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Development of Decentralized Finance in Comparable Indicators of the Financial Sector of the Economy

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ABSTRACT

The sphere of decentralized finance is the subject of widespread debate as the ways of providing services in the financial market. Using distributed registry technologies, smart contacts and a decentralized format of cooperation, it is capable, to a certain extent, of replacing traditional financial intermediaries in some product segments of the financial market. The authors set the **task** of identifying possible markers of liquidity flow into the sphere of decentralized finance, as well as assessing the scale and dynamics of its development compared with segments of the financial sector of the economy. The **purpose** of the study is to form a system of comparable indicators, based on which national regulators will be able to objectively assess the scale and dynamics of development of the DeFi sector. To achieve the goal, the article conducted a quantitative analysis of the relationship between changes in the money supply and the total value locked of crypto assets in the DeFi sector; a comparative analysis of various segments of the DeFi sphere and the financial sector of the economy was carried out. As the main **methods**, the authors used methods of regression analysis, systemic and logical methods, induction and deduction, methods of economic statistics, which made it possible to identify tendencies in the development of the sphere of decentralized finance against the background of indicators of development of the financial sector of the economy. The source data consisted of statistical databases on key indicators of the development of the financial sector of the economy at the international level, as well as databases on services provided by participants of decentralized finance. As a **result** of the study, the impact of changes in money supply on total value locked in DeFi is evaluated, as well as tendencies and scale of development of the sphere of decentralized finance in comparable indicators of the financial sector of the economy are identified. It is **concluded** that the scale of the current development of decentralized finance is not significant. However, according to a number of comparable indicators, this sphere already represents a certain parity with the financial sector of the economy. First of all, this applies to the trading turnover of decentralized exchanges and the volume of trading in crypto derivatives. The results of the study can be used by national regulators when assessing the scale of development of the sphere of decentralized finance under certain monetary and financial conditions.

Keywords: decentralized finance; traditional finance; financial sector of the economy; payments; crypto loans; crypto deposits; infrastructure; scale of development

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INTRODUCTION

With the development of blockchain technology, a whole ecosystem of decentralized finance (DeFi) has emerged, which, unlike traditional finance (TradFi[1]), focuses on providing an analogue of already familiar financial services in a decentralized cryptographic system using smart contracts, decentralized applications, and digital tokens [1–3]. Decentralized protocols for crypto loans, digital asset placement, insurance, payments and transfers, asset management, as well as decentralized applications are among the most widely discussed new technological developments in global finance [4]. Several papers emphasize the reliability and transparency of DeFi services [1], their composability, that is, the ability to interact between protocols and create new (composite) services using various tokens [5].

The technological component of the DeFi sphere, which ensures reliability and transparency in the transaction process, is of practical interest to traditional financial intermediaries as well. In Russia, blockchain technology is already being applied in the circulation of digital financial assets [6]. At the same time, such close attention to the DeFi sector by national regulators is driven by the need to obtain an objective assessment of the impact of this sector on the activities of traditional financial intermediaries, non-financial organizations, and the well-being of the population. It is quite possible that the DeFi sphere opens up new opportunities in terms of providing financial services, while excluding a certain circle of intermediaries and ensuring the transparency of all transactions, their high speed, and cost reduction. However, the DeFi sector can simultaneously amplify existing risks in the financial market and generate its own risks: smart contract risks, transactional risks, oracle risks, and others[2] [7–9]. The national regulator is particularly concerned about the processes of replacing the national currency with crypto-assets. Such a redistribution of assets in the portfolios of economic agents can lead to increased price risks due to the high volatility of crypto-assets. Crypto-assets are issued in a decentralized manner. And in the DeFi paradigm, there is no central institution responsible for ensuring the circulation of digital currency.[3] In its analytical reports, the Bank of Russia repeatedly emphasizes the thesis that the DeFi sector is constantly evolving, scaling its services.

Currently, there is a substantial amount of scientific research addressing issues related to the functioning of the DeFi sphere. However, for the most part, they only reveal individual aspects, which can conditionally be grouped into the following directions:

- description of the theoretical aspects of potential problems, advantages, and the potential of the DeFi sector [10–12];
- consideration of types of DeFi protocols and security issues [1, 13–14];
- analysis of the risks of scaling the DeFi sector [7–9, 15];
- highlighting the common and the unique aspects between the DeFi and CeFi sectors [16];
- possible inefficiencies of the DeFi market [17].

Recently, studies related to conducting quantitative analysis in the DeFi sector have been emerging. Within the framework of scientific research, individual key indicators of DeFi are analyzed [18–21]. The comparison of the development of the DeFi sector with the financial sector of the economy (hereinafter — FSE) is not based on a systematic approach,

[1] Traditional finance (TradFi) is a system of traditional finance based on familiar non-digital assets, tools, and financial intermediaries. URL: https://cbr.ru/Content/Document/File/141992/report_07112022.pdf (accessed on 15.01.2024).

[2] Traditional finance (TradFi) is a system of traditional finance based on familiar non-digital assets, tools, and financial intermediaries. URL: https://cbr.ru/Content/Document/File/141992/report_07112022.pdf (accessed on 15.01.2024).

[3] Cryptocurrencies: trends, risks, measures 2022. URL: https://storage.consultant.ru/ondb/attachments/202201/21/Doklad_eXS.pdf (accessed on 17.04.2024).

but is fragmented — by individual indicators.[4] From an institutional perspective, the FSE represents a set of economic institutions providing financial services to companies and households.

With the development of the DeFi sector, central banks are paying increasing attention to studying the transmission of monetary impulses to changes in the structure of household balances associated with the increase in the share of crypto assets. In addition, as noted by the Bank of Russia, there is a need to develop a system for assessing the scale of DeFi development at the macro level. The solution to these tasks forms the basis of the current research.

