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Trends in the Evolution of the Digital Financial Assets Market in the Context of the Digital Transformation of the Global Economy

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ABSTRACT

The study focuses on identifying the driving forces behind the digital transformation of the economy in the financial sector and the development of the digital financial assets (DFA) market. The **subject** of the research is the factors of digital transformation and the DFA market. The **relevance** is due to the transformation of the world economy, associated, among other things, with the active development of the DFA market, the expansion of the possibilities of using distributed ledger technologies (DLT) and blockchain against the background of high growth rates of the cryptoasset market. The **aim** of the paper is to summarize the main trends in the development of the global cryptoasset market, determine the main factors of investment attractiveness of cryptocurrencies and explore the conditions for the successful implementation of various models of digital currencies of central banks (CBDC). In the course of the work, the **methods** of systematization and classification of information, multivariate statistical analysis were used. As a **result** of the study, 5 clusters of cryptocurrencies were identified, depending on the dominance in the market and the dynamics of price changes. The resulting functions can be used to predict the attribution of cryptocurrencies to the corresponding clusters. Among the factors that have a significant impact on the development of CBDC projects in general and with the wholesale model in particular, one can single out "capital". At the same time, CBDC projects with a retail model are actively and successfully implemented in countries with a high level of technical knowledge and entrepreneurial talent, ahead of the capital factor in their importance. Taking into account the review of global trends, the development of fintech technologies, it was **concluded** that the processes of digitalization of financial assets are inevitable, the emergence of new forms of digital assets that dictate the need for the advanced development of their legal regulation.
Keywords: digital financial assets; cryptocurrency; digital currency; digitalization; fintech

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INTRODUCTION

Huge interest in the development of blockchain technologies in the financial sphere and the emergence of digital financial assets (DFA) is connected with the active phase of the V technological order based on digital technologies. The pandemic has also accelerated the digitalization of both the global and Russian economies.

In order to monitor processes and assess the effectiveness of digital transformation, various global institutions are monitoring them, resulting in a large number of different indices and ratings.

For example, according to the Maturity Index GovTech 2020 of World Bank's, Russia is not among the group of leading countries in the field of digital transformation of the public sector, but the process is highly valued as focused on GovTech [1]. The methodology for calculating the index involves the following stages in the evolution of the public sector, depending on the state of the technological base and the organization of processes: analog government, e-government, digital government, GovTech government. The last stage is characterized by a system-wide public approach to the introduction of digital technologies, capable of ensuring universal access to services for citizens, a simple, efficient and transparent system of government.

Another indicator that measures the scale of the digital transformation of the economy is the Digital Competitiveness Index IMD. By this indicator, Russia moved from 38th to 43rd place in 2020, improving position in 2021 to 42nd place (*Fig. 1*).

According to the given rating in Russia the situation has improved on the factor of "knowledge" and "readiness for the future", and worsened — by factor "technology" due to deterioration of rating by sub–factor "capital" and "technological structure".

Similar to the previous UN rankings, the rating of e–government development is EGDI, which is represented by three factors: online services index (OSI), telecom infrastructure index (TII) and human capital index (HCI).[1] Russia ranked 36th on this indicator in 2020.

Thus, the digitalization of all fields of activity has become central to the global competitiveness of national economies.

DIGITAL FINANCIAL ASSET DEVELOPMENT

The financial sector responded to this process with the emergence of digital financial assets [2] and fintech, including technology–based distributed registries and blockchains [3]. While there are "Blockchain 1.0" — operations with cryptocurrency; "Blockchain 2.0" — transactions outside of cryptocurrencies; "Blockchain 3.0" — operations in the spheres of state and municipal administration, health care, education, Internet of things [4].

However, the emergence of a new type of financial asset — digital — and the new technological base have created some difficulties in its regulation and application.

Can be identified the following main problems that constrain the development of the DFA market in Russia at present:

- insufficient legal framework for the regulation of certain types of DFA [2, 5];
- initial stage of development of the DFA turnover infrastructure;[2]
- cautious attitude financial regulator to blockchain platforms, prohibition on the use as a means of payment and exchange of the most important type of DFA — cryptocurrency [2];
- initial state of standards and infrastructure for interoperability of blockchain platforms;[3]

[1] UN research: e-government 2020. URL: https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20-%20Russian.pdf (accessed on 19.10.2021).

