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Review

Directions of transformation of the financial market infrastructure

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Abstract: Financial markets have adopted measures aiming at strengthening insurance industry and digital financial assets. Efforts have also been made to strengthen the financial sector and expand lending opportunities in times of economic turmoil. The role of the central banks as a mega-regulator have played a crucial role in implementing coordinated policies and improving the stability of the financial sector. This review paper analyses 100 papers and proposes recommendations for policy makers. The results confirm the financial sector has shown positive performance indicators, and the capital market has become increasingly important along with non-credit financial institutions. However, the growing number of first-time investors in the capital market requires a renewed focus on consumer protection and financial literacy. In addition, the development of digital technologies has changed the landscape of financial services, forcing financial institutions to fight for continued customer loyalty.

Keywords: sustainability; transformation; growth; financial market infrastructure

1. Introduction

The financial market infrastructure includes trade, payment, accounting and information institutions. Financial market infrastructure is a platform where transactions with financial assets take place according to certain rules.

Digitalization has led to significant transformations in financial markets. Banks use modern information technologies to adapt to changing conditions in accordance with consumer requirements. This shift has triggered the development of a new set of information technology products in the banking sector. In response, banks have created neobanks or Challenger banks, which mostly operate in virtual environments. Consumers are increasingly directing their demand towards crowdfunding initiatives. The emergence of fintech includes a number of innovative information technologies in the financial industry.

In some cases, financial services are now offered by organizations that are not traditional banks, such as non-credit institutions. Despite the growth in the number of fintech companies, banking networks have not been completely replaced, but have adapted to changing conditions. Financial technology activities may include facilitating financial transactions or providing support services. Key areas of fintech

include robotic investing, online banking and payment systems, and others. At the same time, financial technology research institutions are actively cooperating with banks in order to integrate new technologies and introduce new services and products.

Traditional financial institutions have successfully adapted to the new requirements and standards brought about by digitalization. Fintech enterprises have mainly achieved significant success in the payment sector and currency transfers. An important area of financial technology is the lending sector, which includes services such as microloans. Platforms for connecting borrowers with lenders are being developed, and Internet banking services continue to develop. Currently, traditional financial institutions, including banks, have adapted to changing conditions, and fintech companies complement them rather than replace them.

New segments are emerging in the financial market: banks are optimizing costs by accelerating banking operations. Although blockchain technology provides secure transactions, its decentralized nature creates risks beyond individual segments and requires a reliable access system. The global financial system contributes to the convergence of the Anglo-American and continental models, reducing the gap between securities-based systems and banking systems. The use of machine learning algorithms allows you to quickly analyze huge amounts of data and take action in real time, improving the quality of customer service and the overall efficiency of banks.

Consequently, the financial market, including banking, stocks and securities, is moving to digital platforms. The spread of automated processes allows banks to expand the range of services offered and effectively manage customer requests. Modern banks apply a technology-oriented approach to risk management, using machine learning to adapt specific products to individual customers.

Digital technologies are undoubtedly the main driver of expanding and bringing to the market new classical financial instruments, that make it possible to make long - and medium-term investments in the economy. The topic of new classical financial instruments in the markets is becoming increasingly popular in the scientific literature. The evolution of this area of research has accelerated significantly since 2016. The current information base provides starting points and broad opportunities for new research (Sahabuddin et al., 2023). Researchers pay great attention to expanding the availability of financial services. Financial technologies have made an impressive step towards promoting a wide range of financial services to the masses. A special role in the development of the sector was played by the COVID-19 pandemic and the transfer of many business processes to “remote rails”. More and more attention is being drawn to artificial intelligence, which makes it possible to speed up process optimization and ensure a seamless transition of classic banking business models to modified digital ones. Digital innovations reduce transaction costs and lead to new business models and participants. However, classical economic factors such as economies of scale, maintaining healthy competition, and others remain equally important (Feyen et al., 2021). Nevertheless, the rapid digitalization of the financial market carries real risks for the global financial system and the stability of countries’ development. Many problems, such as uneven access to financial services, remain unresolved. Many digital solutions and products are still difficult to regulate and control (Suryono et al., 2020). In addition, many problems and reasons for the availability of financial services, as well as the real overall economic impact of the implementation, are still not covered.