SOURCE DATA

As initial data describing the DeFi sector, we propose using quantitative and qualitative indicators that can be grouped by various dimensions: financial (*finance data*), market (*market data*), "commodity" (*GMV data*), and user (*alternative data*). Regarding the FSE, economic statistics on monetary indicators, deposit and credit operations, and the development of financial markets at the global level are traditionally provided by the Bank for International Settlements (hereinafter — BIS), the European Central Bank (hereinafter — ECB), the International Monetary Fund (hereinafter — IMF), and the World Bank Group (hereinafter — WBG).

RESULTS

The DeFi sphere offers services across various product sectors (segments): asset management, liquid staking, cross-platform transfer facilitation (*bridges*), derivatives, decentralized exchanges (*DEXs*), data exchange, stablecoin issuance, and others. *Fig. 1* shows the structure of product segments in the DeFi space. From the graphical material, it follows that the largest DeFi segments by the TVL (Total Value Locked) indicator are: liquid staking, crypto loans, cross-platform transfers, and decentralized exchanges. Drawing an analogy with the FSE, it can be said that the most in-demand services in the DeFi sector are those for earning interest on funds, providing loans in crypto assets, "cross-border" (cross-platform) money transfers, and exchange activities.

Fig. 2 shows the dynamics of TVL from 2019 to 2023 inclusive. The graph shows that the number of major projects in the DeFi sector is growing unevenly. In 2019, there were only two major projects involving liquid staking: *Compound* and *MakerDAO*. At the same time, the total locked value of crypto assets in 2019 amounted to only 0.26 billion dollars in equivalent. The *Compound* project specializes in providing crypto loans, while the *MakerDAO* project focuses on the decentralized issuance of stablecoins, which are introduced into circulation based on a credit model. These projects still remain the largest in the DeFi space, but now in terms of individual product segments. The maximum TVL value, equal to 120 billion dollars, was reached in 2021. That is, the growth over 3 years was 462 times.

The number of DeFi projects has also increased exponentially. In the following years, the total value of locked crypto assets decreased along with the capitalization of the entire crypto market, although the number of projects steadily increased. The leader among the largest DeFi projects became *Lido Finance*, specializing in liquid staking. The TVL at the end of 2023 amounted to over 21 billion dollars in equivalent.

ANALYSIS OF THE INTERRELATIONSHIP BETWEEN MONEY SUPPLY AND THE TOTAL LOCKED VALUE OF CRYPTOASSETS

Given that fiat money serves as the source of liquidity for decentralized crypto assets, we assume that during periods of monetary

[4] Why Decentralised Finance (DeFi) Matters and the Policy Implications. 2022. URL: https://www.oecd.org/finance/why-decentralised-finance-defi-matters-and-the-policy-implications.htm (accessed on 25.03.2024).

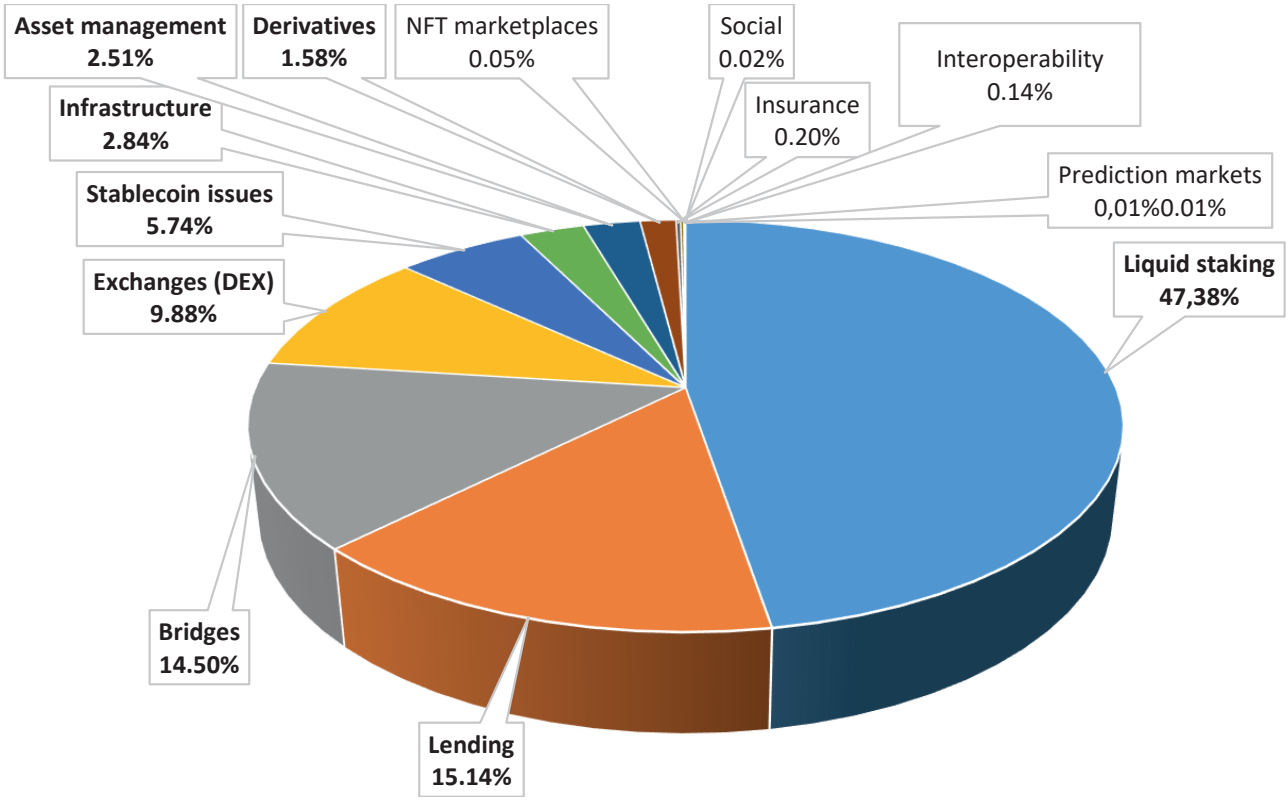

Fig. 1. **Structure of DeFi Product Segments by TVL Indicator (March 2024)**

Source: Author's calculations from data platform "Token terminal". URL: https://tokenterminal.com (accessed on 14.03.2024).

