

Fintech: Digital Transformation of Financial Services and Financial Regulation

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Abstract. This study offers a comprehensive analysis of critical aspects within the domains of financial technology (Fintech) and online payments, with a focal point on the regulatory dimension. It commences by exploring how Fintech, propelled by technological innovations, has orchestrated a paradigm shift, ushering in the digital economy and digital civilization. It underscores Fintech's role in mitigating longstanding issues in traditional finance, particularly information asymmetry and high-risk premiums, harnessing the potential of big data, cloud computing, blockchain, and artificial intelligence. The study extends to a detailed evaluation of the intelligent investment advisory sector (Robo-Advisor) and online payments, delving into security concerns and regulatory considerations. A pivotal highlight is the transformative potential of digital currencies, including central bank digital currencies (CBDCs) and cryptocurrencies, in revamping payment systems, fortifying security, and reducing cross-border transaction costs. Regulatory upgrades play a paramount role in shaping this transformation, ensuring the security of online payments and fostering compliance.

Keywords: Fintech; Financial Innovation; Financial Regulation.

1. Introduction

The challenges that have plagued conventional financial development have found solutions within the inventive financial paradigms of this modern era. Thanks to the remarkable rise of artificial intelligence, big data, cloud computing, blockchain, and other technologies in recent years, the financial sector has birthed a plethora of tech-driven financial innovations that stand fundamentally distinct from the traditional financial institutions. These innovations are collectively referred to as fintech. According to the Financial Stability Board, fintech is defined as "technologically-induced financial innovations that create novel business models, applications, processes, or products with a substantial impact on financial markets, financial institutions, or the delivery of financial services." Consequently, a novel form of finance, digital finance, has emerged [1]. This fresh financial sector, epitomized by fintech, may be steering humanity toward a new age of digital economy and digital civilization.

Fundamentally, digital finance effectively mitigates the elevated risk premiums and extensive operational expenses inherent in traditional finance by harnessing information technology tools like big data, cloud computing, blockchain, and artificial intelligence. This, in turn, furnishes reliable technical underpinning for the extension of the financial service landscape and its outreach [2]. Compared with the previous "Internet finance" research hotspot, digital finance has more breadth and depth, whether it is digital payment, online lending or other financial technology, have greatly reduced the search cost and risk identification cost of the financial market and greatly improve the feasibility of the development of digital inclusive finance. Examinations of the mechanism further reveal that fintech, as a form of technological overflow, possesses the capacity to influence the reconfiguration of the conventional financial system to some degree. It elevates the effectiveness of allocating financial resources and bolsters risk management capabilities, thereby ameliorating the discrepancies in credit resources and addressing the challenges of adverse selection and moral hazard in the financial marketplace [3].

The landscape of the financial services sector is being redrawn by technological shifts, accompanied by the emergence of associated risks. Simultaneously, the expanding online population is accelerating the penetration and proliferation of novel products, platforms, and enterprises to the

public. These tech-driven ventures, with significant implications for financial stability, do not fit within the confines of the current financial regulatory framework because they do not engage in traditional financial activities. This regulatory gap gives rise to substantial vulnerabilities. Furthermore, in comparison to large financial institutions, the size and business model of financial technology enterprises predispose them to heightened susceptibility to severe economic fluctuations, and such turbulence is prone to ripple across other industry players, ultimately precipitating financial systemic risk. Therefore, the regulatory issues posed by fintechs are different from those of traditional finance, and contain significant unanticipated risks that require an urgent response from financial regulation.

Nonetheless, when confronted with technology-fueled financial advancements, traditional regulatory and legislative frameworks have shown signs of falling behind, and technological progress has frequently operated beyond the bounds of existing regulation. As previously noted, scientific and technological innovation has blurred the lines between conventional financial risks and technological risks, ushering in both quantitative and, in some cases, qualitative shifts in risk dynamics. Simultaneously, technological innovation has exacerbated the information asymmetry between those responsible for regulation and those subject to regulation, presenting a regulatory challenge.

In conclusion, the risks accompanying the swift progress of fintech necessitate regulatory attention; however, traditional regulatory frameworks face constraints stemming from information gaps, the absence of regulatory technology, and outdated financial regulatory statutes, rendering them ineffectual in addressing fintech-related risks. Therefore, seeking a new and effective regulatory dimension system is the inevitable choice of the new era of financial regulation to solve the "chaos cycle" shackles, financial innovation and data-enabled digital financial regulatory transformation is imperative. Because the direction and strength of regulation may directly affect the direction of the development of a specific financial industry, this paper will start from different fintech business models, select the typical business models, and study the advantages and risks of these new financial businesses [4]. Based on this, it will put forward reasonable and feasible suggestions for the industry and regulation to safeguard the sustainable and healthy development of digital finance.

