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FINTECH AND THE LIQUIDITY–RESILIENCE PARADOX IN STOCK MARKETS: A CRITICAL REVIEW

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Abstract

This study explores the impact of financial technology (FinTech) on the liquidity and resilience of global financial markets during 2014–2024. The analysis covers electronic trading, algorithmic and high-frequency trading, artificial intelligence, big data analytics, digital brokerage platforms, and distributed-ledger technologies, and their impact on transaction costs, price discovery, market liquidity provision, information efficiency, and market stability. Evidence from around the world has shown that FinTech has significantly reduced information and execution frictions and enhanced market liquidity during normal times by enabling faster order matching, providing liquidity to a larger number of investors, and increasing competition among liquidity providers. The level of technology integration in financial systems is evident in global investment in FinTech, which totaled US$239.3 billion in 2021 and US$95.6 billion in 2024, despite the drop. The facts do, however, show an important liquidity-resilience paradox. While algorithmic trading and market fragmentation may lead to lower average bid–ask spreads, some evidence from the large equity markets shows that spreads are becoming more skewed and kurtotic, meaning that abnormally poor liquidity conditions could still occur during a market stress. In fact, the market shock in March 2020 due to the outbreak of COVID-19 was another example of how digital infrastructure can ensure continuous market access while also accelerating synchronized trading, deleveraging, and shock transmission. When assessing the impact of FinTech, cross-country evidence shows that the impact varies with technological infrastructure, market depth, financial development, regulatory quality, and investor involvement. The study finds that FinTech can improve the efficiency of the markets and the liquidity of everyday transactions, but resilient outcomes is not a foregone conclusion. To sustain its contribution, the adoption of efficient regulation, cybersecurity, clear algorithms, fragmented technological platforms, and institutional resilience to handle systemic risks arising from the growing automation and interdependency of financial markets is needed.

INTRODUCTION

From 2014 to 2024, financial technology (FinTech) has become a more significant driver of financial innovation, transforming the way investors access markets, place orders, receive information, manage their portfolios, and provide liquidity. Technologies under the umbrella term FinTech include digital trading platforms, algorithmic and high-frequency trading, robo-advisory services, artificial intelligence (AI) and machine learning, blockchain and DLT, digital brokerage, mobile investment applications, alternative data analytics, and automated payment and settlement infrastructure (Aldasoro et al., 2024). The size of this change is illustrated by the amount of funding that is being channeled into the sector: the World Economic Forum reported that since 2015, over US$350 billion has been invested in FinTech through venture-capital funding, and that in 2023, global FinTech industry revenue was over US$150 billion, projected to be around US$400 billion by 2028. However, even in the face of monetary tightening and geopolitical uncertainty, the volume of investments in FinTech was still significant at US$95.6 billion in 2024, split into US$63.8 billion in the Americas, US$20.3 billion in Europe, Middle East and Africa (EMEA), and an estimated US$11.4 billion in Asia-Pacific(Arner et al., 2019).

Excluding payments, US$31 billion was spent on digital assets and currencies and US$7.4 billion on reg-tech, painting a picture of a rapidly expanding technological backbone for contemporary financial intermediation. Liquidity and resilience in stock markets rely strongly on the speed, cost, quality, and reliability of the interactions between buyers and sellers, and this technological expansion is key in this regard. Liquidity is conventionally captured by metrics like the bid–ask spread, volume, depth, market turnover, price impact, and transaction costs; while market resilience refers to the ability of a market to withstand large order imbalances or external shocks without significant deterioration in trading conditions or inefficient price movement, which may lead to market instability(Barber et al., 2022). These features became more dominated by electronic and automated structures in 2014-2024. According to data from the Bank for International Settlements (BIS), electronic trading has reshaped the structure and mechanisms of markets, the process of price discovery, and the provision of market liquidity; overall, electronic trading tends to boost the quality of markets, and, in some instances, it can also lead to less robust liquidity and increased volatility.

The importance of this shift is not just for financial hubs; digitization has greatly broadened access to financial services. According to the Global Findex data from the World Bank, the percentage of the adult population with an account rose from 51% in 2011 to 76% in 2021, and the percentage of adults who make or receive digital payments grew from 35% in 2014 to 57% in 2021 in developing economies (Kasuri, Abbas, et al., 2024). While the indicators on financial inclusion do not specifically focus on securities markets, they highlight the evolving digital financial infrastructure that enables people and businesses to access and engage with formal financial markets. The COVID-19 pandemic only furthered this shift(Bhriguvanshi et al., 2024). The Financial Stability Board (FSB) also reported that the pandemic has sped up digitalization in retail financial services and raised the profile of technology-oriented financial service providers, while the World Bank revealed more than 40% of adults in low- and middle-income economies (excluding China) have made a merchant payment digitally for the first time during the pandemic.

