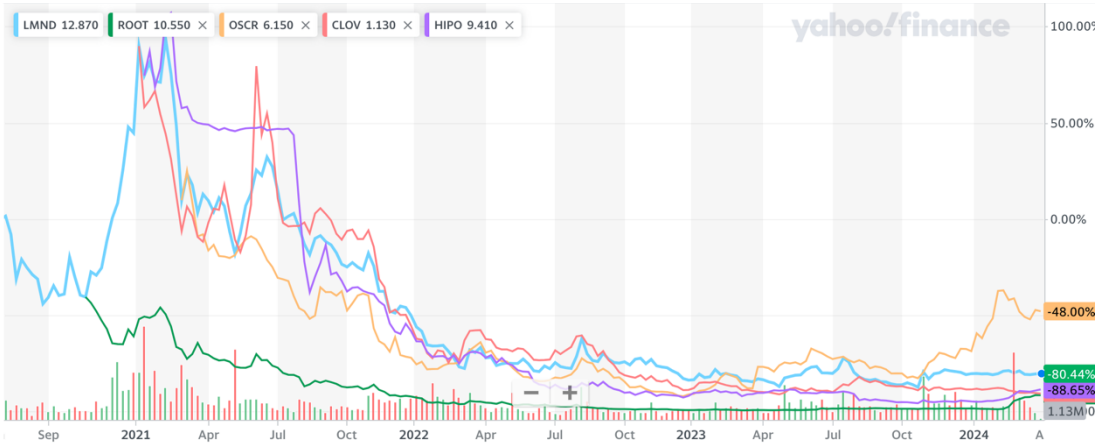

Figure 1. Share price of 5 major insurtechs, Jan 2021 - Apr 2024, "Interactive Stock Chart"

Figure 1 shows the share price of 5 major public B2C insurtech firms from their IPOs in 2021 to April 2024. Data on insurtech market performance is limited – a 2023 BCG study identified only 18 public insurtech firms, the majority of which are not licensed B2C insurers and rather service providers (Stefano et al. 3). The same BCG study found that, in comparison to the overall market, publicly traded insurers, and technology companies, insurtech stocks underperformed all three beginning in mid-2021 and continuing into the present day.

2.2 The Rise and Fall

At a high level, there is an observable downward trend beginning in early 2021, shortly after all five firms began trading. Insurtech firms early enough to bring their company to IPO did reap high returns and share prices for a time period. Notably, Lemonade and Hippo spiked in

value post-IPO in early 2021, enjoying the tail-end of investor fervor over the emerging industry. This success did not last long, however. From June 2021 to December 2022, BCG's FinTech Control Tower InsurTech Index dropped by 85% compared to the NASDAQ's 22% decline and the S&P 500's 6% decline (Stefano et al. 10). The share prices of these firms did not rebound.