[2] Currently there are no certified DFA market operators. Masterchain "Fintech" Association's blockchain platform is certified by the Federal Security Service of the Russian Federation and in the future may become the first information system — certified operator of the Russian DFA market.

[3] At the same time, the Visa payment system made the first transfers with cryptocurrencies and launched in a test mode on the basis of the Ethereum Ropsten network a prototype of the universal payment channel (UPC), in the future allowing for the conversion of various digital assets (tokens, stablecoins, CBDC).

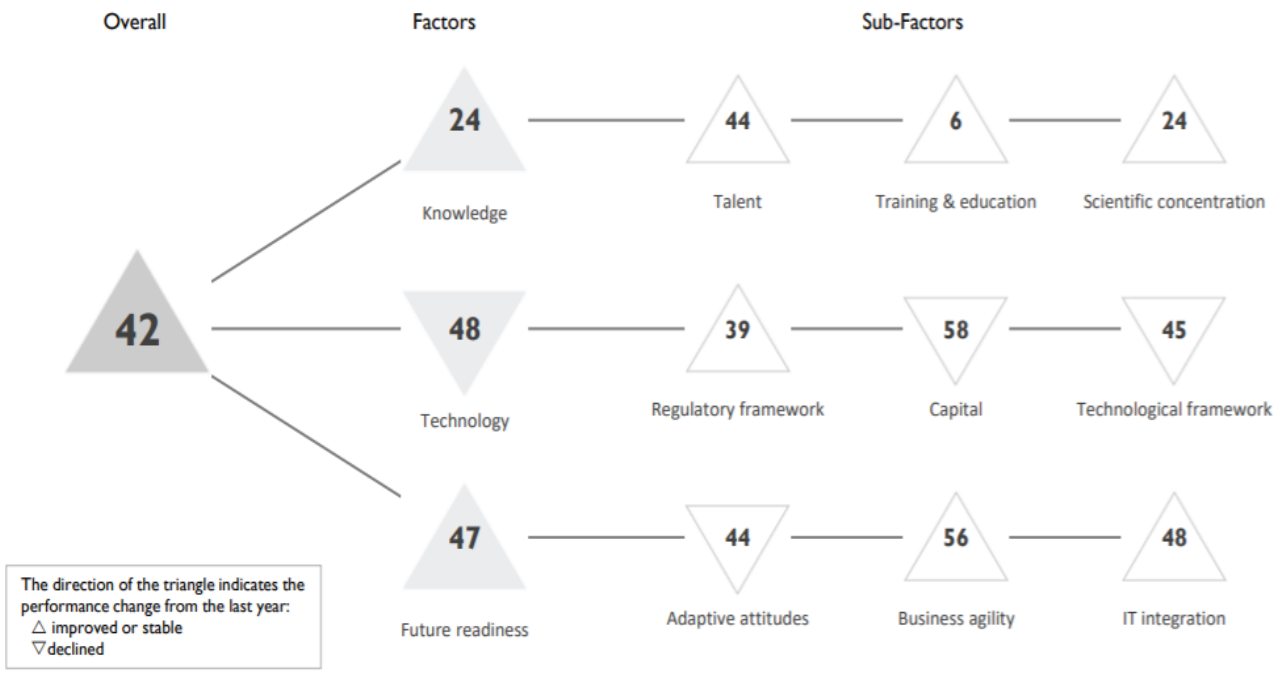

Fig. **Profile of Russia by IMD Global Digital Competitiveness Ranking 2021**

Source: Institute for Management Development (IMD). World digital competitiveness ranking 2021. URL: https://www.imd.org/centers/world-competitiveness-center/rankings/world-digital-competitiveness/ (accessed on 19.10.2021).

- high risks associated with non-compliance with international standards on combating money laundering and the financing of terrorism (CML/FT) and enforcement capacity [6];
- risks to the stability of the financial system and the provision of information security measures at the introduction of the national digital currency [7];
- high volatility and speculation of the cryptocurrency market [8];
- relatively few Russian startups in the field of application and distribution of DLT technology.[4]

At the same time, the global market of DFA is actively developing — there is a high rate of growth of the market of crypto assets and investment in research to expand the opportunities for practical application of DLT-technologies.

