THE EFFECT OF FINANCIAL TECHNOLOGY ON THE SUSTAINABILITY OF BANKS IN THE GULF COOPERATION COUNCIL COUNTRIES

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Abstract

The purpose of this study is to investigate the influence that financial technology (FinTech) companies have on the soundness of bank finances. Using a sample of 480 bank-year observation from an emerging market of the Gulf Cooperation Council (GCC) over the period of 2006–2021, we find that the development of FinTech firms over time increases bank financial stability. The study used the Refinitiv Eikon and Fintch Connect databases to measure variables. When we conduct sub-sample analyses by bank size, bank type, and level of corporate governance, we find additional evidence that supports the hypothesis that FinTech companies have an effect on the financial stability of banks. The findings are consistent with a wide variety of model specifications, indices of financial stability, and applications of FinTech. This study is unique and contributes to the extant literature by offering new evidence on the effect of FinTech on the sustainability of banks in GCC.

Keywords: Bank, Financial Technology, Gulf Cooperation Council, Sustainability, Bank Size, Corporate Governance

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1. INTRODUCTION

Companies that specialize in financial technology, sometimes known as FinTech, have emerged as increasingly significant contributors to the provision of financial services in both developed countries and developing economies. It is interesting to note that approximately half of the top 100 major FinTech cities in the world are situated in developing economies. The rise of this industry is essentially a technical reaction to the shortcomings of conventional banks and other financial service providers, which faced financial instability as a result of the global financial crisis that occurred between 2007 and 2008. FinTech companies provide customers with a comprehensive selection of new and cutting-edge financial products and services. FinTech service providers employ technology to disrupt the traditional financial services given by current banks while at the same time inventing new

financial services, such as peer-to-peer (P2P) lending and mobile phone payments. By doing so, they engage in competition with banks in comparable market categories and enterprises, but they interact with a larger client base and provide financial services that are easy to get and have cheap costs. Because of the advantages that they provide to clients, FinTech companies have become a powerful competitive force in the banking business. There has been a significant amount of research conducted on the topic of how competition in the market affects bank stability. On the other hand, it is unknown if or to what degree these new entrants have an influence on the financial stability of banks in the countries of the Gulf Cooperation Council (GCC). As a result, answering this research question was the reason for doing this study.

The decision to carry out this research was prompted by three significant sources, and those sources served as the study's inspiration. To begin, there has not been any methodical research done using empirical methods on this subject. This work closes that gap in the existing research. Second, we think that this topic is important and that it is worthwhile to conduct an empirical study on it because the FinTech market is expanding at a rapid rate, and the banking industry is under pressure from the market to adopt advanced financial technologies in their transactions and services. Consequently, we believe that it is important to investigate this topic. This pressure has gotten a substantial amount of attention in the banking sector, and as a direct result, banks are prioritizing the provision of financial services that are supported by FinTech. However, if these new banking services are introduced only for the purpose of competing with new entrants, then doing so at the expense of financial stability may put the whole banking sector at risk. The period from 2007 to 2009 was marked by a huge crisis in the financial services sector. Such a state of financial insecurity might recur if there is unhealthy competition and if fewer objective-oriented FinTech services are added to the product base of banking services. Last but not least, despite the rapid expansion of FinTech in GCC and the country's multiple banking systems, there has been very little study done in the past on FinTech and banking. Our research contributes to the existing body of literature and expertise by demonstrating that the growth of FinTech companies is important for the financial stability of banks.

The issue that emerges here is *"How exactly do FinTech businesses influence the financial stability of banks?"* In a purely theoretical sense, the greater level of competition may either worsen or strengthen the financial stability of banks. We hypothesize, based on theoretical perspectives, that the increased competition caused by the rapid expansion of FinTech firms may lower market share and rents for banks from relationship lending, which may induce banks to make risky investments, thereby reducing financial stability. These hypotheses are built on the premise that the increased competition may lower market share and rents for banks from relationship lending. Despite this, FinTech companies may exert indirect pressure on banks, encouraging them to either include FinTech as part of their own services or engage FinTech service providers in their services. This may assist banks in running their businesses effectively, preserving their profitability, and remaining financially stable. Therefore, there is no way to know a priori what impact FinTech companies would have on the financial stability of banks. In this research, we use empirical methods to investigate the connection between FinTech companies and the health of banking institutions.

The paper is organized as follows. Section 2 discusses the literature review. Section 3 presents the research methodology. Section 4 provides the research results. Section 5 discusses the results while Section 6 concludes the paper.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Companies that provide financial services by using FinTech, sometimes known as FinTech, have become more significant in both developed and developing nations. The total amount that was invested in FinTech throughout the world rose to $220 billion in 2021, up from $11 billion in 2010 (Lee, 2021). It is important to note that over half of the top 100 cities in the world for financial technology are located in economies that are still in their development stages. The expansion of this sector may be attributed, at its core, to a technological response to the deficiencies of conventional banks and other traditional suppliers of financial services, which faced financial instability in the aftermath of the global financial crisis that occurred in 2007–2008.

It is essential to take into consideration the ways in which FinTech businesses influence the financial stability of banks. It is possible that more competition may make banks' financial soundness worse, but it could also make it better. We anticipate, on the basis of their theoretical perspectives, that the increased competition brought about by the rapid growth of FinTech companies may result in a reduction of market share and relationship lending rents for banks, which may encourage banks to undertake risky investments and result in a decrease in financial stability ("FinTech 2021", 2020). FinTech businesses might exert indirect pressure on banks to either adopt the technology as part of their own services or utilize FinTech service providers for the services in question. Alternatively, banks could choose to use FinTech companies themselves (Safiullah, 2020). This may make it easier for banks to run their businesses financially while still preserving their efficiency and, as a result, their financial stability. FinTech businesses provide a diverse selection of innovative and game-changing financial services. P2P lending and mobile payments are two examples of the new financial services that have been created while disrupting the traditional financial services that were previously offered by established banks by FinTech service providers. P2P lending refers to a situation in which one individual provides financial assistance to another individual through the use of the internet (Lee, 2021).

In recent years, there has been a rise in the amount of attention paid to enterprises in the FinTech sector due to the rapid development of these organizations and their expansion into worldwide markets ("FinTech 2021", 2020). A great number of commentators have voiced their approval

of the expansion of FinTech companies on the grounds that they believe that recent technological developments in the financial sector have a significant potential to revolutionize financial services by lowering the fees associated with financial transactions and making these services more user-friendly and risk-free. In a manner that is analogous to this, FinTech businesses in the financial sector produce technical advancements and business model breakthroughs that significantly enhance financial services for bigger populations. P2P lending (Lee, 2021).

In recent years, significant instances of breakthroughs in FinTech have garnered a lot of attention owing to their spectacular expansion in emerging countries. In 2017, around $550 billion worth of P2P loans were transacted in China, making it the country with the highest number of P2P loan transactions worldwide. Not only that, but China also has the greatest rate of market diffusion, which is a crucial factor. The driving drivers promoting P2P lending in China include a big supply of money, a larger market dispersion rate, and increased demand for financial goods. These three factors are all interconnected. The primary advantage of P2P lending is that it eliminates the need for the conventional banking system by streamlining the process by which lenders and borrowers may locate one another via the use of an internet marketplace (Huang et al., 2020).

