

28 Priority solutions to problems of regulation of financial markets

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Abstract: The article discusses the mathematical foundations for the introduction of digital technologies in the financial sector. Digitalization of the financial sector ensures transparency in the management of financial resources of both state and commercial organizations. Particular attention is paid to the evolution of the stock market through its digitalization. Various options for the practical use of digital technologies in the described area are shown through the analysis of big data and the identification of significant patterns. The proposals of the authors will improve the efficiency and validity of decision-making in the financial sector.

Keywords: Digital economy, digital technologies, financial market, financial technologies, financial market infrastructure

1. Introduction

Current stage of development of financial markets is characterized by a significant degree of connectivity not only between economic sectors, but also between many countries. Along with the positive consequences due to high integration, a number of problems of global financial regulation arise, the elimination of which is necessary for the smooth functioning of the global financial market.

As an analysis of international practice shows, the use of technologically backward and outdated methods of financial regulation leads to crises such as the Great Recession and accompanying crushing losses for the global economy.

Together with the incompletely thought-out liberalization of markets in the last decade of the twentieth century, these methods marked the beginning of the accumulation of financial risks. Despite significant changes in the global coordination mechanism that have occurred since 2009, the financial regulatory system has been characterized by rigidity and high cost, reducing the efficiency of financial institutions. Today, the system is often overburdened with functions it is not intended to carry out, as governments often resort to exploiting global financial regulation to support law enforcement and policy objectives such as anti-money laundering and financial sanctions.

In this regard, there is a slowdown in the process of globalization, limited access of banks to capital and the development of “shadow banking”. Since a high level of integration is associated with accelerated transmission of shocks and crises, and significant mobility of capital increases its volatility, the negative impact due to the inability of international financial institutions (IFIs) to prevent crisis phenomena is felt not only by developing, but also by developed countries (instability of investments, exchange rates, etc.). The need to achieve global financial stability determines the relevance of analyzing problems and prioritizing problems in regulating the global financial market.

Mathematical modeling in economics is an integral part of the modern theory of financial markets and investment theory. For more than 30 years, organized derivatives markets have existed in the world, and at the same time, various consulting companies have been improving methods for evaluating investment projects. The mathematical apparatus of options theory has become often used both for the needs of the derivatives market and for various types of calculations in the real sector of the economy.

The world in the conditions of the fourth industrial revolution is rapidly transforming and has already led to the emergence of a digital economy.

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The digital economy is an activity whose key factors are data in digital form, and their processing and use in large volumes allows for improved quality, efficiency and productivity in the production, sale, storage and delivery of goods and services.

The financial market is the structure within which the purchase and sale of assets and the borrowing of assets occur, includes:

1. Stock market/securities market (stocks, bonds, issuer options, etc.);
2. Derivatives market/derivative financial instruments (futures, options, etc.);
3. Money market (market for short-term securities);
4. Credit market;
5. Foreign exchange market (Forex).

As an integral part of the economy, the financial market, which allows for the effective mobilization and distribution of free financial resources, is also subject to change. The modern direction of development of financial markets is their digitalization, in other words, the introduction of digital technologies into the activities of financial markets.

Digital technologies in the financial industry are an essential part of evolution and determine the competitiveness of market participants.

Digitalization of the financial sector ensures transparency in the management of financial resources of both government and commercial organizations. The new digital economy is built on different rules and principles and includes new areas, for example, such as: Big Data and data analysis, mobile technologies, artificial intelligence, robotics, biometrics, distributed registries, cloud technologies.

Robotization, blockchain technologies, cloud technologies and much more are gradually being introduced into the financial sector, digital currency, digital securities, technologies in the banking sector and public finance are appearing [1, pp. 28–33].

A key factor stimulating the development of the financial technology market is the development of the Internet and digitalization. Artificial intelligence, automation, big data, distributed ledger technology and machine learning are just a few examples of technology trends accelerating innovation in financial services.

Digital developments can help support and accelerate achievement of each of the 17 UN Sustainable Development Goals.

If at the very beginning of its development the financial technology market was limited to accepting payments and electronic funds, now a number of services are becoming most widespread. [2, p. 228–239]

At their core, financial markets tend to be unpredictable and even illogical. Due to these features, financial data must be considered to have a rather chaotic structure, which often makes it difficult to find stable

patterns. To solve this problem, the algorithm must be equipped with as much objective information as possible. Modeling chaotic structures requires machine learning algorithms that can find hidden laws in a data structure and predict how they will affect it in the future. The most effective methodology to achieve this goal is “deep learning” (in computer vision, machine translation, speech recognition). Deep learning makes it easy to deal with complex structures and extract relationships that further improve the accuracy of the results.