According to CoinGecko, the market capitalization of the crypto market in 2020 demonstrated a historic maximum of 732 bln USD: capitalization growth of the top — 30 coins amounted to 308%, and the capitalization growth of the top-5 stablecoins-439%.[5]

Tether remained the dominant stablecoins with market share over 76%. Stablecoins growth in 2020 exceeded the previous year's growth (107%) due to strong demand from traders using stablecoins for trade and cross-border settlements. Bitcoin (BTC) in 2020 showed a return of 303% and significantly outperformed all major classes of financial assets.[6]

In 2020, there was also a boom in financial innovation related to decentralized finance — DeFi (flash credits, automated market makers, pharming income, algorithmic stablecoins). Capitalization of DeFi market at the end of the year amounted to 20.4 bln USD, average price increase DeFi-tokens — 718%. The 2021 year was marked by explosive growth of memcoins.[6]

As a result of the rapid development of the crypto market, the total number of crypto-

[4] Based on the Skolkovo projects.

[5] Data from CoinGecko. 2020 Yearly Cryptocurrency Report. 2021. URL: https://assets.coingecko.com/reports/2020-Year-End-Report/CoinGecko-2020-Report.pdf, (accessed on 19.10.2021).

asset accounts for service providers for the period 2016–2020 increased by 4 times, to 191 million new accounts [9].

Based on the results of the review of the literature, the following trends characteristic of the development of the world crypto market were identified:

- cryptocurrency market is characterized by the transition from monopolized to competitive [10];
- predictability of cryptocurrencies returns decreases with their market liquidity [11];
- cryptocurrency price dynamics depend on bitcoin price dynamics. And bitcoin is the safest asset in the cryptocurrency ecosystem [10];
- disproved the hypothesis that cryptocurrencies are considered an alternative to fiat currencies or regulated finance [12];
- due to the high volatility of cryptocurrencies are seen more as investment speculative instrument than as monetary units [13, 14];
- active development of blockchain platforms that extend the scope of DLT technology: 19 of the top 20 tokens are built on Ethereum;
- Ripple was able to attract more than 100 banks to its platform, Western Union [10] and Visa, invested 250 mln USD in support of Non-Fungible Tokens (NFT);[6]
- rapid development of decentralized finance services (DeFi), decentralized applications (DApps), NFT [15];
- use of DLT by regulators in SupTech and RegTech (47% — share of the technology)[7];
- the possibility for investors to use bitcoin to diversify their investment portfolio during economic and political crises, in case of significant oil price fluctuations [11];
- most ICOs are in information goods industries with marginal production costs near to zero, and in innovative industries where entrepreneurship plays an important role. In financing preference should be given to token, rather than equity in case of low volatility [16];
- ICO is expected to be more distributed for businesses:

– developing information and products with low marginal production costs;

– demanding entrepreneurial efforts;

– developing products with relatively low demand volatility;

– working in industries with moderate information asymmetry between entrepreneurs and external investors [16];

- monopoly on the mining market: mining pools (10% of all miners) control 80% of cryptocurrency production. 30% of miners considered that the leadership of the pools determines the decision [9];
- 51% attack threat for blockchain projects based on Proof-of-Work (PoW) consensus algorithm. Development of projects on the Proof of Stake (PoS) protocol will mitigate these risks and increase transaction security;[8]
- cryptocurrency exchanges are mainly used for fiat transfers (conversion of fiat currencies into cryptoassets and back);
- retail customers of crypto exchanges constitute the vast majority (from 63 to 75% depending on the region), the share of business and institutional customers ranges from 10 to 30%. Crypto–hedge–funds account for the largest share of institutional and business clients,[9] miners and online–shop [9];
- the overwhelming share of service providers in the cryptomarket of the Asia-Pacific and North American regions has reserves of cryptoassets, which increases customer confidence in them;
- the largest share of licenses of legal entities operating in the cryptomarket were issued by regulatory authorities of the UK and the US (23%). 72% of licensees or applicants have received or applied for a license/registration in their country. Among the types of licenses ob-

[6] RRC article. Ripple has launched a $ 250 million fund to support the NFT industry. 2021. URL: https://www.rbc.ru/crypto/news/61548d199a79472745fb1bac (accessed on 19.10.2021).

[7] Data of the Bank of Russia. Main directions of development of technologies SupTech and RegTech for the period 2021–2023. 2021. URL: http://www.cbr.ru/Content/Document/File/120709/SupTech_RegTech_2021–2023.pdf, (accessed on 19.10.2021).

