

Digitalisation of Banking in Europe – A New Opportunity to Overcome a Future Crisis?

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Abstract

The European Union's aim to establish a unified internal market through the free movement of services and capital depends heavily on financial services. However, the digitalization of financial markets is changing the landscape of financial product and service regulations for clients. This is due in part to the emergence of new entrants such as FinTech firms, which are leveraging advanced technologies and innovative business models to compete with established firms. The banking sector in Europe is particularly affected by the dynamics of this competition, including the entry of new and innovative competitors, the opportunities that arise from business model reshaping, and the balance between efficiency and competitiveness in the market. The European Union's digital finance strategy acknowledges the need for both regulation and private law to work in tandem. National private law systems must be robust enough to handle digital disruption, and regulatory competition should lead to the development of appropriate private law solutions if the European Union regulators ask the right questions. On one side, there are advocates of disruptive scenarios for the banking system, stating that banking is necessary, banks are not. On the other side, some believe that the FinTech phenomenon, like many others, will lose momentum in a few years, because FinTech is only another bubble for them, particularly if significant negative events occur in the sector.

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This article will answer the question of whether the banks will keep their priority and be the customer's first choice in banking and finance over the next decade.

Keywords: Banks, FinTech, financial markets, digital banking, decentralized finance.

Introduction

The progression towards integration of the banking and financial markets in European Union has occurred in distinct stages: the elimination of national barriers to entry, the harmonization of national laws and policies, the achievement of the internal market, the establishment of the single currency area and post-crisis reforms (Born, K., 2017). The digital transformation has presented additional possibilities and challenges for financial services policy. The departure of the United Kingdom from the European Union introduces a new set of obstacles with potential implications for the financial services sector within and outside of the European Union.

The banking system has undergone significant changes since the long financial crisis due to various structural factors. The economic context has been volatile, and supervisory authorities have increasingly intervened in the banking system. Furthermore, the economic recession has had lingering effects in many countries, and technological innovations have developed rapidly. Unconventional monetary policy instruments have been adopted, and low, or negative, interest rates have continued. These changes have led to significant transformations in the way banking is carried out, perhaps more than in any previous period. One of the most notable consequences in Europe has been a persistent period of weak profitability (Matoušek, R. *et al.*, 2012). This has resulted in negative rates of profit for many credit institutions in recent years. As prolonged absence of profitability can negatively impact banks' soundness and the stability of the entire credit sector, scholars, practitioners, and supervisory authorities have developed a new line of investigation into the strategic and operational choices of banks.

This article analyses the business models used by FinTech and BigTech firms and banking institutions in order to highlight differences and analogies, including in the light of current debates over the need for a renewed regulatory framework which balances the potential risks and opportunities generated by FinTech (Tanda, A. *et al.*, 2019). Also, this article evaluates the European Union's strategy from a private law perspective and identifies possible deficiencies.

Payment services, outsourcing business models, crowd lending, robo-advice, and blockchain applications are identified as areas where the relationship between FinTech regulation and private law is most apparent.

This results in a reinterpretation of (digital) contractual obligations. Conventional liability rules must evolve, and contradictory ideas under the European Union's digital finance and data protection laws must be reconciled. The interface between FinTech and private law is exemplified by blockchain law. In order to attract business and address insolvency scenarios, Member States must enhance the private law status of crypto assets. Regulatory sandboxes are used as early warning systems to alert regulators and legislators to risks posed by innovative business models. As innovation intensifies, so will the evolutionary pressure on Member States' private law systems, potentially prompting demands for European Union legislative action if Member States do not perform well.

Discussion

The bank's business model in the fintech era

The primary business model of the European banking sector, which is largely influenced by the economic system it serves, is traditional commercial retail banking. This model focuses heavily on lending activity, with a large portion of funding coming from local depositors who utilize a widespread branch network. Although investment banks operating on a global scale exist, they do not represent the core of the European credit system. Due to the prolonged crisis in the banking sector, there has been a need to reconsider banks' business models. Regulators in the euro area are now scrutinizing the business models of individual credit institutions during the supervisory priorities and Supervisory Review and Evaluation Process (Svalova, V., 2018) as the sustainability of banking strategies has become a matter of concern.