Notably, the legal and regulatory framework governing P2P lending in many countries is still in a very immature condition, despite the fact that it is continually evolving. The platform for P2P lending provides additional value-added services. These services include: monitoring the solvency of borrowers and loan ratings; handling payments; and delivering investment advice to customers (Huang et al., 2020). The platform for P2P lending not only serves as a middleman by collecting funds from individual retail investors and extending loans to individual borrowers and small and medium-sized enterprises (SMEs), but it also provides the aforementioned extra services. Along the same line, P2P lending in the United States is not intended to serve as a substitute for bank lending but rather as an addition to small loans. In an analogous manner, in the United States, FinTech businesses provide superior mortgage loan services than conventional lenders do, and this holds true regardless of the amount of money that the consumer has (Safiullah, 2020).

Although there is a dearth of the empirical literature on this study topic, academics and practitioners in the FinTech industry are showing an increasing amount of interest in it. The significance of developments in FinTech using data gleaned from the filing of patents from 2003 to 2020 (Huang et al., 2020). The authors used machine learning to search for advances in the technologies that underlie their work and learn more about those changes before classifying them. Their research indicates that most FinTech innovations result in considerable value for their respective creators. The authors believe that the Internet of Things (IoT), robot-advisory services, and blockchain technologies, in particular, are the advancements that will be most advantageous to the overall financial industry. The authors also discussed how investing a significant amount of money in one's own inventions may be one way for the financial industry to mitigate the negative consequences of technological advancements (Ismail, 2020; Huang et al., 2020).

The spread of risk that occurs between conventional financial institutions and FinTech businesses during a period of rapid technological change was explored by Li, Li, Zhu, Yao, and Casu (2020). The authors investigated paired risk spillovers across quantiles by utilizing the stock returns of United States banking and FinTech companies in conjunction with the Granger causality paradigm. The most important takeaways from the research pointed to the fact that there is a considerable connection between an increase in the systemic risk of financial institutions and the risk transfer from FinTech businesses to those institutions. The performance of 41 different banks and FinTech businesses in Indonesia was analyzed in order to determine whether or not the growth of FinTech companies has a negative effect on the performance of traditional banks. The most important conclusions from their research indicate that the growth of FinTech companies has a substantial influence on the performance of banks (Phan, Narayan, Eki Rahman, & Hutabarat, 2020).

Nevertheless, the impact that FinTech businesses have on bank funding for small and medium-sized enterprises. Using loan data from provincial banks for the years 2011 to 2021, the author was able to confirm that FinTech businesses had significantly helped to make it simpler for banks to lend to SMEs (Sheng, 2021). When it comes to lending money to small and medium-sized businesses (SMBs), it is noteworthy to observe that large banks are substantially more influenced by FinTech companies than smaller banks are. It would seem that, despite recent progress, there is still a paucity of written material about FinTech.

According to the most recent market research, it is anticipated that the worldwide market for financial analytics would reach $25.38 billion by the year 2028. Even if the use of analytics in FinTech-powered operations is becoming more prevalent, there are still challenges involved in deriving insights from growing volumes of data. These complexities may be ascribed to the skills shortages that are afflicting the technology industry as a whole. Establishing strong connections with suppliers, such as cloud service providers (CSPs), Amazon Web Services, and Microsoft Azure, who are continually upgrading their analytical capabilities, is one way to reduce the impact of this (Hurst, 2022).

Recent ground-breaking advances in software for the FinTech sector are providing regulatory technology (RegTech) with an opportunity to create automated solutions to handle regulation monitoring, compliance, and reporting. When it comes to conforming to the requirements of the law, one of the most convenient ways for a financial institution to do so is by storing all of the new regulations in a single database (Kutsenko, 2022). There are now around 150 firms that are involved in the RegTech industry. This seems like a relatively low quantity when placed in context with the more than 300 million pages of current rules. Failure to comply with required restrictions imposed by the government results in financial penalties and

the potential for crises. The administration of financial institutions should make every effort to prevent these kinds of difficulties (Kutsenko, 2022). It should come as no surprise that there is a need for RegTech solutions on the market. It is obvious that other businesses will soon emerge to fill this need, which will lead to further saturation of the market. Because of this, owners of financial institutions should seriously examine the possibility of becoming one of the key RegTech suppliers in their respective financial sectors.

According to recent findings, over half of the firms that provide financial services in the UK want to raise their investment in FinTech over the course of the next year via the use of acquisitions and partnerships. It is abundantly evident that the future of financial services is a combination of collaboration and competition; it is impossible for a single company to survive in this environment. There will be some consolidations, but acquisitions will not always make sense, and basic vendor-customer partnerships may not be suitable either. While there will be some consolidations, there will also be some mergers (Reddish, 2021). The suppliers of financial services will be on the lookout for partners that possess the appropriate technology, as well as the capacity to integrate it and grow it. However, a successful collaboration requires more than just the union of two technological entities.

Saudi Arabia, the biggest nation in the GCC, has seen quite substantial changes in such a short period of time. These changes have been brought about by a variety of factors (Santosdiaz, 2022d). According to the findings of the report titled "FinTech: Middle East and Africa 2021" published by *The FinTech Times*, the Kingdom of Saudi Arabia is in the midst of massive economic development transformations that are centered around its national economic development strategy known as Saudi Vision 2030. This has resulted in the prioritizing of some aspects, such as its financial services industry and digital transformation in general. One of its initial delivery programs was called the Financial Sector Development Program (FSDP), and its goal was to build up Saudi Arabia's financial services industry into one that is not only robust but also cutting-edge and unique (Santosdiaz, 2022d).

This led to the establishment of the catalyst known as FinTech Saudi, which was introduced in 2018 by the Saudi Arabian Monetary Authority (SAMA). Its primary objective is to accelerate the development and maturation of the FinTech industry in the Kingdom of Saudi Arabia (Santosdiaz, 2022d). It is not only increasing the Saudi FinTech system and advancing the digitization of financial services, but it is also speeding up financial inclusion for both the local unbanked and the underbanked. SAMA and a number of other entities, in collaboration with the G20 Global Partnership for Financial Inclusion (GPFI) and the World Bank Group, conducted research and concluded that the youth, women, and SMEs are the three groups that require comprehensive assistance and support in order to encourage financial inclusion through the use of digital and other regulatory incentives (Santosdiaz, 2022d).

The FinTech industry is expanding at a breakneck pace in the Middle East. According to a statement made by the UAE lender Mashreq in February 1, which cited data from the Middle East Institute, it is anticipated that more than 800 FinTech companies operating in different segments such as payments, InsureTech, and cyber security will raise more than $2 billion in venture capital funding to boost their growth by the year 2022. The UAE Digital Economy Strategy intends to expand the contribution of the digital economy to the gross domestic product of the nation to around 20% in the next 10 years, up from 10% at the present time (Nair, 2022).

The majority of countries in the Middle East and Africa (MEA), including Kuwait, have put into place economic growth programs in recent years (Santosdiaz, 2022b). The Kuwait Vision 2035 plan will seek to diversify Kuwait's economy and also assist the nation in becoming less dependent on oil, which for the majority of the last century and continues to today enhance the economic growth of both Kuwait and its other GCC neighbours. In Kuwait, people between the ages of 15 and 39 make up more than half of the total population. In addition, 70% of people who are under the age of 24 have a banking connection, which is much higher than the average of 33% for the Middle East and the average of 54% for the whole world (Santosdiaz, 2022b). According to data provided by Hootsuite, in terms of the percentage of the population aged 15 and older, nearly 80% of people have an account with a financial institution, almost a quarter of people have a credit card, and more than a third of people make online purchases and/or pay online bills. During the height of the 2020 pandemic, Kuwaitis went digital, just as people did everywhere else in the globe, and their activities there saw a significant uptick. For example, the percentage of people using internet banking reached 84% during the pandemic. And in terms of the perceived preparedness for digital transformation, eighty percent of people in Kuwait said that the government and telecoms providers felt they were ready to transition to online services (Santosdiaz, 2022b).