2.4 The Current State of Insurtech

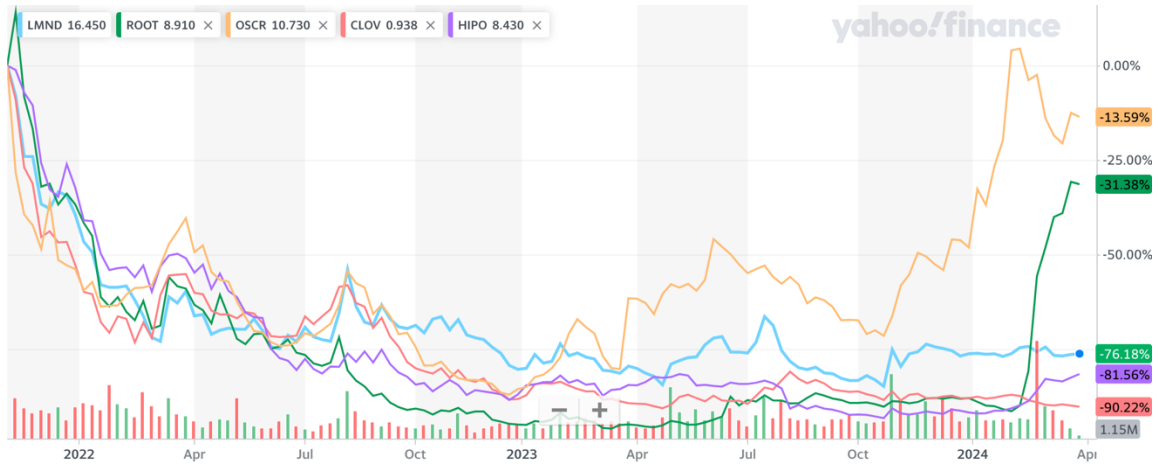

Figure 2. Share price of 5 major insurtechs, Dec 2022 - Apr 2024, "Interactive Stock Chart"

By December of 2022, the price of all five firms' shares became relatively stable, trading at only a fraction of what they once were valued at. Since then, certain firms, including Oscar Health and Root, have been able to combat this stagnancy due to firm-specific advancements. Oscar Health welcomed former Aetna CEO, Mark Bertolini, as their new Chief Executive Officer in March of 2023, driving a price appreciation of over 270% that same year (Eswaran). Upon release of Root's 2023 Q4 earnings, reporting an increase in total revenue of 173% and decrease in losses from $521 million to just $147, Root's share price increased dramatically compared to its peers. Still, the price remains 95% less than at its peak (Nyaga), proving that insurtech firms have a long journey ahead if they seek to regain the value they once held.

Chapter 3

What Caused the Fall of Insurtech? An Analysis

3.1 Potential Causes

Insurtech has shown large potential for disruption, which makes the phenomenon of share price decline, on the surface, surprising. Three reasons stick out as potential explanations for why investors have decided to divest from insurtech. First, state regulations targeting insurtech companies have become increasingly commonplace as insurance commissioners decide how to best protect consumers. It can be theorized that investors react to these regulations negatively en masse, resulting in an overall decrease in share value. A second explanation for this phenomenon is questionable firm-specific management decisions, or idiosyncratic events, independent of other insurer actions. This suggests that the decline of insurtech value is a result of new insurers making poor decisions as opposed to a widespread attitude towards the industry. Lastly, in part due to the former explanations, it is theorized that venture capital for insurtech firms has run dry. As the Covid-19 pandemic saw a spike in technology investments, investors may have since decided to turn their attention elsewhere for better opportunities, especially as interest rates have increased since the pandemic has subsided. It is likely that all three factors have contributed.

3.2 Methodology

In this analysis, an event study methodology is used in order to analyze what caused the drop in valuation across the insurtech industry. An event study is an analysis of how a specific

event, such as a merger, earnings announcement, or stock split, affects the market value of a firm. Short-term event studies, such as the ones completed in this analysis, use daily stock returns. This analysis examines how the share price of a company reacts to a critical event by testing for statistically significant changes in the firm's share price on the date the event occurred, as well as several trading days immediately before and after the event.

This study utilized the University of Pennsylvania's Wharton Research Data Services (WRDS) website, which runs event studies using data from the Center for Research in Security Prices (CRSP). The user first begins by inputting a text file containing company identifiers, such as a ticker, along with dates of events in question. The user then specifies "estimation parameters", including an event window, estimation window, minimum number of valid returns, and time gap length.

An event window is the period of time around an event date that is to be considered when measuring abnormal returns. If an event were to take place on 2/13/2017, an event window of +/- 10 days would examine returns between the dates of 2/3/17 and 2/23/17. "Day 0" refers to the date of the event. The estimation window is similar, but instead a period of time well before the event. This window is used to estimate what expected returns would be if the event in question had not occurred. The user also selects the length of a period of time between the estimation window and the event window (known as the "gap length") to account for information leakage, along with a minimum number of data points ("valid returns") from the estimation window. By comparing returns from the estimation window to those of the event window, WRDS generates abnormal returns by finding the difference between expected and actual returns. Normal expected returns are calculated through an adjusted market model, which obtains the alpha and

beta values from the estimation window that are then used to used estimate the firm's expected return (May).

