ORIGINAL PAPER

DOI: 10.26794/2587-5671-2025-29-4-112-128
UDC 336(045)
JEL G20, G29

Multi-Factor Risk Analysis of Modern Fintech Based on Multimodal Analytics

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ABSTRACT

The relevance of this study lies in the significance of a thorough examination of the implications of the rapid expansion and widespread adoption of modern financial technologies. **The purpose of the study** is to identify the characteristics of fintech-related risks using multimodal business analytics which is based on machine learning, neural networks and data mining technologies. Hypothesis. The use of methods and tools for multimodal business analytics based on machine learning and neural networks will ensure the further instrumentalization of risk assessment and analysis of fintech, taking into account multifactoriality, polyvariance and interdependence nature of risks. This will fully reflect the complexity of modern financial technologies and their impact on the transformation of financial and economic relations. Research methods. The study was based on multimodal analytics, which involved the construction of cross-analysis risk matrices, highlighting the mutual decreasing and increasing influence on the interests of participants in financial relations. For a comprehensive assessment, key fintech tools were selected — cryptocurrencies (as an investment instruments and means of payment), digital financial assets and digital financial services, such as digital transfers. The results of the study showed that modern financial technologies play a key role in transforming the financial sector, making it more accessible, efficient, and customer oriented. It has been stated that the introduction of fintech in Russia contributes to financial inclusion by providing access to financial services for those who were previously excluded from the traditional banking system. Interpretation of multimodal analytics materials has demonstrated that the use of cryptocurrencies for investment and settlements in the Russian Federation is subject to high market and regulatory risks. In the digital financial assets market, issuers face problems of insufficient liquidity, and digital financial services demonstrate vulnerabilities in the field of data protection and operational reliability. As a result, we can conclude that the use of multimodal analytics tools integrating various data sources and research methods allows for a deeper understanding and effective assessment of the complex risks associated with modern financial technologies. Based on the results of the study, we propose practice-oriented recommendations for improving risk management in the Russian financial technology sector for regulators and other parties involved in financial transactions.

Keywords: modern financial technologies; digital finance; fintech; fintech risks; multimodal analytics; machine learning; neural networks; data mining; digital financial assets; digital transfers; cryptocurrencies; digital financial services

For citation: **Shkodinsky S.V., Krupnov Yu.A., Romantsova T.V. Multi-factor risk analysis of modern fintech based on multimodal analytics. *Finance: Theory and Practice*. 2025;29(4):112-128. (In Russ.). DOI: 10.26794/2587-5671-2025-29-4-112-128**

INTRODUCTION

Digitalization of socio-economic development radically affects the financial sector. Financial technologies (fintech) are emerging and actively developing, which are making radical changes in the contours of financial markets and in the functioning of financial institutions. Fintech mediates the latest stage in the evolution of financial relations, the key characteristics of which are disintermediation (getting rid of traditional intermediaries for participants in financial relations) and related digitalization (transferring basic transactions to digital financial platforms and channels) [1].

Digitalization is a key factor in the fourth industrial revolution, which is causing radical changes in society and production. It opens up new opportunities for development, but it also carries risks, especially for the financial sector. In this area, trust and minimal risks remain the foundation of an effective market [2, 3].

The risks associated with the use of new financial technologies require careful analysis and accounting. The regulator, which plays a key role in ensuring the security and development of financial markets and institutions in Russia, should pay special attention to them. Its task is to protect participants in financial relations from systemic threats and risks that undermine trust, which is the basis for the normal functioning of the financial sector.

The risks associated with the introduction of modern financial technologies have their own characteristics. They manifest themselves in their interconnectedness and unpredictability. This means that new financial and economic risks often overlap and affect each other. In addition, there is a high probability of increased negative consequences with simultaneous or sequential manifestation of several risks. Given the specifics of digital tools, methods, and technologies, this seems quite realistic.

In this regard, the use of complex, multidimensional risk research methods of modern financial technologies is of considerable research interest, the use of which would allow for highly accurate risk analysis, taking into account multifactorial factors, including the multivariance of mutual influence on the development and effectiveness of fintech and its contribution to modern financial and economic relations. In this article, the authors consider the theoretical and methodological aspects and practical applications of such an area of analytical activity instrumentalization as multimodal business analytics.