In the case of stock markets, however, there are fundamental paradoxes as to how technology can both enhance the spread, reduce the order matching time, facilitate the flow of information, and make markets more accessible to investors, while simultaneously making markets more fragmented, algorithmically synchronized, volatile, and quicker to lose liquidity during market stress. However, BIS research has demonstrated that fast trading technologies can help liquidity providers better track markets and, under specific circumstances, provide liquidity to help markets cope with shocks, but technology does not rule out adverse selection and does not ensure the provision of stable liquidity (BIS, 2024). The

separation is important since increases in average liquidity do not necessarily mean increases in resilience. The 2014–2024 timeframe is important for the relationship in this regard as it covers the acceleration of the adoption of automated trading and digital investment technologies, the rising use of AI and the use of alternative data, the development of the blockchain-based financial infrastructure, the COVID-19 shock, periods of exceptional market volatility, and the subsequent normalization of monetary policy and financial conditions(Boehmer et al., 2021).

In this context, it is important to consider the effect of FinTech on the liquidity and resilience of the stock markets, to get a wider picture of whether the new technologies are enhancing the ability of financial markets to enable continuous, low-cost trading, while at the same time strengthening their capacity to absorb periods of intense stress. Because the impact of FinTech is unlikely to be uniform: varying levels of market development, regulation, technological infrastructure, investor participation, financial inclusion, and institutional capacity can mean the difference between promoting liquidity and resilience and creating new sources of fragility. The very essence of the experience of 2014-2024 is thus not just about the rapid evolution of financial technology, but about the shift in the architecture of market functioning, as well as the increasingly pressing issue of whether faster, more connected, and more automated markets are also more liquid, more efficient, and more resilient.

FinTech Transformation of Global Financial Markets

From Digital Finance to an Integrated FinTech Ecosystem

From 2014 to 2024, FinTech went from a group of electronic financial services to a technological ecosystem that is not only impacting the infrastructure and intermediation of financial markets, but increasingly the way they work (Mahmood et al., 2024). It was spurred by the rapid evolution of cloud computing, mobile connectivity, artificial intelligence (AI), big data analytics, distributed ledger technology, application programming interfaces (APIs), and automated trading systems (Munir, 2024). A good example of this shift is the amount of investment in Global FinTech. According to the KPMG Pulse of Fintech report, global FinTech investment grew to around US$216.8 billion across 7,321 deals in 2019, prior to the COVID-19 period, when digital adoption and subsequent investments surged to a record US$239.3 billion across 7,321 deals in 2021. Despite significant funding reductions as interest rates rose and venture markets cooled, global investments in FinTech totaled $95.6 billion across 4,639 deals in 2024 (Boehmer et al., 2021).

This spatial distribution of 2024 investment also highlights the global nature of FinTech development, with the Americas receiving US$63.8 billion, EMEA US$20.3 billion, and Asia-Pacific receiving around US$11.4 billion. This growth has transformed financial market intermediation, detraditionalizing it and replacing reliance on traditional physical branches and manual processes with continuously connected digital platforms (Kasuri, Mahmood, et al., 2024). In the securities markets, digital brokerage accounts, mobile securities trading apps, electronic order books, automated securities portfolio management systems, and cloud-based analytics have lowered the barriers between investors and exchanges. It's also been spurred by a larger financial inclusion in the digital sphere. According to World Bank data, the percentage of adults with an account at a financial institution or a mobile money service rose from 51% in 2011 to 76% in 2021, and digital payment use grew significantly in developing economies over the same period. These developments have resulted in an increasingly interconnected environment where technological infrastructure plays a significant role in the initiation, execution, monitoring, and settlement of financial transactions, going beyond the role of a support mechanism for financial markets (Boot et al., 2021).