2. Categories of Fintech

Presently, the Basel Committee on Banking Supervision categorizes fintech into four distinct groups: payments and settlements, deposits and loans with capital raising, investment management, and market facilities. These four classifications exhibit disparities in their development scale and market maturity, along with divergent effects on the established financial system. In the payment and settlement realm, you'll find services oriented towards small-value retail transactions for individual consumers (e.g., PayPal, Alipay) and large-value wholesale payment solutions for institutional clients (such as cross-border payments and foreign exchange operations). In the deposit, loan, and capital-raising sector, the focus rests on P2P online lending and equity crowdfunding – a model where financiers secure modest sums of funding through debt or equity offerings via internet platforms to a specific range of qualified investors.

The investment management sector encompasses intelligent investment advisors and electronic trading services. The former employs sophisticated automated systems to furnish investment and financial guidance, while the latter extends electronic trading services for a wide array of online securities and currency transactions. In the market facilities category, you'll find fundamental technical underpinnings that can serve multiple industries, including customer identity authentication and comprehensive data aggregation and processing. Moreover, this category includes technological infrastructure such as distributed ledgers, big data, and cloud computing, among other components that facilitate fintech operations.

The current investment management and market facilities direction of fintech is in the rapid development stage, so this paper will also focus on the study of these two business models.

2.1. Robo-Advisor

An essential component of financial technology, the intelligent investment advisor, commonly known as the Robo-Advisor, pertains to the application of intelligent algorithmic solutions and portfolio optimization theoretical models. These are built upon the risk preference information furnished by individual investors. Investment return requirements and investment styles provide users with information reference for investment decision-making, thus changing the traditional behavior for investment decision-making. A research analysis conducted by Citibank highlights that between 2012 and 2015, the total assets overseen by global intelligent investment advisors surged from zero to \$29 billion. It is further anticipated that the assets under management by these advisors will experience exponential growth in the coming decade, with projections suggesting that the cumulative asset value managed by intelligent investment advisors by the year 2025 could reach an impressive \$5 trillion.

In recent years, there has been a substantial and swift proliferation of intelligent investment advisors. This surge in popularity can be attributed to the fact that, unlike conventional investment advisors, intelligent investment advisors consider the unique attributes and goals of each investor. They then furnish clients with tailored investment strategies that are highly aligned with their objectives and plans. Furthermore, these smart advisors offer their services at relatively modest fees, ensuring that even investors with smaller asset portfolios can access and benefit from the same high-quality services.

While changing the trading behaviour, investment methods and investors' concept of financial management in the financial market, smart investment has also brought a series of challenges to financial security due to network virtuality, network hacking, network securities fraud and other issues. First, the complex multi-dimensional personal information and the huge amount of data bring difficulties to the realisation of the personalisation of intelligent investment advisors. This limitation primarily manifests in its heavy reliance on a set of basic multiple-choice responses provided by customers. Unlike human investment advisors, it lacks the capability to conduct comprehensive, in-depth assessments of investors. Consequently, it cannot promptly grasp the intricate details of a customer's financial position and investment goals. Moreover, it tends to overlook the potential influence of significant future events on the financial situation and objectives of its clients. The second is the possibility of strengthening the "herd effect" and market resonance, which may lead to a series of challenges to the financial security of the market. and market resonance [5]. Firstly, when financial institutions employ intelligent systems to deliver algorithm-based asset management recommendations to clients, the utilization of similar risk indicators and trading strategies tends to drive convergence in the behavior of financial market participants. This convergence, in turn, heightens the volatility of the financial market. Secondly, the pace of change in the financial regulatory framework struggles to keep up with the rapid integration of AI technology within the financial sector. The domain of intelligent investment services encompasses investment consulting, financial advisory, securities entrusted trading, and asset management, encompassing the regulation of various financial subsectors. However, within the context of sector-specific regulations, the oversight of intelligent investment advisory operations entails navigating a complex landscape of diverse laws, regulations, and departmental guidelines. This intricacy poses a challenge for regulators, as it becomes challenging to define the precise boundaries of regulation in practice. This ambiguity can facilitate the propensity for intelligent investment advisory platforms to venture beyond their core activities and engage in potentially illicit activities, such as deceptive marketing, disguised financial exploitation, and unauthorized fundraising [6].

In order to bring smart investment advisers into the scope of regulation at an early stage and to achieve full regulatory coverage of the application of artificial intelligence in the financial sector, an innovative regulatory model is essential. The government can achieve regulatory innovation in the following two ways: First, there is an opportunity to draw insights from the "regulatory sandbox" approach. This approach involves permitting fintech startups to explore inventive business models within a controlled, scaled-down market setting that features more relaxed regulatory constraints.