The study is based on the idea that the use of digital analytical tools today, in fact, has no alternatives for conducting multifactorial analysis of modern digital technologies, including in the financial sector. It is hypothesized that the use of multimodal business intelligence methods and tools based on machine learning and neural networks will further instrumentalize the assessment and analysis of fintech risks based on multifactorial, multivariate and interdependent risks. This will fully reflect the complex nature of modern financial technologies and their impact on the transformation of financial and economic relations.

The key objective of the study is to identify the features of fintech-related risks based on multimodal business intelligence based on machine learning, neural networks and "data mining" technology.

MATERIALS AND METHODS

The research materials are presented by scientific publications and analytical materials on the subject of scientific analysis. The authors of this paper consider risk as a possible event that can bring both income and losses to the subject of economic activity. This highlights the importance of informed risk management, including the choice between

accepting risk, rejecting it, reducing its level, or transferring it to another entity.

Risks have a deterministic classification, and are also determined by qualitative and quantitative indicators, namely the probability of occurrence (realization) of a risk event and the potential damage that an economic entity may suffer.

The methodology of this study includes the use of conceptual, comparative analysis, and multimodal analytics methods, based on which a comprehensive study of the risks and opportunities of using modern financial technologies has been conducted.

Multifactorial risk analysis involves their comprehensive assessment and identification, including the cross-effect of risks on each other and on a specific object, reducing or increasing its level of economic security [4]. The phenomenon of multifactorial impact of risks is particularly pronounced in new technologies based on digitalization, taking into account the complex nature of the latter. Digitalization poses threats to information security and can make a destabilizing contribution to fundamental economic relations, in particular, disrupting stability in the labor market. But digitalization also provides a breakthrough in the economy and society, providing advanced tools for solving complex tasks that previously required enormous resources or were fundamentally unsolvable with pre-existing technologies.

A striking example of the disruptive nature of digital technologies is the use of tools and methods for multimodal business intelligence based on machine learning, neural networks and other end-to-end technologies of the digital age. Multimodal analytics, or the multimodal approach (training) (eng. multimodal (machine) learnimg) is a relatively new approach to digitalization of assessment and analysis of socio-economic research, which forms multiple layers of data input and output and/or a combination of modalities for studying complex phenomena, as well as multivariate, multifactorial influence on certain phenomena and processes [5–8]. The approach is based on the convergence of technologies such as neural networks, machine learning, and data mining.

Multimodal analytics has a potentially wide range of applications in socio-economic research. In Russia and abroad, primary experience is accumulating in assessing uncertainties in development prospects, in identifying new aspects of existing contradictions and problems, in formulation and verification, as well as in rechecking complex economic hypotheses.

The materials of the primary research discussed below show, among other things, that multimodal analytics can be considered one of the promising tools for conducting risk analysis in financial systems, including modern systems in particular. The main directions of practical application of this approach in the subject area include:

- the use of several modalities for risk assessment, including on the basis of a combination of data sources [9, 10]. This method is particularly useful in identifying and analyzing risks associated with overcoming uncertainties, including information;
- identification of various aspects of economic discourse (important for identifying new and structuring existing risks, including reviewing and supplementing their nomenclature). In this regard, the data mining toolkit opens up significant prospects, with the help of which, in particular, mixed qualitative and quantitative assessments of the content of economic documents, such as annual reports of corporations, are carried out [11, 12]. This method can be easily adapted to identify and systematize risks. It combines text data and quantitative indicators. It also helps to understand the meaning of statements, which is important for risk assessment and correction;
- conducting a multifactorial risk analysis, taking into account the multivariance and interdependence of influence, which,

as noted, are particularly pronounced in digital relations, including digital finance. Multifactorial analysis is supported by a combination of source combinatorics (the first direction from this list), data mining (the second direction), as well as on the basis of multimodal data analysis technology of various nature [13–15] related to multimodal business analytics.

If we discuss the justification for using digital analytics in light of the current shortage of technologies and skills to solve new and complex economic problems directly, then issues from the third category come to the forefront in the context of identifying and assessing financial and economic risks. These issues include the possibility of applying an approach to conducting multifactorial risk analysis that takes into account multivariate and interdependent factors.