and/or fiscal easing, accompanied by an increase in the money supply, there may be a redistribution of assets in the portfolios of economic agents, with an increase in the share of crypto assets. In particular, the rapid growth in the capitalization of the first cryptocurrency, Bitcoin, occurred precisely against the backdrop of monetary and fiscal stimulus measures in the economies of countries with developed financial markets. The subsequent formation and development of the DeFi sector also exhibits cyclicality in its capitalization.

For the purpose of analyzing and assessing the impact of changes in the money supply on the value of digital assets circulating in the DeFi space, we formalize an economic model. As an endogenous variable reflecting the formed liquidity in the DeFi sector, we will consider the total value locked (TVL) of digital assets. This indicator is calculated in market values. Moreover, the steady growth of the total value locked against the backdrop of an increasing number of users and the frequency of decentralized protocol usage indirectly reflects the formation of demand for DeFi services.

In the context of J. Tobin's portfolio theory, crypto-assets can be considered an alternative source of income [22]. The actual demand for this type of asset depends on the expected rate of return associated with investing in it and the economic agent's risk tolerance. A natural limitation on the amount of investment is the total income available to the economic agent, as well as the possibility of attracting credit resources with a servicing cost lower than the expected return from investing in the crypto-asset. Economic agents prefer to form their portfolios not only with reliable securities (government bonds) but

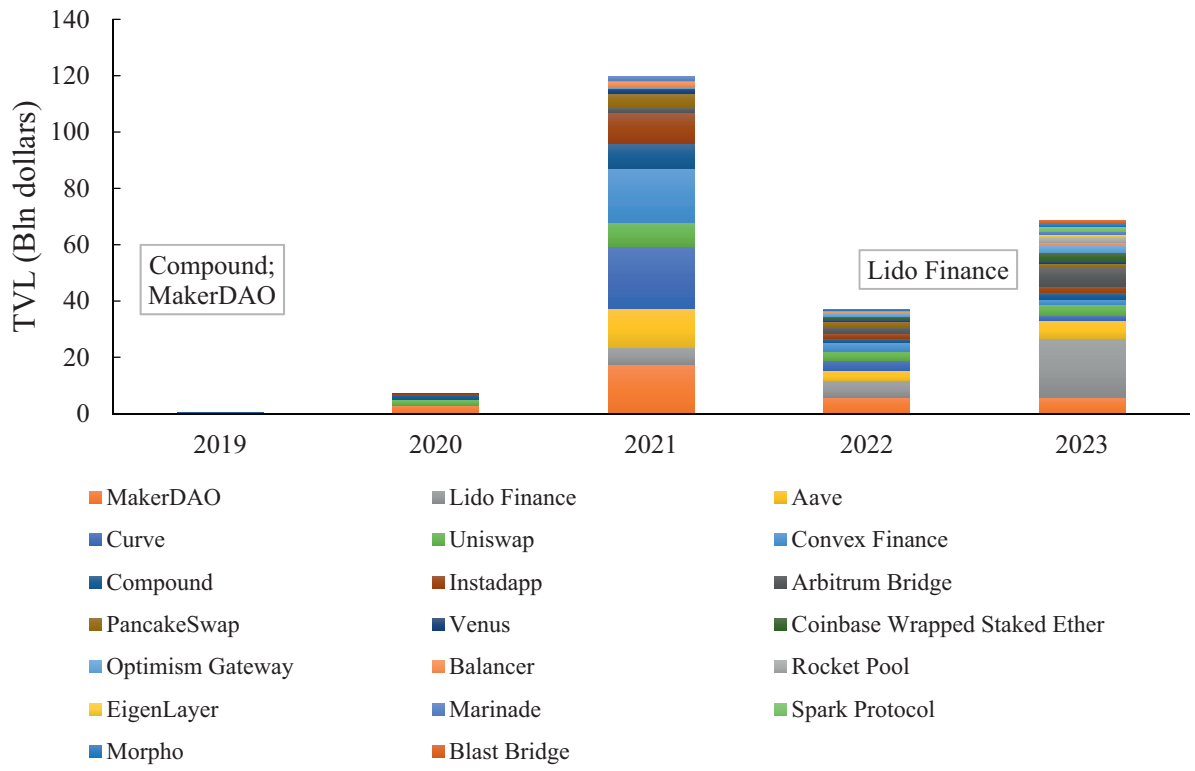

Fig. 2. **Dynamics of the Largest DeFi Projects by TVL**

Source: Author's calculations from data platform "Token terminal". URL: https://tokenterminal.com (accessed on 14.03.2024).

also by including risky assets. By investing in crypto-assets, the investor aims to maximize the portfolio's return at a given risk level. Therefore, the increase in the money supply, which may be driven by non-cash money issuance amid monetary and fiscal easing, is expected to prompt economic agents to revise their portfolios, increasing or decreasing the share of crypto-assets while adhering to the previously mentioned conditions and constraints.