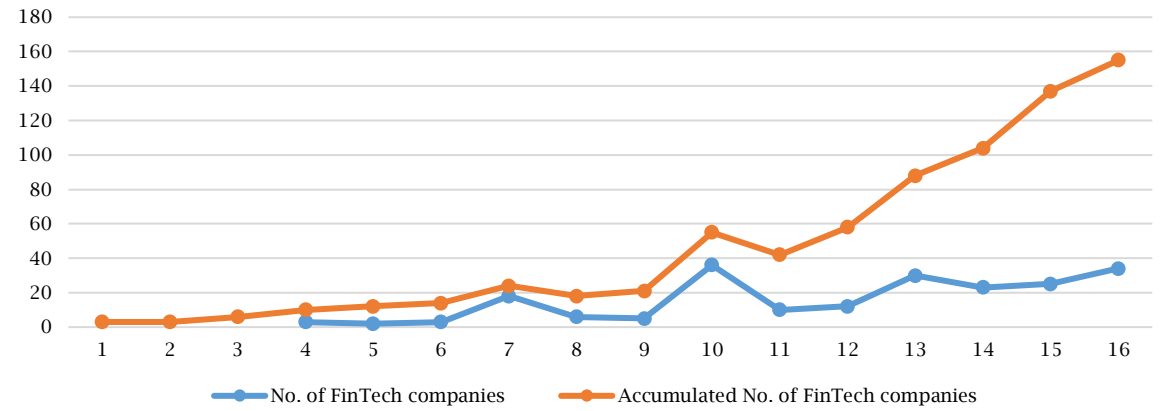
Oman's FinTech ecosystem looks to be farther along in its development than those of its other GCC countries, with whom it shares a border (Santosdiaz, 2022c). Despite this, a greater digital transformation and economic growth are taking place in industries such as fintech as a result of the impetus from the top that is being provided by Vision 2040. The epidemic has also served to underscore the significance of digitization. Over one hundred and 75% of the nation's over 5 million residents have mobile connections, making this country one of the most connected in the world (Santosdiaz, 2022c). According to Hootsuite, more than 95% of the population uses the Internet at least once every month. Similarly, to the rest of the MEA, the majority of the population in the Sultanate of Oman is under the age of 29, with those under the age of 29 accounting for 63% of the total population. Oman, like its other GCC neighbors, has a sizeable community of persons who were born outside of the country and now call themselves expatriates (Santosdiaz, 2022c). This group is believed to number at least 1.7 million people. Thirty-five (35) per cent of people in Oman who utilized fintech in 2020 were reportedly doing P2P money transfers, according to research from that year. Following in the second position was account aggregation with 30%, and in third place was robo-advisor with 15%. The other four were tied for the fourth position,

with linked auto-insurance, connected health insurance, crowdfunding, and connected house insurance all commanding a ten percent share of the market, respectively (Santosdiaz, 2022c).

The bulk of Bahrain's roughly 120 FinTech companies operates in the payments and cryptocurrency sectors (Santosdiaz, 2022a). Additionally, the research notes additional facts, such as the fact that the Central Bank of Bahrain (CBB) has been establishing various new regulatory changes and policies, such as open banking, crowdfunding, crypto-assets, digital financial advising, and the electronic know-your-customer (e-KYC) framework. In addition to this, the ecosystem includes over 19 different incubators and accelerators in the Kingdom (Santosdiaz, 2022a). In terms of government assistance that goes beyond only law, which in the MEA as a whole Bahrain has been leading much in terms of a more regulated approach on issues like open banking, the government can be seen doing this with investment. There are roughly eight different investing bodies in the island country that are now making active investments in various FinTech companies (Santosdiaz, 2022a).

The research unequivocally demonstrates that there is a significant connection between the expansion of FinTech companies and the success of the banking industry. One example of this would be a rise in stock values caused by the expansion of FinTech companies in the United States. When viewed through the lens of emerging markets, the expansion of FinTech firms led to a decline in the performance of Indonesian banks. On the other hand, the growth of FinTech firms in China leads to an increase in bank efficiency while simultaneously lowering risk-taking, internal cash flow, and credit supply to SMEs (Browne, 2020).

Figure 1. Number of FinTech companies in the GCC area (2006–2021)



The conclusions of this body of research are contradictory, which might be due to the varied settings and subjects of the several studies that were conducted. The question of whether FinTech enterprises improve or weaken the financial stability of banks remains insufficiently studied. For instance, some academics have proposed the possibility that an increase in the amount of available competition may either improve or worsen the financial stability of banks. In light of this logic, we postulate that rising competition in the financial sector — due to the quick expansion of FinTech businesses — may decrease the banks' profits from lending, consequently negatively influencing the share prices of those institutions. This is because of the rapid growth of FinTech firms. As a consequence of this, banks are compelled to engage in riskier investments, which will, in the long run, result in a decline in the banks' capacity to maintain their financial stability (Ismail, 2020). Alternately, due to the growing presence of FinTech companies in the financial system, banks may be forced to adopt FinTech services in their banking business. This may eventually help them operate efficiently and maintain their customer base and revenues, which will ultimately help them maintain their financial stability. Given this background, it is not possible to determine the impact that FinTech will have on the financial stability of banks without conducting empirical research. For this reason, we conduct empirical research to determine the relationship between FinTech firms and the financial stability of banks in the context of an emerging market. Given the above arguments, we propose the following hypothesizes:

H1: The development of financial technology companies will improve the financial stability of banks in the GCC.

When compared to conventional banks (CBs), however, the reaction and response of Islamic banks (IBs) to the advent of FinTech and its potential influence seems to be relatively delayed. This is due to the fact that IBs are not as familiar with the business (Almulla & Aljughaiman, 2021). This might be the outcome of the many business models that IBs use (the notion of profit and loss sharing), which are used while they are in existence. However, previous research (Lazahari & Hajjaj, 2018) concluded that it is vital for investment banks to adapt to FinTech in order for them to compete and keep their clients by cooperating with organizations that work in the FinTech industry. Despite this, IBs are more profitable and cost-efficient than CBs and investment banks (Al-Jarrah & Molyneux, 2005). In their study on the influence of cost efficiency on CBs and IBs, however, there was no substantial difference between the two types of businesses, regardless of size, age, or geographical location. In addition, Majid (2003) discovered that there was no statistically significant difference in the levels of

efficiency shown by IBs and CBs. According to the results of the previous research, it would seem that IBs would be required to incur the same extra costs as CBs in order to implement technology into their respective service offerings (Dwivedi, Alabdooli, & Dwivedi, 2021). In spite of the fact that implementing FinTech services has the potential to reduce the cost efficiency of IBs, the majority of their consumers are expected to be religious customers who are more concerned with the operations of the banks. According to the previous discussion, we anticipate that the impact of FinTech services on the performance of commercial banks and investment banks would vary in different ways.

H2: The kind of finance that a financial technology company receives may have an effect on how well it does business.

