

Banking on Change: Fintech's Ascent Amidst European Banking Shake-ups and Collaboration Conundrums

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I. Introduction

The financial sector has always been a primary candidate for the adoption of the latest technological developments. Throughout the past decades, several disruptive forces related to Information and Communication Technology (ICT) advancements have shaped the industry. A few seminal examples to consider are the appearance of credit and debit cards together with ATM machines in the 1960s, and the proliferation of mobile and Internet banking. Today, we live in the age of Fintech 4.0, the latest wave of fintech innovations that commenced in 2018 (Zigurat Institute of Technology, 2022). Fintech, the portmanteau for ‘financial technology,’ attacks traditional business models and value chains from multiple sides, with different categories of fintech companies covering virtually all types of traditional banking services – and certain areas of traditional banking are more at risk than others. Thus, this time, the scope and size of disruption is larger than ever before. On one hand, fintech has the potential to appeal to tech-savvy Millennials whose trust in banks was eroded due to the global financial crisis of 2008-2009, which effectively gave birth to fintech in the modern sense, calling for substantial reforms and opening fruitful opportunities. On the other hand, driving the adoption of fintech innovation is not unique to younger age cohorts. Since financial technology companies place ease of access and a seamless customer journey at the heart of their operational designs, they may be well-positioned to lure in those born in the 1970s and 1980s (Bofondi and Gobbi, 2017). Moreover, the biggest promise of the fintech revolution may lie in finally transferring efficiency-related gains to end customers, as these gains have historically been reaped by incumbent financial institutions instead of clients (Philippon, 2016).

Banks have played a key role in economies across the globe for centuries. These financial intermediaries are vital due to their functions of liquidity provision, managing opacity, and mitigating risks in case of bad loans. Traditional financial institutions have proved to be resilient to headwinds of technological developments. For instance, with the emergence of money market funds in the US in the 1980s, by the early 1990s, the mainstream public view anticipated banks to disappear. However, as famously discerned by Boyd and Gertler (1994), *reports were indeed exaggerated*, highlighting the importance of scrutinising methodological details of public reports. Banks had extended their off-balance sheet items, indicating a shift in business models rather than a significant decline compared to shadow banking and other financial institutions and insurance companies.¹ Banks maintain various sources of competitive

¹ Economist Paul McCulley initially coined the expression "shadow bank" in a 2007 speech at the Kansas City Federal Reserve Bank's annual financial symposium in Jackson Hole, Wyoming. The Financial Stability Board

advantage. Inter alia, their experience in regulatory compliance and their vast networks are to be mentioned, alongside trust that the public have developed towards them, despite the occurrence of occasional upheavals.

Europe at large undoubtedly has a bank-based system, rather than a capital market-based one like the U.S. This can be measured through various indicators, with the most common ones being a higher ratio of bank assets to GDP and a lower ratio of stock market capitalisation to GDP.² The overall number of banks and the share of people employed by the sector are equally important structural financial indicators.³ The banking system of many European countries is highly fragmented, thereby potentially eroding profitability.

Scholars have extensively analysed the positions and potential strategies of both incumbents and new entrants. Regulation plays a pivotal role in this equation. Regulators are confronted with the puzzle of a classical trade-off situation epitomised in a conflict between safeguarding stability and fostering innovation. In Europe, the regulatory dissensus regarding this question is a paramount example of the heterogeneity of the markets of the Member States (Ferrarini and Macchiavello, 2018), setting the stage for fintech disruption to come in all shapes and sizes, taking over at varying paces. There is no common ground in defining core concepts such as ‘financial instrument’ or ‘investment product.’ The lack of more advanced supranational synchronisation paired with the hurdles of the slow EU-level decision making is a grave concern for the future of the European fintech ecosystem. Furthermore, the related legislative frameworks of European countries tend to place emphasis on regulating institutions instead of products and activities, leading to a high level of ambiguity in the emerging fintech arena (Ferrarini, 2017).⁴

Nevertheless, the total value of all fintech companies in Europe accounts for 17% of the total value of all fintech companies worldwide. This indicates the significance and scale of this sector within Europe in relation to the global fintech landscape. An impressive cumulative average

(FSB) created a definition of shadow banks that is more inclusive, encompassing all organizations operating outside of the regulated banking system that carry out credit intermediation (Kodres, 2013).

² The assets of the banking sector in the EU amounted to 39 219 billion euros in 2020, which corresponds to 292 % of EU GDP (www.ec.europa.eu, 2020). It is considerably higher than the 2020 world average of 74% (theglobaleconomy.com, 2020).

³ Notwithstanding, significant consolidation has taken place between 2009 and 2020. By 2020, the number of banks has fallen by an astonishing 33% when compared to 2009 levels: to 5441 banks (www.ec.europa.eu, 2020). Even with the decline in bank employment, one out of every 100 jobs in the EU is still in the banking industry, which employs over 2 million individuals as of end of 2021 (EBF, 2022).

⁴ Other impeding factors that may be mentioned include the preference for cash in certain European countries, such as Italy; over-exaggerated data privacy concerns (see in Germany); and lack of access to capital in fintech startup formation (Baba et al., 2020).

growth rate (CAGR) of over 10% is forecasted for the European fintech market between 2024 and 2029. In terms of venture capital (VC) financing, the largest investment category in Europe consists of the fintech sector, which receives a fifth of all venture capital investments. This share is higher than that in the U.S. or in Asia.

The fact that Europe has a business climate that is conducive to innovation and technological development is impeccably illustrated by the dominance of numerous European nations (such as Switzerland, the Netherlands, and the Nordic countries) on the 2020 Global Innovation Index (Mordor Intelligence, 2023). Various factors influence fintech startup formations across different countries, with the health and breadth of incumbent institutions and the scale of current banking networks playing crucial roles (Hornuf and Haddad, 2018).

Europe at large exhibits a notable prevalence of financial inclusion, owing in part to its expansive banking network.⁵ Some researchers argue that a lower level of financial inclusion offers fertile ground for fintechs to cater to these areas with unmet demand.⁶ Notwithstanding, other studies provide empirical evidence supporting the opposite – showing that the ageing populations of numerous developed countries, such as the UK, openly welcome disruptive solutions that greatly facilitate customer journey. If one considers the latter view, it may be concluded that Europe boasts a wide potential customer base for fintech. According to EY's Global Fintech acceptance Index, fintech adoption in Europe is far higher than the global average of 64%, especially in countries like the Netherlands, the United Kingdom, Germany, Sweden, and Switzerland (Mordor Intelligence, 2023).

In the spring of 2023, the banking sector faced intense pressure in an interconnected global economy following the collapse of US banks Silicon Valley Bank (SVB), Silvergate, and Signature Bank. This triggered a chain reaction of shattered investor confidence spreading to Europe, leading to bank runs in Swiss banking giant Credit Suisse (CS), necessitating a bailout by the national bank and the eventual state-led acquisition of the institution by Swiss UBS (Thompson and Cooban, 2023). Despite major structural reforms in banking regulation aimed at reducing systemic risk and combating opaque managerial practices, recent events highlight the challenge of hedging against individual cases of misjudgement using regulatory tools. While the recent crisis had a significant impact, it was not nearly as disruptive as the bank runs during the global financial crisis (Strauch, 2023).

⁵ Financial inclusion is principally gauged by the proportion of individuals possessing or lacking bank accounts, thereby reflecting the ratio of inhabitants having access to traditional financial services (Barajas et al., 2020).

⁶ A classic example is the success of M-Pesa in Kenya (Ndung'u, 2021).

Focusing on the European financial system, this paper provides an assessment of whether recent banking intricacies have impacted the fintech landscape similarly to the bank failures of the GFC. The elucidation of the links between incumbent financial institutions and innovative new players will ensue to proffer a comprehensive and timely assessment of the current situation as well as of future prospects.

The empirical analysis relying on data from recent years reveals that there is no consistent inverse relationship between the performance of banks and fintech firms. However, significant events in the banking sector can have notable impacts on the fintech landscape. Negative occurrences within traditional banking may create opportunities for fintechs, although they also highlight the sector's susceptibility to volatility. Moreover, the study alludes to the prevalence of myriad variables influencing fintech performance, emphasising the importance of examining individual cases to better understand the dynamics between bank and fintech. Regarding volatility transmission, the 2023 banking turmoil led to immediate adverse effects in the banking sector, but these appeared to be short-lived.

II. Literature Review

The literature surrounding preeminent alterations in the macro and banking environment over the last two decades, both globally and in a European context, is vast. A brief review of the literature pertaining to describing the characteristics of the European financial system, the role of banking, the nature of banking crises and the background of the GFC and the 2023 banking shake-ups, and the evolution of the service provision practices of financial intermediaries will be provided. Subsequently, a prompt analysis of papers uncovering the trends and potential of the financial technology sector will ensue, followed by a conflation of banking and fintech dynamics in an attempt to facilitate the identification of future possible scenarios regarding the evolution of the financial world and the role of Europe therein.

Nevertheless, the literature more closely tied to the research question that is central to this paper is limited. The comparison of the GFC-induced shattering of trust in traditional financial institutions and the links between recent banking shake-ups and fintech's potential developments remain topics to be further explored by scholars.

II.1. The European Financial System

Through the analysis of 151 M&A transactions in Europe during the 1990s, Ayadi and Pujals (2005) find that there was a significant increase in transaction value, resulting in the formation of national „mega-banks”, with M&A taking place within sectors rather than across them. It is also stated that the level of cross-border transactions remained low, despite predictions of

increased activity after legislative reforms related to the EU's single market program and the introduction of the euro. Regarding the links between M&A strategies and value creation, it is emphasised that empirical evidence remains inconclusive. The paper aims to contribute to the literature by conducting balance-sheet ratios analyses as well as cost and profit efficiency scores analyses. Their investigation supports trends suggesting positive effects, despite revenue enhancement expectations remaining unfulfilled in many cases. The authors also emphasise how alliances and cross-shareholding may prove to be promising alternative approaches to mergers and acquisitions. Another general observation is that domestic mergers tended to prioritise cost-cutting, whereas cross-border mergers were focusing on revenue gains while escaping adverse consumer effects.

Ayadi, Arbak and Pieter De Groen (2012) investigate new paradigms of the relationship between bank business models and European banking regulation. When it comes to distance from default and long-term liquidity issues, they find that retail-oriented models seem to be safer overall. Diversified retail banks exhibit greater resilience than concentrated retail banks. There is a scarcity of liquidity and insufficient buffers for wholesale banks. Key risk indicators, such as the Tier-1 ratio and credit default swap (CDS) spreads, are unable to distinguish between different business models. This phenomenon may stem from regulatory constraints as well as moral hazard concerns inherent in entities deemed 'too big to fail.' To help with regulatory considerations specific to each business model, further research and data are needed as the risk-weighted asset (RWA) ratio is not a reliable indicator of default risks for investment banks.

A more recent paper by Pierret and Howarth (2023) examines the stability of the European financial system through the lens of moral hazard within the context of central banking. They shed light on the alarming issue of political considerations often playing a more cardinal role than economic expertise in monetary policy decisions. The article draws attention to the controversy of the fact that moral hazard – what is said to have been at the heart of the issues setting off the GFC – has been used to justify a variety of policy decisions, such as the ECB's centralised supervision and decentralised institutional arrangements.