Algorithmic Trading, AI, and the Digitization of Market Infrastructure

Securities trading played a special role in the changes to financial markets in 2014-2024, in which algorithmic systems have taken on tasks of human intermediaries. Algorithmic and high-frequency trading involve the use of computer programs to spot trading opportunities, execute and cancel trades, manage inventories, and execute trades at hyperspeed (Saleem et al., 2024). The Bank for International Settlements (BIS) has chronicled the shift in market structure, price discovery, and liquidity provision that has occurred with the increased role of electronic and algorithmic trading. Modern markets use automated engines and algorithmic liquidity providers to match buyers and sellers, and not just human dealers. Today's markets place increasing emphasis on automated engines and algorithmic liquidity providers that can respond to changes in price and order flow within milliseconds, rather than relying exclusively on human dealers for matchmaking. These were further enhanced by the use of AI and machine learning technologies, which can process vast quantities of structured and unstructured data, such as company disclosures, news, market prices, transaction history, and alternative datasets (Raza, Munir, Ali, Othi, & Hussain, 2024). These technologies have also evolved in sophistication, impacting the geography and timing of financial participation: markets can be accessed round-the-clock via digital channels, and automated systems can track several securities and markets at once (Carlini et al., 2022).

Blockchain technology added another layer by enabling the development of distributed systems that could record and validate transactions without complete dependence on traditional centralized systems. While blockchain was not widely used in the equity market overall during the period, other trends such as tokenization of securities, digital assets, smart contracts, and distributed settlement showed promise of future shifts in the nature of clearing and settlement. Importantly, technological transformation did not necessarily bring about greater market stability. In normal circumstances, BIS research shows that electronic and automated trading enhances market quality, but at times when liquidity becomes more fragile, market trading strategies respond simultaneously to rapidly changing information. So, the digitalization of market infrastructure had a dual impact: on the one hand, it made markets faster and more efficient for financial transactions; on the other hand, it made markets faster at disseminating market disturbances (Chakrabarty & Pascual, 2023).

COVID-19, Digital Acceleration, and the New Global Financial Architecture

The COVID-19 pandemic was a key catalyst for the FinTech revolution, as it not only disrupted traditional financial activities but also increased reliance on digital channels. According to the Financial Stability Board, the pandemic has fast-tracked digitalization in the retail financial services industry and raised the profile of technology's importance in the sector. A World Bank study found that in low- and middle-income countries (excluding China), over 40% of all adults who used digital merchant payments for the first time during the pandemic were doing so for the first time. The financial markets were extremely volatile at the same time. The need and fragility of technology-driven markets was exemplified in March 2020, when the world experienced a sell-off of electronic trading never before seen. Electronic platforms have helped markets run smoothly despite the physical economic shutdown and the high volume of orders submitted; portfolio rebalancing and deleveraging have occurred at an unprecedented pace (Chen et al., 2022).

The FSB then highlighted the role of interactions among liquidity demand, market intermediation, and financial vulnerabilities in the financial-stability context during the COVID-19 period. Pre-COVID-19, FinTech companies were more focused on AI, embedded finance, digital assets, automated compliance and data-based investment solutions in their development. By 2024, FinTech was thus not only firmly rooted in the technology niche but also integrated into the multilayered financial architecture worldwide. For stock markets, the implications of this shift are especially significant, as digitalization will affect the amount and quality of market liquidity and markets' shock-

absorption capacity. The 2014-2024 time frame is therefore a transition from "traditional" markets, where electronic support is becoming more prominent, to more automated, data-driven, and connected financial markets that lay the technological groundwork for assessing the impact of FinTech on stock market liquidity and resilience (Clapham et al., 2023).

FinTech and Stock Market Liquidity

Mechanisms Through Which FinTech Influences Stock Market Liquidity

There are many interwoven ways in which FinTech influences liquidity in stock markets, including lowering transaction frictions, speeding up information processing, better matching orders, and expanding the range of participants who can provide or demand liquidity. In the conventional market, investors rely on intermediaries to find counterparties and execute trades, whereas electronic trading systems bring together buy and sell offers in centralized or interconnected limit order books, lowering search costs for investors and enabling them to complete trades much faster. A common indicator of this process is the bid–ask spread: the smaller the spread, the less likely the immediate trading costs are high (Cole et al., 2019).

This is reinforced by algorithmic and/or high-frequency trading, which constantly monitor price and order flow and quickly adjust quotes depending on market conditions. The technology, although fast, does not eliminate the adverse selection risk, as evidence from Euronext shows that fast proprietary traders can provide liquidity through both limit orders and contrarian marketable orders, even during periods of market stress. FinTech also bolsters liquidity by giving retail investors access to securities markets via digital brokerage platforms and mobile apps, while AI- and big-data-driven analytics enable market participants to process a much larger information set when setting prices and order sizes. As a result, the technological channel is mediated by reduced search costs, faster execution, stronger price competition, greater participation, and faster liquidity provision. However, the impact is not always direct – during periods of low volatility and uncertainty, algorithmic trading can enhance liquidity, but during times of high volatility and uncertainty, they can withdraw or reduce their exposure (Cornelli et al., 2020).