Work on digitalization of the financial market should be carried out in the area of identification, authentication and digital identity management. For example, in the banking sector—providing remote access to bank services, including the introduction of unified approaches to verifying information provided by the bank when servicing clients, in electronic form. As a result, we should predict an increase in the financial involvement of the population and an increase in the range of financial services.

Currently, blockchain technologies are beginning to be actively used in the financial sector. Blockchain is one of the defining trends in the fintech industry. Distributed ledger technology was previously associated exclusively with cryptocurrencies. The Bitcoin blockchain is the progenitor of a significant part of the top twenty cryptocurrencies: Ethereum, Litecoin, Dash, Bitcoin Cash, Bitcoin SV and others [3, p. 2–23].

Today, they are trying to implement blockchain in all areas where control over the transparency and security of transactions is necessary.

Blockchain is a distributed ledger technology that provides the following:

- Cancellation of mediation;
- Increasing the speed of transactions;
- Verification of transactions.

A 2023 PwC report notes that blockchain technology can be used in a wide range of industries, from heavy industry to fashion labels. According to analysts, the most beneficial use of blockchain is in industries such as public administration, education and healthcare. The report also notes that by 2030, blockchain technologies will ensure global economic growth of \$1.7 trillion. The analysis is part of a series of PwC studies that focus on scenarios for the use of new technologies and their impact on the economy. PwC believes that “blockchain has the potential to help many organizations rebuild and restructure themselves” in the new environment. PwC identified five key blockchain applications and assessed their potential for value creation using economic analysis and industry research. These five key areas include tracking cash flows; payments and financial services; identity management; contracts

and dispute resolution; interaction with clients. [12, p. 1–47]

PwC estimates revenue growth in these areas will be \$28.5 billion by 2030, which will also benefit wholesale and retail trade, communications and media companies, and a broader range of business services.

Insurance and reinsurance companies are actively interested in automating the entire life cycle of insurance operations. The insurance market is characterized by both a high level of opacity and high risks of fraud, as well as a large number of easily digitalized transactions. Insurance and reinsurance services are used by companies in almost every industry.

If insurance companies become drivers of mass adoption of boxed blockchain solutions, adoption will quickly spread to related industries, such as healthcare and logistics. In turn, this could open up new market opportunities for blockchain vendors and traditional system integrators.

Thus, in 2023, RGAX, a subsidiary of two of the largest US reinsurance companies, Reinsurance Group of America and Mutual of Omaha, successfully tested a project to automate reinsurance processes based on blockchain. And AXA Group, a French insurance and investment group of companies classified as systemically important for the global economy, last year invested in the startup Blockstream, whose solutions are intended for developers and issuers of digital assets. The company's products include infrastructure platforms and application development platforms for implementing industrial blockchain solutions.

Analysts call the following companies the market leaders in blockchain technologies provided as a service: Microsoft, HPE, IBM, SAP, Stratis, Amazon Web Services, Oracle, Huawei, Blockstream, PayStand.

One of the options for using blockchain in the credit market could be to determine the credit rating of an individual for approval or refusal of a loan. Credit scoring is a well-known and popular tool for determining the financial ability of an individual to repay the amount of debt over a certain period of time.

China Merchants Bank, the 16th largest bank in the world by revenue, has been actively working on China's national blockchain platform since the beginning of 2022. The bank has successfully implemented an interbank trade finance platform into its operations, collaborates with blockchain startups in the development of decentralized applications and cryptocurrency wallets, and has also patented more than ten inventions aimed at ensuring information security and confirming the identity of clients using blockchain technology [4, p. 1–47].

Stakeholders in this network are the primary respondents in uploading customer-specific transaction data into the blockchain network based on customer

identification, which will then be used for cumulative opportunity identification or customer scoring.

But at the moment, the digitalization of financial markets in the world faces legislative barriers. The modernization of industry legislation lags far behind the development of digital technologies.

The main problem also remains financial security during the transition to a digital economy. This affects the development of legislation and causes serious concerns for many organizations. Today, one thing is obvious: it is necessary to develop comprehensive solutions that will be aimed at improving the current legislation.

In the financial sector, there are trends in the development of digital technologies that not only modernize the internal work of the fintech industry, but also create space for further innovation in this area—these are:

- payments and transfers: online payment services, online transfer services, P2P currency exchange (peer to peer—transfers between individuals), B2B payment and transfer services (business-to-business—transfers between legal entities), cloud cash registers and smart terminals, mass payment services;
- financing: P2P consumer lending, P2P business lending, crowdfunding;
- money management: robo-advising, programs and applications for financial planning, social trading, algorithmic exchange trading, targeted savings services and others.

