



Systemic Risk and Tail Risk of Fintech Firms During Covid 19: A Case of Southeast Asian Economy

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Chronicle

Article history

Received: Oct 15, 2023

Received in the revised format: Dec 27, 2023

Accepted: Dec 28, 2023

Available online: December 29, 2023

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Abstract

The main goal of this research is to compare the tail risk faced by Thai financial technology firms with the systemic risk experienced by financial technology companies in Thailand. During the COVID-19 outbreak, it was also investigated how the effects of tail risk and systemic risk affected Thailand's financial technology businesses. During COVID-19, the number of individuals using financial applications online surged drastically, giving clear proof of the sector's stratospheric ascent. During the same time period, the number of people using cryptocurrency apps increased dramatically. This study is the inaugural examination of its kind, investigating the interplay between tail risk, systemic risk, and Fintech, utilizing data from a sample representative of the Thai economy. Our study primarily centers on the financial technology sector, with the data for Fintech companies being computed for the periods between December 2019 and February 2022. Fintech businesses in Thailand look through the theoretical lens provided by the extreme value theory when calculating the tail risk of their portfolios. The fall in the value of technology businesses has given rise to the idea of establishing a significant number of financial technology companies located in Thailand. A lengthier and more widespread dispersion is consistent with an exponential growth of fintech businesses in Thailand during the course of the COVID-19 time period. Some businesses within our sample exhibit notably short tails, indicating a heightened susceptibility to adverse events, particularly during the COVID-19 period. The results indicate that the global technology index during COVID-19 is reliant on the systemic risk posed by Fintech. It's possible that these outcomes might be attributed to the large growth in customer bases seen by FinTech businesses during COVID-19. Fintech companies in Thailand saw significant growth during the epidemic of swine flu. The current research is among the first of its type when it comes to grasping the issues of tail risk and systemic risk in fintech enterprises in Thailand. This development is highly beneficial for policymakers, financial experts, and academics, as it facilitates a deeper comprehension of these issues.

Keywords: COVID-19, Stock Market liquidity, Stringency Index, Confirmed Cases Death Case, Pakistan

BACKGROUND

FinTech, short for financial technology, represents a relatively recent field of study. The main goal is to introduce innovative financial instruments like digital currencies and crowdfunding platforms, aiming to replace conventional banking practices. Fintech has developed over the last several decades into one of the most extensively researched subfields of finance and money management (Mosteanu & Faccia, 2020). The rapid pace of technological advancement in the financial industry over the past few decades has significantly influenced how thrift institutions carry out their business operations. Fintech, which supports customers in carrying out financial transactions, has fundamentally changed the banking industry (Nair et al., 2021). The investment in the financial technology industry has been growing at an unprecedented rate, and current trends suggest that this trajectory will persist. It was claimed that the company's financial technology segment had received investments totaling more than US\$200 billion over the course of the previous decade. Since 2009, the total value of the market has increased by a factor of five. (Mazur et al., 2021). In 2019, Big Tech's share of the top 10 corporations more than quadrupled, moving from two to seven positions. One of the most important and cutting-edge words of our day is "Fintech," which emerged as a result of the forays that BigTech companies made into the financial sector over the course of the previous decade (Wojcik & Ioannou, 2020). Fintech refers to the application of technological innovations to the financial industry.

The term "financial technology" refers to a business strategy that makes use of technology to speed up the distribution of various financial products and services. The expression is a portmanteau that was created by combining the terms "financial" and "technology" (Ali et al., 2021). In recent years, the term has been overtaken by a booming financial industry that serves the requirements of consumers in both the business and retail sectors (Chang et al., 2020). Fintech businesses have entered the financial industry with the promise of delivering financial procedures that are new, efficient, and generally accessible (Croxon et al., 2021). However, because of the rise of enterprises that are involved in fintech, the financial system, and notably its stability, is now up against a new and unique challenge. Despite the fact that a great number of academics have now come to grips with the undeniable fact that the rise of fintech firms poses an implicit threat to the global financial system, the industry continues to welcome more of these businesses (Kruse et al., 2019). To the author's knowledge, however, there has been either very little or very little study done on the question of how severe a crisis may be produced by a FinTech business.