As we delve into this topic, it becomes apparent that no single business model stands out as the clear winner. A wide range of results are evident in the literature and regulatory landscape, even when the business model is altered (European Central Bank, 2018). However, there is consensus that technology will play a significant role in reshaping the business model and all banking activities in the upcoming years. Financial technology, or FinTech, presents a major challenge for banks and is already a significant issue in many contexts. FinTech encompasses diverse activities and players who share common features such as

the exclusive use of technology to carry out various forms of financial activity, the adoption of new business models by intermediaries, and the creation or re-adaptation of financial instruments and services that offer greater security, faster execution, lower costs, and a wider range of users due to this technology.

In the early part of the decade, a debate emerged with opposing views on the potential evolution of digital banking. On one side, there are advocates of disruptive scenarios for the banking system, even suggesting the end of banks, resulting in the famous quote stating that *“Banking is necessary, banks are not”* (Hoppe, S., 2018). On the other side, some believe that the fintech phenomenon, like many others, will lose momentum in a few years, because fintech is only another bubble for them, particularly if significant negative events occur in the sector. Undoubtedly, the phenomenon represents a significant change in the perception of banking: technology, now pervasive in everyday life, has fundamentally transformed the approach of users and financial intermediaries in the financial sector, including banks. The huge challenge that banks are facing is therefore to comprehend whether they are still called upon to play a fundamental role in all segments of financial intermediation, or whether, in some way or for certain areas of activity, other operators will progressively replace them, to a greater or lesser degree.

The necessary skill set in this field involves processing data rather than banking expertise, which is why it is appealing to large companies that are adept at processing vast amounts of data quickly and inexpensively. The emergence of new players in the payment industry, such as PayPal and Apple, and their growing market share, as well as TransferWise in the international funds transfer space, serve as a good example of the significance of this threat. Another area of interest for fintech is in banking products and services that require some banking expertise and data analysis, albeit not highly sophisticated ones, such as consumer credit, low loan-to-value mortgages, or managing relatively modest savings.

The tasks traditionally carried out by credit officers or financial advisors can now be accomplished through electronic platforms, which may not necessarily be run by commercial banks. These platforms use algorithms and big data to match borrowers with lenders (peer-to-peer lending, loan-based crowdfunding, marketplace lending) and provide a risk ranking to screen borrowers. Alternatively, robot-advisor services can replace human wealth advisors, and are a more affordable option. Unlike traditional banks, fintech

companies typically utilize digital technologies and innovations to interact with customers entirely (or mostly) online, and to process large amounts of information.

Lastly, there is a third area where it is much more challenging for fintech companies to replace banks, which is specific to any credit institution, namely their lending and funding activities and their ability to address maturity mismatch issues. Banks provide liquidity and ensure the repayment of deposits, thanks to the existence of public or private insurance schemes, while also providing credit to borrowers, particularly for high-risk transactions where information, especially of the 'soft' type, which is difficult to process using technological algorithms, plays a crucial role in decision-making. The development of fintech is inevitable, and in many ways, it may even be advantageous. Recently, it has been shown that while digital technology alone cannot enhance financial inclusion, the utilization of financial technology, such as mobile phones and the internet for conducting financial transactions, can be extended to include individuals who lack an account – the unbanked – as well as to encourage greater use of digital financial services among those who have an account.

Fintech's impact on banks is bound to occur, resulting in a gradual decline in the latter's dominance in conventional business, which will inevitably lead to a substantial reduction in their profit margins. Recent research shows that bankers anticipate losing 25% of their market share due to fintech's continued growth, while fintech's expansion could eat away at 60% of banks' retail services profits (Wójcik, D., Knox-Hayes, J., 2020).

The enforcement of Payment Services Directive II (EU Directive 2366, 2015) in Europe presents a significant challenge for the banking industry. The directive aims to create a single integrated payment market with standardized rules between payment service providers, enhancing system security, promoting competition, and transparency towards customers. With Payment Services Directive II, users of online current accounts can use software created by authorized third parties to make payments or access bank account information. Banks must establish dedicated interfaces to communicate with authorized third parties, allowing these new players, if authorized, to operate on the current accounts of end-users. While this presents a risk of disintermediation for traditional banks, as well as a potential loss of competent personnel attracted to more innovative operating sectors, it also opens up new opportunities for developing more innovative and efficient services for customers. At the

regulatory level, authorities must ensure a level playing field by regulating the service provided rather than who provides it.