Also, as an exogenous variable, we propose to consider the market capitalization of Bitcoin. Changes in its capitalization may reflect changes in overall market sentiment in the global crypto asset market. Accordingly, the model can be presented in the following form:

$$TVL = \beta_0 + \beta_1 M2^{(r.)} + \beta_2 M2^{(r.f.)} + \beta_3 B^{(r.cap.)}, \quad (1)$$

where TVL — the total blocked value of crypto assets in the DeFi; $M2^{(r.)}$ — the growth rate of the M2 money supply in the largest institutions representing central monetary authorities (for example, the USA, Europe, Japan, and China); $M2^{(r.f.)}$ — the growth rate of the M2 money supply under a fixed exchange rate; $B^{(r.cap.)}$ — the growth rate of Bitcoin's market capitalization.

Taking into account the exchange rate factor in model (1) allows for the identification of a stable component in the changes in the money supply across the world's largest economies. The initial data for assessing the relationships were taken from the period from May 2019 to March 2024 with a monthly breakdown. Moreover, since model (1) uses growth indicators in annual terms, the final data formed a sample from May 2020 to March 2024 and consisted of 47 observations. Prior to calculating the growth rates, all economic indicators were pre-logged.

Table 1 presents the correlation matrix of the analyzed indicators.

Table 1

Correlation Matrix

Model	*TVL*	$M2^{(r.)}$	$M2^{(r.f.)}$	$B^{(r.cap)}$
TVL	1.00	0.94	0.79	0.70
$M2^{(r.)}$	0.94	1.00	0.80	0.71
$M2^{(r.f.)}$	0.79	0.80	1.00	0.33
$B^{(r.cap)}$	0.70	0.71	0.33	1.00

Source: Author's calculations from data MacroMicro. URL: https://en.macromicro.me/charts/3439/major-bank-m2-comparsion (accessed on 15.03.2024).

Table 2

Regression Results

Model	Coefficients	Std. Error	t-statistics	P-value
Constant (β0)	–0.56	0.68	–0.82	0.42
M2(r.)	14.62	0.80	18.22	0.00

Source: Author's calculations from data MacroMicro. URL: https://en.macromicro.me/charts/3439/major-bank-m2-comparsion (accessed on 15.03.2024).

From *Table 1*, it follows that changes in demand for DeFi services are closely related to changes in the money supply and the market capitalization of Bitcoin. Currency devaluation also has a certain contribution to the identified relationship. However, its influence can be considered moderate, with a correlation coefficient of 0.79. To a greater extent, the exchange rate factor is reflected in the market capitalization of Bitcoin, the value of which is expressed in fiat money.

Subsequent analysis using specialized data analysis software led to the conclusion that the most common determinant among those analyzed in model (1), which has a significant impact on TVL, is the growth rate of the money supply $M2^{(r.)}$. The evaluation results are presented in *Table 2*.

The estimated model can be considered adequate for the analyzed data (the F-value of Fisher's statistic was 332.0 with P = 0.00; the coefficient of determination $R^2 = 0.94$). The dependence of the growth rate of the total locked value of crypto assets in the DeFi sector on the growth rate of the M2 money supply can be expressed directly, excluding the constant. In other words, the overall demand for DeFi services is elastic with respect to the M2 money supply: for every unit increase in the M2 money supply, there is a corresponding increase of 14.62 units in TVL.

Fig. 3 presents the dynamic indicators of the development of the DeFi sector and the monetary indicator.[5]

The economic conclusion is that as a result of the easing of monetary and/or fiscal policy, it appears that part of the assets in the portfolios of economic agents is being replaced by crypto-assets related to the DeFi sector. The concerns of central banks in this regard are quite justified, as the value of crypto-assets is subject to significant fluctuations and can affect the real returns of investors' portfolios and their wealth.

At the same time, it is necessary to objectively understand how large the DeFi

[5] According to the Federal Reserve of the United States, the European Central Bank, the Bank of Japan, and the People's Bank of China.