The trend of integrating financial technologies continues to strengthen and make long- and medium-term investments in the economy. Bonds maturing in 10–15 years may become such instruments (Machkour and Abriane, 2020; Niemand et al., 2021). The nature of financial services is changing significantly. Nevertheless, banks still need to focus on attracting and retaining customers, maintaining their trust, and maintaining the principle of "banking as a service" (Broby, 2021; Mikhaylov, 2023; Stepanova et al., 2024).

Digital financial solutions have a positive financial impact on businesses (Daud et al., 2022). Financial technologies also help credit institutions and representatives of other sectors to achieve the Sustainable Development Goals better and faster. Organizations have more opportunities to focus on social responsibility (Ning and Zhang, 2023). Moreover, the impact of digital financial solutions, according to researchers, also has a positive impact on the efficiency of using natural resources (Ionaşcu et al., 2022). The expansion of the covered list of services offered by financial technologies also extends to the financing of companies. New opportunities are opening up for integrating new long-term classical financial instruments into crowdfunding and other types of investments (Bollaert et al., 2021).

2. Review of literature

Digital innovations reduce transaction costs and lead to new business models and participants. Classical economic factors such as economies of scale, maintaining healthy competition, and others remain equally important (Feyen et al., 2021; Giglio, 2021). However, the process of adapting financial markets to digital solutions and integrating them into familiar services requires overcoming certain barriers. These include issues of customer understanding of the market and products, the interest of customers and employees in innovation, the search for public and social benefits from the introduction of an innovative product (Diener and Špaček, 2021).

Modern technologies are used not only for customer service. Digital solutions are also integrated into the process of reporting, cost optimization, and automation of internal banking systems. Artificial intelligence plays a crucial role in this process, reducing the likelihood of human errors to a minimum and accelerating the technological transformation of accounting (Mosteanu and Faccia, 2020). Moreover, AI can already be called a separate milestone in the development of the financial market, which has a positive impact on the availability of high-quality financial services for representatives of the lower levels of the social hierarchy (Mhlanga, 2020).

Geopolitics changed the financial technologies fully (Abakah et al., 2023; Alshater et al., 2024; Hasan et al., 2024; Naeem et al., 2023).

In recent years, China has placed great emphasis on expanding the access of billions of people to financial markets, and has succeeded in this regard, thanks to which many large and medium-sized banks have already passed the stage of digital transformation and are focusing on expanding the range of new classical financial instruments provided (Hasan et al., 2022). At the same time, many countries still face insufficient development and distribution of digital services. In Europe, most countries remain at a low or medium level of financial technology development. There are also countries with a critically low level of digitalization of financial services: Bulgaria and

Romania (Pakhnenko et al., 2021). This may be due to the uneven distribution of financial flows between countries, even within the single economic bloc. Increasing access to financial services through digital channels has a positive impact on poverty reduction and contributes to economic growth in developing and developed countries. The main factors that reinforce this trend are cost reduction, economies of scale, increased security of client data, and so on. In addition to reducing operating costs, the increased availability of financial services makes it possible to serve remote areas without the physical presence of banks (Kitsios et al., 2021). In times of economic crises such as the COVID-19 pandemic, the release of new classical financial instruments and the overall digitalization of the global economy make life easier for the least protected segments of the population (Pazarbasioglu et al., 2020; Siddik, Kabiraj, 2020). It is important to note that the availability of financial services also has a significant positive impact on long- and medium-term investments in the economy. (Shen et al., 2021), which is especially important in large economic blocks where technology can flow smoothly from country to country.