Let's look at the most promising financial technologies today:

RegTech—technologies for increasing the efficiency of compliance with regulatory requirements and risk management. The scope of application of this tool includes KYC (Know your customer) client identification procedures, identification and prevention of suspicious activity and fraud, as well as automation of the process of preparing and submitting reports. Within the framework of RegTech, the analysis of promising areas of application of this tool is carried out, as well as the preparation of recommendations for the use of solutions by financial market participants.

SupTech (supervision technology)—the use of innovative technologies such as Big Data, machine learning, artificial intelligence, cloud technologies and others in order to improve regulation and supervision of the activities of financial market participants. These technologies automate administrative procedures, transfer interaction between financial market participants into a digital format, and improve the quality and reliability of reporting information [5, p. 34–52].

In the process of development and application of digital technologies, the level of competitiveness of Russian technologies as a whole increases, the range,

quality, level of accessibility and security of financial services offered increases, and costs and risks in the financial sector are reduced.

Research, analysis and development of proposals for the use of financial technologies are also carried out in the following areas:

- Big Data and Smart Data;
- mobile technologies;
- artificial intelligence, robotics and machine learning;
- biometrics;
- distributed registry technology;
- open interfaces (Open API).

The “Strategic Roadmap for the Development of Financial Services in the Republic of Azerbaijan”, approved by the decree of the President of the Republic of Azerbaijan, Mr. ILHAM ALIYEV, dated December 6, 2016, identifies priority activities that will help strengthen financial inclusion in the country, improve regulatory mechanisms to accelerate digital transformation in the banking system, as well as improving the professional knowledge and skills of financial market participants. [6, p.1–5]

Analysis of various indicators in the payment ecosystem allows us to note the fact that since the beginning of 2019, positive results have been achieved in the area of increasing the volume of electronic payments, stable development of the payment card market and the use of electronic banking services in the country.

During 2023, the Real-Time Interbank Settlement System (AZIPS) processed 778 thousand payment orders with a total volume of \$128.5 billion. During the reporting period, 52.8 million payment transactions worth \$13.7 billion were carried out in the Small Payments Settlement and Clearing System (BCSS). Compared to the same period in 2019, the volume of payment transactions in AZIPS increased by 39% (\$28.4 billion), and in BCSS by 36.5% (\$2.9 billion).

Another reform aimed at deepening digital transformation in the banking system was the introduction of appropriate changes to the “Rules for the issuance and use of payment cards.” The adopted changes make it possible to expand the introduction of innovative technologies in the payment card market, strengthen measures to combat fraud in the field of electronic payments, and also contribute to further strengthening the rights of consumers of electronic services. These changes will ensure the successful implementation of the tokenization project (a technology that makes it possible to secure mobile payments. Most contactless payments, including mobile ones (ApplePay, Samsung-Pay) involve the transfer of card data, in particular its number) in the country and will serve to expand contactless payment technologies. [7, pp. 21–35].

In order to increase the share of retail payments in non-cash turnover, to more clearly define the scope of identification and transaction procedures, as well as to improve the efficiency of use, the current limits on prepaid payment cards were raised. In addition, the changes also affected the activity of acquiring banks with business entities in the framework of combating fraudulent transactions in the field of payment cards. According to the new changes, acquiring banks must identify suspicious transactions carried out with payment cards and directly from a card account without presenting cards in their service network and respond in a timely manner when they detect third-party interference in the operation of ATMs, POS terminals and other bank devices.

Currently, the issue of payment cards in the republic is carried out by 29 commercial banks and the national postal operator (“Azerpost” LLC). As of January 1, 2022, the total number of payment cards issued in the country is 7.827 million. As of January 1, 2022, commercial banks and the national postal operator installed 2,654 ATM units and more than 65 thousand POS terminals and 1,633 self-service terminals.

In general, the above-mentioned reforms and a number of other activities that are being carried out in the field of digital transformation will make it possible to raise non-cash payments in the country to a new level and expand the scope of its application. As a result of these reforms, the competitiveness of the payment ecosystem will be increased in accordance with modern requirements.

The European Union’s EU4Digital initiative supports Azerbaijan’s digital reform agenda by proposing a range of measures to advance key areas of the digital economy and society, in line with EU norms and practices, to drive economic growth, create more jobs, improve people’s lives and help businesses. [8, p. 1–5]

EU4 Digital will improve the functioning of government institutions, accelerate economic diversification, promoting growth and job creation, and improve the lives of Azerbaijani citizens. Harmonization of digital markets will lead to better online services with better prices and more choice for all people. Azerbaijan actively participates in each of the six directions of the Digital Markets Harmonization (DHH) initiative and takes on the role of a coordinating country in the direction of Innovation and Startup Ecosystems and the subsection of Electronic Customs. The EU also provided support to Azerbaijan within the framework of the project “Improving the development of electronic services (including e-commerce)”.

