ПРАВОВОЕ РЕГУЛИРОВАНИЕ ФИНАНСОВОЙ ДЕЯТЕЛЬНОСТИ

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LEGAL ASPECTS IN IMPLEMENTING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE FINANCE SECTOR

Abstract. The intensive introduction of artificial intelligence (AI) and robotics technologies in all spheres of human life has raised a series of questions for the regulator. With the development of technology, the role of a person in certain areas of banking is becoming less and less significant. This paper highlights some of the problems associated with the development of regulation of AI technologies in the field of financial technologies. For this purpose, foreign and domestic experience has been analyzed. It was found that several trends can be identified in the regulation of the use of AI technologies in the financial sector abroad.

The first is that any legal restrictions are introduced very carefully (which is not quite typical for this area and contrasts with a fairly strict regulation of blockchain technology). Moreover, in some cases a regulator directly helps the development of technology. Likewise, the desire of regulators to create conditions for the development of technologies in the financial sector has led the world to what is today called "regulatory sandboxes" defining a concept that emerged in the field of fintech as a way to introduce new developments on an experimental basis, bypassing the existing regulatory restrictions. It is no coincidence that financial sandboxes are considered to be the classic and most widespread ones today. And the financial sandboxes themselves serve as one of the isolated examples of such regulation in Russia. It is defined as a mechanism for piloting new financial services and technologies that require changes in legal regulation.

The second trend is related to the one outlined above and consists in identifying three key flagship streams for the development of regulation: regulation of algorithmic trading, creation of regulatory sandboxes in the field of finance, and setting up requirements for AI systems used by financial institutions.

The paper proposes an approach to the regulation of AI systems in financial markets based upon hybrid regulation, constant market monitoring and experimental legal regimes.

Keywords: artificial intelligence, financial sector, experimental legal regimes, regulation

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ПРАВОВЫЕ АСПЕКТЫ ВНЕДРЕНИЯ ТЕХНОЛОГИЙ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА В ФИНАНСОВОЙ СФЕРЕ

Аннотация. Активное внедрение технологий искусственного интеллекта (ИИ) и робототехники во все сферы жизнедеятельности человека поставило целый ряд вопросов перед регулятором. С развитием технологий все менее значимой становится роль человека в определенных направлениях банковской деятельности. В настоящей работе освещены некоторые проблемы, связанные с развитием регулирования технологий ИИ в сфере финансовых технологий. Для этого проанализирован зарубежный и отечественный опыт. Установлено, что в регулировании применения технологий ИИ в финансовой сфере за рубежом можно выявить несколько тенденций.

Первая заключается в том, что какие-либо законодательные ограничения вводятся крайне аккуратно (что не совсем типично для этой сферы и контрастирует с достаточно жестким регулированием технологии блокчейн). Более того, в ряде случаев регулятор прямо помогает развитию технологии. Подобным образом стремление регуляторов создать условия для развития технологий в финансовой сфере привели мир к тому, что сегодня называется «регуляторными песочницами», определяющими концепт, который возник именно в сфере финтеха как способ внедрить новые разработки в экспериментальном режиме в обход существующих регуляторных ограничений. Не случайно именно финансовые песочницы сегодня считаются классическими и самыми распространенными. И именно финансовые песочницы — один из единичных примеров такого регулирования в России. Она определяется как механизм для пилотирования новых финансовых сервисов и технологий, требующих изменения правового регулирования.

Вторая тенденция связана с обозначенной выше и заключается в выделении трех ключевых флагманских направлений развития регулирования: регулирование

алгоритмической торговли, создание регуляторных песочниц в сфере финансов, установление требований к системам ИИ, применяемым финансовыми институтами.

В работе предложен подход к регулированию систем ИИ в финансовых рынках на основе гибридного регулирования, постоянного мониторинга рынка и экспериментальных правовых режимов.

Ключевые слова: искусственный интеллект, финансовая сфера, экспериментальные правовые режимы, регулирование

1. Introduction

The intensive introduction of artificial intelligence (AI) and robotics technologies into all areas of human life has raised a series of questions for the regulator. Eventually, the world has already accumulated some background not only in identifying but also in resolving certain legal matters in this area. In several countries around the world, national strategies for the development of AI technologies have been adopted, and the first complete legal acts with norms of direct action have appeared¹.