The study exposes a professional dissensus between Bundesbank officials and the ECB, epitomised in different views on risk and accountability. On one hand, the ECB sees moral hazard as banks taking excessive risks as a result of government involvement, thus emphasising the eminence of the mechanisms of the market. On the other hand, the Bundesbank describes moral hazard as systematically important financial institutions (SIFIs) taking disproportionate

risks. Consequently, the German Bundesbank endeavours to prioritise considerations of social equity in mitigating the aforementioned complexities.

II.2. Crises and The Banking Sector

II.2.1. Research on the Nature of Banking Crises

Világi (2023) collates the research findings of 2022 Nobel Laureates Bernanke, Diamond and Dybvig on the forces driving panic, bank runs and crises. The author lays emphasis on their contribution to the literature discerning the effects of the aforementioned elements on the real economy. The groundbreaking research of Diamond and Dybvig (1983) offers a theoretical framework for comprehending the causes and welfare impacts of banking crises.

Diamond (1984) expands on the social utility of banking systems due to their roles in mitigating risks arising from information asymmetry in financial contracts. He demonstrates that debt contracts, which guarantee fixed payments regardless of project outcomes, are preferable when information is asymmetric, as they align incentives and reduce the cost of monitoring. He argues that, through delegated monitoring, banks facilitate risk management by distributing monitoring costs among small investors, thus minimising the probability of default. Bernanke (1983) supplements Milton Friedman's monetary explanations by providing empirical evidence that banking system disruptions significantly exacerbated the Great Depression. His subsequent research delved into the macroeconomic role of lending and the banking system, particularly exploring the credit channel of monetary policy transmission, which elucidates how information asymmetry influences lending behavior and exacerbates the impact of monetary tightening on investments and economic activity.

Frydman and Xu (2023) investigate recent empirical literature on banking crises taking place before 1980, underlining the the role of advancements in data analysis in the provision of fresh insights. They find evidence that systemic leverage within the financial system serves as a consistent precursor to crises. It is shown that crises exert significant adverse impacts on the real economy. They also posit that governmental interventions demonstrate potential in mitigating these adverse effects. When examining historical occurrences, it becomes evident that the development and progression of crises exhibit substantial variation across different temporal and geographical contexts.

II.2.2. The Global Financial Crisis

Noeth and Sengupta (2012) explore the role that European banks played in the global financial crisis, underscoring the level of interconnectedness in the international system, which entails both advantages and severe concerns. The authors shed light on how the interlocking crises of

the Eurozone's banking, sovereign debt, and economic recession have contributed to a downward spiral by fostering credit booms in developed nations. With that, the paper offers valuable insights into the way that European banks increased leverage by extending their balance sheet, eventually gaining alarming exposures to toxic US assets emerging from the shadow banking sector. The intriguing dynamics of the Global Savings Glut (GSG) theory are also detailed. The aftermath of the financial crisis is covered in the second section of their study. Some keywords include deleveraging, troubled banks, loan loss provisions, capital flight from the periphery, and the effects of TARGET2⁷ imbalances, as well as ECB initiatives like longer-term refinancing operations (LTROs).

Szyszkka (2011) emphasises the importance of adopting an interdisciplinary approach when examining the genesis of the GFC, arguing that behavioural finance may provide valuable insights for understanding irrational acts of investors. The paper elaborates on the how the debt crisis was exacerbated by the widespread use of opaque financial instruments such as collateralised debt obligations (CDOs) and credit risk swaps (CRS) epitomising mortgage-related risks. He concludes that the crisis highlighted the inadequacy of traditional neoclassical finance theory in explaining the complexities of modern financial markets. He proffers further avenues for research, advocating for the potential incorporation of other disciplines such as neuropsychology, sociology, economic cybernetics,⁸ and geopolitics into the theory of finance, with the objective of constructing more holistic narratives.

Hüfner (2010) analyses the German 3-pillar banking and financial system in the context of the GFC. The paper identifies high fragmentation, weak capitalization, and low profitability as the main factors that amplified the repercussions of the global recession in the German financial world. Shortcomings in banking supervision and the inflexibility of the system are also discussed. The investigation is centred around the inefficiency of the business model of state-owned Landesbanken and the disproportionate share of losses that they have suffered due to their problematic US exposures. Additionally, reforms suggested by Hüfner highlight the need for centralising supervision while guaranteeing independence, widening the scope of regulation

⁷ TARGET2 is a real-time gross settlement system (RTGS) that settles bank-to-bank and commercial transactions as well as payments associated with the monetary policy operations of the Eurosystem. It is one of the largest payment systems in the world, as more than 52,000 banks (considering subsidiaries and branches as well) use it worldwide. Every five days, TARGET2 processes a figure that approximates the GDP of the entire euro region (European Central Bank, 2019).

⁸ There are numerous similarities between System Thinking and the more general field of cybernetics science. Many academics contend that economists' adoption of the scientific paradigm places the incorrect emphasis on mathematics. Thus, the fundamental argument for applying cybernetic principles to economics is that the field should shift toward more qualitative, multidisciplinary analysis (Lawler et al., 2020).

to address risks comprehensively, considering dynamic provisioning and a binding leverage ratio, and introducing a framework for early intervention in systemically relevant banks.

Basten and Serrano (2018) explore the major changes to the European banking sector that occurred after the GFC, highlighting the role of international organisations such as the G-20 and the Basel Committee on Banking Supervision. They expose the unsustainable behaviours that were common in the years before the occurrence of the upheaval, including high risk-taking, ambiguous financial products, and lax regulatory supervision. Moreover, the conundrum that European banks - in contrast to their US counterparts – have found it difficult to recover to pre-crisis valuation levels is addressed. The paper contributes to the discourse by examining the dynamics of market-based indicators and structural indicators to assess the success of regulatory changes. Their findings concerning the analysis of market-based indicators imply that the bail-in and the leverage ratio have proved to be the most effective. Regarding structural indicators, the persistence of the ‘too big to fail’ (TBTF) assumptions for larger institutions plays a cardinal role.

Important considerations related to bank size are also discussed by De Haan and Kakes (2018). The authors cite a number of studies that emphasise the significance of several bank attributes in influencing the resilience of banks in times of crisis. These include business models, size, leverage, and reliance on wholesale finance. They find that, during the GFC, smaller, retail-oriented banks fared relatively better than large, market-oriented ones. However, in the years after the first crisis, the situation reversed, mostly hurting banks that catered to the retail market. The majority of bank losses were incurred by medium-sized banks, which frequently needed government assistance. The article also covers structural reforms and regulatory initiatives like Basel III that affect bank operations and organizational designs. Overall, the evaluation underscores the necessity of all-encompassing measures to control systemic risk in banks of all sizes and the importance of comprehending bank characteristics in assessing banks’ crisis management capabilities.

Clemente, Grassi and Pederzoli (2019) delve into an exploration of the comportment of the European banking system throughout financial crises, drawing on a sample of European banks spanning from 2003 to 2017. They furnish empirical evidence alluding to the prevalence of network analysis. They employ market-based statistical metrics to represent systemic risk, shedding light on the shortcomings of individual risk measurements, such as those based on balance sheet or market data. The study contributes to the on-going endeavours of regulators to facilitate risk mitigation by underscoring the fact that size is not the only factor of paramount

significance. The paper proposes a more practical integration of regulatory and market data for a more nuanced understanding of the components of systemic risk.

Batten et al. (2022) analyse stock market volatility implied by the dynamics between European Global Systematically Important Banks (G-SIBs). They incorporate into their investigation the effects of not only the global financial crisis, but the COVID-19 pandemic as well. To provide an even more nuanced grasp of the topic, the analysis is extended to repercussions induced by other epidemics showcasing similar features, notably the Zika virus and the Swine Flu. However, the paper highlights fundamental differences between the COVID-19 pandemic and the GFC of 2008-2009. According to the authors, the shorter duration of market stress during the pandemic is mainly attributable to immediate and efficacious fiscal and monetary actions undertaken by governments. Notwithstanding, Batten et al. outline future adverse impacts warranting further research, such as sticky inflation and deterioration in bank asset values. The paper contributes to the literature by providing new insights for regulators and practitioners to assess contagion in financial markets during periods of augmented market stress. One of the main findings of the paper is the significance of taking asymmetric effects into account when modelling market behaviour.

Nersisyan and Wray (2010) adopt a historical approach reviewing how the financial sector of the U.S. has evolved and draw parallels between the GFC and the Great Depression. They rely greatly on the work of 19th century American economist Minsky and his concept of the ‘money manager capitalism’⁹ to analyse the emergence of shadow banking. Their concluding remarks call for a substantially different setting in the financial world, arguing that the dominance of TBTF institutions should be eliminated.

II.2.3. The 2023 Banking Crisis

Ciuriak (2023) states that the failure of SVB amidst a backdrop of existing domestic structural issues and geopolitical vulnerabilities underscores historical patterns of financial crises in the United States. He posits that the swift regulatory response to SVB's demise, including the establishment of a Deposit Insurance National Bank under FDIC control, showcased both traditional American practices of allowing bank failures and implementing measures that imposed losses on uninsured depositors, as well as non-traditional interventions to mitigate systemic risks, akin to Canada's approach to banking crises. He argues the necessity of adopting

⁹ Minsky provided the following definition: 'Capitalism in the United States is now in a new stage, money manager capitalism, in which the proximate owners of a vast proportion of financial instruments are mutual and pension funds (Wray, 2009).

measures like those of Canada to mitigate future vulnerabilities in the financial system. He provides evidence that, despite being exposed to the same major shocks as the U.S., Canada's experience with banking crises is materially different. However, he warns of lingering concerns regarding the solvency of the US banking system, compounded by the growth of the shadow banking sector, technological disruptions, and the potential for panic-induced runs on banks in the era of social media and algorithm-driven disinformation.

Rossi (2023) claims that, by definition, the uncertainty regarding the future of the banking sector makes it impossible to assess possible scenarios and risks associated with varying categories of financial assets. The paper also underlines how higher capitalization proposed for systemically relevant banks might not prevent liquidity concerns and bank runs due to potential underlying management issues. He also points out that CS failed to learn from previous pitfalls of other banks such as UBS. Moreover, Rossi articulates poignant criticism concerning the bailout of the institution, contending that it was superfluous. He argues that the forced takeover of Credit Suisse by UBS raises concerns about market concentration, while also exacerbating climate risks due to heightened financing of fossil fuel activities. In addition, he proposes a policy reform instituting a two-department bookkeeping structure within banks to guarantee that credit limits correspond with available income. The paper also points out the importance of establishing a clear division between regulations concerning the issuance of money and the granting of credit.

D'Ercole and Wagner (2023) implement an event study analysis and find that green stocks underperformed during the 2023 banking crisis. The empirical results point out that the turbulence in the banking sector exert a statistically significant negative impact on the cumulative returns of environmentally responsible stocks in the period between 9 March and 20 March. They also examine the two trading weeks preceding and following this window and find no effects during this period. All in all, their findings emphasise the cardinal role that financial stability plays in ensuring the transition to a low-carbon economy.