In the theory of disruptive innovation, new companies that enter an industry and supply new goods and services by using innovative technologies will make those products and services more accessible and cost-effective, which may lead to more market rivalry. In this context, FinTech companies are new entrants that participate in operations traditionally performed by banks (Ibrahim & Truby, 2021). This line of reasoning supports that, whoever provides a two-sided market model that emphasizes company entrance. Based on research conducted in the GCC nations, contend that banks are the institutions that are most afraid of competition from FinTech companies. We can contend that any company that utilizes cutting-edge technology to offer services that were formerly exclusive to banks, such as lending, payments, or investments, has the potential to one day compete with conventional banks and, as a result, affect how well banks do their jobs (Ibrahim & Truby, 2021). Despite the fact that the financial sector and information technology have become deeply intertwined, very few studies have explored the use of technology in financial services. The relationship between the expansion of FinTech companies and the performance of banks. They discovered that the expansion of FinTech companies has a detrimental effect on the performance of banks (Phan et al., 2020). In addition, they highlighted how, despite the obvious and present danger posed by FinTech companies, the efforts made by financial institutions to integrate new technology advancements and make use of them have been feeble and delayed. The effect that FinTech start-ups had on the share prices of retail banks discovered that the effect was negative.

H3: The extent to which entrepreneurs have access to financial resources is a factor that affects the success of financial technology firms.

In order to analyze the hypothesis, each on its own to obtain the results, real-life examples and statistics have to be analyzed. However, the distributed ledger technology (DLT) is not specifically governed by Qatari law; nevertheless, the many implementations of DLT are rather included within the ambit of other legal regimes, including the cyber law of 2014 and the Data Privacy Protection Law of 2016 (Ibrahim & Truby, 2021). Even before the development of DLT, acquiring Trade Finance in Qatar was, and still is, an incredibly difficult procedure that is inconsistent and is done via regulations set by the Qatari financial institutions. This process continues to exist, the procedure was made more difficult by local challenges such as addressing the dangers of money laundering and acts that may fund terrorist organizations (Ibrahim & Truby, 2021). There is no standard framework for the supply of Trade Finance facilities in Qatar, which means that particular conditions are placed on each company by individual providers. These requirements may be somewhat different for each sort of Trade Finance facility that is on offer. The kind and degree of documentation are determined by individual suppliers of trade finance and are a reflection of each bank's risk profile, internal discipline, and commercial strategy and lending stance (Aysan, Belatik, Unal, & Ettaai, 2022).

Letters of credit, letters of guarantee, bills of exchange, promissory notes, cheques, documentary bills (documents against payment (DP)/documents against acceptance (DA)), and export bills for collection (EBC) are the primary Trade Finance instruments used in the nation (Aysan et al., 2022). Part 4 Chapter 6 of Qatar's Commercial Code is where the majority of the provisions governing Trade Finance can be found. Qatar Financial Center (QFC) and Qatar Central Bank (QCB) are two other players that contribute significantly to the regulation of trade finance in Qatar (Kshetri, 2021).

In 2018, the QCB issued Circular No. 6/2018, which put a stop to the trade of Bitcoin. It considered it to be an illegal and high-risk activity and urged that all banks operating in Qatar not to deal with Bitcoin, exchange it with another currency, open an account to deal with it, or send or receive any money transfers for the purpose of buying or selling this currency (Kshetri, 2021). All banks operating in Qatar should not deal with Bitcoin, exchange it with another currency, open an account to deal with it, or send or receive any money transfers for the purpose of buying or selling this Those who disobeyed the circular were likewise subject to the sanctions that were imposed. This was the first caution that was sent to the various financial institutions. More recently, in the year 2020, the Qatar Financial Centre Regulatory Authority (QFCRA) announced that crypto asset services may not be performed in or from the Qatar financial center, while at the same time imposing fines on the businesses that offer such services (Dewi Febriana, 2022). The trade or transfer of virtual assets, as well as the transaction between virtual assets and fiat currency, are all prohibited by this rule. Because of this, there are far fewer opportunities to trade with digital currencies in Qatar.

Within the context of this framework, small, medium, and micro enterprises serve as the primary engine for the creation of new jobs, the generation of new income, and overall economic growth. They also play an important role in the reduction of poverty and the accomplishment of sustainable development goals (Dewi Febriana, 2022). Obtaining financing from official financial institutions continues to be one of the most difficult challenges for small, medium, and micro enterprises in the Arab region. According to a study, the share of small and medium enterprises that receive bank financing in Arab countries does not exceed 9.7% of total bank credit. The available statistics indicate that this is one of the most difficult challenges. According to

statistical research that was carried out by the World Bank in partnership with the Union of Arab Banks (UAB), the Arab Monetary Fund (AMF) issued in 2017, which is a significant increase from the 8% that it issued in 2014 (Kshetri, 2021). The percentage of financing that goes to SMBs falls below 10% in Bahrain, Jordan, Tunisia, Sudan, Kuwait, Saudi Arabia, Mauritania, and Egypt. The percentage of financing that goes to SMBs ranges from 34% in Morocco, 16% in Lebanon, 14% in Palestine, and 11% in the UAE. According to these numbers, the most significant obstacle that small and medium enterprises in the Arab world must overcome is the difficulty of obtaining bank financing. As a result, Arab banks should attach greater importance to this essential sector, which constitutes a huge opportunity for investment and financing for them.

The advancement of technology not only compels people to adjust their behaviours but also necessitates that organizations and businesses be prepared to meet the difficulties and deal with the effects of these advancements.

3. RESEARCH METHODOLOGY

Thirty (30) conventional financial institutions and 480 bank-year observations from different six GCC countries (Saudi Arabia, Kuwait, Qatar, Bahrain, the United Arab Emirates, and Oman) make up our sample. We have chosen the years 2006–2021 as our sample period since, previous to 2006, there were very few FinTech companies operating in the GCC area (see Figure 1). When it comes to bank-level financial data, we use Refinitiv Eikon and Fitch Connect databases to measure our research variables. We gather information on FinTech companies from FinTech GCC by hand. In addition, we go through the annual reports of the various banks to extract data on board governance at the bank level. For variables pertaining to both industries and countries, we use the World Development Indicators database.

The information was gathered from the respondents of the Global Islamic Bankers' Survey (GIBS), which was carried out in the year 2020 by the General Council for Islamic Banks and Financial Institutions (CIBAFI). A total of 101 financial institutions from the GCC were questioned for this study, and the topics of digitization and customer experience in the banking industry were addressed. The dataset was generated by taking particular questions from the questionnaire, also known as the Global Islamic Bankers' Survey (GIBS), and answering them based on the research topics posed by this study. Between November 2019 and February 2020, the survey was carried out. The GIBS is an annual study conducted by the senior management of banks throughout the world. The purpose of the survey is to get a better understanding of the present state of the sector as well as its potential future paths. It is essential to conduct the survey in order to directly observe the management objectives and motives of the decision-makers and to apply this information in quantitative testing. Approximately 35 nations and 101 financial institutions are included in the poll each year. In order to extrapolate geographical patterns, these nations have been divided into seven categories for the purpose of classification. The nation categorization for the data from 2020 is outlined in the table that can be seen below. Every year, the CIBAFI will provide survey results and executive summaries, both of which will include a listing of important highlights from the worldwide banking business.