The Russian doctrine has gradually developed an understanding that nowadays an urgent need has already arisen not only to create but also to develop legal regulation of AI technologies. The state can implement an approach involving observation of the development of technologies with the fastest possible response to specific changes; however, at the same time, it requires the creation of specific tools to promptly respond to emerging risks². Unfortunately, such tools do not exist.

With the development of new technologies, the role of individuals in certain areas of banking activity diminishes; for example, algorithms widely used on trading platforms enable to solve complex mathematical equations and provide detailed logical answers in a few seconds³. At the same time, according to several researchers, the introduction of innovations in the financial sector is limited by legal restrictions⁴.

Indeed, artificial intelligence and machine learning technologies are relatively new, and any international standards and regulations in this field are

¹ Regulating robotics: Introduction to “robolaw”. Legal aspects of robotics and artificial intelligence technologies development / V.V. Arkhipov [and others], under editorship of A.V. Neznamov. M., 2018. P. 232.

² *Pisarenko A.P., Ignatenko V.V.* To the question of the “Non-Human” Law: trends and prospects // Bulletin of the Taganrog institute of management and economics. 2018. № 1. P. 57.

³ *Gelashvili M.* A robot instead of a bank employee: fantasy or reality // Banking review. Application “Best Practice”. 2016. № 1. P. 2.

⁴ *Ashimbayev T.A.* Modern development of the financial market in the era of innovations // Economics and business: theory and practice. 2018. № 7. P. 16.

in the process of emerging; experts highlight particular problems in this area, for instance, related to the risks caused by algorithmic trading⁵.

A number of problems related to the development of regulation of AI technology in financial technology are highlighted in this study.

2. Concept and classification

There is no legal definition of AI; moreover, few of the terminology problems cause such scientific discourse as the problem of determining the term «artificial intelligence».

Since the purpose of this paper is beyond the goal of solving this problem, it is proposed to follow the version contained in the Russian National Strategy of AI development⁶: «Artificial intelligence is a whole range of technological solutions, which simulate cognitive functions of a person (including self-learning and searching for solutions without a predetermined algorithm) in order to obtain the results comparable, at least, with the results of human intellectual activity while performing specific tasks. The range of technological solutions includes information and communication infrastructure, software (including the use of machine learning methods), processes and services for data processing and searching for solution».

We assume that AI applications in the financial sector **can be classified by their scope of implementation** as follows:

1. The use of AI for algorithmic trading.
2. The use of AI by credit institutions for customer service (e.g., tools for analyzing cash flows in customer accounts with anticipation of future spending and arranging for notification, financial assistants, chatbots, robotic assistants, alternative financial advisors, service for recording personal finances; notification of fraud in customer accounts and real-time cash flows, etc⁷).
3. The use of AI for the activities of credit institutions not directly related to customer service (including, for example, Internet platforms to search for

⁵ Artificial intelligence and machine learning in financial services. Market developments and financial stability implications [Electronic source] / www.fsb.org: Financial Stability Board. Access mode: <https://www.fsb.org/wp-content/uploads/P011117.pdf> (date of reference: 14.09.2019).

⁶ Presidential Decree № 490 of 10 October 2019 on the development of artificial intelligence in the Russian Federation [Electronic source] / Official Internet Resources of the President of Russia // Access mode: <http://www.kremlin.ru/acts/bank/44731> (date of reference: 14.09.2019).

⁷ *Butenko E.D.* Artificial intelligence in banks today: experience and perspectives // Finance and credit. 2018. № 1 (769). Pp. 145–146.

an investor or a borrower and check their diligence; organized lending systems; automatic preparation of credit ratings, etc.⁸).

4. The use of AI for processing various types of financial data (big data sets on banking operations, analysis of markets and market information, financial statements, etc.)

In our opinion, this classification enables tracking regulatory problems of the implementation of AI technologies.

The use of algorithmic trading tools leads to questions about the legal conditions for their use. The application of AI systems for the activity of financial market players creates, perhaps, the biggest layer of problems: from requirements of algorithmic transparency and maintenance of non-discrimination to creation of legal conditions for application of separate innovative instruments (regulatory sandbox). The problem of big data is obvious: it includes all aspects of legislation on personal data, impersonal data and various types of confidentiality.

3. The use of AI for algorithmic trading

Today, the involvement of AI systems in the provision of private capital management services, traditionally involving personal communication with a client, is becoming increasingly significant⁹.