II.3. The Evolution of Financial Technology

Marszk and Lechman (2021) elucidate the pivotal role of technological advancements in driving structural shifts within financial markets. In their research, the diffusion of ICT is proxied by fixed broadband networks and Internet user rates, from data between 1990 and 2019. Drawing on panel and country-specific regressions, the study underpins a statistically significant positive correlation between ICT penetration and the development of ETF markets in European

countries, while also discerning the importance of other factors such investment freedom and regulatory quality.

II.3.1. The Factors Driving Fintech Development

Haddad and Hornuf (2018) investigate economic and technological factors playing a crucial role in fintech startup formation across the globe. It is stated that prior to 2015 the United States led the global fintech market, with the UK, India, Canada, and China following. Financing emerged as the dominant segment within fintech, followed by payment, asset management, insurance, loyalty programs, and others. Empirical results of the authors underscore the initial hypothesis that higher-income countries with vast but obsolete banking and financial infrastructures paired with ease of access to the latest technological advancements are best placed for hosting fintech innovation. The positive impacts of lax regulations are also emphasised. Notwithstanding, it is highlighted that questions about fintech efficiency and systemic risk persist. Moreover, the authors identify some key challenges that incumbent banks and newly formed fintechs are faced with. It is also stated that while investment opportunities exist globally, caution is warranted owing to varying profitability and adoption timelines for fintech innovations.

Arner, Barberis and Buckley (2015) proffer intriguing insights into how the fintech revolution has evolved and has been shaped by crises. The study emphasises regional differences and delineates the concepts of FinTech 3.0 and FinTech 3.5, alluding to the increasingly cardinal role of Asian tech companies in the more recent waves of financial technologies innovations. In the paper, Arner et al. contend that the transition to FinTech 3.0 in developed markets has arisen from the 2008 financial crisis and has been propelled by the public's expectations and needs, the entry of technology companies into the financial sector, as well as government calls for a more diverse banking system. On the other hand, in emerging nations, especially those in Asia, FinTech 3.5 has been spurred by inefficiencies within the current financial system and the necessity for development, in conjunction with the swift adoption and accessibility of novel technologies, especially mobile communications. Key trends related to different regulatory approaches are also identified. The authors shed light on the fact that the UK has embraced principle-oriented, forward-looking views, while China, for instance, alongside with many European countries, continues to rely on product-based guidelines.

Török (2019) Endeavour Insight explores Milan's fintech landscape. The investigation extends to analysing the factors that allowed the city to become Italy's main fintech hub after the GFC. Current impediments to further development are also included in the study, alongside with

recommendations. Network analysis reveals the absence of angel investor connections. In addition to access to capital, access to technology and non-financial managerial talent are identified as pivotal obstacles.

Ballesteros (2023) dissects the most substantial ways in which the current global economic upheaval differs from the challenges experienced during the GFC. The study also investigates short- and long-term impacts exerted by the COVID-19 pandemic on digitalisation. Key trends such as sticky inflation caused by and causing further structural shifts in the economy and the financial world, back-end innovations, the increasing role of edge computing are also covered. The authors discern the fact that banks are faced with the threat of big tech companies increasingly investing in AI and attempting to leverage network effects of large platforms and take over the sector of financial services provision. Banks may be relegated to fill merely local roles via utilising their extensive branch networks and edge computing breakthroughs. It is also highlighted how central banks may potentially emerge as other key players in the field by issuing their own currency, so-called central bank digital currencies, or CBDCs. The description of concepts such as edge computing and CBDCs is provided in the Results and Discussion part of the paper.

II.3.2. The Impact of Fintech Innovation

In their systematic review of academic papers of fintech, Sangwan et al. (2020) analyse 130 studies and divide the literature into three broad categories: financial industry, innovation/technology and law/regulation. The authors summarise research findings shedding light on both opportunities and threats to different stakeholders. They conclude that this field offers huge potential and warrant further study for all key players ranging from users and producers to investors and regulators.

Demir et al. (2020) investigate the interrelationship between fintech, financial inclusion, and income inequality, and find that the income inequality reducing effects of fintech appear in an indirect way through its contribution to financial inclusion. However, their results suggest that the effects of financial inclusion in mitigating income inequality are mainly attributable to wealthier nations. This points out the significance of ensuring access to financial services to lower income groups and highlights that financial inclusion should be accompanied by effective fiscal redistribution policies.

Bollaert, Lopez-de-Silanes and Schwienbacher (2021) investigate whether the emergence of fintech funding solutions, such as peer-to-peer lending,¹⁰ have improved the outlook of early-stage firms in terms of access to capital. They posit that fintech has primarily focused on supporting start-ups and small businesses and has opened up promising opportunities for new types of projects and new categories of investors, yet headwinds persist in accessing finance. Nonetheless, their findings belie the existence of compelling evidence that fintech funding will supplant means of traditional finance. They conclude that, to enhance access to capital without compromising investor protection, solutions must address information transparency, lower transaction costs, and promote mechanisms for capturing non-financial benefits for firms.

Lee et al. (2021) examine the Chinese banking industry over a period spanning from 2003 to 2017 from the viewpoint of the links between advancements of the fintech sector and operational efficiency aspects of banks. Their findings illustrate that cost efficiency gains are the weakest in case of state-owned commercial banks, which generally use inferior technology. Notwithstanding, their empirical results underpin that fintech developments exert benign impact on cost efficiency and banking technology, and the effects are strongest in the case of market support services.

Li et al. (2020) focus on US financial markets and estimate spillover effects between the banking and the fintech sector in bearish, normal, as well as bullish cases through the construction and analysis of three types of networks. The results show that risk spillovers are strongest when bearish conditions prevail. Moreover, they find that the risk spillovers of fintech firms to traditional financial institutions exhibit a positive correlation with systemic risk. Thus, they contribute to the existing literature by furnishing empirical evidence on the pivotal role that adequate regulation and oversight of fintech companies plays in the maintenance of financial stability.

II.3.3. The Relationship Between Banks and Fintech Companies

Dermine (2017) goes back to the roots by reviewing the fundamental differences between direct and indirect finance, as well as the basic functions of traditional banking institutions. Adopting a historical approach, several past milestones of ICT developments are analysed within the context of the impacts on the banking sector. Then, the risks of disruption associated with different categories of service provision are placed under scrutiny. Throughout the

¹⁰ Peer-to-peer (P2P) lending is the direct lending of funds to individuals or businesses without the involvement of a formal financial institution as a middleman. Online platforms are typically used for peer-to-peer lending, connecting lenders and potential borrowers (CFI, 2022).

investigation, a special focus is put on peer-to-peer (P2P) lending platforms as they prove to be especially relevant when talking about European markets. He also analyses the factors of the macro environment of the period leading up to 2017, and attributes the recent proliferation of P2P lending solutions and marketplace funding to exceptionally low interest rates and a strong US economic rebound. He also emphasises that sustainability depends on factors such as investor appetite, especially in a décor of rising interest rates. He concludes that while digital platforms offer cost-effective finance, they face hurdles in risk management compared to banks. It is highlighted that banks' unique role in managing opacity and illiquidity underscores their importance in providing liquidity for higher credit-risk assets. Consequently, proposed lending classification of the study suggests banks retain higher-risk transactions, while lower-risk ones can be securitised or funded via marketplace platforms. Dermine also reminds of the importance of regulatory scrutiny and government guarantees to address concerns related to shadow banking and liquidity crises.

Vives (2017) argues that, by using digital technology to target particular consumer demands, fintech firms pose a threat to traditional institutions and undermine their reliance on product-focused banking. The prospective entrance of prominent internet conglomerates such as Amazon, Apple, and Google into the fintech arena portends significant upheaval owing to their extensive consumer data reservoirs and potential dominance over financial service interfaces. The inclination of emerging players to sidestep banking licenses in efforts to alleviate regulatory compliance expenses is also preeminent. Moreover, the paper considers questions of efficiency, as well as dynamics of market structure changes and potential strategic directions of players with differing interests.

Boot (2017) investigates the topic through the lens of banks' prospective realisation of scope and scale economies. Although empirical evidence is still inconclusive, financial institutions' decisions about the pursuit of economies of scale and scope are prompted by factors including IT efficiencies, reputation-related considerations, and diversification benefits. With regards to fintech improvements, recent studies indicate the possibility of growing returns to scale and scope, especially in back-office operations and payments. Another intriguing aspect of the investigation is the reconsideration of how relationship banking may use data analytics to adjust to evolving distribution channels and payment systems. The topic comes down to a battle between relationship banking and transaction-based approaches. Boot states that the latter is driven by not only technological advancements but market exuberance as well, posing risks to relationship banking's value and competitive edge within financial institutions. Additionally, he

delves into the advantages and setbacks related to several ownership forms. In contrast to relationship-oriented commercial banks, which place more importance on institutional franchise value and stability, investment banks are shifting towards a transaction-oriented banking model that emphasises ‘individual star power.’ Considering the threats to stability, the author points out the salience of re-examining alternative ownership arrangements like partnerships and mutual/cooperative banks. Finally, the study proposes that fintech is upending the banking sector through the potential breakdown of established value chains and the empowerment of clients through online platforms and direct contacts. Moreover, it is posited that while banks must adapt to this transformation, they also harbour opportunities to leverage fintech for strategic alliances and operational enhancements.

Regarding the future role of banks, Bofondi and Gobbi (2017) discuss how incumbents have historically shown resilience and adaptability in response to regulatory changes and economic challenges. Consequently, they advocate that while digital technologies may reshape the competitive landscape, traditional banks may persist in playing a paramount role in the emerging financial ecosystem. Moreover, the authors point out that regulators face the challenge of safeguarding against risks without stifling innovation, requiring a less stringent and more coordinated approach that fosters dialogue with industry stakeholders. The exigence to embrace regulatory technology (regtech)¹¹ solutions to amplify regulatory efficacy is also elucidated.

II.3.4. Central Bank Digital Currencies

An intriguing facet of bank-fintech synergies can be explored within the realm of central bank digital currencies, with abundant literature from recent years. Bindseil (2019) delves into the implications of the potential issuance of CBDCs on the financial system utilising a simplified financial accounting framework. He highlights the benefits of narrow banking in reducing bank balance sheets in favour of non-bank financial intermediaries, with CBDC accounts offering comprehensive services. The study emphasises positive impacts with a special focus on countries that showcase declining cash usage and boast widespread adoption of electronic services. A tiered compensation structure is suggested as a means of tackling the issue of CBDC’s possible disintermediation of the banking system.

¹¹ Regtech is the application of new technologies to address the increasingly congested data environment needed to meet the demands of regulatory compliance, whereas fintech is the use of technology and software to deliver financial services. Inter alia, regtech includes robotic process automation (RPA), next-generation data architecture, visual analytics, report automation tools (such as AxiomSL’s ControllerView, Wolters Kluwer’s OneSumX, and Vermeg/Lombard’s AgileREPORTER), and business process management, commonly referred to as BPM (EY, 2019).