[8] Despite the fact that BTC is based on the protocol Proof-of-Work, to carry out the attack 51%, experts estimate that miners will need about 1 billion USD, which makes this event unlikely and indicates the BTC's stability to this threat.

[9] Excluding Middle East and Africa.

tained, the largest share are licenses for cryptocurrency operations (42%), payments and e–money (29%) [9];

- before the introduction of restrictive measures for cryptocurrency mining, China ranked first with a share of 52%, the share of the US and Canada was 12 and 9%, the share of Russia and Kazakhstan — 4% each [9];
- the overwhelming number of cryptomarket service providers supports BTC (90%), the share of support providers of the most popular types of cryptocurrency (ETH, LTC, BCH, XRP) ranges from 74 to 47% [9];
- among the most significant risks to miners in Europe and North America are the risk of centralized capacity in the hands of criminals, the concentration of equipment and miners in a certain geographical area;
- among the most significant risks for service providers in the cryptomarket are identified risks in the field of IT-security and increasing the burden normative regulation of the market [9];
- the most attention of regulators are: consumer protection, the KYC process (know your customer) for remote identity, lack of understanding and awareness of risks, cyberstability and reliability of technological platforms;[10]
- 43% of countries identify fintech as a financial stability risk. In low–income countries, this figure is 57%;[11]
- there is no ban on crowdfunding in 77% of jurisdictions, primary coins and cryptocurrency issuance (mining) is allowed in 67% of, crypto exchanges — in 61% of countries;[11]
- anonymous participation in crowdfunding is prohibited in 13% of countries, the initial release of coins and the issuance of cryptocurrencies (mining) — in 3 and 2% of countries respectively. At the same time, the proportion of countries banning anonymous participation in crowdfunding and crypto exchanges is significantly higher among high-income countries — 16%;[11]
- among the countries that have established regulatory "sandboxes", 66% of these are owned by central banks or other regulatory authorities. In most countries (67%) "normative sandboxes" are separated from payment systems. Testing in "sandbox", as a rule, lasts from 6 months to a year;[11]
- 54% of countries study the pros and cons of Central Bank Digital Currency (CBDC), but have not yet made a decision, and 15% have already decided not to issue CBDC after studying the technological, monetary and financial aspects of stability.[11] High-income and lower middle-income countries are more active in CBDC [17];
- Among the instruments of fintech regulatory are the most popular: issuance of recommendations and standards on individual risks related to fintech-services (54%), and monitoring of providers according to requirements CML/FT (51%), formation of requirements to operational unprofitability and information security (49%);[11]
- "fintech" is considered by most low–income countries as a means of financial integration into the global economy [18];
- those who will cryptocurrency transactions, inherent in the following motivation [19][11]: participate in gambling — 47%, investment portfolio expansion — 25%; desire to acquire a new type of financial asset — 22%; long-term savings — 17%, ideological reason[12] — 17%;
- 31% of consumers who own but are not currently going to buy more cryptocurrencies report that this is due to the fact that they consider the purchase too risky;
- 73% of consumers who do not currently own cryptocurrencies, but plan to buy it in the future, said that the lack of regulatory protection affected their decision not to buy cryptocurrencies today;
- 29% of consumers who do not currently own and do not plan to buy cryptocurrencies,

[10] International Bank for Reconstruction and Development / The World Bank. Summary outcomes of the fifth Global payment systems survey. 2020. URL: https://www.worldbank.org/curated/en/115211594375402373/pdf/A-Snapshot.pdf, (accessed on 20.10.2021).

[11] Based on a survey of cryptocurrency consumers in the UK.

[12] For example, distrust of the ideological system.

Table 1

Rating by categories of cryptocurrencies

Rating by rate of the average weighted price		Rating by market capitalization	
1	Real estate	1	Smart-contracts
2	Doggone Doggerel	2	Stablecoins
3	File sharing	3	Decentralized finance (DeFi)
4	Distributed computing	4	Exchange tokens
5	Memes	5	Binance Smart Chain ecosystem
6	Media	6	Centralized exchange token (CEX)
7	VR/AR	7	Solana ecosystem
8	Retail	8	Polkadot ecosystem
9	Earning game	9	Polygon ecosystem
10	Solana ecosystem	10	Cosmos ecosystem
11	Smart-contracts	11	Management
12	Collaborative economy	12	Decentralized exchange token (DEX)
13	Hacken Foundation	13	Farming
14	Identity	14	Memes
15	Pantera Capital's Portfolio	15	Non-fungible tokens (NFT)