In fact, trading with the use of AI is a sub-discipline of a wider area of robotization — systematic trading, which includes both algorithmic and high-frequency trading¹⁰.

The first automatic trading systems emerged in the 90s of the 20th century and were concentrated in the hands of large institutional investors, but a larger spread of trading robots started with the emergence of the technical possibility of trading on the stock exchange via Internet and the development of brokerage trading terminals. In the middle of the first decade of the 20th century, it enabled algorithmic trading systems to demonstrate high results, significantly exceeding mechanical trading efficiency¹¹.

⁸ *Butenko E.D.* Artificial intelligence in banks today: experience and perspectives // Finance and credit. 2018. № 1 (769). Pp. 145–146.

⁹ *Gelashvili M.* Op. cit. P. 1.

¹⁰ Financial Market Regulation Review № 5 (18.11.2016–31.01.2017). Bank of Russia. P. 18 [text] [Electronic source] / www.cbr.ru: official website of the Central Bank of Russia. — Access mode: https://www.cbr.ru/content/document/file/36014/ai_n.pdf (circulation date: 14.09.2019).

¹¹ *Dosenko E.M.* Trends in development and regulation of the algorithmic trading // Problems of modern economics. 2014. № 3 (51). P. 308.

As experts fairly note, algorithmic trading has become one of the most common ways of performing transactions on modern trading platforms; in this case, the key determinants are both its universality and the possibility of generating relatively stable higher-than-average market income¹². New programs, based on the latest achievements in the field of artificial intelligence, surpass by results both classical managers and old strategies of algorithmic trading, due to which, artificial intelligence may become a major player in the global financial markets in the future¹³.

It is no coincidence that acts aimed at regulating this instrument have been adopted in several jurisdictions.

For example, since 2014, the EU requires that algorithms used for automatic trading must be registered, tested, and have automatic «switches» (MiFID II)¹⁴.

In the UK, there are a set of requirements both for companies engaged in algorithmic trading and for algorithms¹⁵. Companies using high-frequency algorithms are expected to specify procedures for their use, including supervising the implementation of the algorithmic trading policy, reviewing and approving algorithms following the algorithm approval process, creating a mechanism for analyzing algorithmic trading incidents.

Since 2014, Italy has introduced the «Tobin's Tax», which applies to high-frequency trading and transactions with stock derivatives¹⁶. In Russia, high-frequency trading mechanisms have also been in the focus of the regulator for some time¹⁷.

¹² Volodin S.N., Yakubov A.P. Developing the algorithmic trading in global financial markets: Causes, tendencies and perspectives // Finance and credit. 2017. T. 23. № 9 (729). Pp. 532–533.

¹³ Timofeev A.G., Lebedinskaya O.G. The market is preparing for an algorithmic trading // Transport business of Russia. 2017. № 5. P. 57.

¹⁴ MIFID II [text] [Electronic source] / <https://www.esma.europa.eu>: ESMA site. Access mode: <https://www.esma.europa.eu/policy-rules/mifid-ii-and-mifir> (date of reference: 14.09.2019).

¹⁵ Supervisory Statement (SS5/18 Algorithmic trading June 2018) [Electronic source] / <https://www.bankofengland.co.uk>: The Bank of England. Access mode: <https://www.bankofengland.co.uk/-/media/boe/files/prudential-regulation/supervisory-statement/2018/ss518.pdf?la=en&hash=714A0DBD03C2AA95A1322CF1BC35BA846AD597EB> (date of reference: 14.09.2019).

¹⁶ Dosenko E.M. Trends in development and regulation of the algorithmic trading // Problems of modern economics. 2014. № 3 (51). P. 310.

¹⁷ Regulator vs. robot-manipulators [Electronic source] / <https://www.kommersant.ru>: official site of the newspaper «Kommersant». Access mode: <https://www.kommersant.ru/doc/2816090> (date of reference: 14.09.2019).

In 2018, the study «Evaluation of the impact of high-frequency trading on the financial market parameters of the Russian Federation» was published¹⁸. It was noted that «today, many questions about the presence of certain causal links between the trading activity of HFT (high-frequency trading) and the emergence of non-standard situations on the market remain debatable. In the Russian Federation, this problem has not been sufficiently studied, while understanding the effects and mechanisms of high-frequency trading on market parameters is the basis for correct interpretation of certain actions of high-frequency market participants, as well as for selecting instruments to regulate high-frequency trading»¹⁹.