The Z-score is the fundamental metric that we use to evaluate the health of our financial system; a higher Z-score indicates a greater level of financial health, indicating higher financial stability. The Z-score is defined as follows:

$$Z - score_{i,t} = \frac{ROA_{i,t} + CAR_{i,t}}{St.Dev\ ROA_{i,t}} \quad (1)$$

where, *ROA* is the return on assets, *CAR* is the capital-to-asset ratio, and *St. Dev. ROA* is the standard deviation of ROA, for bank *i* at time *t*. The Z-score is a measure that indicates the number of standard deviations that a bank's ROA would have to go below its anticipated value in order for the bank to run out of equity and become insolvent. The stochastic frontier analysis method is used in the next step in the construction of a relative measure of financial stability that we will refer to in the following as the RZ-score (relative financial stability). Following is a specification of both the stochastic stability frontier model and the trans log specification for the stochastic stability frontier model (Fang, Hasan, & Marton, 2014; Safiullah, 2021; Safiullah & Paramati, 2022):

$$ln(Z - score_{i,t}) = lnf_t(X_{i,t}) + v_{i,t} + u_{i,t} \quad (2)$$

$$\frac{Z - score_{i,t}}{w_3} = \alpha_0 + \sum_{g=1}^{3} \alpha_g \ln(y_{g,i,t}) + \sum_{m=1}^{2} \beta_m \ln\left(\frac{w_{m,i,t}}{w_3}\right) + \frac{1}{2}\sum_{g=1}^{3}\sum_{h=1}^{3} \gamma_{g,h} \ln(y_{g,i,t}) \ln(y_{h,i,t}) + \frac{1}{2}\sum_{m=1}^{2}\sum_{n=1}^{2} \delta_{m.n} \ln\left(\frac{w_{m,i,t}}{w_3}\right) \ln\left(\frac{w_{n,i,t}}{w_3}\right) + \frac{1}{2}\sum_{g=1}^{3}\sum_{m=1}^{2} \theta_{g,n} \ln(y_{g,i,t}) \ln\left(\frac{w_{n,i,t}}{w_3}\right) + v_{j,i,t} + u_{j,i,t} \quad (3)$$

where, $ln(Zscore_{i,t})$ is a logarithm of the Z-score for bank *i* in year *t*.

The following is how we define the output variables and the input prices:

- total loans refer to the total amount of customer loans;
- other earning assets include loans and advances to banks, other securities, derivatives (if any), and other investments;
- non-interest income includes net gains (losses) on trading and derivatives, net gains (losses) on other securities, net insurance income, net fees, and commissions, and other operating income;
- the price of deposits refers to the ratio of interest expenses to total deposits.

Following the lead, we utilize the total number of all FinTech businesses and the number of FinTech firms closely associated with banking services as our proxy for the firms that fall under the category of FinTech. These are the variables that we are interested in. Our second method of measuring FinTech tackles a potential worry that certain FinTech companies, namely those that are more closely associated with banking services, may have a different effect on the financial stability of banks compared to other types of FinTech companies.

For an empirical study of the models, an analysis was used using pooled ordinary least squares (POLS) method. This approach will allow us to get a comprehensive understanding of the nature of the relationship between dependent and independent variables.

After that, we do a test of the robustness of the estimate using the dynamic panel generalized method of moment (GMM) estimator. Because the dynamic panel GMM model uses first-differenced variables as instruments for the equations in levels, and because the results are resilient to unobserved heterogeneity, simultaneity, and dynamic indigeneity, this methodology is suitable for the setting of our research. The literature on banking use methods that are comparable to these.

We use the following regression model to conduct an empirical investigation into the hypothesis that FinTech companies have an effect on the stability of banking markets:

$$FS_{i,t} = \alpha + \beta FinTech_{i,t} + \gamma X_{i,t} + \delta M_t + \varepsilon_{i,t} \quad (4)$$

where, i and t refer, respectively, to the financial institution and the year. The abbreviation *FS* refers to the financial stability measures (Z- and RZ-scores). *FinTech* refers to three proxies for FinTech firms (all FinTech firms that are closely related and not related to the banking industry). X signifies bank-level financial control variables, while M represents industry- and macro-level control variables. The standard was set with this particular model (Safiullah & Paramati, 2022; AlHares, 2020). Following the approach of Safiullah and Paramati, (2022), we also consider the inclusion of the Global Financial Crisis (GFC) factor in our base model to find out if the impact of fintech on the bank's financial stability is maintained with GFC. Our goal is to determine whether this impact remains even after we adjust for the GFC. The following is a summary of our expanded model:

$$FS_{i,t} = \alpha + \beta FinTech_{i,t} + \gamma X_{i,t} + \delta M_t + \theta GFC + \varepsilon_{i,t} \quad (5)$$

where, the acronym *GFC* stands for the Global Financial Crisis and is denoted by the dummy variable, which has a value of one during the GFC period (2007–2009) and a value of zero in all other circumstances. This approach is consistent with prior banking literature (Safiullah, 2020; Safiullah & Paramati, 2022).

In order to conduct an empirical investigation of the aforementioned models, we will first use the POLS approach to our research. We are able to acquire a comprehensive understanding of the nature of the connection that exists between dependent and independent variables by using the POLS method. In addition, the analysis of the models was conducted using this methodology as a starting point. In addition to this, we analyze the immediate as well as the delayed implications that FinTech companies have on the stability of banks. The use of the lagging values of the independent variables serves two purposes: first, it addresses the reverse causality concern; second, it allows some time for the independent variables to impact the dependent variable. Both of these purposes are served by the use of the lagging values of the independent variables. This is significant for our research because the influence that FinTech companies have on bank stability may not be immediately apparent. The resolution of this influence with respect to the time period is achieved by the use of lagged values of FinTech variables.

4. RESEARCH RESULTS

The presentation of descriptive data for each variable included in Table 1 marks the beginning of our exploratory inquiry. According to the data, the *Z-score* might vary anywhere from -0.19 to 2.67 in the sample, which suggests that there is a large amount of variation in terms of financial stability across the chosen sample banks. The relative financial stability metric (*RZ-score*) has been shown to exhibit notable variations throughout the sample.

In addition, it seems from Table 1 that FinTech measurements have greater standard deviations. This is due to the fact that the number of FinTech enterprises fluctuates noticeably over the sample period. The youngest bank was roughly 11 years old, while the oldest was approximately 31 years old. The non-performing loans (*NPL ratio*) make up approximately 4.64% of all loans on average, with the greatest amount accounting for 74.32% of all loans. Another essential indication is the increase in assets, which typically sits at around 9% annually. The fact that banks are able to earn money from sources other than conventional banking services is shown by the fact that their non-interest income, also known as their income diversity (*Income diversity*), is close to 19.26% on average. This is an encouraging indicator.

Table 1. Descriptive statistics analysis

Variable	*Mean*	*Std. Dev.*	*Min*	*Max*
Z-score	1.58	0.48	-0.19	2.67
RZ-score	0.77	0.12	0.29	0.97
FinTech	10.13	8.78	0.00	25.00
A_FinTech	13.18	11.05	0.00	32.00
Bank size	3.77	0.75	0.45	5.30
Bank age	24.85	19.45	11.00	31.00
NPL ratio	4.64	7.10	0.00	74.32
Equity capital ratio	13.39	14.31	-1.87	98.02
Assets growth	11.36	23.61	-70.95	246.14
Income diversity	19.26	11.79	-28.62	60.62
ROA	0.63	1.28	-8.55	7.53
Bank concentration ratio	69.15	12.69	10.79	92.46
GDP growth rate	3.01	2.39	-4.91	11.91
Bank-level corporate governance score	61.68	17.01	24.00	87.38

On the other hand, it is essential to be aware that the concentration of banks in the GCC is unusually high since just three banks account for more than two-thirds of the whole banking system in the nation. This fact is equally essential to be brought to your attention. When taken as a whole, these descriptive statistics imply that there is a substantial amount of variety in the sample observations.