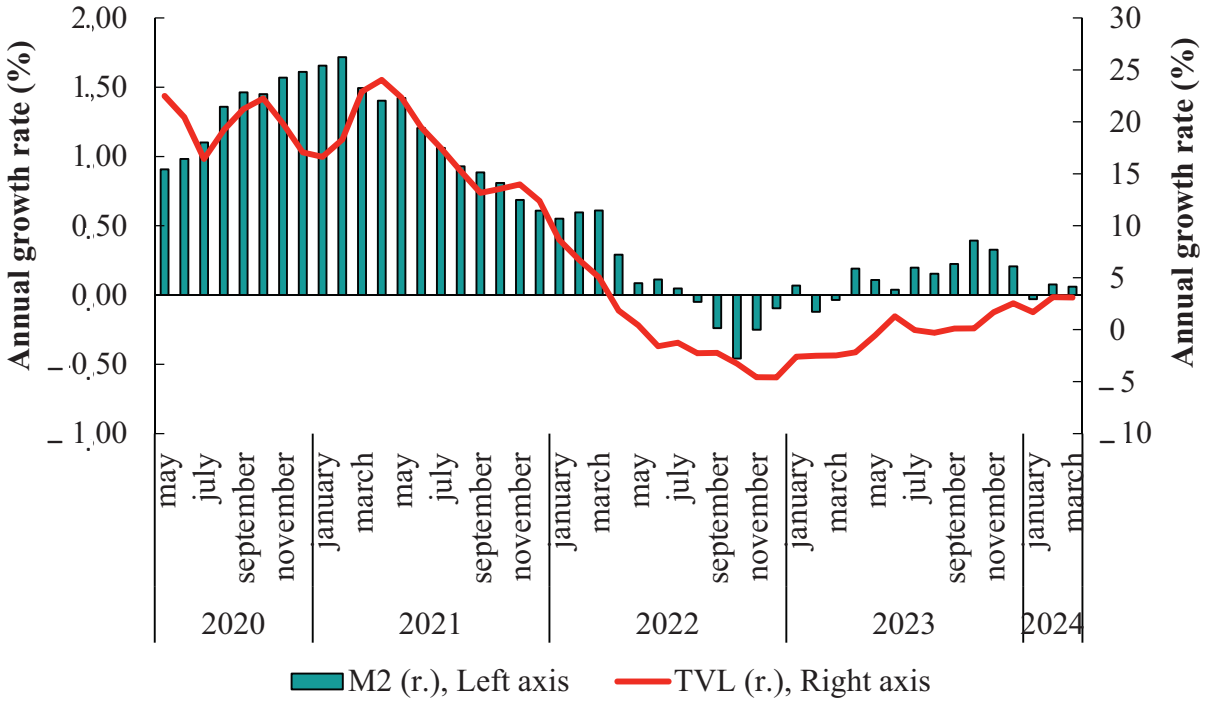

Fig. 3. **M2 Supply of Four Major Central Banks (USD, YoY, R.) and Total Value Locked (TVL) in DeFi (USD, YoY, R.)**
Source: Author's calculations.

market is and whether it poses a threat to the national or global economy. In this regard, we propose to establish a system of comparable indicators for the DeFi and FSF sectors. The connecting elements in this system will be the product segments through which FSE services and DeFi services are provided.

SCALE AND DEVELOPMENT OF THE DEFI SECTOR

For the purpose of analyzing the scale and development of the DeFi sector in comparison with the FSF, a system of comparable indicators has been established. As key indicators, metrics from the DeFi sector were selected that describe the most significant product segments of DeFi by the TVL metric, including market indicators and commodity volume indicators (see *Table 3*).

To analyze and assess the scale of the DeFi sector, one can use the market capitalization indicator known in traditional finance. However, in the DeFi sector, it represents the total market value of crypto assets that are decentralized and traded on blockchains. *Table 4* presents data on the market capitalization of the DeFi sector and public companies whose shares are traded on centralized exchanges. The statistics on companies are taken at a global, worldwide level. The source of the data is the macro statistics of the World Bank group.

The analysis of *Table 4* allows us to draw the following conclusions:

1. The first DeFi projects related to infrastructure development appeared in 2012. In the following 10 years, the market capitalization of the DeFi sector rapidly grew and by the end of 2023 amounted to 83.9 billion dollars in equivalent. However, the scale of the DeFi sector in terms of capitalization significantly lags behind that of public companies in the FSE, whose total capitalization at the global level amounted to approximately 106.6 trillion dollars. The share of the DeFi sector in this total capitalization was only 0.08%.

2. The average annual growth rate of the market capitalization of public companies over

Table 3

Economic Content of Comparable Development Indicators of DeFi and the Financial Sector of the Economy (FSE)

Group of indicators	Indicators	Contents of DeFi indicators	Comparable indicators
Market	**Market scale**		
	Market capitalization	Market value of circulating crypto assets	Market value of outstanding shares
	Means of payment		
	Outstanding supply of stablecoins	Average value of outstanding stablecoin supply (digital currency)	Monetary aggregate M1 (national currency)
Gross market value	**Loans**		
	Active loans	Outstanding borrows on the protocol	Loan debt on bank credits to the non-financial sector of the economy
	Deposits		
	Net deposits	Value deposited to the protocol	Bank deposits of non-financial companies and households
	Infrastructure		
	Trading volume (exchanges)	The total volume of crypto asset trading on DEX	The total volume of buying and selling of company shares on stock exchanges

Source: Author's development.

Table 4

Market Capitalization DeFi and FSE Companies, bln $ US

Years	DeFi	Global Crypto	Public companies	Market cap ratio of DeFi to public companies (%)
2013	0.2	10.0	64 367.8	0.0003
2014	0.8	5.2	67 177.3	0.0011
2015	0.2	6.9	62 268.2	0.0003
2016	0.2	16.0	65 117.7	0.0004
2017	89.4	456.8	79 501.9	0.1124
2018	15.2	102.9	69 028.2	0.0220
2019	9.4	163.3	79 412.2	0.0118
2020	23.7	671.1	95 197.4	0.0248
2021	118.6	1730.5	111 159.3	0.11
2022	35.8	583.1	93 688.9	0.04
2023	83.9	1352.1	106 631.7	0.08
Dynamic characteristics (2019–2023)				
CAGR	1.32	1.30	1.04	1.27
CV (%)	84.03	70.05	12.77	75.96

Source: Compiled by the authors.

Note: CAGR — compound annual growth rate; CV — coefficient of variation.

Table 5

DeFi Payment Instruments and FSE (Eurozone, USA), bln $ US

Year	DeFi Stablecoins	Money aggregate (M1)		Ratio of DeFi stablecoins to M1 (Eurozone + USA), (%)
		(Eurozone)	(USA)	
2019	0.07	11541.0	17812.8	0.0002
2020	1.15	12960.6	20434.1	0.0035
2021	14.01	13461.5	19756.4	0.042
2022	5.56	11984.9	18022.0	0.019
2023	5.58	11295.9	18889.2	0.018
Dynamic characteristics (2019–2023)				
CAGR	1.73	1.00	1.01	1.72
CV (%)	104.07	7.59	5.89	100.12

Source: Compiled by the authors.

the past 5 years (2019–2023) was 1.04, while the DeFi sector grew at a faster pace with an average annual growth rate of 1.30. However, such growth was uneven. The coefficient of variation in the market capitalization of the DeFi sector is almost 5.5 times higher than that of public companies. This once again highlights the susceptibility of crypto asset values to high volatility.

Table 5 presents data on the size of assets used as a means of payment in the DeFi sector and in traditional financial systems (TradFi).