In this regard, it should be noted that multimodal analytics involves the integration of quantitative and qualitative methods of risk analysis, as well as the use of data from various sources and formats. In addition, an important aspect of applying a multimodal approach to risk assessment in modern financial relations is the possibility of taking into account the behavioral aspects of finance [7, 8]. In particular, taking into account the behavioral aspects of investors and market participants should play a particularly important role in the analysis of market bubbles or panics. Multimodal business analytics in the financial sector also involves the active application of elements of cognitive psychology to understand how market participants perceive and respond to risks.

Among the key advantages of a multimodal risk analysis for new financial products are its complexity (using this approach allows you to consider many factors that influence risk, making the assessment more accurate and the accuracy of tools and methods increases with the development of machine learning). Additionally, the flexibility of the tools (based on modern neural network technologies) allows for a high level of adaptability to changes in the financial environment and the appearance of new types of data. Furthermore, the significant predictive power of multimodal approaches (learning) enhances the ability to anticipate rare events or "black swan" scenarios.

An important section of multifactorial risk research based on multimodal analytics is the compilation of a matrix of cross-analysis of key risks, which is used to highlight the impact of some risks on others. It is important to understand whether risks interact with each other, either increasing the likelihood and/or magnitude of losses, remaining neutral, or reducing negative effects by decreasing the likelihood or severity of other risks.

The multimodal risk identification model used in this study integrates input data from various sources, including text; numbers, graphs, and behavior, to take into account a wide range of risk factors and their interactions. The multimodality of the input data provides a deeper understanding of the complex interdependencies typical of digital financial systems such as fintech. This is achieved by combining information from diverse sources, which makes it possible to identify hidden patterns and take into account the influence of external and internal factors. The model is based on the convergence of recurrent neural networks, data mining, and machine learning tools with objective control and expert verification of the quality and relevance of the results obtained to improve queries and performance parameters of the multimodal learning algorithm (business intelligence). The model is based on the principle of self-learning, the data taken as final corresponds to the quality of the evaluation of the results in a recurrent neural network in the 95% confidence interval.

Thus, the use of multimodal analytics in multifactorial risk analysis provides a more

complete and multifaceted understanding of risks in modern financial technologies. The development and active implementation of this approach within a range of fintech risk analysis methods will help to identify hidden threats and weaknesses, as well as to predict the evolution of events in uncertain circumstances. However, considering the novelty of this approach and its limited practical testing, including in the context of modern Russia, it is necessary to expand the scope of research both theoretically and methodologically, as well as from a practical perspective. This publication explores both the challenges associated with the use of multimodal analytics for financial technology risk analysis, as well as the practical outcomes obtained through this approach in the context of its application in financial technology development policies, considering the multifaceted nature of related risks.

The information base of this study included:

1) a set of text information collected by machine from open sources in the domestic Yandex search engine, based on keywords related to the analyzed fintech tools and a set of risks and opportunities;

2) an array of academic articles selected by machine by keywords, published no earlier than 2023 and included in the core of the Russian Research Center (Russian Federation), as well as indexed in the Google Scholar meta-search academic system (489 academic publications);

3) information on initial public offerings of digital financial assets (DFAs) for 2023 and the first quarter of 2024 on 11 investment platforms of registered information system operators;

4) data from the annual reports of Russian banks included in the TOP 10 in terms of capital (as of 01.07.2024), which are public companies.

For data processing, the LLaMA 3.2* multimodal AI utilities versions 11B and 90B and Pixtral 12B from Mistral AI are used.

The risk level was estimated by machine in a point-vector expression in the range from 0 to 1 point, where 0 points corresponded to a qualitative assessment of the probability of risk realization: "extremely low probability" (<0.05) and a loss level defined as "insignificant". A qualitative assessment of the probability of risk realization corresponded to 1 point: "very high probability" (⩾0.95) and the level of losses "critically high".

When assessing the risks of modern fintech based on multimodal analytics, the following gradation is applied, taking into account the cross-influence of risk factors:

- neutral influence: this risk (risk group) does not enhance or reduce the negative impact of another risk (risk group) on the financial relationships under study: a change in the point vector machine score in the range of no more than ± 0.05 points;
- increasing influence: this risk (risk group) increases the influence of another risk on the financial relationships under study, worsening the overall state of economic security during their implementation: a change in the point vector machine score in the range ⩾+0.05 points;
- reducing influence: this risk (risk group) reduces the impact of another risk on financial relations, thereby improving the overall state of economic security during their implementation: a change in the point vector machine score in the range ⩾–0.05 points.