Bordo (2021) puts the question of CBDCs into a historical perspective. He posits that major shocks like wars or economic crises frequently hasten the inevitable technological developments in the monetary and financial system, suggesting that CBDCs might be the next development in this process. He argues that interest-bearing CBDCs have the potential to improve macroeconomic stability and simplify central bank balance sheets by increasing the transmission and transparency of monetary policies. He also highlights that CBDCs entail global ramifications, including the potential transformation of international payments, warranting more advanced international monetary collaboration.

Lee, Yan and Wang (2021) state that leading nations will gain a competitive edge as CBDCs grow. They argue that China's emphasis on features like data privacy and the waning influence of central banks reflect a larger trend towards financial inclusion, emphasising the need for an inclusive and decentralised approach. When compared to European conditions, parallels between the Chinese viewpoint may be discerned as far as the pivotal role of data privacy in regulations is concerned. Nevertheless, the EU seems to showcase a fundamentally different trend, with the influence of central banks ramping up.

Náñez Alonso et al (2020) reminds that countries like Denmark and Israel challenge the superiority of CBDCs over current payment systems. They state that, while China, Uruguay, Lithuania, and the Bahamas are more in favour of CBDC adoption, major central banks like the Federal Reserve, Bank of Japan, and Bank of England delay it. The analysis predicts a cascade effect, indicating a final, broad adoption despite initial reluctance.

III. Data and Methodology

III.1. Event Studies

In the event study analyses, I used daily returns of 30 hand-picked European fintech companies that are currently listed on European stock exchanges; and daily returns of 44 European publicly traded banks. I obtained daily closing prices from Bloomberg to calculate daily log returns. The closing prices were adjusted for splits, stock dividends, cash dividends, and intra-day cash dividends as well. As log returns take into consideration compounding, the addition over time becomes accurate. The sample includes returns spanning the period between the IPOs of different fintech companies and 2 February 2024. Data on the 44 European bank stock returns encompasses the period between 18 January 2022 and 6 February 2024. The estimation window of the event study, as elaborated on below, ensures the focus on the recent banking turmoil and

the immediate period leading up to the event. In the event study analyses, I control for risk using European Fama and French factors downloaded from the Kenneth French online data library.¹²

As far as the selection of the companies is concerned, the landscape of public European financial innovation companies is limited, with many firms being in the startup phase, involving private equity funding solutions. One also needs to bear in mind the fact that capital markets in Europe are less extensive compared to the United States (Baba et al, 2020). Initial Public Offerings (IPOs) of most European fintech companies are rather recent, as demonstrated by Table 1 containing the years marking the IPOs of the sample firms. The IPOs of 16 companies out of the total 30 happened in 2018 or later. In cases in which this argument does not apply, it must be considered that established companies with more advanced commercial traction and a corporate history that can be traced back to the 2010s or the 2000s often experience fundamental shifts in their activities as the available technological toolkits evolve (Zigurat Institute of Technology, 2022). My aim was to focus on the more recent wave of fintech. I aspired to include companies from various countries within Europe, to paint a clearer picture of Europe's fintech landscape. The stocks are listed on Euronext stock exchanges (Amsterdam, Brussels, Milan, Growth) and/or the London Stock Exchange (LSE), the Swiss Stock Exchange (SIX), the Frankfurt Stock Exchange, the Athens Stock Exchange, and Nasdaq Helsinki.

¹² https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html

Table 1. Details of the European Fintech Companies Used in the Research

Ticker	Name	Domicile	IPO	Stock Exchange
AMGO	Amigo Holdings Plc ¹³	UK	2018	LSE
AUGM	Augmentum Fintech Plc ¹⁴	UK	2018	LSE
AZM	Azimut Holding SpA	Italy	2004	EN Milan
BWN	Bowen Fintech Plc	UK	2022	LSE
CLXN¹⁵	Crealogix Holding AG	Switzerland	2000	SIX
CPP	CPP Group Plc	UK	2020	LSE
DATA	Datrix SpA	Italy	2021	EN Milan
FCH	Funding Circle Holdings Plc	UK	2018	LSE
FTK	flatexDEGIRO AG	Germany	2020	Börse Frankfurt
HUDL	Huddlestock Fintech AS	Norway	2020	EN Growth
IGG	IG Group Holdings PLC	UK	2005	LSE
IPF	International Personal Finance PLC	UK	2007	LSE
ISC	Integrated System Credit Consulting Fintech SpA	Italy	2021	EN Milan
LEON	Leonteq AG	Switzerland	2011	SIX
LINV	LendInvest Plc	UK	2021	LSE
MFT	Matica Fintec SpA	Italy	2019	EN Milan
NEXI	Nexi SpA	Italy	2019	EN Milan
PBEE	Pensionbee Group PLC	UK	2021	LSE
PROF	Profile Systems and Software	Greece	2003	Athens Stock Exchange

¹³ Amigo Holdings, a fintech company specialising in subprime loans and the UK's largest guarantor loans company, announced on 23 March 2023 that it would start winding down its operations after failing to secure sufficient capital in a crucial raising round (Amigo Plc, 2023).

¹⁴ Augmentum Fintech is a London-based venture capital firm seeking to invest in Europe-based fintech, banking, insurance, asset management, and financial services companies (Pitchbook, n.d.).

¹⁵ Crealogix is a leading Swiss technology provider of banking and wealth management services. On 22 February 2024, Vencora acquired all publicly held registered shares of Crealogix. The SIX Exchange Regulation approved Crealogix's plan to delist from the exchange as of 7 March 2024. Crealogix is the sixteenth brand in Vencora's growing global portfolio of financial services software companies, allowing it to gain access to new best practices. Thanks to the decentralised business model of Vencora, Crealogix can maintain its independent operations (Crealogix, 2024).

TEMN	Temenos AG	Switzerland	2001	SIX
TRU	Trufin Plc	UK	2018	LSE
TXT	TXT e-solutions SpA ¹⁶	Italy	2000	EN Milan
UMDK	United Mobility Technology AG	Germany	2008	Börse Frankfurt
UPG	Unifiedpost Group SA	Belgium	2020	EN Brussels
WISE	Wise Plc	UK	2021	LSE
ZWIPE	Zwipe AS	Norway	2019	EN Growth
3ZL	Alexandria Group Oyj	Finland	2021	Nasdaq Helsinki
HEEROS	Heeros Oyj	Finland	2016	Nasdaq Helsinki
DOC2	Ease2pay NV	The Netherlands	2022	EN Amsterdam
WPAY ST	Westpay AB	Sweden	2007	Nasdaq Stockholm

The list of bank stocks used in the event study can be found in the appendix. The list is not identical to the constituents of the Stoxx 600 Banks Index. My aim was to choose banks with relatively large stock market capitalisation from a wider scope of countries, including Hungary, the Czech Republic, Slovenia and Croatia, which are not represented in the aforementioned index.

I used event study methodology to assess the impacts of the tremors of Credit Suisse on publicly listed European fintech stocks and prominent European bank stocks. I examined four dates, as shown by Table 2.

¹⁶ Software service provider TXT operates in the aerospace and automotive sector as well as in the fintech sector, where it makes continuous investments and focuses on loan management and large financial system risks (TXT, 2020).

Table 2. Description of Dates Used in the Event Studies¹⁷

Date	Description
Friday 10 March 2023	Following the fall of SVB, CS shares hit a low of 2.41 Swiss francs per share.
Monday 13 March 2023	CS shares saw a 12% drop overnight and were trading at a new low of 2.20 Swiss francs per share. At this point, CS shares were down almost 20% year-to-date.
Wednesday 15 March 2023	CS shares slid as much as 30%. The turbulence was exacerbated by the announcement of key shareholder Saudi National Bank to rule out further financial assistance due to regulatory considerations, among other reasons. ¹⁸
Monday 20 March 2023	The first trading day following the initiation of the state-supported acquisition of CS by UBS on 19 March 2023. ¹⁹

The concept of event studies stems from the Efficient Market Hypothesis (EMH). The EMH posits that all publicly available information is reflected in stock prices. In this sense, new information is, by definition, unpredictable. Thus, movements in stock prices must resemble a random walk. Event studies can be considered as tests of the semi-strong form of the EMH, an approach rendering technical and fundamental analyses fruitless. Consequently, unexpected changes in stock prices are suitable for assessing the economic impact of certain pieces of news on company performance (Bodie, Kane and Marcus, 2021).

In the framework of event study methodology, the analysed period is separated into an estimation window and an event window. Estimation windows used in research papers usually encompass 30 to 750 days. Event windows are centred symmetrically around the event date and typically range from 1 to 11 days (Holler, 2014).

¹⁷ Sources: Ward-Glenton, 2023; Reuters 2023

¹⁸ As the anchor investor in the Swiss bank's capital increase, Saudi National Bank, which is 37% controlled by the kingdom's sovereign wealth fund, paid 1.4 billion francs to acquire an approximately 9.9% share in the lender. In just a few months, the stake has lost more than 500 million francs (El-Din and Halftermeyer, 2023).

¹⁹ The acquisition was completed on 12 June 2023 (UBS, 2023).

Abnormal returns are first computed in the estimation window, averting the effects related to the event (with alpha and beta estimated outside the event window). Abnormal returns are the difference of expected returns and realised returns for the stocks. Then, the average abnormal returns (AARs) are computed for each trading day within the scope of the investigation, based on the abnormal returns calculated for each stock. The formula for calculating the AAR is:

$$AAR_t = \overline{AR}_t = \frac{1}{n} \sum_{i=1}^n AR_{i,t}$$

where n is the number of companies, which is 30 in this research; and $AR_{i,t}$ is the abnormal return of stock i for day t .

As a last step, cumulative average abnormal returns (CAARs) are calculated for each event window respectively by adding up the AARs:

$$CAAR = \overline{CAR}(t_1, t_k) = \sum_{t_1}^{t_k} \overline{AR}_t$$

where t_1 and t_k stand for the first and last day of the event window. Here, the event window is 110 days long.

To measure stock performance in this event study, excess returns are used, which are defined as the difference between realised returns and the risk-free rate. The estimation window allows the estimation of betas utilising time series regressions. To obtain expected returns, I use a five-factor model within the extended Fama and French framework that has the following structure:

$$\begin{aligned} R_{i,t} &= r_{i,t} - rf_t \\ &= \alpha + \beta_{i,M}(rM_t - rf_t) + \beta_{i,SMB} \times SMB_t + \beta_{i,HML} \times HML_t \\ &\quad + \beta_{i,RMW} \times RMW_t + \beta_{i,CMA} \times CMA_t + e_{it} \end{aligned}$$

where $R_{i,t}$ stands for the excess return of stock i at time t ; α is a constant; $\beta_{i,M}$, $\beta_{i,SMB}$, $\beta_{i,HML}$, $\beta_{i,RMW}$, $\beta_{i,CMA}$ refer to the sensitivity of stock i to the market factor, the size factor, the value factor, the profitability factor, and the investment factor respectively; while the returns of the factors at time t are noted by SMB_t , HML_t , RMW_t , CMA_t . The market risk premium is denoted by $(rM_t - rf_t)$.