Financial technology refers to a business strategy that use technology to expedite the delivery of different financial goods and services. Financial technology is a portmanteau formed by combining the phrases "financial" and "technology" (Ali et al., 2021). In recent years, the phrase has been supplanted by a flourishing financial industry that services the needs of corporate and retail customers (Chang et al., 2020). Fintech companies have joined the financial market with the promise of bringing innovative, efficient, and widely accessible financial operations (Croxon et al., 2021). However, as a result of the growth of fintech companies, the financial system and, in particular, its stability face a new and unprecedented threat. Despite the fact that many scholars have accepted the incontrovertible truth that the emergence of fintech firms constitutes a danger to the global financial system, the industry continues to embrace more of these companies (Kruse et al., 2019). To the author's knowledge, however, either very little or very little research has been conducted on the subject of how serious a crisis a FinTech firm may

cause. The financial technology sector saw unprecedented development during the COVID-19 pandemic, with this phenomenon being most pronounced in nations undergoing economic integration, such as Thailand and Malaysia. The worldwide proliferation of fintech applications has been on the increase for some time, and this trend was clearly visible during COVID-19 (Li, 2021; Ashta & Biot-Paquerot, 2018). According to Fu and Mishra's research, the daily average of downloads for fintech android applications increased from 21% to 26% during COVID-19 (2022). As time goes on, statistics continues to back up their assertions that about 900 million app downloads happened within COVID-19's lockout hours.

Evidence from before and after COVID-19 shows that the digital gap has been bridged and the number of people adopting fintech has increased dramatically. The fact that financial technology firms have overcome barriers of distance and reached additional areas is further proof of this theory (Kokkinis & Miglionico, 2020). However, it has helped advance banking regulations and oversight because to the unique risks it presents to investment returns. The financial services sector is profoundly influenced by the ever-shifting expectations of customers. As a result of significant technical breakthroughs, the digital financial sector has been expanding fast, presenting a new challenge to the world's financial and economic institutions (Agur et al., 2020; Clarke, 2019). Fintech companies provide a triple danger within the framework of any financial system. There has been a decline in market concentration and an increased challenge to the fintech industry's dominance due, in part, to the proliferation of small fintech enterprises (Ashta & Biot-Paquerot, 2018; Samunderu & Murahwa, 2021).

Second, there is a lack of oversight in the fintech industry, which is particularly worrisome given the fact that the decentralization of fintech is threatening traditional financial institutions. This makes it harder for financial regulators to keep an eye on technology goods. Last but not least, the largest threat big data businesses represent to the financial system is the unethical collection of client data and its subsequent unlawful use for marketing and commercial objectives. The majority of the blame for this unlawful activity rests with fintech companies (Barr, et al., 2018; Ashta & Biot-Paquerot, 2018). Despite the fact that many researchers have examined the relationship between systemic risk and financial assets using a wide range of theoretical frameworks, the effects of systemic risk on fintech companies in general and ASEAN country fintech companies in particular have received relatively little attention. This study set out to fill this knowledge vacuum by applying extreme value theory to the problem of systemic risk and Fintech businesses in the ASEAN region.

The term "tail risk" refers to one of the greatest threats, which is expressed by a probability function stating that the volatility of the standard deviation will be three times the mean. This is one of the greatest dangers (So Chan and Chu, 2020). The phrase "tail risk" refers to an event with a low likelihood of happening that happens at both the beginning and end of a normally distributed curve. It is reasonable to wonder whether fintech should even be concerned about tail risk, especially under challenging times. According to conventional portfolio theory, the distribution of market returns is normal. According to the tail risk phenomenon, however, portfolio returns are skewed with a larger tail, indicating that expectations and investments may vary beyond three standard deviations (Samunderu & Murahwa, 2021). As a consequence of the most recent COVID-19 epidemic, people throughout the world are preparing for an entirely new normal in

every regard. This involves planning for a global financial climate characterized by a proliferation of disruptive events with longer tails. FinTech, which is an abbreviation for "financial innovative technologies," has emerged as a crisis remedy during the COVID-19 outbreak; however, the tail risk of continuous disruptive events from FinTech may impede the recovery from the crisis or give rise to another crisis that may spread asymmetrically across the globe. The acronym FinTech stands for "financial innovative technology" (Costantino & Pompella, 2021; Samunderu & Murahwa, 2021). Consequently, during the course of this work, we have endeavored to investigate the relationship between tail risk and systemic risk across Arabian ASEAN financial technology firms during the COVID-19 pandemic. In two unique ways, this work adds to the corpus of knowledge. This research has accomplished two primary objectives: (1) It has investigated the interaction between systematic risk and Fintech businesses in COVID-19, and (2) it has demonstrated that tail risk is present in Fintech companies and is more prominent in Fintech firms than in traditional financial institutions.

LITERATURE REVIEW

Companies that deal in information technology are becoming an increasingly essential part of the economy as a whole. The term "financial technology," or "Fintech," refers to the product of collaboration between traditional banks and companies in the technology industry. This collaboration has already had a significant impact on many aspects of the financial services industry, and it is anticipated to have a similar impact on other industries. According to Iman (2020), recent advances in technology are "revolutionizing the financial industry and opening up new prospects in the field of financial services," and he asserts that this is happening. Big data analytics makes it possible to lower the amount of bias in credit score calculations while also improving, measuring, and keeping an eye on the level of systemic risk in P2P lending. The aforementioned financial technologies make it possible to effectively manage risks and the expenses associated with such risks. These technologies also make it feasible to evaluate and monitor market risks as well as the instability of financial market conditions (Vuini, 2020).