RESULTS AND DISCUSSION

The definition and boundaries of the concept of modern financial technologies are still a controversial issue due to their novelty and emergence — a rapidly developing nature, when fundamental science, designed to describe and study them at a deep level, does not keep up with the emergence of new or significantly modified technologies.

An analysis of Russian, for example, [16–18] and foreign, for example, [19–21] research literature allows us to give a

Table 1

Multifactorial Risk Analysis of Using Cryptocurrencies in the Financial System of the Russian Federation

Risk title	Downward impact on financial relationships	Leveling effect on existing threats and risks
Legal risk	It is related to potential changes in legislation that could restrict or prohibit the use of cryptocurrencies for national and international transactions	Legal risks stimulate further elaboration of national legislation and initiatives to unify international regulation, in particular, with friendly countries (EAEU, BRICS)
Market risk	This is due to the significant fluctuations in cryptocurrency prices, which can cause significant financial losses for investors and delays in payments	Secured cryptocurrencies are protected from fluctuations. The volatility factor can be mathematically taken into account with a competent assessment of the risks and opportunities that create the potential for significant speculative gains. Cryptocurrencies, despite their volatility, remain one of the few tools for international investment in the face of sanctions
Technological risk	It includes security threats such as hacking exchanges and wallets, as well as technological failures	It stimulates the search for the best technical solutions to ensure information and financial security
Liquidity risk	Possible difficulties with the rapid exchange of cryptocurrencies for fiat money without significant losses in price	It motivates the development of integrated financial solutions that combine the fiat and digital worlds and contribute to progress in the former and stability in the latter, along with promising legal regulation and the development of loss protection tools related to the realization of liquidity risk
Regulatory risk	It is associated with international sanctions and restrictions that may affect access to foreign cryptocurrency platforms	It is stepping up measures to create sovereign digital platforms, exchanges, and information storage and exchange infrastructure with a high degree of transparency and with a significant level of information security

Source: Compiled by the authors.

synthetic definition, according to which new financial technologies, often called fintech (from the English "fintech" –– financial technology), are a set of innovative technologies and solutions that are used to improve and automate financial services and processes. Fintech technologies have traditionally provided a wide range of applications and products aimed at improving the efficiency, accessibility and convenience of financial transactions for both businesses and end users.

The standard list of new financial technologies (fintech technologies) may include the following:

• Mobile application and platform systems for fast and secure money transfers;

• Contactless payment and digital wallet tools;

• Online lending platforms such as P2P lending;

• Automated investment platforms, together with integrated digital recommendation technologies, including robo-advisors;

• using blockchain technologies to ensure transparency and security of transactions; cryptocurrencies (secured or unsecured) as alternative means of settlement, exchange and investment;

• regtech technologies for automating the processes of compliance with regulatory requirements in the financial sector and/or monitoring compliance with legislation in real time;

• Insurtech technologies (English — InsurTec, high financial technologies in insurance, including the use of big data for risk assessment and personalization of insurance products [22]);

• Cyber security tools — software products and other infrastructure solutions for financial data protection and fraud prevention;

• The use of big data and artificial intelligence to analyze customer behavior, predict market trends, and make decisions.

With regard to innovations in the Russian financial markets and in financial relations in the Russian Federation, the risks associated with the following groups of modern financial technologies are of particular interest.

1. Cryptocurrencies. Investing and payments using cryptocurrencies are characterized by specific risks, which are reinforced by the massive nature of the relevant financial technologies.

Table 1 demonstrates the results of a multifactorial analysis of the risks of using cryptocurrencies in the financial system of the Russian Federation based on multimodal analytics.

Multimodal risk analysis also involves the creation of a cross-risk analysis matrix, highlighted in *Table 1*. The results of the comparative analysis are shown in *Table 2*.

In the cross-analysis matrix shown in *Table 2,* each risk of using cryptocurrencies for investment in Russia, as well as for making payments, is assessed by its impact on other risks associated with the use of appropriate digital finance in socio-economic relations. It is noteworthy that the most significant risks, multiplying the opposite ones in pairs, arise in the subject area along the diagonal of the risk matrix. Namely, high legal risk may exacerbate regulatory risk, as changes in legislation may lead to new restrictions from international partners. Volatility risk has a significant impact on liquidity risk, as sudden price fluctuations can make it difficult to convert assets. Other risks also raise concerns, but they are not typically considered so significant that they require major changes in government policies.