The Basel III standards (Delaney, M., 2019) have been gradually implemented over a prolonged period to aid banks in their gradual adaptation, and they are now in a generally advanced stage. Phase 1 requirements are operational in most places, often before the deadlines set by the Accord. Banks have restructured their balance sheets to comply with the new standards due to the pressure from market expectations. Fully loaded requirements have become the standard for investors, and credit institutions that are weak in regulatory terms often suffer negative market valuations. Additionally, supervisory authorities' increasing use of stress tests to evaluate the degree of resilience to sudden systemic shocks based on fully loaded regulatory parameters has 'forced' banks to make early adjustments for the next phase deadlines.

The reforms have had a clear impact: the balance sheets of Global Systemically Important Banks (G-SIBs) now show a larger quantity and higher quality of own funds, less reliance on short-term wholesale deposits, and more high-quality liquid assets. There has also been a gradual shift away from trading-related business lines towards a retail business model with relatively stable sources of funding (Berger, A., 2019). European Union banks, in particular, have significantly strengthened their capital position over time. This was largely due to the advent of computerized banking services, which rendered a customer's physical presence at the branch unnecessary, reduced transaction times, and limited errors.

Despite the substantial investment required to implement new IT systems and ensure the security of transactions, clients demanded lower fees for various services. Faster transactions and reduced human intervention led to their perception of lower transaction costs. Consequently, banks were forced to re-evaluate their structural strategies and rethink their activities. The financial crisis coincided with the widespread digitization and the growing sophistication and security of online banking services. As a result, branches experienced significantly reduced transaction volumes and became obsolete and often expensive relics of the past. Nevertheless, physical branches retain their inherent economic value because obtaining "soft" information at a distance or through fully automated operations is challenging and categorizing them unambiguously is even more complex.

However, the significant costs associated with maintaining such a *modus operandi*, coupled with the increased expenses resulting from the prolonged period of crisis (credit losses, stricter regulation costs, etc.), prompted banks to automate the collection of data and other information as much as possible, converting it into “hard” information. As a result, high levels of staff are only retained in transactions involving significant amounts and high added value, such as wealth management and corporate finance transactions.

This change has had a significant impact on the lending segment, primarily due to Basel II regulations that require credit institutions to assign a rating to each borrower based on objective and documented factors. Assigning a borrower to a particular risk category result in a different capital requirement for the bank, which is maximum if no rating is allocated. While placing emphasis on the rating as a critical element in evaluating a client's reliability and determining the loan's interest rate makes the evaluation process objective, it fails to account for soft information that cannot be evaluated using metrics.

Digital transformation of the banking and financial market

Financial systems have a subordinate or indirect role in terms of value citation. They provide support for the complex system of economic exchange, which is crucial for the division of labor to function effectively. The payment infrastructures and money facilitate this exchange, while financial intermediation and capital markets allow for the financing of investment and liquidity, as well as the diversification of risks associated with entrepreneurial activity. Consumer finance reduces the budgetary constraints of private households, which enables them to have more purchasing options. Public finance, on the other hand, is essential for governments to balance revenues and expenditures related to the provision of public services.

Furthermore, financial instruments provide insurance against various types of income risks that individuals and organizations may face. Moreover, financial systems have critical pricing and governance functions, which are derived from and complement the primary functions mentioned earlier. Within the financial system, fundamental prices of the economy such as exchange rates, interest rates, and risk premiums are determined. These prices guide the allocation of resources within and across organizations, industries, and national economies over time. It is also essential to assess and manage the risks that arise from most financial transactions and the value of financial assets, which are the

responsibility of those involved in financial transactions and the creation of financial assets.

Failing to fulfill these responsibilities can result in serious consequences. The 2008 global financial crisis, which stemmed from United States housing market loans, was caused by banks and rating agencies mis-assessing the default risk (Kirkpatrick, G., 2009). This was due to fundamental governance issues such as wrong incentives and ineffective oversight. All financial systems require three essential resources. First, physical infrastructure is necessary to support the circulation of money and information. This includes secure transportation of cash, as well as a network of branches and ATMs, and telecommunications networks. Second, it is necessary for service providers, legislators, regulators, and to some extent, corporate and individual users, to have sufficient financial knowledge for the system to work. Third, given the informational nature of finance, trust is essential for the functioning of a financial system.