Source: data from Coinmarketcap and Coingecko on 03.10.2021. URL: https://coinmarketcap.com/cryptocurrency-category/; https://www.coingecko.com/en/categories# (accessed on 03.10.2021).

agreed with the statement that they will consider buying cryptocurrencies in the future, if this is regulated [19];[13]

- among the information sources from which consumers learned about cryptocurrencies, the most popular are: traditional media (27%); news and blogs on the Internet (27%); social media (15%). In 45% of cases, advertisement affected the acquisition of cryptocurrency. Those affected by the advertisement are more likely to later regret the purchase;
- 85% of all current owners of cryptocurrencies did not regret their purchase, 17% of cryptocurrency owners reported negative experience of ownership/purchase of cryptocurrencies (exchange fees, transaction time, stolen cryptocurrencies and volatility of cryptocurrencies) [19];
- 77% of respondents bought cryptocurrency through online-exchanges [19];
- among cryptocurrency options: 47% never used cryptocurrency, 27% used it to purchase goods and services, 25% used cryptocurrency to exchange for other cryptocurrencies [19];

[13] Based on a survey of cryptocurrency consumers in the UK.

Table 2

Component scoring coefficient matrix

Indicators	Components	
	1	2
Market capitalization, mln USD	0.558	0.000
Trading volume (24 ч), mln USD	0.558	–0.001
Price changes (24 hours), %	–0.001	0.639
Price changes (7 day), %	0.000	0.639

Source: compiled by the author with SPSS statistical package.

Table 3

Final centers of clusters

	Cluster number				
	1	2	3	4	5
Market dominance	59.14327	–0.02775	34.71369	–0.02102	–0.01739
Dynamics of price changes	0.03651	2.10307	–0.07868	–0.15378	10.18622

Source: compiled by the author with SPSS statistical package.

• cryptocurrency consumer portrait is as follows: their owners are more educated; men tend to invest more in cryptocurrencies than women; among the various cryptocurrencies, owners of XRP and Ether are the most educated, and owners of Litecoin — the least educated, owners of cryptocurrency have a level of family income above the average, and owners of XRP, Ether and Stellar are the richest [12]; higher income, higher education and digital financial experience increase of acquiring at least one cryptocurrency [12];

• in the market capitalization rating by categories of cryptocurrencies, the leading platforms are smart contracts, stablecoins and DeFi, while in the rating on the price increase criterion — cryptocurrency by categories of real estate, Doggone Doggerel, file sharing (*Table 1*);

• intensifying regulatory requirements has had a strong impact on cryptocurrency prices and transaction volumes, resulting in the recommendation to apply technologically neutral regulation to this class of assets, applying "built-in supervision" and using the potential of the technology itself in the oversight process [12].

Despite a large number of recent research on blockchain and crypto assets to ensure the development of DLT applications, opportunities, boundaries and risks, related to the spread of private and the issue of national cryptocurrencies, forecasting the state of the crypto market, the economy of the blockchain, systematic research on digital financial assets is still insufficient.

The author's own study on the cryptocurrency market focused on the investment attractiveness of cryptocurrencies based on a classification of 6056 cryptocurrencies by capitalization criteria, trading volume and price dynamics.[14] For this purpose the methods of factor, cluster and discriminant analysis were used.

[14] Data from Internet sources as at 06.08.2021. URL: https://ru.investing.com/ (accessed on 06.08.2021).

Table 4

Coefficients of the Fisher classification discriminant function

	Cluster number				
	1	2	3	4	5
Market dominance	3145.760	–1.943	1846.398	–1.092	–2.703
Dynamics of price changes	–10.302	6.401	–6.326	–0.399	28.558
Constant	–93049.866	–8.958	–32057.475	–1.650	–147.442

Source: compiled by the author with SPSS statistical package.

Based on the application of factor analysis of the main component using varimax rotation, were identified 2 factors, which, taking into account the values of the estimates of the coefficients of components, can be characterized as domination of the cryptocurrency market (1 component) and dynamics of price change (2 components) (*Table 2*).

By hierarchical cluster analysis the structure of data on cryptocurrencies in the section of the selected components was studied and it was found that the most acceptable is the allocation of five clusters. Next *k*–average sampling method was divided into five clusters, their centers (*Table 3*) and belonging to clusters of each cryptocurrency.