It can be concluded that there are significant relationships between the legal, market, and regulatory risks associated with the use of cryptocurrencies in the Russian financial system. Legal risks have an increasing impact on regulatory aspects, which indicates the need to improve legislation in conditions of high uncertainty of regulation of cryptocurrencies.

Table 2

Matrix of Comparative Risk Analysis Associated with the Cryptocurrencies Use in Russian Federation

Risk title	Legal	Market	Technological/	Liquidity	Regulatory
Legal		Neutral impact	Downward impact	Neutral impact	Upward impact
Market	Neutral impact		Neutral impact	Upward impact	Neutral impact
Technological	Downward impact	Neutral impact		Neutral impact	Downward impact
Liquidity	Neutral impact	Upward impact	Neutral impact		Neutral impact
Regulatory	Upward impact	Neutral impact	Downward impact	Neutral impact	

Source: Compiled by the authors.

Technological risks, on the contrary, have a downward impact on legal and liquidity aspects, which considers the development of blockchain technologies as one of the key and effective tools that minimize certain traditional financial risks. In general, cryptocurrencies remain a high-risk fintech tool that requires an integrated approach to regulation and risk management.

The attitude of national governments and regulatory bodies towards the use of cryptocurrencies in financial transactions varies significantly, ranging from the imposition of total bans to the granting of various types of permits [23, p. 85]. The strictest regulations are most often applied to decentralized unsecured cryptocurrencies [24] such as bitcoin (the most well-known crypto asset of this type), given the lack of direct supervision over the issue and distribution of the asset, an unknown center of actual control, as well as high financial risks associated with the volatility of any cryptocurrency not secured by the underlying asset. However, these prohibitive measures are not always appropriate and their use does not guarantee the desired effect, particularly in minimizing key risks to financial markets and institutions.

The development of financial relations in the direction of disintermediation is unlikely to be stopped, and an unconditional ban on cryptocurrencies requires at least the combined efforts of the entire world community, or literally turning off the Internet for all users in the country. Accordingly, for better supervision of financial relations, it is primarily important to establish a competent regulatory framework in a timely manner, balancing risks and opportunities, and ensuring the proper level of protection of investors' rights and legitimate interests while helping to minimize losses from reckless investments. Payment and settlement opportunities for using cryptocurrencies under sanctions are also important for Russia. It is not just about payments between states, where cryptocurrencies may not have alternatives in some cases. It is also about settlements between private entities, which fall into a regulatory gray area when using cryptocurrencies. New prohibitions will only make the situation with taxation and currency control worse. In this context, again, it seems reasonable to find a balance between risks and regulation, which in the current conditions cannot be directed except towards

the legalization of cryptocurrencies — in particular, as a payment instrument.

Interest in the subject area is aroused by the potential of transferring the digital ruble from the pilot design stage to the plane of full-scale practical implementation, which has significant potential and can have a comprehensive impact on various aspects of the economy, including the securities market, the capital market and overcoming sanctions. The digital ruble, as a new form of national currency, can significantly simplify financial transactions and increase their transparency, which will lead to increased investor confidence in the Russian securities market, as a result, its capitalization and attractiveness. In the capital market, the introduction of the digital ruble can stimulate the development of new financial instruments and platforms, which will open up additional opportunities for attracting capital. The introduction of the digital ruble has the potential to contribute to more efficient resource allocation and improved access to finance for businesses and individuals, thereby contributing to increased financial accessibility. In terms of overcoming unilateral sanctions against Russia, the digital ruble could play a significant role in reducing reliance on international payment systems and foreign currencies.

Another notable group of modern financial technologies for the application of multimodal learning in risk analysis in the Russian Federation are digital financial assets (hereinafter referred to as DFAs). DFAs are a very remarkable financial instrument that significantly shifts the usual edges of borrowing instruments, primarily in the securities market. In particular, it opens access to small and microbusiness, individual entrepreneurs to debt financing by analogy with corporatization and issuance of bond loans. The release of digital financial assets (DFAs) has been possible in Russia since the early 2020s, thanks to the adoption of necessary legislation and the development of infrastructure (digital platforms) for issuing and circulating DFAs [25].