Lastly, Z tests were run on each of these inquiries in order to determine the significance of the abnormal returns. For example, a Z score of over 1.6 or under -1.6 reflects an abnormal high or low return that occurs with a probability of 0.05 or less, indicating significant results at a 95 percent level of confidence.

Five insurtech companies were identified as suitable to be included in the sample: Lemonade (LEM), Root (ROOT), Oscar Health (OSCR), Clover Health (CLOV), AND Hippo (HIPO). These firms were deemed suitable due to their status as public, B2C, fully-licensed insurers driven by technology. The use of technology is central to the operation of all five companies, which is what classifies them as insurtech firms. Table 1 below gives a brief overview of each insurer.

Table 1. Overview of Sampled Insurers

Name	Ticker	Year founded	Line(s) of insurance	Public since
Lemonade	LMND	2015	Renters', homeowner's, auto, term life (NY only)	July 2020
Root	ROOT	2015	Automotive	October 2020
Oscar Health	OSCR	2012	Health	March 2021
Clover Health	CLOV	2014	Medicare Advantage	January 2021
Hippo	HIPO	2015	Homeowner's	August 2021

3.3 Regulation

The National Association of Insurance Commissioners (NAIC) first acknowledged the need to regulate the use of AI in insurance in 2020 upon the release of the "Principles on Artificial Intelligence (AI)" document. This document established 5 overarching principles insurers should follow when applying risk management techniques to their AI models and procedures. These principles call for insurers that are using AI to assure that it is used in a manner that is 1) Fair and ethical, 2) Accountable, 3) Compliant, 4) Transparent, and 5) Secure/safe/robust. The main concern driving the NAIC's action on insurtech is the risk of unintentional discrimination through the use of AI-driven predictive models. To curb this problem, in the 2020 document, the NAIC set an underlying expectation for insurtechs that any models using machine learning to draw conclusions regarding coverage should be clearly documented and retained by the insurer should a state insurance commissioner request them for inspection (Filabi and Duffy 18). Since the release of this document, many state insurance commissioners have released more specific requirements for insurers wishing to operate within a given state. Colorado, New York, California, Connecticut, the District of Columbia, and Louisiana have all since implemented directives that specify their own state guidelines and laws for reporting and regulating the use of AI in insurance (Deloitte 2023).

Tracking the share prices of major public insurtechs around the release of these directives is a useful way to empirically measure the impact that these releases have on investor outlook and valuation. In November of 2023, the Colorado Division of Insurance released the "Final Governance and Risk Management Framework Requirements for Life Insurers' Use of External Consumer Data and Information Sources, Algorithms, and Predictive Models," an expansion of a draft regulation released in May 2023. This regulation applies to life insurers operating or

seeking to operate in Colorado and contains a series of requirements for the use of ECDIS, which is non-traditional information used for underwriting purposes or to estimate lifestyle indicators. ECDIS includes information such as credit scores, purchasing habits, social media data, court records, biometric data, and more. Colorado life insurers now must implement specific measures to prevent discrimination in the use of ECDIS, including increased documentation obligations in preparation for future state-required discrimination testing ("Colorado AI Insurance Regulations").

Although this regulation is directed at life insurers in Colorado, the increasingly tightening grip state regulators have on insurtech business models, along with the uncertainty of the extent of future regulation, makes all insurtech companies a riskier investment. Additionally, insurers are growing concerned that the AI restrictions placed on life insurers may eventually be applied in other insurance markets, such as personal auto insurance (Zhang). To measure the impact of Colorado's November 2023 regulation, event studies on each of the 5 public insurtech companies listed in Table 1 were conducted using WRDS and the following parameters shown in Table 2.