The scope of risk management includes not only the management of political and economic risks, but also the management of currency exchange, transfers, cultural differences, credit, legal, and commercial risks, and the management of changeable consumer requirements (Arinichev et al., 2018). According to Elsaid (2021), FinTech makes saving money easier, provides consumers with more convenience, and promotes responsible risk management. According to the information available, the incorporation of fintech into the financial sector has the potential to initiate significant paradigm changes within that industry (Borio, 2020). More banking services would be able to be offered, the network structure of the financial industry could be analyzed with the use of big data, and borrowers' potential risks could be evaluated more accurately. Because of these benefits, Fintech companies are able to improve the delivery of financial services, expand access to financial services, and stimulate economic activity (Ahern, 2021). FinTech companies, which have a regulatory framework that is more malleable than traditional banks and access to cutting-edge technical resources, may serve a wider variety of customers, including small and medium-sized businesses (SMEs), which have limited access to banking services. This is because FinTech companies have

a regulatory framework that is more adaptable than traditional banks. According to Chaudhry and colleagues (2022), businesses that deal in fintech have the advantage of lower operational costs since they do not have complicated corporate structures and a large number of levels of administrative employees.

Because most FinTech firms don't even bother with traditional storefronts, they are able to significantly reduce the amount of money they spend on operational expenses. Bank loans are another product that technology businesses aggressively sell to a wider consumer base (Borio, 2020). In support of the findings presented above, Jagtiani and Chaudhry et al. (2022) demonstrated that larger banks that were also more technologically advanced had a significant influence in increasing the amount of funding available to small businesses from 1997 to 2014, despite the fact that these banks did not have physical locations. In addition, Iman (2020) and Samunderu and Murahwa (2021) claim that FinTech lenders give finance to small and medium-sized enterprises (SMEs) with the intention of reducing the credit gap that was previously discussed. Elsaid (2021) asserts that the Lending Club gives access to more money than traditional banks while at the same time retaining a smaller branch network (Jagtiani & Lemieux, 2018). Despite the fact that both groups are subject to the same probability of not paying back their loans, customers who borrow from Lending Club pay lower spreads on their loans than those who borrow from conventional lenders. Lending Club consumers with credit scores that are comparable to those of conventional borrowers are nonetheless deemed to have a greater risk. Collaboration between traditional financial institutions and fintech companies may bring about investment risks as well as security, regulatory, and contractual problems; yet, the potential cost savings from decreased operational and capital expenditures may be enormous (Agur et al., 2020).

To provide a synopsis of Li's (2021) results, we can say that while FinTech companies do have positive impacts on customers, companies, and the economy as a whole, they also confront issues related to the protection of customer data. One of the challenges linked with the growth of financial technology is a misjudgment of creditworthiness, which Mosteanu and Faccia (2020) identified as a danger to consumer protection as a result of this problem. Also, due to their scale, tech giants provide extra risks and expenditures to the market, such as increasing customer switching fees or removing prospective rivals who may otherwise join the industry. This is because tech giants offer a threat to the market in both of these ways. The ability to gather enormous quantities of data for almost no cost at all makes it possible for digital monopolies to emerge, which in turn makes it possible for the aforementioned mega-tech companies to engage in price discrimination and the collection of rents (Borio, 2020). Yigitcanlar et al. (2020) determined that the dangers posed by artificial intelligence (AI) fall into one of two categories: data hazards and cyber security problems. As a consequence of artificial intelligence, systemic risks may come about as a result of assaults on, manipulation of, or threats to economic and financial systems. Additionally, economic instability and the transmission of false signals to the general public may occur as a result of AI. The relevance of FinTech in the financial industry is discussed in a variety of publications that can be found online (Vuini, 2020).

FinTech has been the focus of a significant amount of research, but the effect of the tail risk that is inherent to businesses in the technology sector has not yet been explored. With

correct appraisals of these risks, the appropriate authorities will be able to better monitor and prevent the dangers that FinTech poses to financial systems.

Saputra and Chaerani (2022) investigated the possibility of institutional financial hardship and banking risk exposure using statistical extreme value analysis. The authors assert that countries in the Eurozone have much lower levels of both tail risk and systemic risk in compared to those in the United States. Alsahlawi (2021), who employed multivariate extreme value theory to investigate the systemic risk and contagion risk in US and European banks, came to the conclusion that this finding is consistent with the findings that he obtained. Their study indicates that cross-border ties in Europe are weaker than they are in the United States, and that bank spillover is far more widespread in Europe than it is in the United States. After the consolidation of conventional banks, there is likely going to be a continuous increase in the level of risk in the Eurozone. In addition, the relationship between huge financial institutions and large clearing banks in the United States seems to be the source of the greatest increase in systemic risk.