In 2018, the Bank of Russia developed the Bank of Russia Order No. 4980-U dated 27.11.2018 «On the procedure for accreditation of software for electronic computers through which individual investment recommendations are provided»²⁰, which establishes a procedure for accrediting the software used by investment advisors to provide investment recommendations.

In the procedure defined in paragraphs 2–18 of the Order, accreditation of software for electronic computers, through which individual investment recommendations are provided, shall be performed:

- 1) for software allowing, based on predetermined conditions, to form and provide individual investment advice in an automated way without direct human participation or with restriction of human participation, by collecting and entering information into this software;

- 2) for software allowing converting the provided individual investment advice into instruction to a broker for executing a stock trade and/or a contract, which is a derivative financial instrument stipulated by such individual investment advice, without the direct participation of a client of the investment advisor.

Furthermore, it is noted that this approach to regulation is of a framework nature, and it will be further detailed once law enforcement practices and competencies have been accumulated. In particular, the possibility of a robotic accreditation of investment advisors is under consideration²¹.

¹⁸ Evaluation of the impact of high-frequency trading on the financial market parameters of the Russian Federation Bank of Russia [text] [Electronic source] / https://www.cbr.ru: official website of the Central Bank of Russia. Access mode: https://www.cbr.ru/Content/Document/File/37542/research_HFT.pdf (date of reference: 14.09.2019).

¹⁹ Evaluation of the impact of high-frequency trading on the financial market parameters of the Russian Federation Bank of Russia. P. 3 [text] [Electronic source] / https://www.cbr.ru: official website of the Central Bank of Russia. Access mode: https://www.cbr.ru/Content/Document/File/37542/research_HFT.pdf (date of reference: 14.09.2019).

²⁰ Registered by the Ministry of Justice of Russia 14.02.2019 № 53782.

²¹ Bank of Russia. Report for public consultation. Bank of Russia. Issues and directions of development of regulatory and supervisory technologies (RegTech and SupTech)

We tend to agree that, being an instrument of the financial market, high-frequency algorithms should be under constant supervision of the regulator. Monitoring of the situation will allow us to promptly implement regulatory measures, which at the same time should not be excessive.

4. Regulatory sandbox

In April 2018, the Bank of Russia approved the Bank of Russia's regulatory «sandbox» operating procedure, the main purpose of which is creating a mechanism for prompt and secure introduction of innovative products, services, and technologies into the Russian financial market. The regulatory «sandbox» ensures verification of hypotheses about positive effects of the utilization of financial services and technologies, identification of relevant risks, and identification of required measures for establishing legal and technological conditions for their implementation; the regulatory platform is an effective tool for building new processes, including those related to the usage of SupTech- and RegTech- solutions, as well as assessment of risks of their implementation and prompt creation of legal conditions for their implementation²².

The so-called «regulatory sandboxes», where digital technology is being experimented within the financial sector, exist in Australia, Bahrain, Canada, Denmark, Hong Kong, Indonesia, Jordan, Malaysia, Netherlands, Saudi Arabia, Singapore, Thailand, Taiwan, United Arab Emirates, United Kingdom, and the United States²³.

Regulatory Sandboxes are believed to be the invention of the United Kingdom Government and Financial Conduct Authority (FCA). «Sandboxes» are

in the financial market in Russia. October 2018 [text] [Electronic source] / https://www.cbr.ru: official website of the Central Bank of Russia. Access mode: https://www.cbr.ru/content/document/file/48604/consultation_paper_181016.pdf (date of reference: 14.09.2019).

²² Bank of Russia. Report for public consultation. Bank of Russia. Issues and directions of development of regulatory and supervisory technologies (RegTech and SupTech) in the financial market in Russia. October 2018 P. 23 [text] [Electronic source] / https://www.cbr.ru: official website of the Central Bank of Russia. Access mode: https://www.cbr.ru/Content/Document/File/48604/Consultation_Paper_181016.pdf (date of reference: 14.09.2019).