Appendix (Table A.1) includes a correlation matrix based on pairwise correlations. The correlation matrix reveals that there is a positive association between financial stability (*Z-score*) and *FinTech*. This suggests that the growth of FinTech companies is one factor that leads to the increased financial stability of banks. The coefficient of correlation between *ROA* and financial stability (*Z-score*) is 0.26, which is the greatest possible value. As a result, the presence of multicollinearity does not pose a challenge for this estimator. In conclusion, when it comes to the control variables, *Income diversity* and *Bank-level governance score* show a statistically significant positive link with financial stability, but bank concentration (*Bank concentration ratio*) shows a statistically significant negative correlation with financial stability (*Z-score*). These strong connections between monetary security and the other control factors imply that it is necessary to include controls for these variables in our regression model. Notably, none of the pairwise correlations among the independent variables have a value greater than -0.32 (between *Bank size* and *Equity capital ratio*), and all of the variance inflation factor (VIF) values have remained below 9. As a result, the environment of our investigation is not anticipated to provide significant challenges with multicollinearity.

5. DISCUSSION OF THE RESULTS

The empirical findings are outlined in Table 2. The first three columns (Panel A) explain the contemporaneous influence that FinTech companies have on the financial stability of banks, and the final three columns (Panel B) provide information on the lagged effect (one year) that FinTech companies have had on the financial stability of banks.

Table 2. Financial technology's effect on financial stability

Variable	***Panel A: Contemporaneous effect of FinTech***			***Panel B: Lag effect of FinTech***		
	Development variable: *Financial stability (Z-score)*					
	Model (1)	***Model (2)***	***Model (3)***	***Model (1)***	***Model (2)***	***Model (3)***
FinTech	0.0121*** (3.85)	0.0079** (2.28)	0.0064* (1.64)			
FinTech $_{t-1}$				0.0171*** (4.85)	0.0121*** (3.27)	0.0151*** (3.01)
Bank size		0.0673* (1.63)	0.0813** (1.95)		0.0842** (2.02)	0.0878** (2.10)
Bank age		-0.0002 (-0.04)	0.0002 (0.16)		0.0000 (0.01)	0.0002 (0.09)
NPL ratio		0.0003 (0.07)	-0.0001 (-0.01)		0.0000 (0.00)	-0.0000 (-0.00)
Equity capital ratio		0.0049** (2.30)	0.0041** (2.36)		0.0042** (2.26)	0.0049** (2.08)
Assets growth		-0.0005 (-0.53)	-0.0003 (-0.45)		-0.0007 (-0.54)	-0.0007 (-0.58)
Income diversity		0.0033 (1.46)	0.0023 (1.58)		0.0026 (1.09)	0.0032 (1.25)
ROA		0.1029*** (4.76)	0.1046*** (4.93)		0.1153*** (4.89)	0.1146*** (4.88)
Bank concentration ratio			-0.0013 (-0.53)			0.0025 (0.85)
GDP growth rate			0.0127 (1.06)			0.0062 (0.51)
Constant	1.4834***(34.60)	1.0688*** (6.22)	1.0851***(4.01)	1.4506*** (33.69)	0.9795*** (5.55)	0.7113** (2.38)
R-squared	0.045	0.139	0.154	0.079	0.182	0.201
F-statistics	15.06***	5.83***	5.12***	23.82	7.36	6.32
Skewness and Kurtosis (Jarque-Bera) test for normality (P-value)	0.153	0.271	0.1081	0.145	0.207	0.1972

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

According to the findings, FinTech enterprises have a materially favorable influence on the financial soundness of all alternative models. It is important to note that the delayed influence that FinTech businesses have on the stability of the financial system is far bigger, and this data is consistent across different models. Bank size, capitalization, and branch locations are examples of control variables.

The return on assets is statistically significant and plays a vital part in the process of enhancing the financial health of banks in the GCC. In general, these findings show that the influence of FinTech businesses on the long-term financial stability of banks is higher than the effect that FinTech companies have on banks at the present time. According to these results, when banks start to feel competition from FinTech businesses in the market, they start to react and start taking necessary activities to strengthen their financial stability. These actions include reacting and taking appropriate actions to improve their financial stability.

Following the previous phase, we organized our sample banks into big and small groups as the following stage of our inquiry. The empirical findings on the lagged influence of FinTech enterprises on financial stability are shown in Table 3, broken down by bank size. The findings indicate that FinTech companies continue to have a beneficial effect on the soundness of both big and small banking institutions. On the other hand, the effect of FinTech companies is far more significant on the financial stability of smaller banks than it is of that of larger banks. This empirical data makes more sense in a pragmatic sense since small banks, owing to their size and institutional architecture, are more proactive in implementing essential activities to counteract increased competition and changing market circumstances.

Table 3. Financial technology's effect on financial stability by bank size

Variable	*Panel A: Large banks*			*Panel B: Small banks*		
	Development variable: *Financial stability*					
	Model (1)	***Model (2)***	***Model (3)***	***Model (1)***	***Model (2)***	***Model (3)***
FinTech $_{t-1}$	0.0129*** (2.72)	0.0124** (2.28)	0.0158** (2.04)	0.0188*** (3.52)	0.0138** (2.57)	0.0171** (2.44)
Bank size		-0.1018 (-0.69)	-0.1684 (-1.13)		0.1218* (1.78)	0.1362** (2.00)
Bank age		-0.0001(- 0.14)	0.0004(0.34)		0.0005 (0.26)	-0.0001 (-0.05)
NPL ratio		0.0003 (0.05)	-0.0004 (-0.05)		-0.0011 (-0.22)	-0.0001 (-0.04)
Equity capital ratio		0.0012 (0.23)	0.0029 (0.53)		0.0072** (2.46)	0.0066** (2.22)
Assets growth		0.0028 (0.91)	0.0012 (0.41)		-0.0016 (-0.89)	-0.0012 (-0.68)
Income diversity		0.0022 (0.63)	0.0022 (0.59)		0.0032 (0.89)	0.0038 (1.01)
ROA		0.1446*** (2.67)	0.1601*** (2.96)		0.1051*** (3.78)	0.1042*** (3.67)
Bank concentration ratio			0.0036 (0.69)			0.0020 (0.51)
GDP growth rate			-0.0016 (-0.07)			0.0075 (0.47)
Constant	1.5546*** (24.54)	1.7846*** (2.95)	1.7432** (2.34)	1.3725*** (23.53)	0.7994*** (3.05)	0.5473 (1.29)
R-squared	0.049	0.121	0.144	0.085	0.226	0.234
F-statistics	7.52***	2.22**	2.02**	12.56***	4.61***	3.66***

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

In addition to this, we do an additional study based on corporate governance at the bank level. To be more specific, the sample banks in the GCC have been categorized as either having strong or poor levels of corporate governance, and Table 4 presents the findings of this analysis. It is interesting to note that the findings indicate that FinTech businesses have a stronger beneficial influence on the financial stability of banks that have low levels of corporate governance than those that have high levels of corporate governance. According to what is shown in Table 4, the effects of the control variables were reliable. The most important thing to take away from this study is the fact that banks with poor corporate governance are taking more initiative to improve their financial stability in response to the growing presence of FinTech businesses. This suggests that banks with poor corporate governance are more likely to implement FinTech in their banking services. This behavior could be characterized as an attempt to mask poor governance or as an attempt to take advantage of the weak governance framework of FinTech practices in the banking sector.