The factors are summarised in Table 3. The original three-factor model incorporating the HML and SMB factors was later extended by Fama and French (2015) to include the so-called

profitability (RMW) and investment (CMA) factors.²⁰ The event study methodology can also be applied when the market factor is the only factor used. That case is analogous with the Capital Asset Pricing Model (CAPM), a one-factor model explaining excess return by the relationship between a stock's sensitivity to overall market movements, as represented by beta, and the market risk premium, as defined by the difference between market return and the risk-free rate (Aytug, Fu and Sodini, 2020).

Table 3. Summary of the Four Fama and French Factors (Dartmouth.edu, 2024)

Name	Acronym	Description
size factor	SMB (small minus big)	the difference between the mean returns of small and large stocks
value factor	HML (high minus low)	the difference between the mean returns of high and low book-to-market ratio stocks
profitability factor	RMW (robust minus weak)	the difference between the mean returns of robust and weak operating profitability portfolios
investment factor	CMA (conservative minus aggressive)	the difference between the mean returns of conservative and aggressive investment portfolios

In my research, I used an estimation window of [-130;-20]. I incorporated four different event windows into the investigation, presenting both pre- and post-event-day impacts: [-1;-1], [0;0], [1;1]. This is to study the exact day of the events, as well as the trading days immediately before and after the events. The negative (positive) numbers in the notation refer to the number of trading days before (after) the date of the event. It is to be noted that the trading day following Friday 10 March is Monday 13 March; and the trading day following Monday 13 March is the same as the trading day preceding Wednesday 15 March. To avoid overlaps, the duplicate sections of Table 4 presenting the results of the event studies are crossed out.

²⁰ The model has also undergone other alterations since its creation, with researchers adding other elements, such as Carhart's momentum factor (1997).

III.2. Linear Regression Analysis

The other cornerstone of my empirical investigation is examining how the performance of the 30 European fintech companies are correlated to the performance of the Stoxx 600 Banks Index encompassing prominent publicly listed European banks.²¹

In the linear regression analysis, I used Euro Stoxx 50 daily returns as a control variable.²² The constituents of the aforementioned two indexes are listed in the appendix.

To handle occasional data discrepancies, I used forward filling, meaning that missing values were filled with the most recent available data points. The data set encompasses returns spanning from 14 July 2021 to 2 February 2024 to focus on the 2023 banking crisis and its lead-up period. Stoxx 600 Banks Index daily log returns and the daily log returns of the 30 European fintech stocks are calculated based on Bloomberg data on adjusted daily close prices. Daily log returns of the Euro Stoxx 50 are computed using data on adjusted daily close prices obtained from Yahoo Finance.

Since currently there is no European stock market index for fintech companies,²³ I constructed an equal-weighted portfolio of the selected fintech stocks to consolidate data and use it as an input for the linear regression analysis. An equal-weighted index²⁴ value is obtained by adding up the share prices of all stocks included in the portfolio and multiplying it by the weight (Lake, 2022). Since I used the data of 30 companies, each one received a $100/30 = 3.33\%$ weight. The index value changes according to a dynamic approach using daily rebalancing drawing on the data set of daily stock returns.

A standard OLS time-series regression is used to investigate the relationship between European bank stock performance and European fintech stock returns, adding Euro Stoxx 50 data to control for overall equity market movements. The regression equation is:

$$Y_t = \alpha + \beta_1 \times X_{1,t} + \beta_2 \times X_{2,t} + \varepsilon_t$$

²¹ The Stoxx Supersector indices are available for 20 supersectors, one of which is Banks, in accordance with the Industry Classification Benchmark, ICB. The principal source of revenue is used to categorise the applicable benchmark index's indicators. Each supersector's largest stocks are selected based on free-float market capitalisation (Stoxx, 2024a).

²² The Euro Stoxx 50 is the Eurozone's leading blue-chip index, tracking the region's supersector leaders. As of July 2023, the most frequently traded EUR-denominated index derivatives on Eurex are options on the EURO Stoxx 50 Index, which underlies around 27 billion euros in ETF assets and futures (Stoxx, 2024b).

²³ Even though the Stoxx Global Fintech Index and the iStoxx Global Fintech 30 Index may include European-based stocks, it has a global focus, with the largest constituents being US companies such as MasterCard and VISA (Stoxx, 2023).

²⁴ Equal-weight funds aim to reduce the weight of large-cap firms in an index and the related funds, as this can unjustly affect the index's or fund's performance. As a result, value investors might favour the equal-weighted strategy. However, outsize drops may be observed in bear market conditions (Lake, 2022).

where Y_t is the value of the constructed fintech index in month t ; α is a constant; β_1 and β_2 are the slope coefficients of the Euro Stoxx 50 factor and the Stoxx 600 Banks respectively; $X_{1,t}$ and $X_{2,t}$ are the values of the Euro Stoxx 50 factor and the Stoxx 600 Banks factor respectively; while ε_t is the value of the idiosyncratic error term in month t .

IV. Results and Discussion

IV.1. Event Studies

For each event window for each event date, I report the CAARs of the European fintech and bank stocks related to the event studies on the demise of Credit Suisse. T stats are shown in parentheses below the CAARs. P values are indicated according to the following notation system: statistical significance at the 10%, 5% and 1% level of significance is indicated by *, ** and ***, respectively.

Table 4. Results of the Event Studies

Bank Stocks				
Event Window	CAAR 10 March	CAAR 13 March	CAAR 15 March	CAAR 20 March
[-1;-1]	-0.007*** (-2.761)	-	-	-0.010*** (-4.167)
[0;0]	-0.022*** (-9.366)	-0.030*** (-12.662)	-0.024*** (-9.558)	-0.005** (-1.996)
[1;1]	-	0.010*** (4.388)	0.001 (0.624)	0.014*** (5.793)
Fintech Stocks				
Event Window	CAAR 10 March	CAAR 13 March	CAAR 15 March	CAAR 20 March
[-1;-1]	-0.140*** (-2.659)	-	-	0.037 (0.745)
[0;0]	0.024 (0.464)	0.158*** (3.021)	0.0313 (0.562)	0.002 (0.043)
[1;1]	-	0.003 (0.056)	-0.014 (-0.267)	-0.029 (-0.566)

IV.1.1. Bank Event Studies

The results of the event studies of bank stocks illustrate that the 2023 banking tumult and the demise of Credit Suisse (CS) had a statistically significant immediate impact on the performance of European bank stocks. An average abnormal drop of 0.7% can be observed in the shares of the sample institutions right before 10 March, marking the fall of US Silicon Valley Bank (SVB). As the banking crisis unfolds, the average abnormal dips in share prices of European banks become more and more pronounced. 10 March brings about a -2.2% average abnormal change, hitting -3% on 13 March with the trembling of Swiss banking giant CS. Results belonging to that event are significant at the 1% level. The following day, negative effects already seem to fade away, then a subsequent new low hit by CS shares brings about a -2.4% average abnormal change in the share prices of prominent European banks. Nonetheless, immediately after that event, adverse effects seem to lose momentum, with the last trading day before UBS acquisition announcement inducing a moderate -1% average abnormal drop, followed by a statistically highly relevant, moderate benign impact marked by an average 1.4% abnormal increase in bank share prices on the next trading day. It can be stated that effects reverse as the level of ambiguity surrounding the merger decreases and the situation stabilises.

Broadening the investigation, it may be added that between 10 March and 24 March, European Supersectors Banks, Financial Services, and Insurance were severely affected, but Banks were hit the hardest, falling by more than 12% (Baechle, 2023). When examining individual cases, it can be observed that adverse effects lingered during the month that followed, with certain banks suffering more than others. Deutsche Bank was affected the most, the crisis shedding light on its already ongoing struggles. At its worst, its share price was down by 14% on Friday 24 March but closed the day with a more moderate loss of 8.6% while its credit default swaps jumped to near-record levels (Isaac and Sweney, 2023; The Economist, 2023).

To gain a deeper understanding of the effects of these happenings, it is essential to examine what caused the turmoil in the U.S. The second, third, and fourth biggest US bank failures occurred in that month.²⁵ On March 8, it started with Silvergate Bank in California; then a bank run on SVB occurred, causing the institution to be seized by regulators on March 10. Lastly, March 12 marked the shutdown of New York-based Signature Bank by regulators, citing systemic risks (Wack, 2023).²⁶

²⁵ The biggest ever US banking failure was that of savings and loan association Washington Mutual during the GFC (Wack, 2023).

²⁶ Nevertheless, more rounds of US bank failures followed in the same year, with First Republic Bank, Heartland Tri-State Bank, and Citizens Bank collapsing in May, July, and November, respectively (FDIC, 2023).

The background of these happenings is rooted in the global changing of the low interest rate environment, as well as irregularities in international markets induced by the aftermaths of the COVID-19 pandemic. Rising inflation had a key role. To simplify the matter, it may be stated that elevated inflation is attributable to structural ‘mega forces’ reshaping economic conditions, such as labour market constraints caused by the phenomenon of aging populations, and supply chain disturbances set off by a trend of geopolitical fragmentation (BII, 2024). In the period preceding the crashes, many US banks had placed their reserves in U.S. Treasury securities, which had been offering low interest rates for a number of years, meaning lower yields and relatively higher prices. Bond prices fell as the Federal Reserve started hiking interest rates in 2022 in reaction to the 2021–2023 inflation spike, lowering the market value of bank capital reserves and resulting in unanticipated losses for certain banks. Silicon Valley Bank sold its bonds in order to preserve liquidity - but realised alarming losses in the process. Additionally, prior to and during the COVID-19 pandemic, numerous banks acquired market exposure to cryptocurrencies and cryptocurrency-related businesses – but the 2020–2022 cryptocurrency bubble burst in late 2022. Both Silvergate and Signature Banks were severely affected by steep losses incurred in their crypto-focused portfolios (Choi, 2023). The link between crypto bubbles and economic crises unfolding in the background (mainly the COVID-19 pandemic) is inflation hedging. Given the scarcity of cryptocurrency due to the immense technological capacities required for its mining, people tend to bet on its value when they are losing trust in fiat currencies due to inflationary pressures (Choi and Shin, 2022).

SVB’s business model was flawed. Banks inherently struggle with a liquidity mismatch problem caused by enormous differences in the duration of their mostly long-term assets and dominantly short-term liabilities. In the low interest rate period, prior to 2022, SVB built up a massive long-term Treasury bond portfolio of its assets, estimating that it had mostly long-term liabilities as the bank’s management believed that clients would not withdraw their SVB deposits in the short-term, at least not in significant volumes.²⁷ The ‘higher-for-longer’ era caused significant losses in its bond portfolio, shattering their clients’ confidence over the safety of their deposits, eventually panicking each other into a bank run, resulting in SVB’s collapse. SVB was not prepared for this as it invested too much into customer loyalty – instead of

²⁷ Additionally, startups taking out loans from SVB were frequently prevented from diversifying where they place their deposits due to clauses (covenants) embedded in the legal documents governing the debt, which force them to retain all or part of their funds with the lender (Seligson, Anand and Azevedo Rocha, 2023).

adequately hedging its interest rate risk with swaps or other derivatives, only to find out that their clients are not any more loyal than those of other banks (Levine, 2023).