One of the indirect factors of development, confidence-building and accessibility of digital finance remains the improvement of financial literacy. Researchers note that its growth among the population accelerates the introduction of new classical financial instruments, as well as expands the availability of financial services for private investors (Lo Prete, 2022). Until pre-pandemic 2019, the digital development of the financial market within major economies was particularly uneven. The example of China shows that the development of new classical financial instruments largely depended on economic centers, and access to innovative services was heterogeneous (Ding et al., 2021). A growing number of neo-banks are emerging in the global economy, characterized by a low level of trust in their activities, as well as a lack of economies of scale. This, in turn, carries the risk of loss of liquidity. Large banks, on the contrary, with the transition to digital business models, have more opportunities to retain customers and develop their IT infrastructure (Wewege et al., 2020).

As part of the study of the digitalization of the financial market, it is also worth considering the efforts of banks to develop digital marketing, which have become especially relevant in the era of COVID-19. It allows organizations from countries with a low level of population involvement in digital financial services to promote digital payments and other services (Darma and Noviana, 2020). The COVID-19 pandemic itself has had a particular impact on the progress of the financial sector. It has accelerated the development of financial technologies and their integration into the market due to the shift of many organizations' focus to remote service. The period of economic recovery after the end of the main phase of the pandemic triggered a rapid growth of the banking sector and a variety of business services. At the same time, it is becoming increasingly difficult to regulate innovations by law (Wójcik and Ioannou, 2020). "Contactless" services have become widespread in the era of COVID-19. And during the economic recovery phase, extensive investments were made in science and technology, which subsequently helped improve the quality of remote services provided (Zuo et al., 2021). Digitalization has allowed many small and medium-sized businesses in Iran to survive the economic shock through remote interaction with their customers (Mehralian and Khazaee, 2022).

A turning point and major stage in the development of the digital financial sector

has been the widespread integration of electronic payments, which, despite their positive effect, can carry a systematic risk for both customers and payment companies or banks (Risman et al., 2021). Another potential risk of digitalization of the financial sector is the likely influx of speculative investments. Foreign investment flows may negatively affect the consumer price index in developing countries (Okoyeuzu and Isa, 2020). Despite the fact that financial technologies facilitate household access to the financial market, it also creates certain risks. So, for example, there is a danger of getting more and more customers into the debt trap. Widespread adoption of digital solutions increases household participation in the financial market (Yue et al., 2022).

Table 1 shows the dependence of the degree of development of the digital services market and the popularity of using digital services of banks.

Table 1. Index of digital development of EU organizations in 2023.

Country	Organizations with very low digital development index	Organizations with low digital development index	Organizations with high digital development index
France	0.355	0.426	0.192
Italy	0.296	0.426	0.25
Norway	0.145	0.415	0.376
Serbia	0.218	0.405	0.328
Spain	0.317	0.4	0.246
Germany	0.22	0.399	0.335
Czech Republic	0.308	0.379	0.271
Netherlands	0.193	0.377	0.363
Slovakia	0.383	0.368	0.22
Cyprus	0.294	0.366	0.305
Estonia	0.323	0.362	0.271
Portugal	0.29	0.354	0.309
Belgium	0.22	0.353	0.334
Austria	0.318	0.35	0.287

Sources: Eurostat (2024).

The emergence of innovative drivers of economic growth in the context of digitalization creates new competitive conditions for counterparty relations. In the Russian Federation, the financial market and its individual segments have traditionally been the driving force of digital innovation.

In order to ensure the continued growth of the modern economy in the face of growing geopolitical risks, measures are needed to reduce internal risks and costs of financial transactions and create conditions for healthy competition. For these purposes, effective data exchange between financial market participants is necessary, which contributes both to the development of existing major players and reduces barriers to the emergence of new ones (Wang et al., 2023a, 2023b, 2023c; Li et al., 2023; Song et al., 2023).