Keddad and Schalck (2020) were able to arrive at their estimations for the tail risk by using the extreme value theory. They made the observation that the left tails of the indices are more substantial than the ones on the right. Nguyen (2018) used data on returns and sales growth from 1963-2010 in order to conduct an investigation into how time-varying extreme event risks have an effect on asset markets. They came to the conclusion that tail risk is likely a major predictor of asset prices due to its ability to predict the future extreme returns of certain stocks. In addition to this, they came to the conclusion that time-varying tail exponents were extremely prevalent across the whole organization. Mathematically speaking, the collective tail risks are connected to the shared dynamics that may be seen in the tails of individual enterprises (Aikman et al., 2021).

Adrian and Brunnermeier (2011) studied the influence of state characteristics on the extreme and systemic financial risks of financial firms by using the extreme quantile regression model. In the course of the research that was carried out in China, 33 publicly-traded banks and trust businesses were questioned. According to the results, the risk profiles of different quantiles of financial institutions seem to be different as a direct result of the effect of state variables. When severe quantiles are present, the adverse impacts of the short-term liquidity risk spread on banks ultimately lead to a rise in the level of risk that banks face. As a direct result of this, the financial infrastructures of banks are at risk of experiencing possibly catastrophic effects. This finding is in line with the findings of the systemic risk contribution, which indicates that banks have a greater risk exposure to the financial systems in which they operate compared to other types of financial firms. In the meanwhile, value at risk research has shown that financial institutions are far less susceptible to disturbances in their systems than securities are. The size and leverage of a company were shown to have a significant relationship with the amount of systemic risk that they contributed. Larger financial firms that make heavy use of leverage are more likely to pose a threat to the whole financial system than their more modest counterparts.

Paulin et al. (2019) shown via the use of a dynamic analysis that in order for a bank to be more susceptible to systemic risk contagion, it must have both a high risk contagion rate and a low risk isolation protection rate. Idiosyncratic risks, as stated by Ellis et al. (2021), may shed light on the one-of-a-kind characteristics of bank risk when taken into

consideration in the context of the financial industry. When a bank has a significant level of idiosyncratic risk, the quantity of equity capital it has is often inadequate. According to the findings of the study carried out by Gong et al., tail risk and the risk of experiencing financial hardship are highly and positively connected with one another (2020). If a bank consistently has substantial negative daily equity returns, this is an indication that a financial crisis is more likely to occur at that particular bank. Similar results were found by Aikman et al. (2021) in their study of the link between tail risk indicators and financial distress among publicly listed US firms from 1990 to 2016. In addition, studies of systemic risk may be found in Neveu (2018) and Lux et al. (2020). In addition, earlier research has shown the significant negative effects that systemic risk and tail risk have on the economic system as a whole as well as the financial system. Regrettably, there has not been any comparative study carried out on the effects that tail risk and systemic risk have on significant technological businesses. The purpose of the current research is to apply the univariate extreme value (EVT) theory to the investigation of the tail risk and systemic risk faced by THAILAND Fintech businesses. This is done on the basis of the hypothesis that "technology businesses have a larger tail risk than financial organizations."

DATA AND MEASURES

The sample for this study was drawn from Thailand's thriving ecosystem of financial startups. For this tail-computation exercise, we consulted DataStream for Thailand indexes on topics including the economy and technology. Meanwhile, we've utilized data that rolls over a three-year period to calculate the time-varying tail risk. The major aspect motivating the analysis of tail risk is the trend of rapid decline in the stock indices of the Fintech firm. The univariate expected value of the distribution (EVT) is used in the calculation of equity tail risk. Use of the semi-parametric method, as stated by Chaudhry et al. (2022), conforms to the Generalized Pareto Distribution's characterization of losses as excessive beyond a large threshold. It's an estimator developed by De Haan et al. that uses a semi-parametric strategy (1994). To determine the quantile y , we choose the minimum value of $p = P(W, w)$.

$$\tilde{w}_p = W \left(\frac{m}{np} \right)^{\frac{1}{a}} \dots \dots (1)$$

The $(n-m)$ th cut-off point is denoted by the expression $q > W_{n-m,n}$, where $W_{n-m,n}$ refers to the $(n-m)$ th cut-off point of the tail. This expression is valid for any given sample size n . By using Hill's (1975) estimator, we are able to arrive at the following solution for equation 1:

$$\tilde{a} = \left(\frac{1}{m} \sum_{j=0}^{m-1} \ln \left(\frac{W_{n-j,n}}{W_{n-m,n}} \right) \right)^{-1} \dots \dots \dots (2)$$