The first and third clusters are cryptocurrencies with absolute market dominance and moderate price dynamics. Cryptocurrencies belong to the second cluster are characterized by positive moderate price dynamics with little market dominance. The fourth cluster is represented by cryptocurrencies with little dominance and negative price dynamics. Cryptocurrencies are included in the fifth cluster with significant price increases and also slight market dominance.

In this case, the first cluster represents Bitcoin (BTC), the second cluster includes 259 cryptocurrencies, the third cluster — Ethereum (ETH), stablecoin Tether (USDT),[15] to the fourth — 5743 currencies, to the fifth — 23 cryptocurrencies (FIS, YFIII, DBIX, ETGP, ZUM, WTN, ZET, IRA, AAA, GR, AVC, TCFX, SVN, LMCH, KIWI, TAVITT, TRONX, DGMT, HP, KTN, ETHV, KMW, YFIKING).

Thus, it can be noted that cryptocurrencies of the first, third and especially fifth classes were of significant investment interest to consumers in the period under review.

Discriminant analysis was used to determine the rules for classifying cryptocurrencies to the selected groups (*Table 4*). However, 99.4% of the observations were correctly classified.

Wilks' lambda test with significance $p \leqslant 0.001$ indicates a difference in the average values of the discriminant functions received. Calculation of canonical correlation (0.991) and (0.802) also showed a strong correlation between factors and indicators of cluster membership.

These functions can be used to predict the assignment of cryptocurrencies to the appropriate classes — observation (cryptocurrency) belongs to the group that corresponds to the highest value of the discriminant function.

The next question the study examined was the conditions under which countries are successful in releasing CBDC. Then, authors were applied methods of correlation and discriminant analysis.[16]

[15] Originally released on the Bitcoin blockchain, since 2017 it is released on the Ethereum blockchain, is linked to the US dollar.

[16] The application of factor analysis to reduce the sample size of indicators was not satisfactory.

In the research used a set of 74 indicators for 167 countries from the following data sets:

- information base for the research of national digital currencies — Auer R., Cornelli G., Frost J. (2020) [20];
- World Bank data on digital–projects of National Governments;[17]
- UN research on e-government in 2020;[18]
- World Bank research on global financial development in 2020;[19]
- data for the World Bank research on global digital competitiveness in 2020.[20]

Assessment of the relationship between the level of development of CBDC [21] projects and the selected variables was assessed using the Spearman's correlation coefficient, because some of the variables involved in the analysis were sequential and not properly distributed.

Correlation analysis (*Table 5*) found that the level of development of national CBDC projects is statistically significant correlated with the factors that characterize:

- Indices of development of online public sector services, e–participation, open and e–government; human capital development index and years of learning; telecommunication infrastructure development index, including active population using the Internet, mobile and fixed broadband, mobile phones for payments; level of availability of financial services (availability of the population with debit and credit cards, salary cards, accounts in a financial institution, accounts used for the acceptance of state payments, ATMs) — positive below-average correlation;[22]
- Payments and obligations for Government digitalization projects, including information and communication technology projects (ICT) and e-government — weak positive correlation;[23]
- Ratio of bank overhead costs to total assets; inflow of money transfer to GDP; Countries ranked on the World Digital Competitiveness Index (IMD, 2020) and its sub–factors in 2020 — negative correlation below average;[24]
- Bank's net interest margin — weak positive correlation.[25]
- The same factors are also related to the level of development of the CBDC retail model. However, the correlations for this model are weaker than in the overall assessment of CBDC's level of development. Even weaker correlation with CBDC wholesale project status assessment.
- By a step-by-step discriminant analysis, an attempt was made to construct classification functions for predicting the state of various CBDC models. Thus, the following functions have been given the best result in terms of correctly classified values:
- for an overall assessment of the CBDC project status, coefficients of the Fisher classification discriminant function are presented in *Table 6*.

However, the share of correctly classified observations in the use of these rules was 50.8%.

Wilks' Lambda test with significance criterion p = 0.001 indicates a very significant difference in the average values of the discriminant functions received. However, calculation of canonical correlation (0.463) showed a fairly low level of correlation between factor and state group CBDC.

Quality of Fisher's classification discriminant functions (*Table 6*) is rather

[17] Digital Governance Projects Database. URL: https://datacatalog.worldbank.org/search/dataset/0038056/ (accessed on 20.10.2021).