Empirical Evidence on FinTech and Liquidity Conditions

The available empirical studies compiled over the last 12 years (2014-2024) suggest overall better average liquidity, but with differing sizes and stability of improvements at the market and circumstance levels. In a recently published study on average spreads in equity markets conducted by the BIS, the study finds that the average bid–ask spread has decreased significantly over the longer time period studied, suggesting that average liquidity has improved; at the same time, it observes an increase in the skewness and kurtosis of spreads in equity markets. This implies that during normal periods, markets can appear very liquid, yet experience very large liquidity deterioration during stress periods. It points to algorithmic trading and market fragmentation as key drivers of this dual effect: on the one hand, these mechanisms generally lead to smaller average spreads, and on the other hand, they cause the distribution of spreads to become more skewed, especially in equities (Dakalbab et al., 2024).

The analysis also reveals that the European Central Bank's data suggest that competition among HFTs may negatively affect liquidity, as HFTs can quickly revise quotes once information becomes available, reducing costs for standard investors. The evidence also suggests why using spreads as the only means of assessing liquidity is a mistake. The ECB highlights that low bid–ask spreads can mask small absolute amounts available at the quoted levels and that depth is not necessarily a product of a liquid market at transaction cost. This will be particularly significant for evaluating FinTech, as automated systems often place smaller orders and may quickly revoke or cancel quotations. Empirical evidence reinforces the case for a conditional effect of liquidity enhancement in technology, rather than a general one asserting that technology is always and everywhere associated with deeper and more stable markets (Danielsson & Uthemann, 2024).

Market Outcomes: Spreads, Depth, Trading Activity, and Liquidity Quality

The changes brought about by FinTech are evident in the principal market outcomes: the bid–ask spread, trading volume, market depth, price impact, execution speed, and transaction costs. The cost of immediacy has been significantly reduced in electronic markets, and a range of technologies enable liquidity providers to compete simultaneously for order flow. The research findings of BIS on electronic markets suggest that greater automation and competition can lead to lower spreads, and that a concentration of trading interests on electronic markets can reduce search frictions and improve order matching. The benefits are especially important for equities, as lower transaction costs can lead to more frequent trading and the speedier incorporation of information into prices. However, the evidence from 2014-2024 is clear that there's something to be said for a good average liquidity score and a resilient liquidity score. The BIS's cross-market analysis suggests that, despite the recent decline in average spreads, the increasing skewness of spreads in equity markets indicates that significant periods of extreme illiquidity are more common (Daud et al., 2022).

As a result, FinTech can create a market where investors typically experience a low spread and fast execution, but a much greater spread when it turns volatile. Market depth is also a key factor, as a tight spread with few orders can offer less protection than the spread alone may indicate. The changes resulting from the transformation are accordingly mixed but with an important economic component: FinTech has improved the efficiency of everyday trading, lowered the average cost of a transaction, speeded up execution, opened up new markets to participants, and made price competition more intense, but also made trading liquidity riskier through automation, fragmentation, synchronized trading strategies, and fast withdrawal of liquidity. Rather than that, it is not the effect of FinTech on liquidity that should be the focus of attention, but rather that the nature and speed of liquidity, its cost, and its resilience are influenced by technological innovation, and indeed, technological innovation is an important factor in the functioning of the equity market(El Hajj & Hammoud, 2023).

FinTech, Information Efficiency, and the Resilience of Stock Markets

FinTech, Information Processing, and Stock-Market Efficiency

In this way, the information supply chain linking technological innovation and market efficiency has been completely reshaped by the advent of FinTech, and information-processing dynamics have grown in importance – giving way to this new reality. Traditional markets depended heavily on human analysts, brokers, and institutional intermediaries to collect, interpret, and transmit information, whereas contemporary FinTech systems can process prices, order-book data, corporate announcements, macroeconomic indicators, news, social media signals, and alternative datasets in milliseconds. The significance of algorithmic trading is that this automated approach can continuously scan public information and convert new information into trade orders without the lag time of manual decision-making. The European Central Bank study provides evidence that high-frequency traders trade in the direction of permanent price changes and against transitory pricing errors, leading to greater price efficiency, as well as in the direction of macroeconomic announcements, market-wide price changes, and limit-order-book imbalances (European Central, 2020).