Trust is essential because the reliability of information is as important as its content. Trust is established when all participants share consistent beliefs. These beliefs are closely related to the knowledge base, which is the second resource mentioned earlier. Additionally, financial systems rely on a legal framework and regulatory oversight, including rules, institutions, and procedures for their implementation. This is not limited to regulating financial instruments, institutions, and markets, but also encompasses corporate law and bankruptcy. The legal framework defines rights and duties, supports the governance of the system, contributes to its overall stability, and partially codifies its knowledge base. When combined, the legal framework and regulatory oversight represent a critical source of trust.

The design of the financial system is to carry out its functions, including markets, organizations, financial instruments, business models, and products and services. It is evident from the history of finance and the study of contemporary financial systems that there are multiple ways in which these functions can be fulfilled (Wirtz, B., 2020). For instance, the concept of money has evolved over time, as have exchange rate systems. While modern economies now rely on fiat money produced by central and commercial banks, the design of these banking systems still reflects distinct national characteristics.

The role and importance of financial intermediation, financial regulation, public finance, corporate finance, and the allocation of financial assets owned by private households vary across different countries. National differences in the

design of financial systems may appear to be the result of explicit design choices made by legislators, regulators, expert commissions, or business leaders in the financial industry. While such choices are certainly made, they are also path-dependent and influenced by the specific conditions of each country's context, as well as the political and economic interests that stem from the existing status quo. In times of crisis or with the advent of new technologies, decisions may be needed to adapt the system. However, the options available are still limited by the existing circumstances.

Digital Transformation and Finance: The Informational Nature of Finance

The transformation of digital technology is a revolutionary change that affects all areas of our lives. The internet, mobile networks, sensor technology, social networks, and platform business models have all contributed to tremendous connectivity, while advances in computing power such as neural networks and deep learning algorithms have also been significant. However, the profound and far-reaching effects of digital transformation are not solely the result of technological advancements. Instead, they are primarily linked to two other major factors.

The first factor of digital transformation is based on exploiting two key characteristics of digitalized information. These characteristics include its limitless shareability at almost zero marginal cost, and its ubiquitous accessibility and use, not bound to a specific location. The second factor pertains to the essential role that receiving, analyzing, and sending information plays in financial, social, and cultural life. While information has always been an essential part of our existence, digital transformation is making us aware of its existential nature and providing us with new tools to collect, analyze, and exchange vast amounts of information in previously unimaginable ways. The question of how we use these new powers is of fundamental importance.

The financial industry is being radically transformed by digital transformation, which is not surprising given that finance is primarily concerned with gathering and processing information, a task directly affected by digital transformation. Money, the foundational element of finance, is a clever device for conveying information. It serves as a unit of accounting and denominator of the price system, conveying information about the value of goods, services, assets, and liabilities. It also acts as a store of value and medium of exchange, keeping a record of who holds claims on the economy in terms of purchasing power, and

how those claims are redistributed through transactions such as trading, lending, borrowing, saving, and investing.

Undoubtedly, the financial industry deals with more than just money. It offers an array of services pertaining to risk management and governance. However, these activities also largely entail the collection and processing of information. This is not the first instance where the informative nature of finance has positioned it at the forefront of profound economic transformations. The financial sector was one of the initial industries to feel the impact of information and communication technologies. The utilization of mainframe computers and telecommunication networks facilitated the adoption of cashless transactions between banking accounts, the deployment of ATMs, and the use of credit and debit cards.

The financial industry has been a frontrunner during fundamental economic transformations because of its informational nature, which involves collecting and processing information. Although the financial industry provides various services related to risk management and governance, its core activity is handling money, which is an ingenious information device that informs about the value of goods and services as well as assets and liabilities in balance sheets. The impact of digital transformation on the financial system is significant and wide-ranging, but it is also complex as the actual outcomes depend on national contexts. Using this framework, it is crucial to acknowledge that the primary and secondary functions of finance remain unchanged by digital transformation, as they are not reliant on a particular technological system. Nevertheless, digital transformation does affect the resources and designs utilized to execute these functions. A lot of discussions about digital transformation tend to focus solely on the design level, overlooking the resource-related consequences.

Digital Finance Infrastructures

Today, central banks around the world are testing digital currencies that use distributed ledger technologies, which take advantage of the substantial growth in connectivity, computing power, and storage capacity. According to a recent survey by the Bank for International Settlements, roughly 60% of central banks worldwide are conducting trials with central bank digital currencies (Boar, C., Wehrli, A., 2021). In July 2021, the European Central Bank initiated an investigation phase for the development of a digital euro. The introduction of such currency systems could make current cash circulation and bank transfer

infrastructures partially obsolete. Additionally, crypto assets also utilize a distributed ledger technologies infrastructure and were initially introduced in the private sector outside of the public payment system.