²³ *Eggers W.D., Turley M., Kishnani P.* The future of regulation: Principles for regulating emerging technologies. Deloitte Insights, 2018 [Electronic source] / <https://www2.deloitte.com: site. Access mode: https://www2.deloitte.com/insights/us/en/industry/public-sector/future-of-regulation/regulating-emerging-technology.htm> (date of reference: 14.09.2019); Citation: Digital Economy Regulation Issues (Analytical Report) // Strategic Development Center Fund. P. 62.

used when it is impossible to determine without experiment whether a solution works or not. They allow rules for innovative approaches to be tested in a limited environment. The regulatory «sandbox» operates in a market environment and interacts with real consumers²⁴. FCA regulatory sandbox²⁵ provides individual legal support to participating companies and the ability to violate/modify legal regulations in a controlled test mode²⁶.

In the U.S., a financial sandbox has been operating in Arizona (Arizona's FinTech Sandbox²⁷); and currently, there are discussions about scaling up the initiative²⁸.

In Australia, there is the ASIC regulatory sandbox²⁹ that enables financial companies to test products for up to 12 months without an AFS license (Australian Financial Services)³⁰.

In Singapore, the FinTech regulatory sandbox³¹ allows testing products and services in a real environment with limited resources such as space and

²⁴ International experience of application of “sandboxes”. The review was created as part of the activities of a block of members of the Collegium (Minister) of the Eurasian Economic Commission for Internal Markets, Informatization, ICT. P. 9. [text] [Electronic source] / <http://www.eurasiancommission.org>: official website of the Eurasian Economic Commission. Access mode: <http://www.eurasiancommission.org/ru/act/dmi/workgroup/materials/Documents/> (date of reference: 14.09.2019).

²⁵ Regulatory sandbox [Electronic source] / <https://www.fca.org.uk>: official FCA website. Access mode: <https://www.fca.org.uk/firms/regulatory-sandbox> (date of reference: 14.09.2019).

²⁶ Sandbox tools [Electronic source] / <https://www.fca.org.uk>: official FCA website. Access mode: <https://www.fca.org.uk/firms/regulatory-sandbox/sandbox-tools> (date of reference: 14.09.2019).

²⁷ Arizona's FinTech Sandbox [Electronic source] / www.azag.gov: site. Access mode: <https://www.azag.gov/fintech> (date of reference: 14.09.2019).

²⁸ How Fintech Regulatory Sandboxes Can Help the United States Catch Up to Europe and Asia [Electronic source] / www.lexology.com: Lexology — Globe Business Media Group site. Access mode: <https://www.lexology.com/library/detail.aspx?g=c408d6d7-a66c-490a-b5de-5167d48eaf75> (date of reference: 14.09.2019).

²⁹ Fintech regulatory sandbox [Electronic source] / asic.gov.au: ASIC — Australian Securities and Investments Commission. Access mode: <https://asic.gov.au/for-business/innovation-hub/fintech-regulatory-sandbox/> (date of reference: 14.09.2019).

³⁰ Regulatory guide 51: Applications for relief [text] [Electronic source] / asic.gov.au: ASIC — Australian Securities and Investments Commission. Access mode: <https://download.asic.gov.au/media/1238972/rg51.pdf> (date of reference: 14.09.2019).

³¹ Regulatory-sandbox <https://www.mas.gov.sg> [Electronic source] / www.mas.gov.sg: A Singapore Government Agency Website. Access mode: <https://www.mas.gov.sg/development/fintech/regulatory-sandboxhttps://www.mas.gov.sg/development/fintech/regulatory-sandbox> (date of reference: 14.09.2019).

time. Depending on the product, the MAS (Monetary Authority of Singapore) provides regulatory support during testing, and after an entity leaves the sandbox, all regulations must be followed.

In Thailand, the Bank of Thailand regulatory sandbox allows new players to enter the market from 6 to 12 months using the government platform. Enterprises are controlled by BOT, and in case of failure, all players (consumers and business operators) are protected from financial losses³².

In the UAE, ADGM (Abu Dhabi Global Market) RegLab³³ allows participants to test their products for 2 years. Support and mentoring of participants are provided by the ADGM, including financial institutions, venture capital, angel investors, etc.

In Hong Kong, the Fintech Supervisory Sandbox allows a limited number of participants to test new products. FSS has developed a system for collecting feedback from banks, high-tech companies, and users. This has accelerated project launches and reduced development costs³⁴.