This implies that a more efficient price discovery process can be reinforced by ensuring that market prices react quickly to economically relevant information. The development of execution algorithms has also enhanced the matching of buyers and sellers across increasingly segmented and divided e-markets. According to the Bank for International Settlements, execution algorithms can enhance the efficiency of matching liquidity providers with liquidity consumers in the market, as well as price discovery. The extent of automated trading is large: analyses of full exchange-message data reveal that over 20% of trade volume can be executed by “high-frequency trading races”, in which market participants compete to take advantage of very short-lived price discrepancies.

This is an example of the relevance of technological speed for price formation in today's context. However, the faster a system, the higher its level of informativeness is not necessarily. AI systems can interpret the same data simultaneously, and machine learning algorithms, trained on similar datasets, can make correlated trading decisions. This synchronization might help speed up price adjustment, albeit with a possible impact on liquidity diversity. Thus, the main contribution of FinTech is to increase the efficiency of information; however, the quality of the information, the variety of trading strategies, and the strength of the technological infrastructure are all necessary for the ultimate success of FinTech (Feyen et al., 2021).

FinTech and the Resilience of Stock Markets During Financial Stress

The connection between FinTech and market resilience is more nuanced, as the technologies that enhance price discovery in "normal periods" can be used to accelerate transmission in "shock periods" of extreme volatility. Resilience of the market means the ability of financial markets to withstand massive order imbalances, maintain orderly trading, ensure liquidity, and re-establish efficient price formation following a market shock. The returns over the past 10 years (2014 to 2024) reveal that the average bid–ask spread is not necessarily an indicator of resilience. In recent BIS research on equity, foreign-exchange and government-bond markets in the United States, Europe and Japan, it has been found that the average bid–ask spreads have come down significantly over the long term, reflecting the improvement of the average level of market liquidity, but that spreads are more skewed and have more kurtosis in equity and government-bond markets. This means simultaneous and/or more intense periods of illiquidity in markets, while under normal conditions they are more liquid (Financial Stability, 2022).

Importantly, the study reveals that algorithmic trading and market fragmentation not only lower average spreads but are also correlated with increases in spread skewness, which is especially high in equity markets, thereby revealing the dual effect of algorithmic trading and market fragmentation on average liquidity and market resilience. The shock experienced in March 2020 by the real world due to the COVID-19 pandemic is the best example. The Financial Stability Board (FSB) has framed the pandemic as the greatest challenge to the financial system since 2008 and emphasized the importance of ensuring market continuity and risk management in the event of an extraordinary stress. The BIS analysis also shows a large episode of market dysfunction in March 2020, when price discovery and the matching of buyers and sellers were hindered, and funding markets were put under significant stress. The episode shows how digitalization can have both positive and negative impacts on resilience. Electronic markets facilitated trading and information flow despite many restrictions on physical markets, and automated systems enabled fast repricing and portfolio adjustments (Financial Stability, 2024).

But the speed can enable coordinated selling, margin calls for liquidity withdrawals, and super-fast money removal. The post-pandemic assessment by the FSB thus highlighted the importance of building resilience in non-bank financial intermediation, where technological platforms, investment funds, and other market-based intermediaries are increasingly intermingling. Based on this, an intermediate conclusion for the period 2014-2024 is warranted: there is clear evidence that FinTech has contributed to improvements in information efficiency, execution speed, monitoring capability and functioning of the markets in normal times, but that in stress, resilience depends on the technological efficiency being matched by diversified liquidity provision, effective risk controls and capacity to avoid synchronized algorithmic responses. The key message is that a technologically advanced stock market is not inherently resilient; rather, the propagation speed of information and shocks depends on the technology: FinTech is becoming an important shaping factor in financial market stability (Frino et al., 2021).