Table 4. Financial technology's effect on financial stability by bank-level corporate governance

Variable	*Panel A: High corporate governance*			*Panel B: Low corporate governance*		
	Development variable: *Financial stability*					
	Model (1)	***Model (2)***	***Model (3)***	***Model (1)***	***Model (2)***	***Model (3)***
FinTech $_{t-1}$	0.0103* (1.63)	0.0129* (1.72)	0.0115 (0.96)	0.0196*** (4.87)	0.0121*** (3.38)	0.0159*** (3.13)
Bank size		-0.0308 (-0.23)	-0.0473 (-0.41)		0.1021** (2.43)	0.1055** (2.45)
Bank age		-0.0018 (-0.80)	-0.0014 (-0.61)		0.0009 (0.59)	0.0009 (0.50)
NPL ratio		-0.00181 (-0.18)	-0.0025 (-0.28)		0.0002 (0.01)	0.0006 (0.17)
Equity capital ratio		0.0043 (0.60)	0.0033 (0.39)		0.0046** (2.20)	0.0037** (2.16)
Assets growth		0.0033 (0.80)	0.0034 (0.81)		-0.0011 (-0.91)	-0.0013 (-0.94)
Income diversity		-0.0023 (-0.47)	-0.0019 (-0.33)		0.0052** (2.01)	0.0059** (2.13)
ROA		0.1291 (0.89)	0.1809 (1.21)		0.1077*** (5.22)	0.1071*** (5.10)
Bank concentration ratio			-0.0014 (-0.18)			0.0021 (0.69)
GDP growth rate			0.0089 (0.34)			0.0115 (0.85)
Constant	1.5223*** (19.54)	1.6479*** (3.31)	1.7894* (1.88)	1.3512*** (27.18)	0.8173*** (4.77)	0.5691** (2.01)
R-squared	0.022	0.055	0.064	0.122	0.311	0.323
F-statistics	2.73*	1.73*	1.62*	23.17***	8.83***	7.15***

*Notes: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

Next, we conduct an additional sub-sample analysis based on the type of bank. The findings of the influence that FinTech businesses have had on the overall financial stability of CBs are shown in Table 5. According to the results, FinTech businesses have a far more favorable and substantial influence on the financial stability of banks. This suggests that GCC banks are more effective in embracing FinTech in their service offerings and in handling the rivalry posed by FinTech companies. We further analyze the influence that FinTech businesses have on the financial stability of banks by accounting for the Great Financial Crisis era. The findings of this investigation are shown in Table 6. According to the data, FinTech businesses are continuing to play a beneficial role in positively driving the financial soundness of banks in the GCC. We also point out that the size of the bank, the amount of capital it has, and its return on assets are all possible determinants of the financial stability of the bank.

Table 5. Financial technology's effect on financial stability by bank type (conventional)

Variable	Development variable: *Financial stability*		
	Model (1)	***Model (2)***	***Model (3)***
FinTech$_{t-1}$	0.0079 (1.53)	0.0122* (1.78)	0.0101 (0.91)
Bank size		-0.0505 (-0.39)	-0.0831 (-0.61)
Bank age		-0.0023 (-1.21)	-0.0018 (-1.02)
NPL ratio		0.0003 (0.06)	-0.0001 (-0.01)
Equity capital ratio		-0.0001 (-0.04)	-0.0018 (-0.31)
Assets growth		0.0058* (1.81)	0.0041* (1.63)
Income diversity		-0.0009 (-0.22)	-0.0022 (-0.37)
ROA		0.0797 (0.59)	0.1139 (0.78)
Bank concentration ratio			-0.0025 (-0.36)
GDP growth rate			0.0189 (0.66)
Constant	1.5823*** (24.12)	1.8521*** (3.78)	2.1635** (2.49)
R-squared	0.015	0.054	0.068
F-statistics	2.51*	0.91	0.70

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

Table 6. Financial technology effect on financial stability in the GFC

Variable	Development variable: *Financial stability*		
	Model (1)	***Model (2)***	***Model (3)***
FinTech$_{t-1}$	0.0143*** (4.21)	0.0127*** (2.83)	0.0143*** (2.53)
Bank size		0.0823** (2.22)	0.0861** (2.03)
Bank age		0.0000 (0.00)	0.0001 (0.16)
NPL ratio		0.0005 (0.13)	0.0002 (0.05)
Equity capital ratio		0.0055** (2.17)	0.0044** (2.17)
Assets growth		-0.0008 (-0.59)	-0.0012 (-0.65)
Income diversity		0.0026 (1.21)	0.0038 (1.29)
ROA		0.1138*** (4.74)	0.1134*** (4.77)
Bank concentration ratio			0.0018 (0.63)
GDP growth rate			0.0029 (0.21)
GFC	-0.1056 (-1.11)	-0.0807 (-0.91)	-0.0371 (-0.32)
Constant	1.4707*** (28.73)	1.0051*** (5.55)	0.7477** (2.33)
R-squared	0.083	0.172	0.208
F-statistics	12.55***	6.44***	5.61***

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

We carry out further research using different measures of financial stability (a relative measure utilizing the stochastic frontier technique), as well as FinTech (firms that provide banking services in addition to WealthTech, remittance/FX, RegTech, InsurTech, and PropTech). The relative financial stability metric may be accommodated by the employment of a stochastic frontier-based financial stability measure, which also rates the financial stability of a bank in comparison to the most successful and financially healthy banks throughout the whole sector. Table 7 summarizes the findings of several different assessments of the state of the financial system. Based on the findings, it seems that FinTech businesses are continuing to have a large and favorable influence on the financial stability of banks. The magnitude of the impact is statistically significant and consistent across all of the models. The research presented here reveals that the influence of FinTech enterprises on the financial stability of banks is good, regardless of the methods used to assess financial stability.

We investigate the influence that FinTech companies have on the financial stability of banks further by adopting a different measure of FinTech. As our major measure of FinTech in the parts that came before, we focused on companies that are intimately affiliated with the banking sector. In this part, we broaden our measurement by taking into account all FinTech companies in order to have a better understanding of the total effect that they have and the results of this expansion are given in Table 8. The data presented in the table demonstrates that the alternative indicator for FinTech is positive and has a statistically significant influence on the financial stability of banks in the GCC. Noteworthy is the fact that the impact magnitude is less obvious when using this alternate measure of FinTech in comparison to our primary findings, as seen in Table 8. This research demonstrates that FinTech companies that are strongly associated with the banking business have a stronger effect on the financial stability of banks than other FinTech companies that are not directly associated with the banking industry.

Table 7. Financial technology's effect on financial stability — Alternative measure

Variable	Development variable: *Relative financial stability (RZ-score)*		
	Model (1)	***Model (2)***	***Model (3)***
FinTech$_{t-1}$	0.0011* (1.67)	0.0017* (1.63)	0.0013*** (2.33)
GFC	0.0434** (2.01)	0.0119 (0.43)	0.0111 (0.2)
Bank size		-0.0344 (-1.11)	-0.0337 (-1.07)
Bank age		-0.0001 (-0.29)	-0.0000 (-0.01)
NPL ratio		-0.0001 (-0.02)	-0.0004 (-0.22)
Equity capital ratio		0.0000 (0.02)	0.0001 (0.04)
Assets growth		0.0010 (0.75)	0.0006 (0.71)
Income diversity		-0.0002 (-0.21)	-0.0003 (-0.17)
ROA		0.0368 (0.76)	0.0512 (1.16)
Bank concentration ratio			-0.0014 (-0.67)
GDP growth rate			0.0022 (0.26)
Constant	0.7650*** (59.67)	0.9516*** (6.38)	1.0251*** (4.11)
R-squared	0.019	0.048	0.043
F-statistics	3.02**	2.55**	9.37***

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

Table 8. Financial technology's effect on financial stability — Alternative proxy for financial technology

Variable	Development variable: *Financial stability*		
	Model (1)	***Model (2)***	***Model (3)***
A_FinTech$_{t-1}$	0.0106* (4.22)	0.0066* (3.03)	0.0104*** (2.65)
Bank size		0.0832 (2.05)	0.0776 (2.11)
Bank age		0.0005 (0.27)	0.0004 (0.32)
NPL ratio		-0.0002 (-0.04)	-0.0002 (-0.02)
Equity capital ratio		0.0034** (2.38)	0.0038** (2.13)
Assets growth		-0.0002 (-0.37)	-0.0003 (-0.28)
Income diversity		0.0021 (1.12)	0.0028 (1.24)
ROA		0.1147*** (4.72)	0.1143*** (4.78)
Bank concentration ratio			0.0019 (0.61)
GDP growth rate			0.0077 (0.63)
Constant	1.4403*** (33.14)	0.9442*** (5.35)	0.7188*** (2.34)
R-squared	0.055	0.166	0.185
F-statistics	21.58***	7.13***	6.11***

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

In conclusion, we estimate the models by making use of several alternative estimating strategies, such as the dynamic panel GMM, and present the findings in Table 9. The findings indicate that financial technology businesses continue to have a beneficial impact on the financial system, and this finding is in line with an alternate method of gauging the health of the financial system. The fact that our conclusion was not influenced by unobserved heterogeneity, simultaneity, or dynamic indigeneity was validated by the fact that it was possible to generate a robust result by utilizing the dynamic panel GMM estimator.