Under this model, regulators can determine whether existing regulatory rules need to be improved by testing, observing and evaluating risks, so as to promote the development of fintech under the premise of controllable risks; and secondly, it can guide the intervention of regulatory technology in regulation. In the era of fintech, not only do financial institutions need to know their own data, but regulators need to grasp the data of financial institutions in order to conduct financial risk assessment and maintain financial stability. As a result, the compliance cost of financial institutions has increased, thus giving rise to the development of RegTech. The concept of RegTech, first proposed by the FCA, provides a solution for financial institutions to meet regulatory requirements by using artificial intelligence technology to perform data, scenario and risk analysis. In the United Kingdom, a multitude of RegTech firms have surfaced, offering assistance to industry operators in the reduction of compliance expenditures. Concurrently, they extend IT regulatory services to regulatory bodies, guaranteeing the transparency of fintech operations [7].

In addition, the regulatory authorities need to improve the regulatory laws and regulations and the supporting rules system related to intelligent investment advisers, and put forward higher obligation requirements for operators in respect of the special risks of intelligent investment advisers, and continuously improve the supporting dispute resolution mechanism and the corresponding compensation arrangements, so as to promote the healthy development of the intelligent investment adviser industry.

2.2. Digital Currency

The foundational impetus for the progression of currencies stems from societal needs, and digital currencies represent a novel currency form propelled by fintech advancements. Depending on the issuing authority, digital currencies fall into two main categories: those issued by central banks and those issued by private entities. Among them, privately issued digital currencies are mainly represented by Bitcoin, Litecoin, etc., and the core supporting technology is blockchain, which is mainly characterised by decentralisation and is able to be used by means of applying data encryption, timestamps, distributed consensus and economic incentives, and is therefore also known as digital cryptocurrency. As of January 2019, the total market capitalisation of digital cryptocurrencies globally exceeded \$128 billion, with 2,096 types, of which Bitcoin ranked first with a 53% share. The legal regulation of virtual currencies such as Bitcoin is inconsistent across countries, with some actively exploring it and others banning it altogether, but regulations are mainly limited to cryptocurrencies and ICOs, with governments around the world largely recognising the value of the blockchain technology behind it. However, the innovative development of blockchain technology in the financial sector will inevitably clash with financial regulation, leading to possible grey areas in the field and bringing new challenges to the operation of sovereign currencies and financial regulation.

In the realm of financial innovation, digital cryptocurrencies emerge as a novel payment mechanism, and numerous scholars acknowledge their role as a technological innovator. Blockchain technology's innovation primarily revolves around aspects such as distributed ledger systems, asymmetric encryption, and smart contracts. The significance of blockchain within the financial sector primarily lies in its capacity to facilitate enhanced data and information sharing, amplify the efficiency of value transmission, and bolster information security and trustworthiness. Fernandez-Vazquez, S argues that virtual currencies such as Bitcoin, as a product of the development of infocomm technology, have strong technological roots, and their development may become a precursor to legal digital currency [8]. Zhuang and Zhao argued that the three features of distributed bookkeeping, no central governing body and based on cryptographic principles that decentralised virtual currencies such as Bitcoin have can ensure the fairness and reliability of its operation mechanism and can effectively prevent inflation [9].

However, the application of sovereign digital currencies can reflect the advantages of blockchain technology to a certain extent, while private digital currencies are not quite the same. Viñuela research pointed out that the most important reason for lawbreakers to choose virtual currencies to carry out money laundering and terrorist financing is that this kind of decentralised virtual currencies lack a

centralised management agency [10]. Its mining and transfer process can be achieved anonymously, which makes it easier for illegal money launderers to take advantage of them.

Simultaneously, the stability of the Bitcoin market system is contingent upon the trust established among economic participants. However, it's essential to note that Bitcoin lacks inherent value or representational attributes; rather, its worth is contingent upon market dynamics and the confidence of its users [11]. Hence, the majority of scholars do not ascribe monetary characteristics to private digital currencies, exemplified by Bitcoin. Instead, they tend to view them as digital commodities, assets, or instruments for speculative purposes.