Global Evidence: Cross-Country Differences in FinTech, Liquidity, and Market Resilience

Global evidence from 2014-2024 suggests that the impacts of FinTech on stock-market liquidity and resilience are highly dependent on financial-market development, technological infrastructure, regulation capacity, investor participation, and institutional quality. Adoption of FinTech has grown in both advanced and emerging economies, at many levels and in various forms. An important sign of this broader digital transformation is global account ownership, which has risen from 51% in 2011 to 76% in 2021, and from 63% in 2017 to 71% in 2021 in developing economies. The growth was even stronger in Sub-Saharan Africa, where 33 percent of all adults had a mobile-money account in 2021. Digital payment adoption also jumped significantly in developing economies, with the proportion of adults making or receiving digital payments increasing from 35% in 2014 to 57% in 2021. Increased overall financial inclusion is essential to provide the technological and behavioral building blocks for digital investment, but digital financial inclusion does not equal equity-market investment(Frino et al., 2021).

The uneven global development is also evident from the geographical concentration of capital in the FinTech industry. The total volume of investment in FinTech in 2024 reached US$95.6 billion, distributed among the Americas (US$63.8 billion), EMEA (US$20.3 billion), and Asia-Pacific (approx. US$11.4 billion). In the Americas, US$50.7 billion was attracted, with the United Kingdom picking up US$9.9 billion, accounting for almost half of the Europe, Middle East and Africa (EMEA) total. This level of concentration also means that, in general, advanced markets have more advanced electronic trading systems, faster connectivity, cloud-based systems, sophisticated analytics, and algorithmic liquidity providers than lower-income markets. Therefore, the impact of FinTech on liquidity will be greater and more direct in markets where technological infrastructure is well established in the exchanges and brokerage systems. This distinction is confirmed by evidence from the BIS. Based on its comparative analysis of the United States, Europe, and Japan, it finds that the average bid–ask spread has significantly narrowed over time, suggesting that average liquidity has improved, but that the skewness and kurtosis of spreads have increased in the equity markets, pointing to more severe cases of illiquidity despite improvements in normal-period liquidity(Frost, 2020).

The research also reveals that algorithmic trading and market fragmentation lead to a decrease in the average spreads, but an increase in their skewness, especially in equity markets. The results are especially significant for advanced economies, as they indicate that technological sophistication can have positive effects on predictable trading conditions and on the sensitivity of liquidity to market stress. The correlation is more diverse in emerging and frontier markets(Frost et al., 2019). The potential gains of FinTech are greater than those of traditional financial measures, given that it can leverage digital platforms to address constraints such as limited physical financial infrastructure, high transaction costs, limited access to financial markets for investors, and low levels of financial intermediation. An important example of this is mobile financial services. In Sub-Saharan Africa, the World Bank reports that mobile technology is partly replacing traditional financial infrastructure, with 33% of adults having mobile money accounts in 2021. However, converting financial access to digital liquidity on stock markets requires complementary securities market infrastructure. There can be a wide gap between a country's size of mobile payments and its size of equity market, depth of markets, institutional participation, disclosure systems, or the amount of foreign investment (Khan, Munir, & Ahmed, 2020). In such a case, FinTech can facilitate access to financial services without necessarily creating additional liquidity in the stock market. This is another significant source of differences across countries; therefore, regulatory quality is another factor (Fuster et al., 2019).

Advanced markets typically have more sophisticated securities regulations, electronic surveillance, investor protection, and market-making structures that enable FinTech innovation within relatively mature institutional frameworks. While technology leapfrogging can bring significant benefits to emerging markets,

insufficient cybersecurity, data governance, regulatory oversight, technological competence, and institutional stability can hinder digital financial innovation from delivering its benefits and lead to new types of systemic risk. These differences are important for resilience, and the COVID-19 episode has shown this(Haas et al., 2021). In the midst of the economic shock and related liquidity stress of March 2020, the Financial Stability Board (FSB) characterized the situation as "unprecedented", with "significant and sustained mismatches" between demand and supply of liquidity in financial markets. Financial institutions, investors, and other actors were able to continue their operations under the harsh conditions of physical restrictions, with digital infrastructure and electronic trading and remote access maintaining market continuity. At the same time, it was the same interconnected systems that enabled quick repricing and the simultaneous dissemination of risk reductions across markets. Technological capacity varied across regions, thereby affecting markets' ability to absorb the shock and sustain trade. In the post-pandemic era, therefore, the evidence points towards a "FinTech dividend of liquidity" that is not uniform across the globe(Haddad & Hornuf, 2019).