The bankruptcy announcement of SVB entailed increased investor scrutiny into Credit Suisse's operations as well. The government deemed the preservation of the stability of CS essential for the sake of the stability of the system. Credit Suisse was Europe's 16th biggest bank (Yahoo Finance, 2023), and one of the 29 institutions titled global systematically important banks (FSB, 2023). The SNB had to step in and offer a sum of 50 billion Swiss Francs to CS to borrow. A larger crisis could be averted with the help of this offer and some additional measures, such as CS repurchasing considerable amounts of its own debt in international markets. The latter included the repurchase of 500 million of euro bonds and \$2.5 billion of US dollar bonds (Thompson and Cooban, 2023). As I pointed out previously, even though major bank stocks plummeted after these challenges, and the central bank had to step in, the banking crisis in great part inspired by US bank struggles was contained rather seamlessly, definitely avoiding a 2008-style meltdown. It can be concluded that there was no lethal structural system-wide issue in the global financial framework. The 2008 scene was characterised by the emergence of shadow banking with subprime-mortgage-backed securities against a macroeconomic backdrop enhancing European the risk appetites of European banks. These banks played a key role in fuelling and managing major capital flows in the global bank network, as per the Global Savings Glut theory elaborated by former Fed Chair Ben Bernanke. All in all, due to the nature of the banking industry, individual cases of mismanagement may still be strong enough to fuel temporary bank runs, especially accelerated in the digital era. Notwithstanding, panic-led disruptions fade away more easily and with less collateral damage than system-induced ones (Strauch, 2023).

IV.1.2. Fintech Event Studies

The results of the fintech event studies allude to another intriguing narrative. We can find statistically significant, negative abnormal returns of -14% on the trading day preceding SVB's fall. On 9 March, depositors at SVB began to pull out money of the bank en masse, which may have raised doubts about the future prospects of fintech startup financing, given the bank's central position in the global fintech ecosystem (Korn, 2023). However, it needs to be emphasised that SVB did not play a considerable direct role in fintech financing in Europe. Hence, effects on the outlook of the European fintech landscape were, in fact, not as dreadful as initially feared (Hunt, 2023). No particular effect can be observed for the first selected event date itself. Then, the more Europe-specific event of 13 March, which is the next trading day

after SVB's collapse on 10 March, marking a sharp drop in CS shares, brought about a 15.8% average abnormal increase in the share prices of the observed European fintech companies. This seems to be supporting the hypothesis that banking shake-ups may contribute to the relative attractiveness of the financial technology sector providing innovative alternative solutions. 15 March and 20 March, dates that proved to be of significant importance for banks, broadly leave fintech returns unaffected.

Overall, this nuanced landscape suggests that the trembling of banking behemoths may represent fruitful opportunities for fintechs, especially for those involved in the lending business. Some of these opportunities may be more pronounced in the private sector, as illustrated by the case of Cashare. Credit Suisse (CS) and UBS long held sway in Switzerland's corporate banking world, but the situation is changing now. Foreign players are eager to step in to fill the space – German Commerzbank is to be mentioned, among others; but they seem to be shooting for the segment of the corporate lending market above two million francs. Trends in SME financing underscore that these businesses are prompted to consider alternative sources of funding, especially with banks presenting them with more stringent conditions in great part due to the aftermaths of the COVID-19 pandemic. Cashare, a Swiss private company launched in January 2008 operates the largest peer-to-peer online lending platform in the country. In a recent article, its CEO confirmed the composition of Cashare's clientele has experienced a shift from private individuals to businesses – and the company is poised for double-digit growth this year (Buholzer, 2024).

Furthermore, the event study underpins the higher volatility nature of fintech stocks. It is to be noted that certain fintech companies may benefit from increased levels of overall stock market volatility, as many of them are involved in large volumes of derivatives trading. A prominent example is the case of Swiss Leonteq. However, as detailed in the previous section, the 2023 banking crisis did not give birth to untameable financial contagion.

Leonteq, one of the publicly listed companies included in the event study analysis, and a leader in the structured products market, bets on volatility. Consequently, recent macroeconomic and stock market conditions severely hurt the company's profitability. Volatility is down-scaled as more investors tend to remain cautious with their equity investments and are more prone to explore cash-like instruments offering more generous returns in the high interest rate era (Finews, 2023). In February 2024, Leonteq announced a three-quarters dividend cut to 1 franc a share, necessitated by an arresting 87% fall in net profits for fiscal year 2023. Nevertheless, the outlook for the company is not that obscure considering that Leonteq maintained its solid

client franchise, reported stable net fee income, and saw an almost 30% increase in the number of new products issued (Finews, 2024). Another intriguing aspect of the Swiss fintech's operations is the long-term strategic partnership with Raiffeisen Switzerland, which has recently been confirmed to continue until 2030. The bank holds an approximately 29% stake in Leonteq. It has been confirmed that the company will continue selling Raiffeisen's products through its channels in Europe and Asia. In addition, in the framework of their cooperation, a unique platform connected to Leonteq will be set up for the bank for issuing, distributing, and hedging a portion of its derivative products (The Swiss Times, 2024).

In the following, the case of publicly listed Swiss fintech Temenos will be briefly presented. Temenos stocks are also included in the event study analysis. The company that mainly works with banks and wealth management institutions can be linked to CS as the two had a successful collaboration, yet it illustrates how the performance of fintech companies may remain largely independent from that of banks. Via offering the implementation of automated workflows, Temenos significantly enhanced the operational efficiency of the Fund Services team of CS that used to manage over 700 funds with rigorous paper-based processes (Temenos, n.d.). Despite CS being a long-term client of Temenos, company representatives confirmed in the 2023 first quarter Results Conference Call that business with CS only constitutes a 1% maintenance revenue stream for Temenos, hence they do not see CS's demise as a major risk. It is also emphasised that the integration of CS within UBS will probably take 3-4 years. Moreover, they believe that Credit Suisse is still a strong brand, thus it will be retained in the country for an extended period of time. The earnings call also sheds light on strong growth attributed to spurring demand for their software-as-a-service (SaaS) and cloud solutions across various bank tiers and geographies including Europe, the United States, Latin America, and the Middle East. Company representatives also confirmed that Temenos did not see any direct adverse impact exerted by the turbulence in the US regional banking market. They reminded the stakeholders of Temenos that, within the banking sector, which represents only part of Temenos's client base next to other fintechs and neobanks, they mostly cater to diverse and conservative institutions with extensive and successful franchises, which remained unaffected by the banking crisis (Temenos, 2023).

In conclusion, the fintech sector may benefit from the demise of traditional financial institutions, but the landscape is more nuanced, showcasing colourful fintech profiles and business models. Numerous variables are at play when it comes to shaping the performance of public as well as private fintech companies both globally and in the region. As it is also

underpinned by the results of the linear regression analysis presented in the next section, no consistent inverse relationship can be established between fintechs and banks. Hence, it is advised to rely on case study analyses to better understand anomalies in the returns of certain stocks.

IV.2. Linear Regression Analysis

The results are presented in the below table.

Table 5. Results of the Linear Regression Analysis

	Coefficient	Standard Error	T stat	P value
Intercept	-0.00174	0.001036	-1.677	0.094007
Euro Stoxx 50	0.470697	0.140324	3.354	0.000841
Stoxx 600 Banks	0.076039	0.110109	0.691	0.49007

Overall, it may be concluded that the changes in the level of the Stoxx 500 Banks Index do not allude to inverse changes in the returns of the fintech index. The P value 0.490 indicates that results are not statistically significant. In light of the results of the event studies and the regression analysis, it may be concluded that, even though a general inverse correlation does not hold, events of systemic importance in the world of banking may induce important changes in the fintech sector as well. One of the five mega-forces that will shape the future of the global economy is ‘the future of finance’ (BII, 2024). A discussion of this more nuanced landscape of bank-fintech collaboration versus competition will ensue, followed by a brief evaluation of future scenarios.

EU banks have responded to the growing competition from fintechs by using a variety of strategies. Over 80% have created in-house financial technology solutions, and a comparable percentage have entered into business alliances with third-party fintechs. Investing in fintech businesses and assisting fintech accelerators with the goal of purchasing fintech startups that show promise are other popular strategies (Baba et al., 2020).

Evaluating possible actions and responses of incumbents and new entrants from a strategic point of view, it can be said that the decisions of both camps primarily depend on whether the future state of the financial landscape potentially involves banks and fintechs being strategic complements or rather substitutes. Thus, possible strategies to adapt by players on each side also depend on their capacities to evaluate the intentions and capabilities of their competitors. Also, in harmony with the thesis of path dependence, the actions adopted by incumbent

financial institutions are heavily influenced by the volume and effectiveness of their legacy technologies.²⁸ It may be concluded that banks' response to fintech disruption will not be homogeneous in their nature (Vives, 2017).

As far as banks' support of the fintech industry is concerned, first, it is imperative to highlight the role that European banks play in fintech financing. Incubators and accelerator programs of large banks such as Commerzbank, Barclays and J.P. Morgan are to be mentioned (Haddad and Hornuf, 2018). Moreover, European (fintech) SMEs dominantly rely on private equity funding. The biggest banks often participate in such debt funding rounds, or offer equity investment, including Credit Suisse. For instance, in 2019, CS agreed to invest up to £225 million in London-based, AI-powered marketplace lending company Lendable (Weeks, 2019). Credit Suisse has also participated in the 2022 funding round of Curve, a paytech firm offering convenience for customers by aggregating multiple cards via its mobile app, and the 2023 funding round of Swiss digital currency platform Taurus, along with Deutsche Bank. Other recent examples include the participation of BNP Paribas in the 2023 funding round of data and insights network AccessFintech; HSBC's \$10 million equity investment in credit infrastructure and analytics company Nova Credit in 2022; Barclays's participation in 2022 in the £140 million debt funding round for embedded finance platform Liberis; and Barclays and J.P. Morgan investing in German insurtech company Wefox in 2023 (Potel and Turgel, 2023).

The provision of loans for startups and SMEs is also a preeminent function of the banks of the region. As previously exemplified by the case of Cashare, enticing clientele from this cohort presents an apex opportunity for fintech enterprises.

As far as collaboration between traditional financial institutions and new players is concerned, it may take several forms, such as a referral partnership model, fintechs as vendors, private-/white-label collaborations, or hybrid models (H.E.S. FinTech, 2022). One of the main drivers for banks to partner with fintech firms instead of developing in-house solutions is the possibility of regulatory arbitrage. According to The Economist (2015), regulatory compliance has moved from being a back-office job to a 'corner-office' one, both for banks and fintechs, alluding to its ever-increasing strategic importance. The biggest regulatory hurdle possibly hindering the activities of fintech firms in the future is the potential need for a banking license. On the other hand, the EU's Payment Services Directive II of 2015 (PSD 2) has opened new dimensions for

²⁸ Institutional economists Paul David and W. Brian Arthur developed the concept of path dependence in the 1980s. The theory posits that economic outcomes are not only dependent on current conditions but are heavily influenced by the path of previous outcomes. In other words, 'history matters' (Puffert, 2019).

fintech to entice the current clientele of traditional banks. It allows access to the bank customer interface to third parties, thereby equipping fintech companies with a powerful tool to disrupt banking value chains (Baba et al., 2020).