Table 2. Estimation Parameters for Event Studies

Estimation Parameter	Input
Event Date	11/14/2023
Estimation window	100
Minimum Number of Valid Returns (observations)	70
Gap (days)	50
Event Window Start (days)	-10
Event Window End (days)	10

The results from the event study are shown below in Table 3, where the rows in bold reflect statistically significant reactions to the directive.

Table 3. Event Study 1 Results

Insurer	Largest mean abnormal return from study	Day relative to event	Z for abnormal return	Probability of Z	Significant?
Lemonade	-0.070259496	-2	-1.293669049	0.09788988	NO
Root	**-0.135217616**	**0**	**-1.444952304***	**0.074235642**	**NO**
Oscar	0.155659498	-5	2.200026009	0.986097475	NO
Clover	**-0.18556842**	**-5**	**-3.922056643****	**0.000043898**	**YES**
Hippo	**-0.071013299**	**1**	**-1.941764900****	**0.026082784**	**YES**

2 out of the 5 insurers sampled, Clover and Hippo, had a significant negative share price reaction at a 95 percent level of confidence in the days surrounding the release of the November 2023 CO directive. On day zero, Root had a reaction that was statistically significant at a slightly lower 90 percent confidence level. Lemonade and Oscar did not show signs of significance, but it is worth noting that Oscar does not operate in Colorado, which may have curbed the impact of the event. It may also be surprising that Lemonade, the only public insurtech to offer life insurance, did not see a significant change around the event. However, Lemonade only offers term life insurance in New York, so this practice is likely unaffected by the Colorado regulation. The results of this event study suggest that, possibly dependent on internal or business model-related factors, regulation can and has had a significant impact on insurtech valuation.

3.4 Idiosyncratic Events

When management makes decisions, investors react by buying or selling shares, reflecting whether or not they believe the decision to be a positive one or not. For this reason, the systematic decline of insurtech value could potentially be reaction by investors to poor decision-making across firms, many of which are startups with little experience relative to large incumbent insurers. One such example of this phenomenon is Lemonade Insurance's decision to acquire Metromile, an auto insurance company offering pay-per-mile car insurance enabled by telematics.

Lemonade's decision to acquire Metromile was, on the surface, strange. The two companies, other than being insurers, have little overlap. Lemonade was able to rationalize this decision with Metromile enabling them to enter the auto insurance industry – by acquiring Metromile, Lemonade absorbed the firm's licenses and policyholders across 49 states, along with over $250 million in cash. Moreover, Daniel Schreiber, co-founder and CEO of Lemonade, expressed that the firm's interest in Metromile arises from their valuable developments in predictive technology (Lemonade). The acquisition of Metromile was announced on November 8, 2021, and was completed on July 28, 2022. Just a day later, on July 29th, Lemonade laid off 20% of Metromile's workforce in an effort to scale back costs and increase efficiency (Moorcraft).

Shareholders had mixed reactions to the acquisition. Some agreed with Lemonade in their decision, citing the new ability to plunge into the auto insurance business as evidence of a strong, forward-looking decision. Lemonade did not only acquire an auto insurer and all of its tangible assets, but also its talent – a full team of data engineers already familiar with the insurtech industry and its needs. Metromile's acquisition allowed Lemonade to skip through what may

have been years' worth of organic growth (Moorcraft). Other investors did not hold such a positive outlook about this decision. Kaenan Hertz of Insurtech Advisors LLC recalls that Metromile is not a competitive firm. Some investors, Hertz told S&P Global, may view the merger as "two money-losing organizations that are going to be losing even bigger sums of money." Public insurtechs that have not measured up to shareholder expectations, Hertz explained, "will have a much harder time raising additional capital because they have not been able to return at the rates they were originally valued." While some investors worry about the future post-merger, others believe that the money could have simply been better spent elsewhere. Matteo Carbone, director of the IoT Insurance Observatory, explained, "the real issue is that with $500 million you could buy a small insurance carrier that is profitable, not one that loses hundreds of millions a year adding to Lemonade's losses." He noted that although Lemonade did acquire licenses to operate in almost all states, they could have done so independently for far less cost. Ultimately, "there is a lot of nice storytelling rather than business rationales," he explained (Hollmer).