Despite the regulator's rather strict approach aimed at ensuring the centralization of control and supervision over the issuance and circulation of DFAs, the DFAs market in Russia has shown significant growth over the past two years, reflecting the high interest of participants in financial relations. So, as analysts of the SberCIB project note, "since the beginning of 2024, the volume of DFA emissions has been 47 billion rubles. And for the entire period of the market's existence (since 2022), this figure has reached 133 billion rubles". At the same time, the choice of tools has expanded".[1] An additional illustration of the DFA's potential in financial relations can be the fact that in early 2024 the United States imposed sanctions against large private operators of information systems for the production of DFA in Russia — Atomize and Lighthouse. In addition, it should be borne in mind that Russia, in principle, has become one of the pioneers among jurisdictions in which not only de facto digital securities have been legalized (even with specific names and regulatory features), but also a sovereign infrastructure controlled by the regulator for the issuance and circulation of such instruments has been deployed. However, like other digital financial technologies, there are numerous risks associated with the issuance and circulation of DFAs, the key ones of which have been analyzed using a multimodal approach. The results are presented in *Table 3*.

The matrix of comparative risk analysis of the issuance and circulation of digital financial assets in the financial system of the Russian Federation is presented in *Table 4*.

It can be stated that, due to the establishment of a transparent regulatory framework and secure infrastructure for the issuance and circulation of digital financial

[1] Digital financial assets: Market overview in 2024. 2024. URL: https://sbercib.ru/publication/tsifrovie-finansovie-aktivi-obzor-rinka-v-2024-godu (accessed on 15.09.2024).

Table 3

Multifactorial Risk Analysis Associated with the Emission and Circulation of Digital Financial Assets in Russian Federation

Risk title	Downward impact on financial relationships	Leveling effect on existing threats and risks
Legal	Regarding changes in legislation that could impact the status and treatment of DFA	The DFA's legal framework is the foundation for developing promising regulations on other digital assets, providing a testing ground for legal experimentation, and contributing to the attractiveness of the DFA market
Market	It is associated with changes in interest rates and economic instability, which can affect DFA profitability	The issue of DFA in Russia addresses the key challenge of ensuring financial inclusion in the country
Technological	It includes security threats such as cyber attacks on platforms where DFAs are issued and/or circulated, as well as technological failures	The DFA's sovereign infrastructure is the base for developing the latest digital technologies and platforms based on its own equipment and technologies
Liquidity	Outside the developed secondary market, it can be difficult to quickly sell or trade DFAs without losing a significant amount of money	The DFA secondary market, which is expected to develop in the near future, will provide a number of investors with attractive tools for balancing portfolios according to risk or profitability criteria
Regulatory	Related to international and domestic regulatory changes, which may limit access to the DFA market	The Bank of Russia has received the opportunity to experiment with flexible intervention practices in digital financial transactions. Based on this understanding of the opportunities and limitations, regulation of fintech is being developed in other areas DFAs (Credit Facilities) can be used to purposefully attract portfolio investments from friendly parties into the Russian economy

Source: Compiled by the authors.

assets (DFAs), the impact of significant risks, if any, is minimized. Specifically, market risks are given the greatest attention, as they are assessed at an average level. However, when combined with other risk factors, they usually form the most significant level of risk.

Based on the results of modeling the matrix of cross-risk analysis of the issuance and circulation of digital financial assets in the financial system of the Russian Federation, the following assessment can be made. The identified risks associated with the issuance and circulation of digital financial assets demonstrate a more pronounced influence of technological and regulatory factors, which, in the context of the impact on the state of economic security in the relevant area of financial relations, are generally neutral or favorable (reducing the level of associated risks and increasing the state of economic security). The technological risks of issuing and circulating DFAs in Russia have a

Table 4

Matrix of Comparative Risk Analysis Associated with the Emission and Circulation of Digital Financial Assets in Russian Federation

Risk title	Legal	Market	Technological	Liquidity	Regulatory
Legal		Neutral impact	Downward impact	Downward impact	Neutral impact
Market	Neutral impact		Neutral impact	Neutral impact	Neutral impact
Technological	Downward impact	Neutral impact		Neutral impact	Downward impact
Liquidity	Downward impact	Neutral impact	Neutral impact		Downward impact
Regulatory	Neutral impact	Neutral impact	Downward impact	Downward impact	

Source: Compiled by the authors.