Crypto assets, along with their infrastructures, can serve as a means of transaction and a store of value. Nevertheless, even with their significant diffusion and value, they are not considered legal tender and their use is restricted to economic entities who have willingly agreed to participate by investing in them. The extent to which crypto assets and their infrastructures can replace or complement the essential functions of the financial system is uncertain. The reason for this uncertainty lies in the fundamental issues related not only to the high volatility of prices but also to regulatory and security concerns. The emergence of cashless mobile or online payments was enabled by the internet, mobile networks, smartphones, and the development and dissemination of application programming interfaces. In contrast to distributed ledger technologies, these payment methods are dependent on the existing banking infrastructure. While they have significant implications for the design of business models, from an infrastructural viewpoint, they simply add an extra digital layer.

Digital disruption and the enablement of customers

The infrastructure of financial markets (Vives, X., 2019) has been altered by FinTech and artificial intelligence. The use of distributed ledger technology promotes algorithm-generated cross-border transactions, which speeds up the privatization of rulemaking (Möslein, F., Omlor, S., 2019). As a result, the application of artificial intelligence and machine learning strengthens the interconnection between financial markets and institutions (Financial Stability Board, 2017). Networks are appearing that evaluate the feasibility of private regulation, regulatory intervention, and the enforcement of norms in cross-border situations. FinTech has created an environment of regulatory competition on a global and EU level, which could lead to a race to the bottom in some areas. However, the intersection between functional digital markets and the monetization of financial data poses a complex challenge for regulators and industry professionals. Private blockchains operate under a set of rules agreed upon by the gatekeeper of a permissioned system (Reed, C., Murray, A., 2018). Therefore, lawmakers may need to provide private law remedies with *erga omnes* effects to ensure the enforceability of results generated by distributed ledger technology. In 2019, the UK Law Tech delivery panel launched a public

consultation on the legal status of crypto-assets, distributed ledger technology, and smart contracts under English law (UK Jurisdiction Task Force of the LawTech Delivery Panel, 2019).

Despite the flexibility of English common law, there was a sense that the financial community lacked certainty about the legal status of crypto-assets, distributed ledger technology, and smart contracts. Switzerland has also made a similar argument, noting that rules on the commodification and tradability of financial instruments (i.e., blockchain-based tokens) are needed to support openness towards innovation. This argument was used in the Swiss government's draft for a law on distributed ledger technology. Liechtenstein's new blockchain law is similarly influenced by this legislative approach. Competition authorities advocate for a principle-based approach that recognizes the positive welfare effects of financial disruption caused by FinTech, acknowledging that technology often advances faster than the law. The Spanish Competition Commission supports market entry under transparent rules that require disclosure of potential conflicts of interest. From a legislative perspective, a focus on transparency reflects a policy choice for informed markets (Buttigieg, *et al.*, 2020). However, some critics may argue that such emphasis on transparency could also reveal legislative unwillingness to intervene in the negative impacts of digital finance, leaving investors to bear the consequences and potentially resulting in litigation. As a result, private actors must absorb the allocative effects of this policy approach to innovation, relying on their ability to design contracts that can withstand challenges.

Critics argue that the current regulatory approach towards FinTech has a micro-transactional bias, which leads to the neglect of macro-level risks in favor of private business models. Some suggest that a technocratic focus on the micro-level could worsen self-referential growth and systemic risks, if applied as a normative imperative. Rather, a framework of public accommodation should be adopted to address privately created risks and liabilities (Omarova, S., 2019). However, it is challenging to evaluate the macro-economic effects of a purely transactional regulatory approach without examining the private law framework for FinTech transactions. The potential for innovation in finance is heavily reliant on the adaptability of private law, as regulators struggle to create standards that can anticipate and address the unintended consequences of machine learning (Chiu, I., 2016). This implies that the regulatory framework for the European Union financial sector may implicitly rely on private law to provide functional

solutions when statutory financial law falls short. Therefore, a polycentric approach that combines governmental rulemaking with effective private contract and digital asset rules is necessary.