Financial globalization, on the one hand, and the weakening of control of national governments over the movement of capital, on the other, contributed to the outflow of capital not only through legal, but also

through semi-legal and illegal channels, exacerbating the problem of “capital flight” in many countries.

The main international organizations that form the structure of the financial stability institution continue to be the World Bank (WB), the International Monetary Fund (IMF), the Bank for International Settlements (BIS), the Basel Committee on Banking Supervision (BCBS), and the International Organization of Securities Commissions (IOSCO), but at the same time new institutions are being formed, such as the New Development Bank, the Asian Infrastructure Investment Bank, etc. Currently, “international financial institutions have begun to pay more attention to stabilizing exchange rates and maintaining the autonomy of monetary policy, and all this in the context of capital controls” [9].

It is international financial organizations that have a significant role to play in solving the problems of financial globalization: creating stable financial institutions, ensuring the security of the derivatives market, improving the coordination of non-bank financial institutions and eliminating the problem of large financial institutions with a large number of economic ties, the bankruptcy of which will lead to crisis phenomena for the economy as a whole. (too big-to-fail). The BIS and BCBS take an important part in the formation and elimination of the problem of too big-to-fail, developing reasonably stringent requirements for capital, risk coverage, ensuring liquidity and sustainability of systemically important banks in the world (Basel III, approved in 2010–2011). The International Association of Insurance Supervisors is also developing global capital standards, participating in the formation of the sustainability of financial institutions. IOSCO, in turn, works to improve the sustainability of non-bank financial institutions and the security of the financial derivatives market. This international organization has developed the Principles of Financial Market Infrastructure and compiled recommendations for money market funds. The Financial Stability Board also monitors national financial systems along with the IMF and World Bank financial sector assessment program, and one of the IMF’s tasks is to coordinate policies across countries at the macro level. “The global financial system is witnessing a rapid increase in the number of financial market-related economic and policy measures designed to develop financial market functions and contribute to achieving the goals of sustainable development of the global economy” [10].

In recent years, reforms have been carried out that have created a new institutional framework for financial regulation and increased the stability of the global financial system.

However, improving the regulation of the international financial market at this stage has been largely implemented in the banking sector, while maintaining

the stability of non-banking financial institutions is only at an early stage due to the lack of a coordinating legal framework and “shadow banking”.

The main failures in the regulation of the global financial market are the regulatory trap (regulators often begin to act based on commercial and political benefits, and not in the interests of increasing economic efficiency), the focus of regulators only on the banking sector, and technological failures.

These failures cause the following problems of global financial stability:

- reduction in credit supply in conditions of high requirements for banks and their costs, which causes interruptions in the credit channel for the implementation of monetary policy;
- development of regulatory arbitrage;
- insufficient regulation in the field of new financial technologies (including cryptocurrencies).

Also, sources of financial market problems such as money laundering and terrorist financing, tax evasion, sanctions and the negative impact of the coronavirus pandemic remain relevant [11, 12].

Based on the study of expert opinions, we believe that in order to implement more effective regulation of financial markets, it is advisable to apply the following measures:

1. creation and development of international self-regulatory organizations. Since financial stability acts as a public resource that gives rise to the “tragedy of the commons” (like all collective goods), the creation of agreements between a small number of states will allow achieving and updating goals much faster with an accelerated response to financial innovations.
2. Ensuring the most efficient regulation at the micro level can be achieved by creating international self-regulatory organizations for large financial players (an example is the positive results of the creation of the International Swaps and Derivatives Association, which developed standards for over-the-counter contracts used by more than 800 members from fifty-six countries);
3. development of financial regulatory “sandboxes” (a legal regime that allows experiments in the field of financial innovation in a controlled environment). The first financial regulatory sandbox was implemented in the UK in 2016 to support the spread of financial innovation. Today, “about 20 projects are already underway around the world, at various stages of development. In addition to the UK efforts, achievements in Asian markets such as Hong Kong and Singapore also stand out.”

2. Conclusion

Despite the fact that in the last decade, international regulatory practices have developed significantly, making it possible to reduce the risks of the global financial market, a number of problems in the field of global financial regulation remain unresolved, hindering the achievement of global economic stability. The author of the article considers the following problems of global financial coordination to be priority:

- exacerbation of the problem of “capital flight” to offshore zones,
- reduction in credit supply in conditions of high requirements for banks and their costs,
- insufficient regulation in the field of new financial technologies (including cryptocurrencies),
- the continued influence of such sources of financial market problems as money laundering, terrorist financing, tax evasion, sanctions and the negative impact of the coronavirus pandemic.

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