[18] UN Study: e-government 2020. URL: https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20-%20Russian.pdf (accessed on 19.10.2021).

[19] Global Financial Development Database. URL: https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database; (accessed on 20.10.2021).

[20] IMD World Competitiveness Center. IMD World digital competitiveness ranking 2021. URL: https://www.imd.org/centers/world-competitiveness-center/rankings/world-digital-competitiveness/ (accessed on 19.10.2021)

[21] Rating scale: 0 — the project is not formed; 1 — the initial level of development of the project; 2 — the project is successfully developing; 3 — the digital currency is launched.

[22] 0.3 < Coeff. correlations ⩽ 0.5.

[23] 0 < Coeff. correlations ⩽ 0.3.

[24] — 0.5 < Coeff. correlations ⩽ — 0.3.

[25] — 0.3 < Coeff. correlations ⩽ 0.

Table 5

Spearman's correlation coefficients

Criteria	Overall evaluation of the CBDC project	Retail evaluation of the CBDC project	Wholesale evaluation of the CBDC project
E-government development index (EGDI), 2020	0.472**	0.423**	0.233**
Online Services Index, 2020	0.511**	0.472**	0.276**
Telecom infrastructure index, 2020	0.431**	0.371**	0.212**
Human capital index, 2020	0.376**	0.354**	0.132
Income level (per capita GDP), 2020	0.315**	0.256**	0.154
Number of mobile cellular per 100 people	0.333**	0.292**	0.131
Percentage of individuals using the Internet	0.394**	0.333**	0.177*
Number of fixed (wired) broadband cellular per 100 people	0.380**	0.340**	0.188*
Number of active mobile broadband cellular per 100 people	0.381**	0.319**	0.197*
Adult literacy (%)	0.176*	0.181*	0.016
Gross enrolment rate	0.402**	0.377**	0.142
Expected length of education (in years)	0.407**	0.377**	0.158*
Average length of learning (years)	0.342**	0.319**	0.149
E–participation index (EPI)	0.485**	0.441**	0.289**
Open government development index, OGDI	0.473**	0.418**	0.318**
Account with a formal financial institution (% aged 15+)	0.408**	0.360**	0.281**
Account used to accept government payments (% aged 15+)	0.418**	0.406**	0.121
Accounts to receive wage (% aged 15+)	0.388**	0.325**	0.220*
ATMs for 100 000 people	0.345**	0.288**	0.259**
Bank's net interest margin (%)	–0.311**	–0.251**	–0.274**
Bank's overhead to total assets (%)	–0.239**	–0.170*	–0.214**
Credit card (% aged 15+)	0.423**	0.370**	0.239**
Debit card (% aged 15+)	0.397**	0.336**	0.269**
Electronic payments used to make payments (% aged 15+)	0.378**	0.331**	0.213*
GDP per capita (in constant 2005 prices, USD)	0.375**	0.311**	0.217**

Table 5 (continued)

Criteria	Overall evaluation of the CBDC project	Retail evaluation of the CBDC project	Wholesale evaluation of the CBDC project
Mobile phone for payment (% aged 15+)	0.348**	0.290**	0.157
Inflow of money transfer to GDP (%)	–0.310**	–0.275**	–0.199*
Stockmarket capitalization relative to GDP (%)	0.490**	0.342**	0.498**
Obligations for closed DG–projects, mln USD	0.198*	0.197*	0.148
Obligations for opened DG–projects, mln USD	0.251**	0.260**	0.089
Total obligations for DG–projects, mln USD	0.254**	0.255**	0.133
Payments for closed DG–projects, mln USD	0.189*	0.188*	0.129
Payments for opened DG–projects, mln USD	0.256**	0.265**	0.095
Total payments for DG–projects, mln USD	0.241*	0.242*	0.130
Investment in ICT and E–government in open projects, mln USD	0.224*	0.233*	0.082
Investment in ICT and E–government in carryover projects, mln USD	0.221*	0.225*	0.041
Total investment in ICT and E–government, mln USD	0.201*	0.212*	0.063
Index IMD 2020	0.429**	0.340**	0.233
Rank for IMD 2020	–0.429**	–0.340**	–0.233
Knowledge, 2020	–0.440**	–0.409**	–0.212
Talent, 2020	–0.368**	–0.241	–0.293*
Training & education, 2020	–0.356**	–0.356**	–0.010
Scientific concentration, 2020	–0.345**	–0.409**	–0.195
Technology, 2020	–0.454**	–0.293*	–0.321*
Regulatory framework, 2020	–0.410**	–0.246	–0.293*
Capital, 2020	–0.454**	–0.270*	–0.436**
Technological framework, 2020	–0.381**	–0.300*	–0.201
Future readiness, 2020	–0.390**	–0.315*	–0.189
Adaptive attitudes, 2020	–0.352**	–0.336**	–0.138
Business agility, 2020	–0.361**	–0.290*	–0.106
T-integration, 2020	–0.367**	–0.240	–0.217