Table 5

Multifactorial Risk Analysis Associated with Digital Financial Services in Russian Federation

Risk title	Downward impact on financial relationships	Leveling effect on existing threats and risks
Legal	Uncertainty in legal regulations can increase the vulnerability to cyber attacks due to a lack of clear standards. Misinterpretation of laws can lead to operational errors and fines, which can be costly and damaging to businesses	Each crisis situation, which might not have arisen if there was a proper legal settlement, acts as a source for finding the best solutions in the regulatory sphere and legislation
Market	It covers the risks associated with changing market conditions, the impact of competition, and changes in consumer preferences	The disintermediation effect will increase financial accessibility by promoting digital financial services
Technological	Risks related to cybersecurity, system failures, and insufficient protection of user data. Among other things, disruptions in technological processes can lead to operational disruptions and increased costs	It promotes the development of laws and regulations aimed at protecting financially vulnerable people from technological risks
Operational	It includes a wide range of risks related to deficiencies in process management, human error, and insufficient staff training in digital financial services	The staff for digital services, who require training on a large scale, contribute significantly to the human potential of the digital economy. We provide uniform standards for employee training and comprehensive training programs

Source: Compiled by the authors.

Table 6

Matrix of Comparative Risk Analysis Associated with Digital Financial Services in Russian Federation

Risk title	Legal	Market	Technological	Operational
Legal		Neutral impact	Neutral impact	Upward impact
Market	Neutral impact		Downward impact	Neutral impact
Technological	Neutral impact	Downward impact		Neutral impact
Operational	Upward impact	Neutral impact	Neutral impact	

Source: Compiled by the authors.

downward impact on both legal and liquidity aspects, which underscores the importance of implementing reliable technological solutions to prevent system failures. Regulatory risks also have a downward impact on liquidity, which indicates the need to create flexible and transparent regulatory mechanisms.

As a result, it can be concluded that the development of the DFA sovereign market in the Russian Federation requires a balanced approach between technological innovation and the regulatory framework to reduce systemic risks.

In the context of the economically secure development of the DFA market in Russia, while steadily increasing financial accessibility, it is important to minimize the set of market uncertainties facing issuers and investors, which can be reduced by organizational, legal, technical and technological methods and tools. DFA is already considered as one of the rather conservative tools for attracting broad investments [26] (from an indefinite range of investors), and in order to integrate the DFA market into modern financial markets, it is also important to actively promote the practices of secondary circulation of digital financial assets, including the unification of these DFA platforms, standardization of quotations, and their presentation in real time, exchange of information between information system operators on the release and circulation of DFAs.

Another, final group of modern financial technologies for conducting multifactorial risk analysis is digital financial services (services and maintenance) such as transfers, mobile applications, and others. *Table 5* presents the results of the primary multifactorial analysis of the relevant risks using multimodal analytics.

The matrix of comparative analysis of digital financial services in the financial system of the Russian Federation is shown in *Table 6*.

Based on the matrix of comparative analysis of digital financial services in the Russian financial system, it can be concluded that the interaction between legal and operational aspects is a significant risk factor for the successful development of digital finance. At the same time, legal risks are having an increasing impact on operational risks, which highlights the importance of clear legal frameworks and user protection in light of the rapid growth of digital platforms. Market and technological risks have a neutral or diminishing effect on each other, indicating a gradual decrease in market volatility due to the maturation of technology. However, operational risks continue to be a critical

concern that requires enhanced control over processes and infrastructure.

In the context of using digital financial services in Russia, it is essential to address several operational and legal risks. The legislation on digital financial services must be complete and consistent, without creating a negative environment that encourages the transfer of these transactions to the shadow economy. It is crucial to establish standards for services, security measures, and professional qualifications for staff, as well as to promote targeted training and the overall improvement of financial literacy among users.

Based on the findings of the study, we can propose practice-oriented recommendations aimed at improving risk management in the Russian fintech sector. The regulator should strengthen its supervision of cryptocurrency transactions and develop more stringent security standards for digital assets. Financial market participants should invest in cybersecurity measures and improve their data management systems in order to minimize operational risks and enhance user confidence.