Data exchange between participants should take place in a standardized manner to ensure market uniformity and security of information transfer between participants in information exchange, which requires the creation of a single market roadmap with

consistent routing of each participant's processes. They should provide measures to reduce the impact of risk factors and identify the mutual interests of financial market participants. Such an exchange also has an economic value—for example, credit institutions get a more complete picture of the client's creditworthiness and other qualitative and quantitative characteristics, which simplifies the management of the risk of financial transactions with them, and therefore reduces the amount of the necessary reserve for possible loan losses and allows targeted promotion of long-term instruments.

It should also be noted that the financial market of the Russian Federation has a high level of concentration of funds among large players in order to distribute capital more evenly among market players. The following studies confirm this.

In the Russian economic space, there is also a high share of users of financial services marketplaces, which, from the point of view of players who do not present their products on them, means the loss of a certain share of the potential customer base (He et al., 2023; Long, et al., 2020; Olowe et al., 2021; Rastogi et al., 2020; Zachariadis and Ozcan, 2022), which contributes to an improved customer experience in banking applications, due to which it is possible to use customer information from various sources (Murinde et al., 2022; Pazarbasioglu et al., 2020; Wewege et al., 2020).

Products related to investment activities, such as predictive models of the financial market, will also be developed based on obtaining information from various sources available using new medium - and long-term classical financial instruments (Alzoubi and Aziz, 2021).

The development of new classical financial instruments will also affect the payment industry of the financial market, due to the emergence of a new way to initiate payment and conduct operations through partner interfaces, instead of classical interactions within the bank interface (Billiam et al., 2022; Farrow, 2020; Lynn et al., 2020; Westermeier, 2020). Such interaction will ensure coordinated work of the state with the market, which will reduce regulatory barriers.

Coordinated work within the market will also contribute to the development of new long-term classical financial instruments (Nanaeva et al. 2021; Sloboda, 2020). The authors talk about the development of financial intermediation in a new paradigm-the distribution of financial products through marketplaces and partner interfaces, which allows us to develop new ways of financial intermediation (Stefanelli and Manta, 2023; Vaganova et al., 2022).

At the same time, research notes the need for major changes in legislation that will provide regulatory support for the development of new classical instruments in the financial market (Farimani et al., 2022; Fritsch et al., 2020). Many research authors note that in addition to the positive effects of new classical financial instruments, they carry risks associated with data transmission security, the need to develop separate specifications and "sandboxes" for testing and further standardization (Khurshidbek et al., 2022; Tsanakas, 2023). Ultimately, many researchers note that the development of new classical financial instruments will lead to a new type of ecosystem based on data exchange (Dinçkol et al., 2023; Ramdani et al., 2020; Valero et al., 2023). Assessment of the prospects for the development of new classical financial instruments in the Russian financial market includes the number of open interfaces of credit institutions and financial service providers of the Russian Federation connected

to the program during the study period, information on the concentration of mortgage, credit, and deposit market volumes, as well as information on the dynamics of opening remote service accounts (An et al., 2020, 2024).

In general, the financial technology has crucial meaning for the financial infrastructure and the development of new medium-and long-term classical financial instruments in the Russian financial market has great potential for increasing efficiency, expanding access, improving integration and stimulating innovation. This, in turn, can contribute to the growth and development of the economy as a whole.

3. Methodology

The methodology is based on analysis of 100 sources about financial market infrastructure that confirms the possibility of financial crises due to the fact that fluctuations in income and expenses, as a rule, are quite unpredictable and inaccurate, so operations are associated with unforeseen random events (Chernova, 2011; Kudryavtsev and Vdovina, 2010; Kutukov, 2008) (**Table 2**).

Table 2. Methodological process for searching and selecting the articles.