The largest issuer of stablecoins in the DeFi sector is the MakerDAO project. Its share of all issued stablecoins in the DeFi sector is approximately 94%. These crypto assets can be used not only within the DeFi sector. In global trade, the number of transactions where digital services, services, and even physical goods can be purchased with stablecoins is gradually increasing. However, a question arises: how comparable is the volume of issued stablecoins in the DeFi sector with the amount of cash and non-cash money, which traditionally serve as a means of payment? Let's consider the economies of the Eurozone and the USA as an example.

The analysis of *Table 5* allows us to draw the following conclusions:

1. By the end of 2023, the amount of issued stablecoins in the DeFi sector amounted to 5.58 billion dollars in equivalent, while the M1 money supply in the Eurozone was 11.3 trillion dollars in equivalent. That is, the differences in scale amounted to more than 2000 times. If we compare the most liquid part of the money supply in the Eurozone and the USA to the amount of circulating stablecoins, the share of the latter was 0.018%. It is known that the transactional demand for money is directly dependent on the volume of goods, works, and services produced. Analyzing the obtained results, it can be said that the circulation of stablecoins

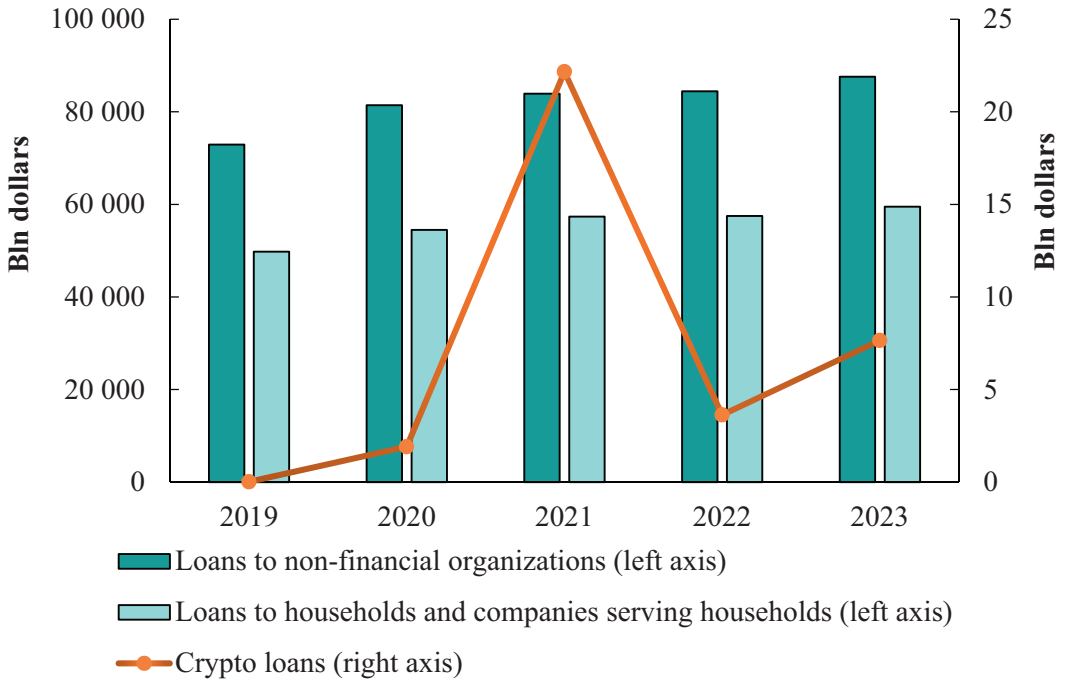

Fig. 4. **Total Credit to the Non-Financial Sector and Crypto Loans**

Source: Author's Calculations.

is largely related to gaining access to services in the DeFi sector.

2. Unlike the market capitalization indicator, the average annual growth rate of the total value of stablecoins in the DeFi sector is higher, amounting to 1.73 over the past 5 years. At the same time, the M1 money supply in the Eurozone and the United States has hardly changed. Drawing further parallels between DeFi and the FSB, one can note a more pronounced demand for stablecoins as a means of payment in the DeFi sector. Undoubtedly, this is related to the active development of this sector.

In our opinion, the overall prospects for the use of crypto-assets in e-commerce look quite interesting. Thus, according to the latest report "Global payments methods", cryptocurrency is already being used in the field of e-commerce. And in 2023, its share among other payment methods was 0.2% or about 11 billion dollars in equivalent.[6]

[6] Global payments methods. URL: https://worldpay.globalpaymentsreport.com/en?utm_medium1=RTW#download-report (accessed on 01.06.2024).

Fig. 4 shows the dynamics of the total amount of crypto loans in the DeFi sector and the total volume of bank loans provided to the non-financial sector of the economy. The statistics on bank loans are taken at a global, worldwide level. The source of the data is the Bank for International Settlements database.

From the presented graphical material, it follows that the share of all crypto loans provided in the DeFi sector in the total volume of loans granted to the non-financial sector of the economy at a global level is extremely low. Specifically, when compared to non-financial corporations at the end of 2023, it amounted to 0.009%, and when compared to households and the companies servicing them, this value was 0.013%. The total cumulative amount of loans at the end of 2023 was over 147 trillion dollars, while the total amount of crypto loans was 7.66 billion dollars in equivalent. The scales of the DeFi and traditional financial sectors in terms of lending are simply incomparable. At the same time, when analyzing the dynamics of crypto loans, it is necessary to note the strongest fluctuations in their magnitude. In the analyzed period,

Table 6

DeFi Crypto Deposits and Deposits of Non-Financial Sector of Economy in Eurozone and USA, bln $ US

Year	Crypto deposits	Deposits of non-financial sector		Ratio of crypto deposits to deposits of non-financial sector, (%)
		(Eurozone)	(USA)	
2019	0.30	11 670	18 440	0.0010
2020	10.36	12 956	21 602	0.0300
2021	126.99	12 079	24 836	0.344
2022	39.93	11 555	24 548	0.111
2023	78.75	12 175	26 244	0.205
Dynamic characteristics (2019–2023)				
CAGR	2.00	1.01	1.05	1.94
CV (%)	101.77	4.57	13.49	101.18

Source: Compiled by the authors.