It is noteworthy that already in 2016 the European Banking Federation presented a concept paper with recommendations for the creation of a pan-European fintech sandbox, which would allow companies to experiment with new transborder financial services³⁵.

The widespread use of regulatory sandboxes has demonstrated that this tool is one of the most effective ways for a regulator to manage changes in public relations. It is no coincidence that this model emerged in the fintech field, and started to spread to other industries.

In our opinion, the model of experimental legal regimes is in great demand for all aspects of AI technology.

³² Thailand launches regulatory sandbox for fintech services [Electronic source] / [www.vantageasia.com: Asia Business Law Journal](https://www.vantageasia.com/asia-business-law-journal). Access mode: <https://www.vantageasia.com/thailand-launches-regulatory-sandbox-for-fintech-services/> (date of reference: 14.09.2019).

³³ FinTech Regulatory Sandbox (RegLab) [Electronic source] / www.adgm.com: Abu Dhabi Global Market. Access mode: <https://www.adgm.com/setting-up/reglab/overview> (date of reference: 14.09.2019).

³⁴ Fintech Supervisory Sandbox (FSS) [Electronic source] / www.hkma.gov.hk: Hong Kong Monetary Authority. Access mode: <https://www.hkma.gov.hk/eng/key-functions/international-financial-centre/fintech/fintech-supervisory-sandbox-fss/> (date of reference: 14.09.2019).

³⁵ Innovate. Collaborate. Deploy. The EBF vision for banking in the Digital Single Market Brussels, 14 November 2016 [text] [Electronic source] / www.ebf.eu: European Banking Federation. Access mode: <https://www.ebf.eu/wp-content/uploads/2017/01/EBF-vision-for-banking-in-the-Digital-Single-Market-October-2016.pdf> (date of reference: 14.09.2019).

5. Setting requirements for AI systems used by financial institutions

In the financial sphere, neural network methods are intensively adopted in various fields and areas, ranging from basic research to data mining, forecasting, risk management, automatic rating and check reading, the security of bank card transactions, engineering applications etc³⁶. Information filtering and behavioral analysis are widely used in work with artificial intelligence algorithms in the financial sphere³⁷. Artificial Intelligence is successfully applied in modeling, analysis, and forecasting of slower and more regular economic processes, in particular, in investment activities, lending, and marketing. Artificial Intelligence also simplifies the processing of unstructured and disparate databases, which store information about individual objects, reducing the number of analysts working with each segment, thereby reducing the costs³⁸.

In this situation, there is quite a large (de facto — undefined) number of situations in which certain aspects of technology application will require adjustment of legal regulation.

Below, we will focus on some of the problems that are currently being addressed by regulators in most countries³⁹.

The problem of algorithmic transparency

The rule-based expert systems are usually transparent in their performance, although none of them are capable of learning and improving; in-depth learning, on the other hand, is excellent for examining large amounts of marked data, yet it is almost impossible to understand how such an AI system generates models. This ‘black box’ problem is significant in industries where social relations are highly regulated, for example, financial markets where regulators insist on familiarity with which decisions are made in a particular way⁴⁰.

³⁶ Sokolova I.S., Galdin A.A. Practical application of artificial intelligence in the digital economy // Models, systems, networks in economy, engineering, nature and society. 2018. № 2 (26). P. 77.

³⁷ Borzova E.P. The problem of the relation of human factors and artificial intelligence algorithms in economics and finance // Moscow economic journal. 2018. № 5 (2). P. 65.

³⁸ Ibid. P. 66–67.

³⁹ Some of the issues described here are highlighted in Artificial Intelligence and machine learning in financial services market developments and financial stability implications, 1 November 2017, Financial Stability Board [Electronic source] / <https://www.fsb.org/site>. Access mode: <https://www.fsb.org/wp-content/uploads/P011117.pdf> (date of reference: 14.09.2019).

⁴⁰ Davenport T.H., Ronanki R. Artificial intelligence for the real world // Harvard Business Review. Boston. 2018. Vol. 96. № 1/2. Pp. 108–116.

Data usage problem

The AI system is based on data, while in the financial sphere, personal data are highly sensitive. In addition, there are a number of secrets (e.g. bank secrecy) that also complicate the correct legal assessment of methods for collecting, processing, and using data to create AI systems. In this regard, Article 11 of the GDPR, which grants the right to «explain the decision made after the [algorithmic] evaluation» and related articles, which imply similar requirements, are illustrative. Meanwhile, some authorities are studying the issue of whether consumers generally should understand complex modeling methods for credit systems⁴¹.