It is shaped by the interplay between technology and the institutions where it is used. Technological penetration, equity market development, and algorithmic liquidity provision are stronger in advanced economies, whereas automated trading, fragmentation, and rapid liquidity withdrawal are more prevalent in emerging economies. While digital platforms and greater participation can offer significant benefits to emerging economies, infrastructure and regulation, market depth, and investor capability also pose significant constraints (Hendershott et al., 2019). In conclusion, the global evidence from 2014-2024 suggests rather than proving that the relationship between FinTech and liquidity and resilience of financial markets is conditional and not universal: FinTech tends to enhance and accelerate market liquidity and market efficiency in financial-market transactions as a whole, but may also lead to a decline in liquidity and resilience of stock markets, depending on whether technological innovation is accompanied by the equally necessary market depth, regulatory institutions, and digital infrastructure, and whether technological innovation is accompanied by mechanisms to prevent technological efficiency becoming technological fragility(Hodula, 2022).

Risks, Regulatory Challenges, and the Future of FinTech-Enabled Stock Markets

Risks and Regulatory Challenges

The high level of FinTech integration into stock markets has resulted in significant gains in efficiency but has also brought technological, market-structure, operational, and regulatory risks that can affect market liquidity and resilience. The need for financial markets to rely on automated algorithms, artificial intelligence, cloud infrastructure, and a relatively limited number of technology providers is one of the most important challenges. The Financial Stability Board (FSB) highlighted third-party dependencies and service provider concentration, market correlations, cyber risk, model risk, and data governance shortcomings as significant AI-related vulnerabilities that could have systemic impacts (Ilahi et al., 2024). The concern is even more pertinent, as financial institutions could depend on common cloud, information, or artificial intelligence vendors; a disruption at any one of these vendors could thus impact multiple institutions at once. Algorithmic similarity is a factor that accentuates the problem. Responses to new information may be very similar across financial institutions if they rely on the same data, models, and automated trading strategies. Such widespread use of the same AI systems could worsen herding, liquidity hoarding, runs, fire sales, and market volatility, warns the Bank for International Settlements, especially since automated systems can operate at much greater speed than humans (International Monetary, 2024).

This poses a basic resilience issue – technologies that enhance liquidity in the course of normal operations can accelerate liquidity withdrawals during a stressful event. Another important vulnerability is cybersecurity. As reliance on interconnected digital platforms continues to rise,

the impact of cyberattacks, downtime, data manipulation, and AI-powered fraud becomes increasingly critical. The FSB highlights AI-powered cyberattacks, fraud, deepfakes, and financial disinformation as emerging issues. As a result, regulatory authorities are left with a tough balance to strike between protecting the integrity of the market and stifling technological innovation (International Organization of Securities, 2023). This is heightened by the pace of technological innovation: regulatory frameworks are usually designed for well-defined financial institutions and activities, while FinTech can render exchanges, brokers, technology, data, and non-bank financial intermediaries indistinguishable. This challenge is highlighted by the regulatory discussion on predictive analytics. In July 2023, the U.S.

The Securities and Exchange Commission (SEC) released proposed rules regarding conflicts of interest arising from broker-dealers' and investment advisers' use of predictive data analytics, with a focus on situations where technology might be used to help maximize a firm's results rather than investors'. Transparency was highlighted in March 2024 when the SEC fined two investment advisers US$400,000, for false claims regarding their use of AI. The cases highlight that the regulatory landscape for FinTech is rapidly expanding into areas that include not only the traditional rules on market abuse and investor protection, but also algorithmic accountability, algorithmic disclosure, data governance, model validation, cybersecurity, third-party risk, and explainability (Khan, Munir, & Riaz, 2020). The challenges to regulation are further compounded by the international nature of the services and trading technologies, as they are traded and used across national boundaries, and regulation is largely nation-state based. The BIS therefore recommends for more attention in the regulatory framework the areas of governance, expertise and skills, model-risk management, data governance, non-traditional financial-sector participants, new business models and third-party providers of AI services(Le et al., 2021).