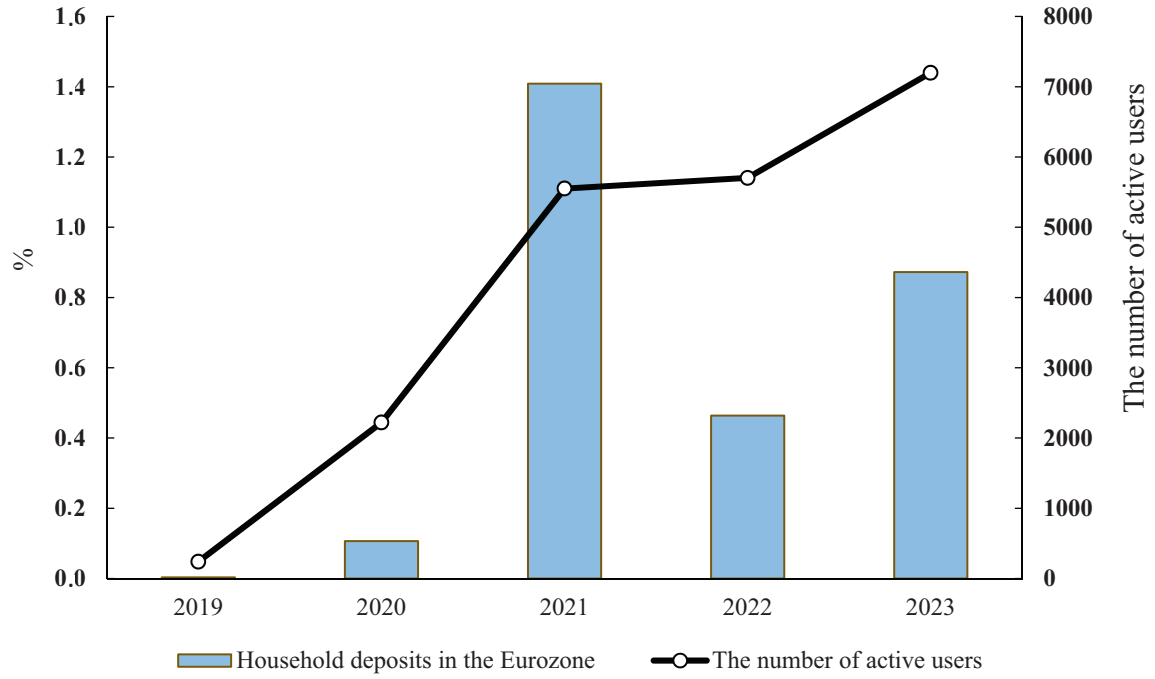

Fig. 5. **Ratios of DeFi Crypto Deposits to Bank Deposits, Number of Active Users of DeFi Lending Platforms**

Source: Author's calculations.

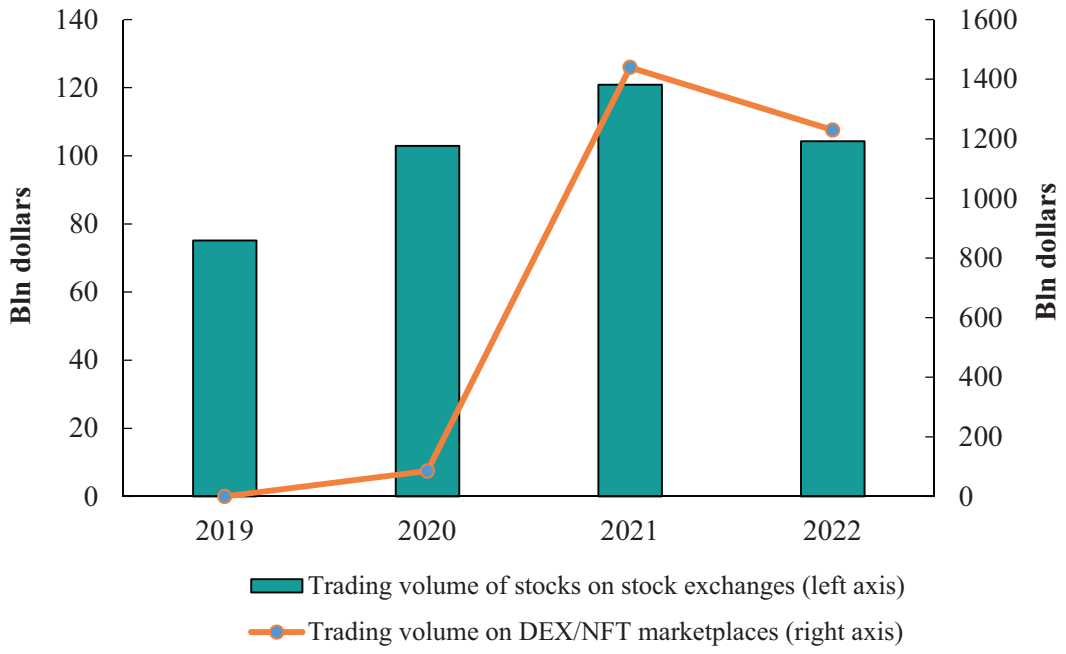

Fig. 6. **DeFi and Stock Trading Volumes on Traditional Stock Exchanges**

Source: Author's calculations.

2021 stands out particularly, when the market capitalization of the global cryptocurrency market significantly increased after many countries "emerged" from the COVID-19 pandemic.