Decentralised finance and fintech activities

The traditional banking system has been opened by the amended Payment Services Directive (PSD II) (EU Commission, 2020). Peer-to-Peer (P2P) and peer-to-Business (P2B) payments have become commonplace and mobile wallets are now widely accepted (EU Directive 2366, 2015). Real-time payment systems operate on platforms that are frequently surveyed by the European Central Bank or national banks. Any delay or disruption in the system is immediately noticeable to end-users, which can create reputational risks for the payment services provider. Due to the stricter regulatory requirements, customer online identification is now using tokenization of payment processes, supplemented by artificial intelligence devices that use past payment patterns to verify customer transactions.

The integration of tokenized payments into distributed ledger technology allows tokens to serve as private keys that grant access to value stored on a blockchain. How these tokens and keys are classified under private law will determine if payment service providers have correctly separated customer accounts and stored their values on the blockchain, making them insolvency-proof and protected from third-party attachment. The effectiveness of electronic storage and verification schemes depends on their compatibility with data protection laws. As payment services are increasingly provided in the context of outsourcing arrangements or distributed networks, digitization has prompted a shift in contract law analysis towards the exploration of specific duties of loyalty and care. Payment service providers often delegate the transfer of funds to comprehensive algorithms, without ever physically handling the transferred values. Cloud computing has provided an infrastructure for banks and start-ups, allowing for offshore data processing to reduce costs. It is up to each national legal order to determine whether designing a payment system or a distributed network also entails liability for malfunctions.

The compliance of the system

Compliance with risk management mechanisms is a prerequisite for outsourcing under both statutory law and supervisory practice, provided that

enforcement remains credible. While standard contracts can facilitate digital transactions, the bargaining power of parties on a digital network may vary, potentially leading to loss of autonomy for banks as FinTechs capture some of the added value. A data protection case from Sweden in 2013 showed that data processors may have a stronger position than data controllers, as the latter may lack sufficient control and insight into the data processing chain for storing information in the cloud. This legal uncertainty is magnified for consumers when payment service providers operate in interrelated contract networks with complex organizational features that may be difficult to trace back to a jurisdiction. In addition, diverging proprietary standards and protocols create challenges for cross-border business.

The Regulation on digital operational resilience for the financial sectors (EU Regulation 2554, 2022) sets out professional standards for financial service providers, their contractors, and sub-contractors. Article 4 of the Regulation requires internal governance mechanisms and control frameworks to manage risks, and mandates that the financial service provider remains responsible for the safe storage of personal financial data when outsourcing. Contractual arrangements with third-party providers and potential subcontractors are required to replicate the safety standards of the outsourcing financial entity. However, the Financial Stability Board has warned against excessive optimism that such safeguards will be passed along the chain of contracts to fourth or fifth parties or beyond. The European Banking Authority and the Board of the International Organization of Securities Commissions have both issued detailed sets of governance rules to mitigate this risk. The Expert Group on Regulatory Obstacles to Financial Innovation proposes a certification or licensing scheme to ensure minimum standards are observed. The Regulation on digital resilience, however, does not address liability standards concerning third-party storage of electronic assets and values. Safe storage of tokenized funds on permissioned blockchains, as required by Article 10(1)(a) of PSD II (EU Directive 2366, 2015), can only be guaranteed if such tokens are insolvency-proof. Strict adherence to Article 20(2) of PSD II would suggest no-fault liability if digital assets stored in networks are misappropriated. Under Article 24 of Directive 2009/65/EU (EU Directive 65, 2009), as amended, the depositary may escape liability if a loss has arisen due to an external event beyond its reasonable control with unavoidable consequences.

Artificial intelligence and robo-advice in financial market

The question of whether private law systems can balance the interests of investors against those of financial institutions relying on artificial intelligence is reinforced by robo-advisory schemes. Robo-advisers utilize various business models, with the level of human interaction and intervention varying when collecting and processing information to provide investment recommendations. Fully digitalized robo-advisory systems process market information and restructure customer portfolios based on algorithms that invest and rebalance the account according to customer risk preferences (U.S. Securities and Exchange Commission, 2017). Robo-advisory services are initiated through a service contract between the customer and the financial service provider, with support from a contract with the cooperating bank of the financial service provider. If automated financial advice schemes are provided by a network of firms with unclear allocation of liabilities between the financial institution and an outsource provider, risks may be amplified (Ringe, W. G., Ruof. C., 2018).