Country of research	Number of Papers	Keywords	Time period
United States	37	Financial market infrastructure	2015–2024
United Kingdom	4	Financial market infrastructure	2023–2024
Australia	3	Financial market infrastructure	2023–2024
EU	32	Financial market infrastructure	2023–2024
Japan	2	Financial market infrastructure	2023–2024
China	4	Financial market infrastructure	2023–2024
New Zealand	2	Financial market infrastructure	2023–2024
Russia	11	Financial market infrastructure	2008–2024
Korea	2	Financial market infrastructure	2023–2024
United Arab Emirates	3	Financial market infrastructure	2023–2024
Total	100		2008–2024

Source: Authors.

These literature about financial market infrastructure is temporary in nature. The main idea confirmed by researchers worldwide is that the possibility of temporary use of digital transformation by as well as their potential conversion, justifies the correctness of such terms as attracted funds. These funds can be temporarily used although only as a source of investment. Investment efforts of financial market organizations are supported by the mechanism of distribution of financial market reserves. The fulfillment of contractual obligations, financial guarantees and the impact of inflation require the insurer to develop a carefully thought-out and fair investment strategy. In conditions of acute economic instability, the investment risks of a financial market company should be reduced by investing financial market reserves in the safest forms that bring a modest but stable profit.

4. Discussion

The definition of financial market reserves is mainly based on the assessment of

the insurer's outstanding obligations, which leads to their adjustment depending on fluctuations in financial market obligations. The increase or decrease in the size of financial market reserves is directly proportional to the increase or decrease in financial market liability. An increase in financial market reserves is permissible only in the event of a sharp increase in the insurer's contractual obligations. The calculation of the insurer's reserves is based on the basic principle of accounting, which consists in determining the financial results of an economic entity. It is important to note that income expressed in the form of financial market premiums relates exclusively to the period of their accrual, and expenses indicated by financial market payments are recorded in the reporting period in which they occurred. There are different points of view on the definition of financial market reserves. In the generally accepted definition of financial market reserves, they represent a set of target cash reserves that contribute to the fair distribution of losses among financial market participants (Chernova, 2011; Kudryavtsev and Vdovina, 2010; Kutukov, 2008).

In fact, financial market reserves serve as specialized funds for financial market companies, carefully formed at the expense of financial market premiums, with the sole purpose of fulfilling the obligations of insurers to policyholders. When formulating the concept of financial market reserves in actuarial science, a slightly different approach is used. The estimation of the financial market reserve value is based on an idealized mathematical model that determines the dynamics of the cash pool formed from incoming financial market premiums, taking into account payments. Risk financial market assumes that financial market payments are made continuously during the entire term of the contract. At the end of the financial market period, the value of the fund should ideally be zero, which means that the total amount of the financial market premium is equal to the amount of financial market payments. The amount currently held in the fund is the amount required to secure future payments based on future income. This quantification is an estimate of the insurer's liabilities or, in other words, the financial market reserve. In scenarios where the financial market premium is transferred in a lump sum, the amount of the financial market reserve approximately corresponds to the present value of future payments. Conversely, if the financial market premium is paid in installments, the financial market reserve corresponds to the present value of future financial market payments deducted from the present value of future financial market premiums. In addition, the cost of financial market transactions is included in the total amount of financial market payments (Chernova, 2011; Kudryavtsev and Vdovina, 2010; Kutukov, 2008).

The topic of optimizing the diversification of financial market companies' reserves into innovative assets is extremely relevant in modern conditions. Financial market companies, due to the nature of their activities, are forced to distribute the received financial market premiums to various financial institutions. Consequently, investing these premiums is a critical aspect of long-term life financial market, retirement plans, and various other financial market products. In addition, investments in financial market reserves and company funds serve as an important additional source of income for insurers. Therefore, financial market companies are currently paying increased attention to managing investments received from collected financial market premiums and internal funds. The review of investment policy is constrained by the urgent need to comply with the regulatory framework governing the assets

allowed to cover financial market reserves. A comprehensive analysis of insurers' performance shows that current investment indicators are relatively low and have minimal impact on the increase in domestic funds. Therefore, it is extremely important to periodically review the structure and structure of assets held for reservation, in accordance with the prevailing external conditions in which financial market companies operate. This requires a reassessment using systematized data on various investment instruments that are currently relevant. This assessment should include an assessment of their actual reliability, liquidity, and profitability, followed by adjustments to the existing regulatory framework (Chernova, 2011; Kudryavtsev and Vdovina, 2010; Kutukov, 2008).