It is known that crypto loans are a profitable operation. Each user of the lending protocol can provide loans in crypto assets. Moreover, one of the sources of funds for these operations can be the national currency. And if the yield from providing crypto loans is higher than the yield from alternative investment avenues, users will direct part of their savings into crypto assets. In our opinion, the problem of capital outflow from the country's economic turnover into the DeFi sector, into its lending protocols, is not yet so serious due to the extremely small scale of this sector.

Table 6 presents data on the size of crypto deposits in the DeFi sector and in the FSA. The economies of the Eurozone and the USA are considered as examples.

The analysis of tabular data reflects a steady demand for DeFi services in terms of placing free funds. Over the past 5 years, the average annual growth rate of crypto deposits has more than doubled the corresponding growth rate of deposits in the non-financial sector of the economy. However, the scale of the DeFi sector in terms of crypto deposits is extremely insignificant when compared to the scale of the FSE in the analyzed countries. By the end of 2023, the total crypto deposits amounted to 78.75 billion dollars in equivalent. In the Eurozone alone, the most liquid component of the money supply (M1) on the same date amounted to 12.175 trillion dollars in equivalent.

In the context of analyzing the scale of the DeFi sector, let's highlight another aspect. As seen in *Table 6*, the growth in crypto deposits over the years is uneven. This follows from the fact that a significant portion of circulating crypto assets does not have a strict peg to fiat currencies (*non-backed crypto's*). Therefore, their value is quite volatile and partly depends on the overall market sentiment in the global crypto market. This assumption is also based on the analysis of the dynamics of active users in the DeFi sector (see *Fig. 5*).

The decrease in the share of the DeFi sector in the total volume of bank deposits did not occur due to a reduction in the number of active users of DeFi services, but rather was

Table 7

Compound Annual Growth Rates of the DeFi and FSE for 2019–2023

Activities	Growth rates	
	FSE	DeFi
Market scale	1.04	1.32
Means of payment	1.01	1.73
Credit activity	1.05	4.22
Deposit activity	1.05	2.00
Infrastructure (exchange)	1.12	21.32

Source: Author's calculations.

caused by a decline in the capitalization level of the global crypto market in 2022. At the same time, it is fair to note that by the end of 2022, the number of active users did not see a significant increase compared to the corresponding period in 2021.

Next, let's analyze decentralized exchanges (DEXs) and traditional stock exchanges. As a comparable metric, we consider trading volume. In the DeFi sector, trading volume reflects the total "traded" value of crypto assets on decentralized exchanges and NFT marketplaces. The source of data for analyzing the trading volumes of public company shares is the macro statistics from the World Bank Group. The results are presented in *Fig. 6*.

Analyzing the obtained results, we note that the scale of the DeFi sector in terms of trading volumes on DEX and NFT marketplaces is insignificant when compared to the trading volume of stocks on traditional stock exchanges. At the same time, changes in the aggregate trading volumes on DEX and NFT marketplaces are characterized by a high positive trend. The compound annual growth rate (CAGR) over the period from 2019 to 2022 was 21.32. By the end of 2022, the trading volume in the DeFi sector exceeded 1.2 trillion dollars in equivalent. Of course, it is still difficult to compare this figure with the trading volume of stocks at 104.3 trillion dollars in equivalent as of the end of 2022. Nevertheless, considering the pace of development in the DeFi sector, the gap no longer seems so vast.

However, the main conclusion is not even this. Such rapid growth in trading volumes on DEXs and NFT marketplaces indicates that an increasing number of economic agents are seeking alternative ways to save and accumulate the value of their assets. How critical the identified scale of the DeFi sector for trading crypto assets is for the national economy is objectively difficult to determine. To answer this question, in our opinion, it will require conducting more than one study. But it is obvious that the DeFi sector is still outside the scope of regulation by national regulators. It is also obvious that economic agents converting fiat currency into crypto assets and trading on DEXs and NFT marketplaces are outside legal protection.

Table 7 presents the summary results on the dynamics of the development of the DeFi and FSF sectors.

Based on the tabular data, it follows that during the analyzed period, the FSE developed

quite steadily, without significant fluctuations. The highest average annual growth rate was shown by exchange activities in terms of trading shares of public companies. The DeFi sector, for its part, is characterized by quite high growth rates in the segment of lending in crypto-assets, as well as a significant increase in trading volumes on decentralized exchanges and NFT marketplaces.

CONCLUSION

Thus, as a result of the conducted research, it has been revealed that changes in monetary and/or fiscal conditions, accompanied by significant changes in the money supply, have a substantial impact on the total value of digital assets in the DeFi sector. It is likely that economic agents revise ("optimize") their asset portfolios, reducing or increasing the share of crypto assets depending on their risk appetite and budget constraints. For monetary regulators, including the Bank of Russia, it is becoming evident that the transmission of monetary impulses will be reflected in the structure of household savings, where a new form of wealth preservation is emerging in the form of crypto-assets. Therefore, in order to protect the savings of Russian citizens, the Bank of Russia, together with the Ministry of Finance of Russia, should promote the development of new instruments in the financial market that will be attractive from an investment perspective for citizens. An example of this is the long-term savings program, which will be implemented starting in 2024.

Regarding the scale and development of the DeFi sector, the conducted research showed that in terms of deposits, lending operations, and total market capitalization, the DeFi sector has an extremely low ratio compared to the corresponding indicators of the traditional financial system. We are talking about hundredths of a percent. A certain exception is exchanging activity. Here, the share of trading volumes on decentralized exchanges and NFT marketplaces amounted to just over 1%. We consider that such a scale does not yet pose a serious threat to the economy. However, the DeFi sector is quite dynamic and has the potential for further growth. The development of the conducted research, in our opinion, is a systematic study of the issues of opportunities and prospects for the integration of DeFi and the sphere of traditional finance (TradFi). A certain synergy is possible here. And it needs to be systematically researched.

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