Throughout the whole of the process of estimating, the presence of anomalous returns may be understood by referring to the parameter designated by the letter "m." Because technical enterprises are where our major attention is directed, we determined that the appropriate value for m in this context is 300, as suggested by Chaudhary et al. (2022). In the current inquiry, the tail quantile estimator is utilized as a benchmark against which Hill's (1975) estimate may be assessed. This allows for more accurate comparisons between the two estimates. In addition to this, the updated equation is written as follows:

$$\tilde{E}(W - \tilde{w}_p; W > \tilde{w}) = \frac{\tilde{w}_p}{a-1} \dots \dots \dots (3)$$

Equation 2 gives a theoretical basis for the anticipated shortfall in the tail, while Equation 1 provides information about the tail quantile. Together, these two equations make up our metrics for the tail risk in the information technology and financial industries. Probabilities at the extreme quantiles vary from 0.1% all the way up to 0.2% at their highest point. According to the figures, a violation of the quantile may be expected to take place somewhere between 500 and 1000 days. Our investigation also investigates the possibility of a shortfall in crisis barriers that were meant for COVID-19 being underestimated.

The estimation of systemic risk is done using a semi-parametric approach. Because a misspecification resulting from incorrectly distributed assumptions has the potential to have a significant effect on systematic risk estimates and potentially skew the results, we have chosen to utilize a semi-parametric approach in our analysis. This decision was arrived at as a direct consequence of the aforementioned fact. The multivariate spillover risk may be computed using equation 4, which is provided.

$$\overline{L_{N/1}} = \frac{I_q}{l} = \frac{m}{n} \times C_{n-m,n}^a \times q^{1-a} \dots \dots \dots (4)$$

q is equal to 1/p when applied to a smaller but more numerous sample population, and the value of the tail-estimator drops to when N is equal to 2. The symbol $C_{n-m,n}$ is used to refer to the process of tail snipping of the (n-m)th order. The Hill estimator is denoted by the letter "m" in equation 4, and the total number of observations is denoted by the letter "n." The number of extreme returns is represented by "m." The following equation 5, which provides further systematic risk assessment used in the study, is as follows:

$$\check{E}\left(\frac{\theta}{\theta} \geq 1\right) \approx \frac{N}{\frac{n-1}{kn} \sum_{i=1}^n U_{i=1}^N W_{i>w_{i,n-k}}} \dots \dots \dots (5)$$

RESULTS

The potential downsides of fintech are outlined in Table 1. The average IT business only receives a score of 2.15, which is much lower than the figure of 2.59 that was reported by Chuhadry et al. (2022). The fall in the worth of technology businesses has given rise to the idea of establishing a significant number of financial technology companies located in Thailand. A lengthier and more widespread dispersion is consistent with an exponential growth of Fintech businesses in Thailand during the course of the COVID-19 time period. We show that crisis risk is positively correlated with both company growth and expansion, which is in line with the findings of Chuhadry et al. (2022) and Papanikolaou and Wolff (2014), who asserted that any risk stemming from a crisis presents an opportunity for non-conventional businesses to develop and grow. The findings support the findings of Ellul and Yerramilli (2013), who discovered that an ineffective risk management strategy is related with a bigger tail. It is anticipated that the technology industry as a whole will have a longer tail as a result of the risk-taking character of businesses in the financial technology sector. There are a few businesses in our sample that have very short tails, which suggests that they are much too susceptible to unfavorable occurrences during COVID-19.

The information on the systemic risk that THAILAND's Fintech companies are exposed to is shown in Table 2. It would seem that the industrial and technological indices were at their strongest during the COVID-19 conference. The results indicate that the global

technology index during COVID-19 is reliant on the systemic risk posed by Fintech. It's possible that these outcomes might be attributed to the large growth in customer bases seen by FinTech businesses during COVID-19. Fintech companies in Thailand saw significant growth during the epidemic of swine flu. In point of fact, Chuhadry et al. (2022) discovered that starting in 2019, the tail-s of financial companies started to shrink while the tail-s of technical organizations began to expand.