To test the effect that idiosyncratic events such as this one have on insurtech value, an event study was run on Lemonade during the days surrounding their announcement that they would acquire Metromile. This event study uses the same set of standardized estimation parameters shown in Table 1. Day zero is defined as November 8, 2021, the day that Lemonade announced the merger (completed on July 28, 2022). Lemonade was the only insurer included in this event study.

Results from the event study are shown below in Table 4, where a row in bold reflects a statistically significant reaction to the merger.

Table 4. Event Study 2 Results

Day relative to event	Mean abnormal return	Z for abnormal return	Probability of Z	Significant?
-5	0.055389032	1.252906013	0.894880043	NO
-4	0.034462869	0.779553888	0.782173246	NO
-3	0.046279432	1.046845841	0.852414658	NO
-2	-0.013197783	-0.298535295	0.382647321	NO
-1	-0.029854079	-0.675302548	0.249741783	NO
0	0.01215083	0.27485312	0.608285457	NO
1	**-0.103734061**	**-2.346475878****	**0.009475946**	**YES**
2	0.00942898	0.21328456	0.584447492	NO
3	0.045165985	1.021659565	0.846528972	NO
4	-0.036101587	-0.816621866	0.207072278	NO
5	-0.02825528	-0.63913754	0.26136673	NO

The day after the announcement (day 1) saw a large decrease in mean abnormal returns. A Z-score of -2.346475878 with a probability of 0.009475946 suggests that the event caused a significant negative share price reaction at a 95 percent level of confidence. Based on the event study, it would be appropriate to conclude that idiosyncratic events across individual insurers can and has been a contributing factor to the fall of insurtech value.

3.5 Lack of Venture Capital

In its infancy, insurtech startups saw a massive influx of venture capital and early investors, due in part to the success of its counterpart, fintech. Since then, the investing environment has changed significantly, complete with higher interest rates, rising inflation, and potentially more profitable emerging industries and investment opportunities. 2022 saw investments in fintech and insurtech startups drop nearly 50%, indicative of an ongoing trend (Oletzky 487). This decrease in investment volume has the ability to tank insurtech valuation. However, it is difficult to pinpoint a moment in time when this shift began, making an event study impractical. Instead, evidence is reflected through data over time.

Venture capital was crucial to the early days of public insurtech companies, and still is today for many firms seeking to go public. Reaching its peak in 2021 with over 1300 venture capitalists investing in insurtech firms, investors flocked to the industry in search of a new golden egg. The interest in insurtech spawns out of venture capitalists' affection for fintech. Since 2008, fintech saw its global investment amounts skyrocket nearly 12,000% from an estimated $930 million in 2008 to $121.6 billion in 2020. Much of this fintech investment boom is due to venture capitalists' interest in producing "unicorn" companies, which are firms valued at over $1 billion, for their potential for generating massive returns. As of 2022, fintech has produced a total of 312 unicorns – however, they have become increasingly rare. In 2022, the discovery of new unicorns declined from 37 in Q1 to only 5 in Q4 (Sable). As the production of fintech unicorns declined, insurtech offered venture capitalists a new, yet strikingly similar, industry to explore. In May of 2020, Lemonade Insurance surpassed a $2 billion valuation after securing $300 million in series D funding from investors (Menear). As of December 2022, there were 44 insurtech unicorns ("Insurtech Unicorns").