The controversy over the main body of currency issuance is deeply rooted in the issue of credit guarantee. In the era of credit money, digital currencies are issued by different subjects with different credit guarantees behind them, which is the key to the large credit risk of many virtual currencies. The central bank digital currency is the state using the existing technology, with the national credit endorsement issued currency, with the nature of legal tender. Scholars are mostly optimistic about the issuance of digital currencies by central banks and believe that there is more room for the development of central bank digital currencies than private digital currencies. Yen contends that the issuance of digital currencies by the central bank offers significant benefits concerning the total controllable supply, the capacity to diminish credit-related risks, and the equitable, not-for-profit nature of such issuance [12]. It is therefore not appropriate to adopt the same regulatory policy for virtual currencies and blockchain, and blockchain finance needs to enable innovation under sandbox regulation, with regulators taking the lead in completing the tracking tests for risks.

The legal regulation of financial blockchain should adopt the parallel mode of platform regulation and business regulation, for the former, it is necessary to strengthen the identity audit of the operating qualification of the platform and the access of users, and strengthen the audit and registration of their qualification and real identity, with emphasis on the regulation of large-value or business transactions; for the latter, it is necessary to classify the regulatory authority according to the business function engaged in, and broaden the boundary of the regulation, so as to incorporate the digital cryptocurrencies and the trading service providers, including financial technology companies, into the scope of regulation. For the latter, it is necessary to divide the regulatory authority according to the business function, broaden the regulatory boundaries, and include digital cryptocurrency trading service providers, including financial technology companies, in the scope of regulation.

The attributes of digital cryptocurrencies should also be clarified, and anti-money-laundering-related laws and regulations should be improved. Monetary authorities should strengthen the regulation and supervision of private digital currencies, and since they are not credible and highly speculative, their application should be strictly controlled within a local scope, and illegal financing activities using private digital currencies should be resolutely outlawed. Regulators worldwide should uphold the principle of technology neutrality and actively engage in the advancement of cutting-edge technologies such as modern cryptography, blockchain, and distributed ledger systems employed in digital cryptocurrencies. They should expedite research pertaining to legal tender digital currencies issued by central banks and contemplate the introduction of sovereign crypto-digital currencies. Additionally, regulatory bodies should establish comprehensive guidelines for the utilization of digital currencies to ensure the stability of the digital currency ecosystem. This presents a paramount concern for monetary authorities.

Regulators should proactively investigate innovative regulatory approaches and leverage advanced technologies such as big data and cloud computing in overseeing emerging financial technologies like digital cryptocurrencies. A "cloud platform" can be set up to keep records of digital cryptocurrency transactions, and a money-laundering risk monitoring model based on data mining technology can be constructed to provide early warning and effective prevention and control of illegal activities.

2.3. P2P Lending

P2P online lending, as a representative of the peer-to-peer financial model, had attracted much attention worldwide. Thought to revolutionise the traditional financial model for the benefit of investors and borrowers alike, P2P has played a key role in financial inclusion. It offers the potential for micro-credit and meets the financing needs of micro, small and medium-sized enterprises (MSMEs) and individuals. The sector has also attracted a large number of investors and borrowers, providing them with easy access to finance and investment opportunities.

The P2P online lending industry has also experienced many setbacks. In its early stages, the government and society lacked a comprehensive understanding of the industry, and imperfect regulatory policies led to its wild growth and lack of effective regulation and clear rules. The emergence of problematic platforms and the involvement of some platforms in credit intermediation have led to increased moral and operational risks. Insufficient industry self-regulation and lack of regulation and supervision have led to the emergence of regulatory loopholes. Regulatory policies are not timely enough and coordination problems between regulators are evident. These factors have led to the emergence of problematic platforms and increased investor losses.

The P2P online lending industry still has potential for growth in the future. Firstly, an improved credit environment and the use of central bank digital currencies will provide opportunities. Digital currencies can improve collection capacity and reduce the likelihood of debt evasion and cancellation. Not only will this contribute to the robustness of online lending businesses, but it could also provide regulators with more powerful tools to monitor capital flows and compliance. In addition, the use of digital currencies could provide greater assistance in the regulation of the fintech industry, ensuring that financial innovation and risk control go hand in hand.

Second, the introduction of regulatory technology (RegTech) can improve the efficiency and effectiveness of regulation, and the pilot P2P online lending regulatory reform can introduce more technological tools for regulation. RegTech can be used for data analysis, risk assessment and monitoring the compliance of online lending platforms, thus reducing the burden on regulators and enhancing the operability of regulation.

In addition, reducing the burden of online lending enterprises, drawing on relevant regulatory experience from abroad, grading management and establishing a risk-release mechanism are all effective ways to improve regulation. In regulatory upgrades, more flexible measures should be adopted to accommodate different types of online lending enterprises, encourage compliance, while standardising the industry and avoiding a "one-size-fits-all" approach [13].