Today, there is a pressing issue regarding the legalization of foreign-origin digital currencies as payment instruments in Russia and international transactions, which would help circumvent sanctions and bring Russian crypto investments into the legal sphere of economic relations. The government's decision-making process is constrained primarily by multiple factors, including concerns about economic security risks. Overcoming this uncertainty with the help of high-precision multimodal business intelligence will allow us to proceed to the phased implementation of a state-legal experiment on the implementation of international cryptocurrencies — both private unsecured and secured (stablecoins), taking into account the possibility of controlled actions with associated risks, including their partial acceptance (including testing), transfer (including the release of digital analogues of derivative financial instruments) and minimization (primarily through the introduction of a sovereign asset exchange infrastructure, processing and transmission of highly sensitive financial information).

Regarding the DFA market, our multifactorial analysis has allowed us to take specific measures to stimulate the secondary market. These measures primarily include centralized exchange platforms and regulatory aspects such as tax policy. By understanding the risks associated with these measures and their level of influence, we are able to make more informed decisions about our next steps. This does not mean that we should fundamentally reject innovations in government policy, but rather take into account the complex interplay of risk factors and corporate policies. This approach will help to facilitate corporate policies and overcome uncertainties, which will in turn be an important driver for attracting new investors and increasing investment in the Russian DFA market.

In the field of financial services, including digital transfers, the use of multimodal analysis results can lead to the development of highly accurate regulatory approaches and the selective application of risk-based control tools for implementing and updating sovereign platforms and regulations. This is particularly important for domestic and cross-border money transfers.

The authors have presented some of the key financial technologies that are currently available. However, there is a significant area for future research that involves expanding the analysis by incorporating additional technologies and refining the list of potential risks. This would facilitate the development of relevant analytical tools and methods, which could be supported by advanced digital technologies such as big data analytics,

recurrent neural networks, and data mining. Additionally, the use of these technologies in integrated digital analytical methods such as multimodal learning could also contribute to this process.

CONCLUSIONS

Thus, modern financial technologies are playing a crucial role in transforming the financial sector by making it more accessible, efficient, and customer-focused. Their use provides several benefits, including reduced costs in financial transactions due to disintermediation, faster transaction speeds, and improved user experience. Additionally, fintech is promoting financial inclusion by providing access to financial services for those who were previously excluded from traditional banking systems.

The results of a multifactorial analysis conducted using multimodal analytics allow us to state that the use of cryptocurrencies for investment and settlements in the Russian Federation is subject to high market and regulatory risks, issuers face problems of insufficient liquidity in the DFA market, and digital financial services demonstrate vulnerabilities in the field of data protection and operational reliability. The use of multimodal analytics tools with the integration of various data sources and research methods allows for a deeper understanding and effective assessment of the complex risks associated with modern financial technologies, providing more accurate forecasting and management of these risks.

Multimodal training can become the basis for further development of the multifactorial risk analysis methodology. It adapts models to new types of data and improves forecasting accuracy in an increasingly complex digital economy. Highly accurate multifactorial risk analysis will strengthen control over the safe implementation and development of digital financial instruments, while not abandoning the widespread legalization of innovations in fintech. In particular, a legal experiment will be useful for legalizing private unsecured international cryptocurrencies, secured digital currencies of non-Russian origin to facilitate international settlements, as well as in the framework of the development of the DFA secondary market and in decision-making in infrastructure development and regulation of digital financial services such as digital transfers within Russia and abroad.

The research results can be applied in the development of governmental and corporate policies related to the low-risk digitalization of financial services. They can also be used for the preparation of new theoretical and methodological studies, as well as for the empirical testing and development of multimodal analytical models in financial risk management.

The study makes a significant contribution to the theoretical understanding of the impact of various risks on financial technology. It also provides a practical test of tools for assessing the sustainability of new financial technologies using multi-modal digital analytics. The interaction between methodological and applied aspects shows the potential of digital analytical tools to ensure the safe use of digital financial technology and promote sustainable socio-economic development.

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S. V. Shkodinsky — statement of the problem, development of the concept of the article, application of multimodal analytics.
Yu. A. Krupnov — critical analysis of literature and research, generalization of research results, formation of the conclusions of the study.
T. V. Romantsova — collection of statistical data, application of multimodal analytics, tabular and graphical representation of the results.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was submitted on 15.10.2024; revised on 10.11.2024 and accepted for publication on 27.12.2024.
The authors read and approved the final version of the manuscript.

Translated by N.I. Sokolova