When taken as a whole, our substantial body of research demonstrates that FinTech companies and the financial soundness of banks are favorably and strongly related to one another.

Table 9. Financial technology's effect on financial stability — Dynamic panel GMM estimation results

Variable	Development variable: *Z-score*	Development variable: *RZ-score*
	Model (1)	***Model (2)***
Z-score$_{t-1}$	0.3277 (1.49)	
Ref s$_{t-1}$		0.5144 (0.55)
FinTech$_{t-1}$	0.0122** (2.35)	0.0102** (2.22)
Bank size	0.2857** (2.28)	0.4638** (2.22)
Bank age	0.0027 (0.19)	-0.0021 (-0.26)
NPL ratio	-0.0042 (-0.18)	-0.0147 (-0.66)
Equity capital ratio	0.0054** (2.436)	0.0104** (1.67)
Assets growth	-0.0021 (-0.38)	-0.0101 (-0.71)
Income diversity	-0.0082 (-0.32)	-0.0023 (-0.24)
ROA	-0.0362 (-0.17)	0.0217 (0.14)
Bank concentration ratio	0.0017 (0.38)	0.0013 (0.32)
GDP growth rate	-0.0036 (-0.19)	0.0073 (0.47)
Constant	-0.2566 (-0.26)	-0.7248 (-0.83)
F-statistics	8.11***	7.23***
Hansen J statistics (P-value)	0.756	0.952
AR (1) test	-2.02**	-1.81**
AR (2) test	1.01	0.11

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

Table 10. Financial technology's effect on financial stability — Post-2013

Variable	Development variable: *Financial stability*		
	Model (1)	***Model (2)***	***Model (3)***
FinTech$_{t-1}$	0.0111*** (2.63)	0.0101** (2.31)	0.0074 (1.26)
Bank size		0.0711* (1.62)	0.0780 (1.75)
Bank age		-0.0002 (-0.13)	-0.0001 (-0.06)
NPL ratio		0.0022 (0.23)	0.0013 (0.23)
Equity capital ratio		0.0026 (1.38)	0.0027 (1.41)
Assets growth		-0.0012 (-0.72)	-0.0012 (-0.37)
Income diversity		0.0004 (0.36)	0.0001 (0.14)
ROA		0.0631** (2.03)	0.0676** (2.07)
Bank concentration ratio			-0.0026 (-0.81)
GDP growth rate			0.0153 (0.65)
Constant	1.4555*** (22.23)	1.0756*** (5.03)	1.2708*** (3.22)
R-squared	0.022	0.071	0.101
F-statistics	7.34	2.12	2.00

*Note: ***, **, and * indicate statistical significance at 1%, 5%, and 10% levels, respectively. T-stat. is in parenthesis.*

In order to explain the significant changes that have occurred in the growth of FinTech since 2010, we investigate the influence that FinTech companies have had on the financial stability of banks during this time period (see Table 10). There is evidence to suggest that FinTech companies have a favorable influence on the financial stability of banks. This conclusion is consistent across all models, which suggests that FinTech may play a role in enhancing the financial stability of banks.

6. CONCLUSION

The findings of our empirical research indicate that financial technology businesses have a considerable beneficial influence on the financial stability of banking institutions located in the GCC. Our research also shows that financial technology companies have a stronger favorable impact on the financial security of low-corporate governance institutions, and small banks than they do of large banks. In light of these results, we propose a number of policy implications that are essential for further enhancing the financial stability of banks located inside the GCC. To be more specific, we contend that big banks are not as agile as smaller banks when it comes to putting proper measures into place to strengthen their financial stability. As a result, we recommend that major banks continue to safeguard their client base by providing services that are both creative and competitive so that they can live up to the expectations of consumers in the market. This proposal is in line with the results, who believe that financial institutions might prevent the detrimental effect of the innovations implemented by competitors by investing extensively in their very own inventions. This recommendation is compatible with their findings. Banks are able to compete with their rivals and give consumers financial services that are more effective and competitive when they behave in this manner. The same line of reasoning can be applied to conventional banks and banks with high corporate governance, both of which are falling slightly behind their competitors in terms of the rate at which they are able to improve their financial stability in response to the growing number of FinTech companies operating in the country.

In addition, we believe that the existence of FinTech businesses has contributed to an increase in the financial stability of GCC banks in general; however, the degree of this improvement varies greatly amongst individual banks. FinTech companies continue to expand as a result of shifting conditions in the economy, technical advancements, and the provision of quick and inexpensive financial services. Therefore, banks need to be prepared to defend their customer base and maintain their dominant position in the market by offering services that are both competitive and appealing to their clientele. The most important thing to take away from this study is that the presence of FinTech companies does not have a negative impact on the financial stability of banks, that their presence results in healthy market competition, and that their presence may result in improved banking services for customers who do not have bank accounts. Despite the contributions presented above, this research has potential limitations that should be considered and are associated with the sample collected. This research depends only on banks listed from six countries (Saudi Arabia, Kuwait, Qatar, Bahrain, the United Arab Emirates, and Oman) of the GCC. We believe that further research should investigate the influence of FinTech companies on both banking and non-banking companies. Further studies may also examine FinTech firms in other regions. If so, this would further enhance our knowledge of FinTech and its broader impact.

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APPENDIX

Table A.1. Correlation matrix

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
Z-score (1)	1.0											
FinTech (2)	0.16*	1.0										
Bank size (3)	0.11	0.06	1.0									
Bank age (4)	0.02	0.05	0.24*	1.0								
NPL ratio (5)	-0.02	-0.14*	-0.03	0.04								
Equity capital ratio (6)	0.04	0.11*	-0.32*	-0.02	1.0	1.0						
Assets growth (7)	-0.07	-0.16*	-0.05	-0.02	0.03	0.04	1.0					
Income diversity (8)	0.11*	0.15*	0.19*	0.17*	0.04	-0.11	-0.11	1.0				
ROA (9)	0.26*	0.11	0.11	0.06	-0.02	-0.14*	-0.11*	0.01	1.0			
Bank concentration ratio (10)	-0.11*	-0.56*	-0.02	-0.07	0.05	-0.02	0.12*	-0.15*	-0.01	1.0		
GDP growth rate (11)	0.04	0.01	-0.01	0.01	-0.05	-0.01	0.01	-0.02	0.02	0.24*	1.0	
Bank-level governance score (12)	0.21*	0.04	0.25*	0.19*	-0.02	-0.12	-0.13*	0.17*	0.16*	0.02	0.11	1.0

*Note: * indicates statistical significance at a 5% level.*