Table 1.
Tail risk of Thai Fintech

	α	$x(p)$		$ES(W > s)$		$ES(W(I))$	
		P = 0.10%	P = 0.20%	s = 0.25%	s = 0.50%	P = 0.10%	P = 0.2%
1. Kredivo	2.912	0.2102	0.1923	0.1979	0.2981	0.0323	0.0451
2. Omise	2.312	0.1702	0.1423	0.1279	0.2181	0.0525	0.0472
3. Claim Di	2.2211	0.1331	0.1289	0.1221	0.2723	0.0448	0.0606
4. Roojai	2.0128	0.1403	0.1995	0.1371	0.2561	0.0613	0.0813
5. Jitta	2.9201	0.1453	0.0966	0.1207	0.2129	0.0466	0.0922
6. Finnomena	2.2701	0.1561	0.1764	0.1316	0.1372	0.0334	0.0643
7. Masii	3.1212	0.1623	0.0884	0.2111	0.4303	0.0425	0.1811
8. DeepPocke	2.8721	0.1422	0.1371	0.2021	0.2224	0.0438	0.0915
9. FlowAccount	2.432	0.2081	0.1139	0.1281	0.2221	0.0358	0.0854
10. Piggipo	2.9021	0.2607	0.1473	0.1013	0.2336	0.0934	0.0602
11. Stock2Day	2.4928	0.1728	0.1616	0.1201	0.2642	0.0984	0.0614
12. Deepscope	2.2301	0.2231	0.1221	0.1102	0.2414	0.0876	0.0504
13. StockRadars	2.7501	0.1366	0.1254	0.1271	0.2883	0.0856	0.0632
14. AmiLabs	1.9812	0.1002	0.1748	0.1761	0.3441	0.0961	0.1764
15. Investorz	1.8021	0.1451	0.1221	0.1021	0.2329	0.0671	0.0951
Average	2.48212	0.1670	0.1419	0.1410	0.2582	0.0614	0.0836

Table 2.
Systemic risk of Thai Fintech firms

	<i>Country Market I</i>		<i>Country Technology I</i>		<i>Global Market I</i>		<i>Global Techno</i>	
Kredivo	0.55	0.52	0.47	0.54	0.36	0.36	0.42	0.55
Omise	0.37	0.41	0.39	0.46	0.42	0.42	0.52	0.37
Claim Di	0.32	0.49	0.38	0.41	0.36	0.37	0.45	0.32
Roojai	0.41	0.41	0.59	0.39	0.39	0.43	0.52	0.41
Jitta	0.50	0.57	0.34	0.54	0.41	0.44	0.44	0.50
Finnomena	0.52	0.39	0.47	0.27	0.34	0.28	0.29	0.52
Masii	0.50	0.37	0.35	0.45	0.38	0.43	0.50	0.50
DeepPocke	0.54	0.47	0.43	0.47	0.32	0.24	0.25	0.54
FlowAccount	0.43	0.45	0.44	0.48	0.37	0.36	0.43	0.43
Piggipo	0.23	0.47	0.54	0.49	0.34	0.40	0.47	0.23
Stock2Day	0.32	0.50	0.46	0.43	0.33	0.34	0.49	0.32
Deepscope	0.29	0.23	0.46	0.54	0.38	0.36	0.48	0.29
StockRadars	0.31	0.32	0.52	0.46	0.28	0.33	0.42	0.31
AmiLabs	0.48	0.46	0.38	0.53	0.26	0.32	0.34	0.48
Investorz	0.29	0.39	0.44	0.36	0.39	0.30	0.35	0.29
Average	0.40	0.42	0.44	0.45	0.35	0.35	0.42	0.40

Equations 4 and 5 together provide a theoretical basis for systemic risk that is based on the tail. The stock price of technology companies is employed as a proximal driver of systemic risk, whereas the index of national markets is used as a covariate in this analysis.

CONCLUSION

As the progression of COVID-19 continues, a substantial body of evidence has amassed, indicating that the swift evolution of Fintech is not only a pressing necessity but also a pivotal solution to some of the financial sector's most persistent challenges. This evidence underscores that the rapid development of Fintech is both timely and crucial for addressing certain intractable issues within the financial services sector, which is currently lagging in terms of innovating digital connections with customers. Because the fintech industry grew rapidly during the COVID-19 pandemic, and because this expansion was particularly out of the ordinary in developing economies like Thailand, the present study seeks to investigate the tail risk and systemic risk of fintech firms in South east asia by applying the univariate extreme value (EVT) theory, which is predicated on the hypothesis that technology firms are more prone to tail risk. This investigation will be carried out by applying the univariate extreme value (EVT) theory. The sample population for the current study is comprised of organizations that deal in fintech that are located in Thailand. December 2019 and February 2022 will be used as the computation period for the data of the fintech companies. In order to calculate tail-values, DataStream indexes are applied. Some examples of these indices are those that follow the financial market and technical advancement. In addition, we have utilized rolling data over the course of a period of six years to analyze how the tail risk has evolved over that period of time. The precipitous decline in stock price experienced by the fintech business is the key impetus for the conduct of this examination of tail risk. According to the findings of the study, financial technology firms are making this process simpler for their customers by providing them with online platforms that allow the pairing of prospective borrowers with possible lenders. According to the findings, tail risk has the potential to play a substantial influence in asset prices due to its ability to predict the future extreme returns of certain stocks. This capability allows tail risk to act as a leading indicator of asset prices. The results of the research provide credence to the theory by demonstrating that technology-based enterprises in THAILAND have a more resilient tail than the typical company does.