The P2P online lending industry has great potential as a means of financial inclusion, but it also comes with challenges and failures. In the future, through improved regulatory policies, introduction of regulatory technology and enhanced industry self-regulation, this industry is expected to grow healthily and provide financing and investment opportunities to more people. Regulatory upgrades and innovations will be key to ensuring the sustainability and stability of the industry. The utilization of digital currencies will continue to advance the growth of the sector and enhance the accessibility of financial services. As regulatory frameworks evolve, it's imperative for governments and regulators to collaborate closely with industry stakeholders to realize the objective of financial inclusion.

2.4. Mobile Payment

With the rapid advancement of technology, online payments, also known as mobile payments, have become an integral part of everyday life. The online payment industry is rapidly expanding and becoming an important part of the global financial ecosystem. Mobile payment platforms such as Alipay and WeChat Pay have become the payment tool of choice for users in China and beyond, enabling the popularity and convenience of mobile payments. international payment platforms such as PayPal are also widely used around the world. These platforms help users manage their finances and improve their quality of life, leading the way to the future of payments with far-reaching implications for individuals, merchants and society as a whole.

Although online payments are on the right track, there are still some risks and challenges. Firstly, security issues often plague users. Despite strong security measures, data leakage or hacking may still occur, and some payment platforms may also misuse users' personal information, putting the safety of users' personal information and funds at risk. Secondly, digital payments may lead to financial exclusion, and the digital payment infrastructure in some regions is still inadequate, preventing many people from enjoying the convenience of online payments. In addition, online payment crosses national boundaries, but there is no global regulatory framework, and the lack of regulation of online payment in some countries has led to some illegal activities and unfair competition, which harms the rights and interests of users [14].

In the future, online payments will continue to grow and are an important part of financial life. Firstly, the rise of digital currencies is likely to further boost the popularity of online payments, with central bank digital currencies (CBDCs) and cryptocurrencies already starting to change the rules in the payments space. This will additionally enhance the effectiveness and safety of online transactions while simultaneously diminishing the expenses associated with cross-border payments [15]. In addition, online payments will further integrate fintechs such as artificial intelligence and blockchain technology. This will provide smarter and safer payment solutions along with improved authentication and anti-fraud measures.

In order to promote further sustainable development of online payments, regulators need to make corresponding regulatory upgrades and technological innovations. Regulators ought to encourage payment service providers to implement more robust data protection and security protocols to mitigate the vulnerabilities related to data breaches and fraudulent activities. Furthermore, they should reinforce the monitoring mechanisms for anti-money laundering and counter-terrorist financing. Second, a more comprehensive regulatory framework should be put in place, which must balance the security and convenience of payment systems and ensure that users' data and funds are properly protected. In addition, in the face of cross-border payment challenges, regulators should strengthen international collaboration and develop global online payment standards to ensure interoperability of payment systems between different countries. Finally, education and publicity should be promoted to raise users' awareness of online payment security so that they can better protect their funds and information.

Online payments have made substantial progress within the fintech arena, and though obstacles persist, prudent regulation and technological advancements, coupled with the proliferation of central bank digital currencies and the adoption of regulatory enhancements, will further enhance the convenience, efficiency, and security of online transactions. This, in turn, will make a more significant contribution to the growth of the global economy.

3. Conclusion

This study offers a comprehensive examination of the advancements and hurdles encountered in the realms of financial technology and online payments, with a specific focus on regulatory aspects. Fintech's transformative influence is undeniable, redefining traditional financial models and leading us into the era of the digital economy. However, these changes necessitate addressing inherent challenges such as security concerns, financial inclusivity, and regulatory adaptations.

Online payments have seamlessly integrated into daily life, offering unparalleled convenience. However, concerns persist over security vulnerabilities, demanding robust data protection and security measures to mitigate risks. The ascendancy of digital currencies, specifically CBDCs and cryptocurrencies, promises to elevate online payments in terms of efficiency, security, and cost-effectiveness, provided that stringent regulatory upgrades are in place. For the sustainable development of online payments, regulators must play a proactive role, enforcing the necessary regulatory enhancements. This encompasses the strengthening of data security and protection measures to guarantee the safety of users while also bolstering the systems for monitoring anti-money laundering and counter-terrorist financing. Moreover, establishing a comprehensive regulatory

framework, striking a balance between convenience and security, and fostering international cooperation to set global online payment standards are pivotal steps.

In conclusion, online payments and Fintech, with prudent regulation and technological innovation, along with the growth of digital currencies and regulatory refinements, are poised to significantly enhance convenience, efficiency, and security. Collaboration between governments, regulatory bodies, and industry stakeholders is imperative for achieving the goal of financial inclusion and promoting sustainable economic development.

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