Automated investment services or robo-advice have been identified as susceptible to various issues, including home biases, behavioral biases, and conflicts of interest that are not disclosed. Inadequate software and algorithm design may result in customers incurring losses. To address these concerns, regulatory bodies have mandated that automated investment firms must enhance their governance and risk management structures, regularly supervise and update their algorithms, and disclose to potential customers the underlying assumptions, limitations, and risks associated with their algorithms. Singapore and European Union law stipulate that the responsibility for overseeing and managing client-facing tools lies with the board and senior management of the robo-advisory firm. However, it is unclear whether this oversight and disclosure framework complements the concept of providing proper investment advice under the service contract. In the United States, the level of duty owed under the service contract has sparked a debate on how robo-advice can be reconciled with the statutory duties under investment law, which are informed by portfolio theory.

The United States Financial Industry Regulatory Authority has observed that financial service providers that rely solely on robot-generated advice do not meet the standards of fiduciary care owed when advising clients. Consequently, financial advisory firms have developed hybrid models that involve human oversight and counterchecking of robot-generated advice before it is applied to

customer risk parameters. The Bank of England and the Financial Conduct Authority recommend specific risk management mechanisms when financial services employ machine learning applications. Machine learning algorithms must activate an alert mechanism that triggers human approval before execution. Under its regulatory sandbox scheme, the Financial Conduct Authority requires a qualified financial advisor to evaluate the quality of the underlying algorithms when testing robo-advice schemes. Algorithms must be revised in accordance with the advisor's assessment. The United States Financial Industry Regulatory Authority has proposed a similar approach.

Article 25(1) of MiFID II (EU Directive 65, 2014) and Article 54(1) of the MiFID II Delegated Regulation (EU Regulation 565, 2017) in the European Union require investment firms to conduct a suitability assessment before providing investment advice. Even when investment advice or portfolio management is given through an automated or semi-automated system, the investment firm still holds ultimate responsibility for conducting a proper suitability assessment, which cannot be delegated to algorithms. The European Securities and Markets Authority has established organizational standards for investment firms using algorithms to assess suitability, including policies to review and update algorithms in response to market changes and legislative developments. Additionally, internal procedures should be in place to detect errors within the algorithms that may result in inappropriate advice or disregard of relevant laws. Although European Securities and Markets Authority guidelines are considered soft law in the European Union, they are widely followed. These guidelines may be transformed into specific algorithm-related duties of care and loyalty under innovative FinTech contracts using standard interpretation techniques. While investment firms should not be able to contract out of their liability under the suitability rule, the precise legal implications of Article 25 MiFID and the MiFID II Delegated Regulation for national contract laws are uncertain. The potential of contract law to evolve is still being tested when it comes to determining the specific rights parties have when they sue an investment firm for breach of contract.

Conclusion

The present study showed that the private law and private contracting are essential for FinTech to thrive. The European Union Digital Finance Strategy aims to strike a balance between promoting innovation and investor protection by creating an efficient interface between financial regulation and the evolutionary

potential of private law. The European Union believes that mandatory rules and soft law codes of conduct will foster innovation and private ordering, with any resulting externalities to be absorbed by private law. However, this requires the evolution of national private law systems to accommodate the enforceability of claims, particularly in the areas of payment services, outsourcing models, crowdlending, robo-advice, and blockchain applications.

The liability rules for digital markets must be adequately established to provide a framework for the infrastructure of digital markets. The business models involved in FinTech are subject to varying degrees of liability under finance and data protection laws, with uncertainty surrounding the incorporation of algorithms and artificial intelligence into established liability concepts. Current regulatory sandbox models focus on transparency and insurance requirements for bilateral business relationships, ignoring a more fundamental liability problem in the context of long outsourcing chains and digital networks. The courts or legislators must decide whether those who design the organizational structure of a network should also be liable for its malfunctions, which would require a re-assessment of current burden-of-proof rules.

The classification of crypto assets under private law is not addressed in the European Union Digital Finance Strategy, unlike non-European Union jurisdictions. *Erga omnes* status must be afforded to crypto assets with respect to third-party interventions in service chains for digital payments, outsourcing to clouds, distributed ledger technology settlement processes, and insolvency scenarios. The European Union regulatory instruments and Member State private laws are still in a state of flux, and as private law systems accommodate practitioners' creativity and regulators' principle-based approach, shortcomings may become more apparent. The European Union should adopt fine-tuned private law rules for digital finance to address Member State diversity as a liability. Private international law rules for FinTech transactions and the interface between digital finance law and the General Data Protection Regulation should be given priority on a future legislative agenda.

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