Insurtech also became a desirable investment during 2019-2021 in part due to effects of the Covid-19 pandemic. In an effort to maintain a healthy insurance industry and support policyholders, government entities offered special support to insurers. The H.R.5823 Pandemic Risk Insurance Act of 2021 was enacted by congress to compensate to property and casualty insurers for their incurred losses resulting from any coverage of pandemics and outbreaks. Certain states enacted their own provisions to encourage the development of new insurance and health technologies during the pandemic. In January 2020, Vermont created a regulatory sandbox that allowed insurers to waive certain regulatory requirements while testing new technologies and programs. In June of that same year, New York's Department of Financial Services launched the DFS FastForward program to support innovators in the insurtech and fintech industries during Covid-19 (Duchene). These programs allowed insurtech companies more room for growth along with federally-backed financial support, making them an even more attractive investment to venture capitalists.

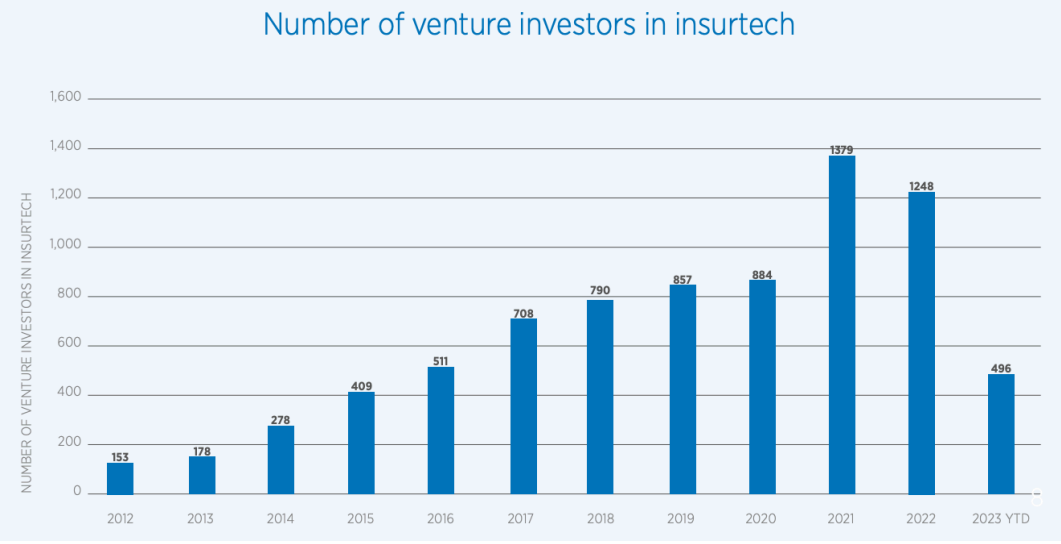

Figure 3. Venture investors in insurtech, 2012 – 2023, Johnston et al.

The number of venture capitalists invested in insurtech, shown above in Figure 3, peaked in 2021, declining from nearly 1400 active investors to under 1250 in 2022. The number of investors in 2023 dragged behind, totaling under 500 as of August. Funding volume has decreased significantly as well. Q4 of 2021 retained over $5.29 billion from investors, while Q4 of 2022 fell to $1.01 billion; less than 1/5th of 2021's total (Johnston et al. 5). A BCG FinTech Control Tower survey from 2023 determined that equity funding amounts of all insurtech product lines declined significantly from 2021 to 2022, suggesting the decline is industry-wide as opposed to being contained to specific lines of insurance (Stefano et al. 3). So, what could have caused this retreat by venture capitalists who were once so eager to pour money into insurtech companies? To understand, one must consider that a majority of venture capital funds invested in insurtech are not insurance-related funds, and likely have little experience operating in such a complex industry (Johnston et al. 8).

As explained in section 3.3, the insurance industry is highly bound by statutes, regulations, and cultural concerns about privacy and information security. Considering the significant negative effect that Colorado's November 2023 directive had on market returns, as regulation among states increased, investors likely retreated. One such example of this occurring is in property insurer Hippo's IPO. The day before insurtech firm Hippo went public in August of 2021 through a SPAC, a multitude of investors exited, causing it to lose 83% of its capital (Oletzky 490). As with any industry, firm-specific events, such as Lemonade's acquisition of Metromile (explored in section 3.4), was likely an additional contributing factor to the exit of venture capitalists. Changing economic conditions, including higher inflation, rising interest rates, and weak economic growth, all led to a downturn in investments in the global technology sector in 2022 causing venture capital investments in technology firms to fall 33% from the

previous year. Together, these factors caused the impact of this downturn to amplify to an approximate 50% decrease for insurtech firms (Stefano et al. 1).