The problem of discrimination

The introduction of AI systems may lead to discriminatory practices based on race or gender. Typically, it may not be targeted, but an unintended action resulting from incorrect original data. Designing non-discriminatory practices in using data is in the active phase, yet it remains an incomplete area of research.

The problem of responsibility is a classic issue for financial markets. In certain cases, questions may arise about the liability of a producer or a distributor of a financial product based on data or algorithms provided by a third party. Another aspect of the problem is the extent to which people may have the right to rely on expert systems in a wide variety of conditions; and who will be responsible when artificial agents perform an increasingly wide range of tasks⁴².

Intellectual Property problem

From the point of view of the financial sphere, this problem has a non-standard aspect. In the case of AI systems, the adjustment of intellectual property law is typically put in the context of ownership of objects created with AI, while in finance the issue is to guarantee the rights of software owners subject to disclosure, for example, of the models applied. Rigorous public financial regulation in many aspects is strict towards private law in the form of protection of intellectual property rights. Therefore, it is fair to assume that one of the key factors of transparency in the interaction between consumer, producer, and regulator is the availability of a standard toolkit for validating AI-based systems; such toolkit will have to meet the requirements of the regula-

⁴¹ *Gordon M., Stewart V.* Insights on Alternative Data use on Credit Scoring // CPFB Law 360. 2017. May.

⁴² *White L., Chopra S.* A Legal Theory for Autonomous Artificial Agents // University of Michigan Press. 2011. Chapter 4.

tor while leaving sufficient freedom to protect the intellectual property of the software producer and the owner of the training model⁴³.

The problem of transboundary nature of financial markets

Currently, the development of AI technology in finance is concentrated in a small number of countries, while its adoption can occur in financial institutions all over the world and affect any market. In this regard, it is important for regulators to progressively consider transboundary cooperation in implementing new technologies⁴⁴.

6. Proposed regulatory approaches

A large study, «The New Physics of Financial Services», conducted in August 2018 under the International Economic Forum, presents a detailed analysis of the prospects and problems of implementing AI technologies in the financial sector⁴⁵. At the same time, regulatory issues were identified as one of the key challenges in the industry. The study mentions that existing regulatory regimes do not keep pace with new technologies and create obstacles in revealing the potential of AI⁴⁶.

The above statements about the restrictive nature of regulatory regimes appear to be true for the development of AI technology in general. However, in the financial sphere, the situation is ambiguous.

First, in many cases, regulation can act as a driver for the implementation of developments or help to put the right emphasis on the regulation of social relations, which is beneficial not only to consumers but also to the in-

⁴³ Overview of regulation of financial markets No. 5 (18.11.2016–31.01.2017). Bank of Russia. P. 20 [text] [Electronic source] / www.cbr.ru: official web-site of the Central Bank of Russia. Access mode: https://www.cbr.ru/content/document/file/36014/ai_n.pdf (date of reference: 14.09.2019).

⁴⁴ Artificial intelligence and machine learning in financial services. Market developments and financial stability implications, 1 November 2017, Financial Stability Board [Electronic source] / <https://www.fsb.org>: site of Financial Stability Board. Access mode: <https://www.fsb.org/wp-content/uploads/P011117.pdf> (date of reference: 14.09.2019).

⁴⁵ The New Physics of Financial Services. World Economic Forum. By R. Jesse McWaters and others [Electronic source] / <http://www3.weforum.org>: site. Access mode: http://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf (date of reference: 14.09.2019).

⁴⁶ With translation and certain clarifications provided by us: The New Physics of Financial Services. World Economic Forum. By R. Jesse McWaters and others [Electronic source] / <http://www3.weforum.org>: site. Access mode: http://www3.weforum.org/docs/WEF_New_Physics_of_Financial_Services.pdf (date of reference: 14.09.2019).

dustry. Second, targeted regulatory non-interference or the use of soft law can also contribute to the development of the industry. Lastly, it should not be ignored that the financial sphere is very sensitive to both substantive public relations and regulation.