This research makes a distinctive contribution by centering on the exceptional time frame of COVID-19, coinciding with wildly fluctuating commodity prices and a substantial market upheaval due to a significant shock. Moreover, it stands out as one of the few studies utilizing univariate extreme value theory to assess the tail risk of financial technology businesses, marking a unique addition to academic literature (EVT). Furthermore, this study represents a pioneering effort for financial technology firms in Thailand.

DECLARATIONS

Acknowledgement: We appreciate the generous support from all the supervisors and their different affiliations.

Funding: No funding body in the public, private, or nonprofit sectors provided a particular grant for this research.

Availability of data and material: In the approach, the data sources for the variables are stated.

Authors' contributions: Each author participated equally to the creation of this work.

Conflicts of Interests: The authors declare no conflict of interest.

Consent to Participate: Yes

Consent for publication and Ethical approval: Because this study does not include human or animal data, ethical approval is not required for publication. All authors have given their Consent.

REFERENCES

- Adrian, T., & Brunnermeier, M. K. (2011). CoVaR (No. w17454). National Bureau of Economic Research.
- Agur, I., Peria, S. M., & Rochon, C. (2020). Digital financial services and the pandemic: Opportunities and risks for emerging and developing economies. *International Monetary Fund Special Series on COVID-19, Transactions*, 1, 2-1.
- Ahern, D. (2021). Regulatory Lag, Regulatory Friction and Regulatory Transition as FinTech Disenablers: Calibrating an EU Response to the Regulatory Sandbox Phenomenon. *European Business Organization Law Review*, 22(3), 395-432.
- Aikman, D., Bluwstein, K., & Karmakar, S. (2021). A tail of three occasionally-binding constraints: a modelling approach to GDP-at-Risk.
- Ali, M., Raza, S. A., Khamis, B., Puah, C. H., & Amin, H. (2021). How perceived risk, benefit and trust determine user Fintech adoption: a new dimension for Islamic finance. *foresight*.
- Allam, Z. (2020). The forceful reevaluation of cash-based transactions by COVID-19 and its opportunities to transition to cashless systems in digital urban networks. *Surveying the COVID-19 Pandemic and its Implications*, 107.
- Alsahlawi, A. M. (2021). The Role of Hedging and Derivatives Techniques and Fintech Adoption on Financial Risk Management in Thai Banks. *Cuadernos de Economía*, 44(126), 10-22.
- Arinichev, I. V., Matveeva, L. G., & Arinicheva, I. V. (2018). Forecasting the bankruptcy of an organization based on metric methods of data mining. *Адрес редакции*, 9(1), 62.
- Ashta, A., & Biot-Paquerot, G. (2018). FinTech evolution: Strategic value management issues in a fast changing industry. *Strategic Change*, 27(4), 301-311.
- Barr, M. S., Koziara, B., Flood, M. D., Hero, A., & Jagadish, H. V. (2018). Big data in finance: highlights from the big data in finance conference hosted at the University of Michigan October 27-28, 2016. *U of Michigan Law & Econ Research Paper*, (18-010).
- Borio, C. (2020). The Covid-19 economic crisis: Dangerously unique. *Business Economics*, 55(4), 181-190.
- Chang, V., Baudier, P., Zhang, H., Xu, Q., Zhang, J., & Arami, M. (2020). How Blockchain can impact financial services–The overview, challenges and recommendations from expert interviewees. *Technological forecasting and social change*, 158, 120166.
- Chaudhry, S. M., Ahmed, R., Huynh, T. L. D., & Benjasak, C. (2022). Tail risk and systemic risk of finance and technology (FinTech) firms. *Technological Forecasting and Social Change*, 174, 121191.
- Clarke, C. (2019). Platform lending and the politics of financial infrastructures. *Review of international political economy*, 26(5), 863-885.
- Costantino, L., & Pompella, M. (2021). Fintech in Light of the 2020 Emergency: Excess Innovations to the Facts-From Securitization to Tokenomics, and More. *Review of Business*, 41(1), 44-68.
- Croxson, K., Frost, J., Gambacorta, L., & Valletti, T. (2021). Platform-based business models and financial inclusion. *BIS Paper*, forthcoming.
- De Haan, J., & Sturm, J. E. (1994). Political and institutional determinants of fiscal policy in the European Community. *Public choice*, 80(1), 157-172.
- Ellis, S., Sharma, S., & Brzezczyski, J. (2021). Systemic Risk Measures and Regulatory Challenges. *Journal of Financial Stability*, 100960.
- Ellul, A., & Yerramilli, V. (2013). Stronger risk controls, lower risk: Evidence from US bank holding companies. *The Journal of Finance*, 68(5), 1757-1803.
- Elsaid, H. M. (2021). A review of literature directions regarding the impact of fintech firms on the banking industry. *Qualitative Research in Financial Markets*.
- Fu, J., & Mishra, M. (2022). Fintech in the time of COVID– 19: Technological adoption during crises. *Journal of Financial Intermediation*, 50, 100945.