Venture capital funding is essential in supporting a startup's endeavors, driving progress, and increasing IPO valuation, but the role of venture capital post-IPO and its relation to share price is often overlooked. Venture capital groups on average remain invested for 3 years following a firm's IPO. In the event that venture capitalists sell off all of their shares at one time, valuation can tank. On top of this, divestment by venture capitalists can signal to the market that something is very wrong, causing a negative cascading effect. Studies show that average monthly returns for venture capital-backed IPOs are lower post-exit than when the venture capital group was still invested. Firms that maintain venture capital funding post-IPO on average display higher Tobin's Q values (reflecting higher market valuations), greater R&D expenditures, and hold more cash, making them more desirable investments and thus increasing share valuation (Basnet et. al. 13).

When comparing the inflection points of public insurtech valuation and of insurtech venture funding volume, it is clear that there is a connection between the two. As shown below in Fig. 1 (located in Chapter 2.1), 2021 was the last year insurtech firms enjoyed high market values relative to where they are today.

2021 was also the last promising year for insurtech funding. Funding volume, shown below in Figure 4, dropped by over 50% from Q4 of 2021 to Q1 of 2022 (Johnston et al. 5).

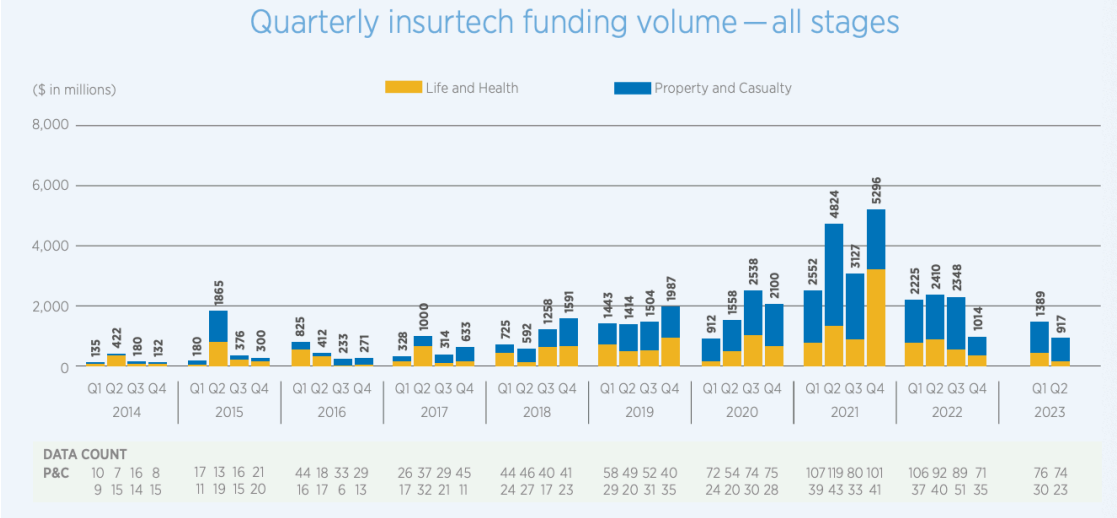

Figure 4. Quarterly insurtech funding volume, 2014 – 2023, Johnston et al.

Ultimately, 2022 was a turning point for investor perception of insurtech. By mid 2022, some public insurtechs had lost more than 90% of their market value when compared to their highest valuations (Oletzky 490). By 2023, insurtech investors who were most active in 2021 reduced their insurtech investment volume in 2023 to a mere 12% of 2021's volume (Johnston et al. 7).