We believe that in the financial sphere, the lack of regulation can sometimes hinder the development of technology. Therefore, the uncontrolled introduction of algorithmic trading systems has once already raised questions from global regulators⁴⁷. For example, on May 6, 2010, starting from 2:42 a.m. North American Eastern Time, the Dow Jones index fell by almost 1,000 points in six minutes, the largest instantaneous collapse in its history. According to experts, the market lost \$1 trillion that day in literally a few minutes. Shares of some reputable companies completely depreciated, and some «blue chips» (such as Procter & Gamble) lost up to one-third of their value⁴⁸. This story was called a flash crash and the US Securities and Exchange Commission (SEC) hastened to blame HFT, a computerized trading algorithm that now represents more than 70% of turnover on the stock market⁴⁹. Although the culprit was later found to be an individual⁵⁰, the problem has essentially remained. The trader Navinder Singh Saraho, who allegedly collapsed the market at the time, used robotic algorithms for this purpose.

This situation is only a small prerequisite for the main problem. The introduction of any unregulated AI application technology may eliminate the desire of society to use it: partly because of fear, partly because there is no way to investigate or prevent a recurrence of an incident. In that case, regulation will no longer be able to help introduce technology.

This problem is well understood in the field of unmanned aerial vehicles, where the lack of regulation does not allow even testing of such vehicles, and

⁴⁷ Financial black swans driven by ultrafast machine ecology. Neil Johnson, Guannan Zhao, Eric Hunsader, Jing Meng, Amith Ravindar, Spencer Carran, Brian Tivnan [Electronic source] / <https://arxiv.org>: site of Cornell University. Access mode: <https://arxiv.org/ftp/arxiv/papers/1202/1202.1448.pdf> (date of reference: 14.09.2019).

⁴⁸ Robots collapse markets [Electronic source] / www.gazeta.ru: official site of the newsletter of "Gazeta.ru". Access mode: https://www.gazeta.ru/science/2012/02/21_a_4007981.shtml (date of reference: 14.09.2019).

⁴⁹ Destroy in nine seconds. How an unknown person has destroyed an algorithm [Electronic source] / <https://habr.com>: official website Habr. Access mode: IPO BATS <https://habr.com/ru/post/447834/> (date of reference: 14.09.2019).

⁵⁰ How a Mystery Trader with an Algorithm May Have Caused the Flash Crash. Silla Brush, Tom Schoenberg and Suzi Ring. 22 April 2015 [Electronic source] / www.bloomberg.com: news portal of Bloomberg. Access mode: <https://www.bloomberg.com/news/articles/2015-04-22/mystery-trader-armed-with-algorithms-rewrites-flash-crash-story> (date of reference: 14.09.2019).

any accident stops development (as in the case of the unfortunate accident involving an Uber car that hit a person). The same problem is emerging in finance, where lack of algorithmic transparency or control over algorithms can cause the most unpleasant consequences, in some cases.

Therefore, the solution to the problem of regulating AI technologies in the financial sphere is not unambiguous.

For this reason, we tend to believe that the position stated in one of the Bank of Russia's publications is correct: before elaborating specific approaches to regulation, it is necessary to determine general positioning of the role of the regulator in developing financial systems based on AI. The involvement of the regulator may range from publishing recommendations and sponsoring literacy programs to the active development of heterogeneous financial markets where, similarly to aviation, some «flights» will be conducted in unmanned mode⁵¹.

Another idea appears to be original, that one of the first steps to the regulation of relations of the consumer and the manufacturer of AI can be a creation of the consortium, issuing specialized licenses for software with the application of artificial intelligence, and also developing methodological and tool maintenance of validation of training models.

In our opinion, **the approach to regulation of AI systems in financial markets has to be distinguished by the following characteristics:**

1. **Hybrid regulation** that incorporates mandatory legislative requirements, recommendations, technical standards, self-regulatory tools.
2. **Continuous monitoring of the market** is something that makes financial regulators differ from other industries and is often lacking.
3. **Experimental regimes** that allow accurate testing of innovative technologies.
4. **High dynamics of regulatory influence** as a combination of the above-mentioned factors.

This model, in our opinion, is relevant for regulating AI technologies in general.

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⁵¹ Financial Market Regulation Review № 5 (18.11.2016–31.01.2017). Bank of Russia. P. 20 [text] [Electronic source] / www.cbr.ru: official website of the Central Bank of Russia. Access mode: https://www.cbr.ru/content/document/file/36014/ai_n.pdf (date of reference: 14.09.2019).

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