- Gomber, P., Kauffman, R. J., Parker, C., & Weber, B. W. (2018). On the fintech revolution: Interpreting the forces of innovation, disruption, and transformation in financial services. *Journal of management information systems*, 35(1), 220-265.
- Gong, X. L., Liu, X. H., Xiong, X., & Zhang, W. (2020). Research on China's financial systemic risk contagion under jump and heavy-tailed risk. *International Review of Financial Analysis*, 72, 101584.
- Hills, J. G. (1975). Possible power source of Seyfert galaxies and QSOs. *Nature*, 254(5498), 295-298.
- Iman, N. (2020). The rise and rise of financial technology: The good, the bad, and the verdict. *Cogent Business & Management*, 7(1), 1725309.
- Jagtiani, J., & Lemieux, C. (2018). Do fintech lenders penetrate areas that are underserved by traditional banks?. *Journal of Economics and Business*, 100, 43-54.
- Keddad, B., & Schalck, C. (2020). Evaluating sovereign risk spillovers on domestic banks during the European debt crisis. *Economic Modelling*, 88, 356-375.
- Kokkinis, A., & Miglionico, A. (2020). Open banking and Libra: a new frontier of financial inclusion for payment systems?. *Singapore Journal of Legal Studies*, (Sep 2020), 601-629.
- Kruse, L., Wunderlich, N., & Beck, R. (2019, January). Artificial intelligence for the financial services industry: What challenges organizations to succeed. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*.
- Li, S. (2021). How Does COVID-19 Speed the Digital Transformation of Business Processes and Customer Experiences?. *Review of Business*, 41(1), 1-14.
- Lux, T., Luu, D. T., & Yanovski, B. (2020). An analysis of systemic risk in worldwide economic sentiment indices. *Empirica*, 47(4), 909-928.
- Mazur, M., Dang, M., & Vega, M. (2021). COVID-19 and the march 2020 stock market crash. Evidence from S&P1500. *Finance research letters*, 38, 101690.
- Mosteanu, N. R., & Faccia, A. (2020). Digital systems and new challenges of financial management—FinTech, XBRL, blockchain and cryptocurrencies. *Quality-Access to Success Journal*, 21(174), 159-166.
- Nair, D., Veeragandham, M., Pamnani, P., Prasad, S., & Guruprasad, M. (2021). Impact of COVID-19 On Fintech Industry. *International Journal of Research in Engineering, Science and Management*, 4(2), 27-34.
- Neveu, A. R. (2018). A survey of network-based analysis and systemic risk measurement. *Journal of Economic Interaction and Coordination*, 13(2), 241-281.
- Nguyen, D. B. B. (2018). *Tail risk and long memory in financial markets* (Doctoral dissertation, Hannover: Institutionelles Repositorium der Leibniz Universität Hannover).
- Papanikolaou, N. I., & Wolff, C. C. (2014). The role of on-and off-balance-sheet leverage of banks in the late 2000s crisis. *Journal of Financial Stability*, 14, 3-22.
- Paulin, J., Calinescu, A., & Wooldridge, M. (2019). Understanding flash crash contagion and systemic risk: A micro–macro agent-based approach. *Journal of Economic Dynamics and Control*, 100, 200-229.
- Samunderu, E., & Murahwa, Y. T. (2021). Return Based Risk Measures for Non-Normally Distributed Returns: An Alternative Modelling Approach. *Journal of Risk and Financial Management*, 14(11), 540.
- Saputra, M. P. A., & Chaerani, D. (2022). Estimation of Maximum Potential Losses for Digital Banking Transaction Risks using the Extreme Value-at-Risks Method. *Risks*, 10(1), 10.
- So, M. K., Chan, T. W., & Chu, A. M. (2020). Efficient estimation of high-dimensional dynamic covariance by risk factor mapping: Applications for financial risk management. *Journal of Econometrics*.
- Vučinić, M. (2020). Fintech and Financial Stability Potential Influence of FinTech on Financial Stability, Risks and Benefits. *Journal of Central Banking Theory and Practice*, 9(2), 43-66.
- Wójcik, D., & Ioannou, S. (2020). COVID-19 and finance: market developments so far and potential impacts on the financial sector and centres. *Tijdschrift voor economische en sociale geografie*, 111(3), 387-400.

Yigitcanlar, T., Desouza, K. C., Butler, L., & Roozkhosh, F. (2020). Contributions and risks of artificial intelligence (AI) in building smarter cities: Insights from a systematic review of the literature. *Energies*, 13(6), 1473.