Market performance into 2024 suggests that investors no longer hold such an affectionate view of insurtech firms who develop and distribute their own insurance products. Considering all factors, it is likely that insurtech's downfall and drop in share value was caused by venture capital groups' retreat from the insurtech industry. This retreat was caused in part by investors' lack of experience with insurance and its changing regulatory environment, along with a general turning away from financial technology as a whole.

Chapter 4

Limitations and Further Study

There are a number of limitations to this thesis that should be acknowledged. First, there is a lack of insurtech firms that are traded publicly. Event studies and timelines only considered 5 out of very few publicly listed B2C insurtechs, limiting the sample greatly. The inclusion of private insurtechs, of which share value data is unavailable, could have resulted in different results. The sample size constraint also meant that insurtechs sampled offer different lines of insurance from one another, potentially affecting results. For example, an auto insurer's returns may not be a strong proxy for measuring the effects of a regulation targeting life insurers.

In order to draw stronger conclusions, it would be necessary to conduct additional event studies on different regulations and firm events. It is important to acknowledge that the effects of a singular event may be coincidental without conducting further research. The ability to study more events is limited by the length of time that insurtechs have been traded publicly. Events prior to mid-2021 were unfit for event study analysis, as public insurtech firms did not have enough historical returns data to yield results. In the future, if more data were to become available, it would be worthwhile to rerun these event studies after segmenting insurtechs by offerings, state of incorporation, business model, and more.

Chapter 5

Conclusion

Insurtech experienced a strong surge of support while in its infancy, encouraging many startups to pursue IPOs through the help of venture capital groups. Investors were attracted to these firms for their potential to reap massive returns if nurtured properly. Their unique ability to reach consumers, cut costs through predictive technology and automation, and disrupt an industry long-dominated by incumbents led to huge valuations, with some firms being valued at over $1 billion. However, this positive outlook did not last long. As insurtech companies faced obstacles for the first time, their struggles were reflected in their market value, with share price plummeting in mid-2021.

This thesis established three factors that led to the dramatic decrease in share value. First, states began to ramp up their regulatory requirements in response to the use of AI-powered algorithms, databases, and machine learning programs by insurers. These regulations made the outlook of certain insurtech firms questionable, as many of the affected firms relied heavily on artificial intelligence to operate. Second, as with any industry, firm-specific events can explain differences in value from one period to another. Many insurtech startups have made decisions unpopular with investors as they learn to navigate the industry. Lastly, as venture capital was crucial to the success and development of so many insurtech startups, the mass exit of venture capitalists from the industry had the opposite effect.

Analysis conducted in Chapter 3 provided empirical evidence for the contributions of these three factors. Section 3.3 showed that three out of the five firms sampled displayed a

statistically significant amount of negative abnormal returns around the event of a regulatory directive aimed at insurers using artificial intelligence and sensitive user data in pricing models. Section 3.4 displayed how firm-specific events can impact share price by determining the statistical significance of negative abnormal returns in the days following Lemonade's controversial announcement to acquire auto insurer Metromile. Section 3.5 compared inflection points between the share prices of the five insurers and the presence of venture capital in the industry, displaying a visible correlation between the two. The section went on to establish possible contributing factors to the retreat of venture capitalists, expanding on the regulatory and idiosyncratic reasons explored in sections 3.3 and 3.4.

Since the 2021 decline, insurtech stocks have struggled to regain traction. All hope is not lost, however. While the majority of 2021's top 40 investors have left the space (down to only 12% participation in 2023), The top 40 investors in 2023 have only reduced their participation by 29% since 2021. This suggests that today's remaining investors are more well-informed than those who have since left the space. Today, many large insurers and reinsurers maintain dedicated insurtech funds in the hopes that they might one day be able to see large returns and have a stake in technology that may be viable for their own use in the future (Johnston et al. 8). With backing from experienced firms and investors familiar with the insurance environment, it is possible that the insurtech industry will one day see a return to the market value it once held.

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