Source: compiled by the author with SPSS statistical package.

Note: * – correlation is significant on 5%-level (2-way); ** – correlation is significant on 1%-level (2-way).

Coefficients of the Fisher classification discriminant function

Factors	Status of overall evaluation of the CBDC project		
	0	1	2
Capital, 2020	0.152	0.099	0.082
Constant	–4.259	–2.425	–2.011

Source: compiled by the author with SPSS statistical package.

Table 7

Coefficients of the Fisher classification discriminant function

Factors	Status of retail evaluation of the CBDC project		
	0	1	2
Knowledge, 2020	0.112	0.078	–0.089
Talent, 2020	0.027	0.019	0.170
Constant	–3.796	–2.420	–2.948

Source: compiled by the author with SPSS statistical package.

Table 8

Coefficients of the Fisher classification discriminant function

Factors	Status of wholesale evaluation of the CBDC project status		
	0	1	2
Capital, 2020	0.130	0.081	0.056
Constant	–3.453	–2.025	–1.538

Source: compiled by the author with SPSS statistical package.

low, which does not allow them to be used to determine the status of the CBDC project on the basis of the value of the "capital" factor, but shows that this factor has a significant impact on the state of affairs of CBDC projects;

• Fisher classification discriminant functions were obtained for the CBDC retail model (*Table 7*).

The proportion of correctly classified observations in their use was 61.9%. Wilks' Lambda test with significance criterion p = 0,004 and p = 0,000 indicates a sufficiently significant difference in the average values of the discriminant functions received. However, calculation of canonical correlation (0.495) and (0.271) shows a low level of correlation between factors and indicators of CBDC state group affiliation, which does not allow the resulting functions to be used for prediction.

However, the fact that both factors in the classification model account for more

than half of the variation in retail CBDC condition traits may indicate that retail model projects are active and successful in countries with a high level of technical knowledge and entrepreneurial talent, ahead in its importance for the development of retail CBDC even capital factor;

• Fisher classification discriminant functions were obtained for the CBDC wholesale model (*Table 8*).

Likewise for the general model for determining the status of the project by wholesale CBDC, the capital factor was significant. However, the share of correctly classified observations was slightly higher for the model — 60.3%. Wilks' Lambda test shows a significant difference in average values of discriminant functions obtained ($p = 0.002$). However, the calculation of canonical correlation remains quite low for this model (0.438). The use of the obtained functions for prediction, as in previous cases, is undesirable, but very significant for explaining the factors of development of the CBDC wholesale model.

Noteworthy is the fact that no other factors from the 74 indicators studied provided a higher quality classification function to explain the success of CBDC projects, indicating the relevance of the research findings.

CONCLUSION

Thus, taking into account the global trends in digitalization, the development of fintech, the dynamics of the crypto market and, in particular, the development of projects to launch CBDC, it can be concluded about the inevitability of the processes of digitalization of financial assets, the emergence of new forms of digital assets, which require the accelerated development of regulatory and legal regulation of this market and its infrastructure.

According to the author, measures aimed at curbing the development of certain types of DFA are ineffective from a historical point of view and contradict the logic of the evolutionary development of the world economy.

In this context, the presented research makes a significant theoretical and practical contribution to generalization of the main trends in the world market of cryptoassets, identification of the main factors of investment attractiveness of cryptocurrencies and conditions, contributing to the successful implementation of CBDC.

The results obtained can be demanded by the participants of the financial market when assessing the investment attractiveness of cryptocurrencies using the functions for the forecast of the assignment of cryptocurrencies to the selected clusters. In addition, the research of the conditions for the successful implementation of CBDC can form the basis of regulatory projects that develop concepts of their own national digital currencies.

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