Future of FinTech-Enabled Stock Markets

AI, machine learning, automated investment platforms, tokenization, cloud-based technology, alternative data, and more self-directed trading tech are likely to be a part of the future of FinTech-powered stock markets. AI's use in finance is expected to be crucial, given that it can be employed for real-time market surveillance, sentiment analysis, portfolio optimization, fraud detection, risk management, compliance, and automated execution(Nowaczyk & O'Halloran, 2024). According to the FSB, the financial institutions are already implementing AI in their operations to boost efficiency, comply with regulations, create personalized financial products, and analyze data, and generative AI is finding its way into applications like summarizing documents, retrieving information, and generating code. The potential effects on liquidity could be significant: improved price discovery and quicker order execution due to more accurate forecasting, and quicker identification of abnormal trading patterns than by traditional monitoring systems with AI-powered market surveillance. Concurrently, there will be growing reliance on the ability of markets to prevent technological concentration and synchronized algorithmic behavior in the future(Li et al., 2021). In FSB's 2024 assessment, it highlights that policy makers should improve their information regarding AI adoption, increase the monitoring of vulnerabilities, and increase regulatory and supervisory capabilities, such as implementing AI-based supervisory tools. This signals a regulatory model that will increasingly rely more on advanced analytics to be used as tools to monitor markets in real time as opposed to the primary mode of investigation, which is retrospective. Another significant milestone will be the tokenization of financial assets and the possible application of distributed-ledger technology for trading, clearing and settlement(Nguyen et al., 2022). In the event that it is implemented successfully at scale, tokenization may be able to speed settlement times, automate contractual obligations using smart contracts, and lower reconciliation costs while issues of interoperability, legal recognition, cyber security, custody, and liquidity are yet to be

addressed. This market fragmentation will also mean there will be a greater level of interdependence between the future market and a limited number of providers of both technology, data and cloud. This establishes an important policy trade-off between economies of scale/technological efficiency and single points of failure due to concentration(Marozva & Magwedere, 2021).

The BIS also notes that the "vast capital expenditure" needed to build sophisticated AI systems, along with the need for data and computing resources, can help attract the concentration of a few providers. Future FinTech development should not just be judged by the technology's ability to accelerate or lower the cost of markets, but also by its ability to enhance market transparency, diversification, and shock-resistance and to make markets institutionally accountable. The need for increased regulatory cooperation internationally will grow as the laws in different countries may create regulatory arbitrage and differing implementation of the algorithms, algorithms' governance, use of data, cyber security and digital assets(Mullins et al., 2023). Cooperation in shaping standards and best practices for the safe use of AI in finance was also highlighted by the OECD-FSB dialogue in 2024. In sum, the path ahead after 2024 paints a picture of continued enhancement of the technological capabilities of stock exchanges, with whether FinTech will proliferate and be a significant contributor to liquidity and resilience in the long run turning on its governance and incentives as well as its innovation. The most sustainable model will thus be one that will integrate the use of AI for efficiency with a strong human framework, multi-technology, transparent algorithms, cyber security, investor protection, and international supervision(Mishra et al., 2022).

Conclusion

The findings of this study reveal that FinTech has emerged as a structural change in how global stock markets operate in the last six years, impacting the pace and price of trading, the quality of market liquidity, information processing and the resilience of markets. Electronic trading, algorithmic trading, artificial intelligence, big data analysis, mobile investment platforms, and the digital financial infrastructure have significantly diminished the frictions of transactions and information. The investment in FinTech has been soaring high, having peaked at US$239.3 billion in 2021, but dropping to US$95.6 billion in 2024, reflecting the technological revolution that is going on within financial markets. Overall, the evidence supports the notion that FinTech has an impact on normal-period liquidity by reducing the bid–ask spread, increasing order execution speed, enhancing the level of market participation, and enhancing price discovery. Not all the relationship is positive, however. While average bid–ask spreads have fallen, BIS evidence suggests that the distribution of the spreads in equity markets has become more skewed, and kurtotic, suggesting the likelihood of severe episodes of illiquidity has increased. So, at the same time, highly liquid markets can become sensitive to liquidity shortfalls in times of stress, while being very liquid in more normal times. In the context of the COVID-19 market turmoil in March 2020, this is a case of the digital systems maintaining access to the market while also facilitating synchronized trading, deleveraging, and shock transmission. Cross-country evidence also shows that the impact of FinTech is dependent on digital infrastructure, depth of the market, institutional quality, the capability of the regulatory regime, and investor participation. Advanced markets have complex technological ecosystems, but also increased risk of algorithmic concentration and technological interdependence; emerging markets have many opportunities for the digital leapfrog but are also constrained by infrastructure and regulatory issues. In the future, AI, tokenization, cloud technology and automated market surveillance will all play a bigger role in FinTech's impact. The main argument is thus that the word 'FinTech' should not be viewed solely as being about a way to boost liquidity. Its over-all meaning is to change market liquidity (broad sense) in terms of its quality, velocity, availability and shock resistance. Effective regulation, cyber security, transparency, diversified infrastructure and strong institutional oversight will be essential in order to ensure

sustainable benefits through technological innovation.

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