However, there are several hindrances to such cooperative initiatives. Organisational hiccups run the danger of compromising fintech's inclination toward quick experimentation epitomised by the wide-spread 'fast-and-fail' approach. On the other hand, when it comes to setting expectations and gauging success, banks struggle due to a dissensus on whether qualitative or quantitative measures should be applied (Deloitte, 2020).

Nevertheless, one may find numerous bank-fintech partnerships in Europe, especially in retail finance. A few recent prominent examples are as follows. French Banque Paribas & Cie has integrated London-based Finastra's Payments To Go solution, enabling instant payments and access to Europe's TARGET Instant Payments Settlements. Swiss crypto platform Taurus and Deutsche Bank have formed a global partnership, focusing on digital asset custody and tokenization services. The collaboration is backed by Deutsche Bank's aforementioned participation in Taurus' Series B funding round. Intesa Sanpaolo's collaboration with Nexi introduces SoftPOS, an Android-based contactless payment solution for merchants. Libra Internet Bank in Romania adopts Temenos Payments to modernise its payment capabilities, with a special focus on cross-border payments and reporting. Italian publicly traded paytech company Nexi, as well as Swiss fintech Temenos are part of the event study analysis of this paper. Lloyds Bank's partnership with American fintech Fiserv facilitates dynamic currency conversion for UK and European merchants. The main objective is providing access to wholesale FX rates and market risk management services. Lastly, Saxo Bank and Mastercard's collaboration introduces open banking payments within investment platforms. The initiative is expected to simplify fund transfers for customers, initially in Denmark with plans for expansion across Europe (Methri, 2023).

Concerning potential disruption brought about by new entrants, bank services for which primarily data processing expertise is required are the most in peril. The paramount exemplars comprise payments, securities brokerage, and passively managed investment vehicles, alongside consumer credit facilities delineated by quantifiable credit risk (with potential for commodification). Banking services that lie at the nexus of both data analysis and special banking acumen are also imperilled – these include more complex lending services, advisory, private banking, and active asset management. With these considerations, it is not astonishing that in Europe, fintechs providing lending services through varying business models and

innovative firms offering payment solutions are the most widespread (Ilollari and Shehu Shahini, 2023). Fintechs have the enormous advantage of not being tied up by maintenance costs of legacy systems. In 2018, around one-third of the administrative expenses incurred by EU banks went towards IT-related expenditure. Yet less than one-fifth was allocated to digital innovations, partly due to the astronomical cost of sustaining outdated infrastructures (Baba et al., 2020). Related to this, another danger is that the calming prevalence of elevated switching costs for customers may impede banks' incentives to innovate. Ensuring high switching costs for a well-developed clientele is made possible by the provision of a vast array of services, also known as universal banking. The bank cannot discriminate between old and new customers, hence may behave as a peaceful 'fat cat' with the intention of protecting the profitability of its sizeable customer base (Vives, 2017). Furthermore, an additional formidable asset of both nascent and entrenched fintech enterprises resides in their innovation-centric organisational ethos, prioritising the empowerment of engineers—an aspect underscored by Schumpeter's innovation theory as early as the 1930s.

However, one must bear in mind that the reason that more advanced banking expertise is required for lending services is the fact that they do not merely comprise the supply of funds. Risk control via collateral assessment and loan restructuring or recovery in case of default are equally prominent in this respect. Given that assets with greater credit risk are frequently opaque and thus illiquid, banks have a special function in providing liquidity and mitigating cases of default. Thus, the key competitive advantage of banks lies in their unique balance sheet and thereby their ability to manage duration and liquidity mismatch. Other key resources and capabilities comprise their extensive infrastructure, their immense and trusting clientele, and their experience in regulatory compliance concerning capital and liquidity requirements, for instance. This is why banks have proved resilient towards ICT disruptions throughout history and are unlikely to simply disappear from the scene in the near future (Dermine, 2017). Hence, despite all counterarguments, banks have major capacities to innovate on their own. A few eminent examples from Europe include Spanish bank BBVA and Dutch investment bank ABN Amro. BBVA allows customers to integrate external accounts into its app, enabling global balance inquiries and transfers. Moreover, non-clients can also utilise the app as a comprehensive banking interface. Driven by similar considerations, ABN Amro developed the Grip app, which offers users insights into spending and financial coaching across six Dutch banks. These initiatives emphasise customer engagement beyond traditional boundaries (Unnax, 2020).

In spite of all this, Philippon (2016) has pointed out that ICT development-related efficiency gains have historically been reaped by incumbent financial institutions. There has been no material decrease in the unit cost of financial services for end users. Fintech's big promise is disseminating these cost gains to the clientele. The principal inquiry pertains to how the fintech paradigm shift will fulfil its grand pledge of enhancing efficacy in the provision of financial services (Bofondi and Gobbi, 2017). There exist two primary trajectories. One is leaving the traditional bank balance sheet structure in place, with financial institutions 'keeping their skin in the game.' This would involve leaving the current financial system broadly unchanged by collaborating with banks. The other path would involve the creation of a radically different model of 'thin layer' financial institutions, similarly to the working of current peer-to-peer (P2P) lending platforms (Vives, 2017). An intriguing parallel drawn in this respect was contributed to the literature by McAfee and Brynjolfsson (2017), based on a quote from American strategist Tom Goodwin: "Uber, the world's largest taxi company, owns no vehicles. Facebook, the world's most popular media owner, creates no content. Alibaba, the most valuable retailer, has no inventory. And Airbnb, the world's largest accommodation provider, owns no real estate" (Bofondi and Gobbi, 2017).

On a different note, it is worth mentioning the danger that fintechs may not push the financial services industry towards a landscape where friendlier end customer prices prevail after all. Pioneering entrants have access to dimensions of data that are not available to traditional banks. These new sources of data and better overall capabilities to combine existing data²⁹ result in fintechs being able to resort to opportunistic pricing strategies. The first one is connected to assessing the value that different borrowers place on the convenience of a more seamless customer journey with online origination technology, and determining interest rate premia based on that. The other one is associated with refined mortgage risk valuation and thereby incorporating default or prepayment risk into their offers more cleverly. Empirical evidence substantiates the efficacy of fintechs in executing such pricing discrimination.

²⁹ The role of big data and the trend of increased use of the abundance of non-financial data on customers is to be mentioned here. An interesting aspect of this is the danger that data analysis costs will eventually increase due to the over-abundance of information making it harder to find and focus on the most tell-tale pieces of information. In the literature, this is referred to as 'information risk' (Boot et al., 2021).

Banks may have certain tools at their disposition with which they could try to foreclose entry of new and more agile players – for instance, with obfuscation or tying strategies.³⁰ However, reflecting on all previously detailed considerations, it may be concluded that it is unnecessary for them to even try to do so. Regarding emerging entrants, theoretically, a possible strategy for them might be trying to remain small enough not to get the attention of big banks – or even restrict themselves to targeting unbanked customers segments (Vives, 2017).

All in all, partnerships between banks and fintech companies seems to be the trend for the near- or medium-term future. As for the longer run, the industry seems to be headed towards embracing the concept of embedded finance with big tech companies taking over the financial services scene. The integration of financial services or products, such as payments and banking, into the customer value chain of a non-financial services company (for instance, through an app or any other platform) is known as embedded finance (Hatch and Schmitz, 2023). The emphasis is on providing a seamless customer journey. In this scenario, traditional financial institutions may eventually be ascribed a new role in a setting where narrow banking would be implemented, perhaps via utilising edge computing tools. Narrow banking, also known as 100% reserve banking, has been on the table as early as from the 1930s, inspired by experiences during the Great Depression. It has been described by famous monetarist Milton Friedman in his book titled *A Program for Monetary Stability* (1959). Narrow banking would require commercial banks to keep all their deposits at the central bank or invested in short-term government bonds. This raises doubts about the profitability of banks (Godek, 2023). Edge computing is the practice of processing and storing data closer to the item or individual creating the data. It is an alternative for cloud processing, which handles data at a data centre that could be thousands of kilometres away from the original source (Muhn, 2020).

Another likely scenario is the introduction of central bank digital currencies (CBDCs), that may be regarded as the reconciliation of bank and fintech synergies – and that may hold the promise of solving the question of trade-off between decentralisation and stability. This may happen simultaneously with the previously described points. This would also entail a scale-down of the activities of commercial banks. In addition, it prompts various inquiries concerning monetary

³⁰ Institutions could use obfuscation techniques that raise barriers to entry and boost profit margins. For instance, they may intentionally reduce the usefulness of Internet search facilities in connection with their product offerings. Generally speaking, unclear dynamic pricing effects may result from digital technology's increased price transparency. Bundling and tying tactics are tools that incumbents might use to either compete with or discourage newcomers. For example, banks may attempt to link product A to product B in order to increase their market share in a certain consumer segment (Vives, 2017).

policy, as it would render traditional tools ineffective. There exists substantial ambiguity regarding this matter among experts. Furthermore, the chronology of how these disparate elements will interplay remains an unresolved puzzle.

V. Conclusion

In a nutshell, the results of the empirical analysis convey the message that no general inverse relationship of bank and fintech performance can be established, based on data from recent years. Notwithstanding, big events in the banking sector have the possibility to exert non-negligible impact on the fintech arena. Moreover, the results underpin the hypothesis that negative events associated with banks may bear fruitful opportunities for prosperous new players, boosting the relative attractiveness of the alternative solutions they proffer. Nevertheless, the results remind of the higher levels of volatility that this sector may be subject to. Furthermore, the analysis suggests that there are numerous other variables at play that shape the performance of financial technology companies. Scrutinising individual cases remains of primary importance in crafting more accurate narratives of the conditions that prevail in this nuanced landscape of bank and fintech dynamics.

As far as volatility transmission in the banking sector is concerned, the 2023 banking turmoil had sharp immediate negative effects, precipitating a cascade of events unique to the intricacies of this sector. However, these repercussions are transitory in nature. The recent banking crisis and the macro backdrop and resulting monetary and regulatory environment against which it happened is fundamentally different from that of the GFC. In the new era, structurally elevated inflation prevails, resulting in a higher-for-longer monetary approach. Price hikes stem partly from labour market constraints caused by the phenomenon of aging populations, and from supply chain disturbances attributable to a trend of geopolitical fragmentation. The GFC was a credit crisis, exacerbated by shadow banking products causing discrepancies in the highly interconnected global system. Regarded as a wake-up call for regulators, the GFC has brought about a scene characterised by banks with more powerful capital buffers and healthier liquidity conditions. Still, cases of individual mismanagement prove to be perennial. Flawed operations of even smaller banks may set off bank runs, let alone global banks of systemic importance, as illustrated by the recent banking turbulences. Notwithstanding, panic-led crises can be contained relatively seamlessly. It is imperative to acknowledge that certain banks may endure greater adversity than their counterparts. Therefore, the meticulous evaluation of risk profiles for individual institutions remains as paramount as it was in the context of fintech enterprises.