The structural dynamics that determine the types of assets accepted for provision of financial market reserves have been changed. It is noteworthy that the permissible share of shares, bonds and real estate was increased, and the total value of assets accepted for replenishment of internal funds does not correlate with assets located on the territory of the Russian Federation. The marginal distribution of government securities issued by constituent entities of the Russian Federation and municipal securities is differentiated depending on the specific type of financial market for which these reserves are intended (for example, life financial market and other categories). Theoretically, the insurer's reserves can be allocated to various sectors of the national economy. For example, in the Western financial market, fixed income securities, as well as shares of industrial and transport companies, are highly preferred, since they can bring large profits. However, the prevailing investment landscape of Russian financial market companies is more focused on investments in OFZs (Chernova, 2011; Kudryavtsev and Vdovina, 2010; Kutukov, 2008). In the pension fund industry, experts point to two important reasons for the growing interest in alternative assets: historically low interest rates and trends in portfolio diversification. Experts point to two important reasons for the growing interest in alternative assets: historically low interest rates and trends in portfolio diversification. However, studies do not provide empirical evidence to support this conclusion (Farrow, 2020; Hensen and Kötting, 2022; Nugroho and Supangkat, 2023; Ramdani et al., 2020).

Academic literature on alternative assets and portfolio diversification focuses primarily on the diversification benefits that alternative assets bring to pension fund portfolios. To determine the behavior of pension fund portfolio diversification, we use two different variables: complex investor and international stocks. The first variable, "complex investor", is a dummy variable for pension funds that do not invest more than 60% of their portfolio in a single asset class (An and Mikhaylov, 2020; Mutalimov et al., 2021; Mikhaylov, 2021; Mikhaylov et al., 2023; Moiseev et al., 2023).

That is, pension funds that invest more than 60% of their portfolio in a single asset class are defined as paying less (or little) attention to portfolio diversification trends. In this article, pension funds are referred to as 'traditional investors'. The 60% bound is based on classic asset management practices that recommend 60/40 stocks-bond portfolios for optimal long-term returns (Broby, 2021; Kellezi et al., 2021; Nam, 2023).

5. Conclusion

The main direction of transformation of the financial market infrastructure is fintech development based on technological progress, economic conditions, social dynamics, institutional frameworks, regulatory frameworks, and even geopolitical conditions.

The share of sophisticated investors has increased dramatically over the past decade, from 47.6% in 2000 to 77.3% in 2015. Especially after the 2008 financial crisis, we are seeing an important shift in the sample. In fact, this indicator confirms that more and more pension funds are realizing the potential benefits of portfolio diversification and are trying to implement new management methods. The second variable, "international stocks", is the percentage of the stock portfolio invested in foreign markets. Equity funds invest less in stocks when interest rates rise. This observation is in line with expectations, as higher interest rates put pressure on the stock market and encourage pension funds—and other long-term investors—to reallocate part of their portfolio into bonds.

Pension funds have increased their investment in alternative assets due to low interest rates. The analysis confirms the importance of portfolio diversification and raising interest rates on alternative assets. Pension funds with more active participants own riskier assets. This observation is consistent with the investment theory of the life cycle: pension funds with younger participants may own riskier assets, since young employees, compared to older employees, want to get more profit from the diversification between human and financial capital.

An allocation policy (or strategic asset allocation) is a long-term investment plan of a pension fund that determines the policy weights (i.e., the portion of the portfolio) invested in different asset classes. In practice, the policy allocation is adapted to market trends.

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