Another salient aspect to consider is the progressively nuanced nature of bank-fintech relationships, with fintechs utilising their agile settings to bring about innovation, while banks enthusiastically embrace collaborative prospects owing to numerous factors, such as an outlook for regulatory arbitrage. Banks also assume a crucial role in raising funds for fintech financing, particularly if one takes into account the pronounced over-reliance on the banking sector in Europe, which stands in stark contrast with the comparatively limited capital market funding options.

There is an important degree of ambiguity as far as the future of finance is concerned, with keywords such as embedded finance, narrow banking, edge computing, and central bank digital currencies promising potential disruption.

The primary limitation of this research lies in the dearth of data regarding the effects of the banking crisis on the performance and funding of startups and privately held fintech companies. However, this paper enriches the on-going dialogue by providing a novel viewpoint on European bank-fintech interactions, extrapolating insights from historical occurrences, making comparisons with the US where relevant, and appraising future prospects considering the distinctive features of the European financial system.

The ever-changing variables of this field warrant further research and regular re-evaluation of the most important elements responsible for shaping the future of all players in the financial services industry. A non-exhaustive list of further avenues for research include: event study analysis to discern the effects of SVB's fall on US fintech stocks; comparative research on managerial faux pas that are behind the fall of major banks; more in-depth analysis of bank-fintech collaboration on a case study basis; edge computing reshaping the functions of banks; and public sentiments towards the adoption of fintech applications to the detriment of traditional banking contracts in Europe.

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Appendix

Table 6. European Bank Stocks Used in the Event Studies

Ticker	Name	Domicile	Stock Exchange
ACA FP	Credit Agricole SA	France	EN Paris
AKTIA FH	Aktia Bank Oyj	Finland	Nasdaq Helsinki
BAMI IM	Banco BPM SpA	Italy	EN Milan
BARC	Barclays Plc	UK	LSE
BBVA SM	Banco Bilbao Vizcaya Argentaria	Spain	Madrid Stock Exchange
BEKN SW	Berner Kantonalbank AG	Switzerland	SIX
BNP FP	BNP Paribas Sa	France	EN Paris
BPE IM	BPER Banca SpA	Italy	EN Milan
DANSKE DC	Danske Bank AS	Denmark	Nasdaq Copenhagen
DKB GR	Deutsche Kreditbank AG	Germany	Börse Frankfurt
DNB NO	DNB ASA	Norway	EN Oslo
ETE GA	National Bank of Greece SA	Greece	Athens Stock Exchange
EUROB GA	Eurobank Ergasias Services and Holdings SA	Greece	Athens Stock Exchange
FBK IM	FinecoBank Banca Fineco SpA	Italy	EN Milan
GLE FP	Société Générale SA	France	EN Paris
GRKP SW	Graubuendner Kantonalbank	Switzerland	SIX
HPB CZ	Hrvatska Poštanska Banka dd	Croatia	Zagreb Stock Exchange
HSBA	HSBC Holdings Plc	UK	LSE
ISP IP	Intesa Sanpaolo SpA	Italy	EN Milan
JSK DC	Jyske Bank AS	Denmark	Nasdaq Copenhagen
KBC BB	KBC Bank NV	Belgium	Euronext Brussels
KOMB CP	Komerční Banka AS	Czech Republic	Prague Stock Exchange
LLOY LN	Lloyds Banking Group Plc	UK	LSE
LUKN SW	Luzerner Kantonalbank AG	Switzerland	SIX

MB IM	Mediobanca Banca di Credito Finanziario SpA	Italy	EN Milan
MONET CP	Moneta Money Bank AS	Czech Republic	Prague Stock Exchange
NDA SS	Nordea Bank Abp	Sweden	Nasdaq Stockholm
NLBR SV	Nova Ljubljanska Banka dd	Slovenia	Ljubljana Stock Exchange
NWG LN	Natwest Group Plc	UK	LSE
OMASP FH	Oma Säästöpankki Oyj	Finland	Nasdaq Helsinki
OTP HB	OTP Bank Nyrt	Hungary	Budapest Stock Exchange
PBB GR	Deutsche Pfandbriefbank	Germany	Börse Frankfurt
PKO PW	Powszechna Kasa Oszczednosci Bank Polski SA	Poland	Warsaw Stock Exchange
SAN SM	Banco Santander SA	Spain	Madrid Stock Exchange
SEBA SS	Skandinaviska Enskilda Banken AB	Sweden	Nasdaq Stockholm
SOR NO	Sparebanken Sør	Norway	EN Oslo
SPL PW	Santander Bank Polska SA	Poland	Warsaw Stock Exchange
STAN LN	Standard Chartered Plc	UK	LSE
TKBP SW	Thurgauer Kantonalbank	Switzerland	SIX
UCG IM	UniCredit SpA	Italy	EN Milan
VG8 GR	Varengold Bank AG	Germany	Börse Frankfurt
VMUK LN	Virgin Money UK Plc	UK	LSE
ZABA CZ	Zagrebačka banka dd	Croatia	Zagreb Stock Exchange
ZUGER SW	Zuger Kantonalbank AG	Switzerland	SIX

Table 7. Euro Stoxx 50 Constituents

Company	Supersector	Country	Weight (%)
ADIDAS	Consumer Products & Services	Germany	0.93
ADYEN	Industrial Goods & Services	Netherlands	1.44
AHOLD DELHAIZE	Personal Care, Drug & Grocery Stores	Netherlands	0.95
AIR LIQUIDE	Chemicals	France	2.80
AIRBUS	Industrial Goods & Services	France	2.44
ALLIANZ	Insurance	Germany	2.70
ANHEUSER-BUSCH INBEV	Food, Beverage & Tobacco	Belgium	1.52
ASM L HLDG	Technology	Netherlands	8.47
AXA	Insurance	France	1.67
BASF	Chemicals	Germany	1.30
BAYER	Health Care	Germany	1.64
BCO BILBAO VIZCAYA ARGENTARIA	Banks	Spain	1.30
BCO SANTANDER	Banks	Spain	1.72
BMW	Automobiles & Parts	Germany	1.14
BNP PARIBAS	Banks	France	2.05
CRH	Construction & Materials	Ireland	1.17
DANONE	Food, Beverage & Tobacco	France	1.13
DEUTSCHE BOERSE	Financial Services	Germany	1.05
DEUTSCHE POST	Industrial Goods & Services	Germany	1.39
DEUTSCHE TELEKOM	Telecommunications	Germany	2.15

ENEL	Utilities	Italy	1.51
ENI	Energy	Italy	1.02
ESSILORLUXOTTICA	Health Care	France	1.67
FLUTTER ENTERTAINMENT	Travel & Leisure	Ireland	1.05
HERMES INTERNATIONAL	Consumer Products & Services	France	2.23
IBERDROLA	Utilities	Spain	2.22
Industria de Diseno Textil SA	Retail	Spain	1.22
INFINEON TECHNOLOGIES	Technology	Germany	1.58
ING GRP	Banks	Netherlands	1.46
INTESA SANPAOLO	Banks	Italy	1.27
Kering	Consumer Products & Services	France	1.21
L'OREAL	Consumer Products & Services	France	3.20
LVMH MOET HENNESSY	Consumer Products & Services	France	7.18
MERCEDES-BENZ GROUP	Automobiles & Parts	Germany	1.91
MUENCHENER RUECK	Insurance	Germany	1.47
NOKIA	Telecommunications	Finland	0.67
NORDEA BANK	Banks	Finland	1.15
PERNOD RICARD	Food, Beverage & Tobacco	France	1.29
Prosus	Technology	Netherlands	1.58
SAFRAN	Industrial Goods & Services	France	1.70
SANOFI	Health Care	France	3.48
SAP	Technology	Germany	4.12

SCHNEIDER ELECTRIC	Industrial Goods & Services	France	2.96
SIEMENS	Industrial Goods & Services	Germany	3.91
STELLANTIS	Automobiles & Parts	Italy	1.18
TOTALENERGIES	Energy	France	4.27
UNICREDIT	Banks	Italy	1.19
VINCI	Construction & Materials	France	2.08
VOLKSWAGEN PREF	Automobiles & Parts	Germany	0.85
Vonovia SE	Real Estate	Germany	0.42

Table 8. Stoxx 600 Banks Index Constituents

Company	Supersector	Country	Weight (%)
ABN AMRO BANK	Banks	Netherlands	0.77
AIB GROUP	Banks	Ireland	0.56
AVANZA BANK HLDG	Banks	Sweden	0.29
BANCO BPM	Banks	Italy	0.73
BANK OF IRELAND GROUP	Banks	Ireland	1.21
BANKINTER	Banks	Spain	0.45
BANQUE CANTONALE VAUDOISE	Banks	Switzerland	0.34
BARCLAYS	Banks	Great Britain	3.29
BAWAG GROUP AG	Banks	Austria	0.44
BCO BILBAO VIZCAYA ARGENTARIA	Banks	Spain	4.95
BCO SABADELL	Banks	Spain	0.69
BCO SANTANDER	Banks	Spain	6.53
BNP PARIBAS	Banks	France	7.78
BPER Banca	Banks	Italy	0.31
CAIXABANK	Banks	Spain	1.83
CEMBRA MONEY BANK	Banks	Switzerland	0.26
CLOSE BROTHERS GRP	Banks	Great Britain	0.20
COMMERZBANK	Banks	Germany	1.31
CREDIT AGRICOLE	Banks	France	1.70
DANSKE BANK	Banks	Denmark	1.81
DEUTSCHE BANK	Banks	Germany	2.34

DNB BANK	Banks	Norway	1.83
ERSTE GROUP BANK	Banks	Austria	1.26
FINECOBANK	Banks	Italy	0.94
GRP SOCIETE GENERALE	Banks	France	2.27
HSBC	Banks	Great Britain	17.60
ING GRP	Banks	Netherlands	5.53
INTESA SANPAOLO	Banks	Italy	4.83
INVESTEC	Banks	Great Britain	0.39
JYSKE BANK	Banks	Denmark	0.40
KBC GRP	Banks	Belgium	1.88
LLOYDS BANKING GRP	Banks	Great Britain	4.30
NATWEST GROUP	Banks	Great Britain	2.00
NORDEA BANK	Banks	Finland	4.34
PEKAO	Banks	Poland	0.54
PKO BANK	Banks	Poland	0.84
RINGKJOBING LANDBOBANK	Banks	Denmark	0.46
SKANDINAVISKA ENSKILDA BK A	Banks	Sweden	2.14
STANDARD CHARTERED	Banks	Great Britain	2.31
SVENSKA HANDELSBANKEN A	Banks	Sweden	1.49
SWEDBANK	Banks	Sweden	1.78
SYDBANK	Banks	Denmark	0.31
UNICREDIT	Banks	Italy	4.50
Virgin Money UK	Banks	Great Britain	0.26