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Beyond Bitcoin: A Taxonomy of Cryptocurrencies in a Historical Perspective

K.D. Shilov, A.V. Zubarev
Gaidar Institute for Economic Policy, Moscow, Russia

ABSTRACT

The field of cryptocurrencies is in existence and dynamically evolving for over 14 years. Each year introduces new cryptocurrencies, with their total number exceeding 8,500. However, to date, there is no exhaustive categorization of cryptocurrencies that could possibly fully describe the landscape of the cryptocurrency market, which underscores the **relevance** of this research. **The objective** of this study is to construct a hierarchical categorization (taxonomy) of cryptocurrencies based on their main characteristics and functions. The principal research method is a retrospective analysis of the development of the cryptocurrency field from the creation of Bitcoin to the present day. As the industry evolved, new projects emerged, which significantly differed in their properties from what existed before, thus forming entirely new categories and niches in the cryptocurrency space. Moreover, the emergence of certain types of cryptocurrencies could lead to changes in the existing classification. **The outcome** of this research is a taxonomy of interchangeable cryptocurrencies/tokens. The proposed taxonomy is accompanied by a detailed examination of the cryptocurrencies associated with each category, as well as a consideration of the largest cryptocurrencies in terms of capitalization through its prism. The **scientific novelty** of this research lies in the absence of similar studies that look at the issue of categorizing cryptocurrencies through a historical lens.

Keywords: cryptocurrencies; bitcoin; blockchain; smart contracts; ethereum; decentralized finance (DeFi); taxonomy; categorization

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INTRODUCTION

The cryptocurrency market has existed for over a decade and continues to evolve, despite the ongoing skepticism from some investors and researchers, as well as regulators (see, for example, [1–5]). With each passing year, the number of cryptocurrencies is increasing (*Fig. 1*), and new services, protocols, and applications are emerging in the market.

On average, the market capitalization of cryptocurrencies has not significantly dropped below $ 1 trillion for almost 2.5 years, which is comparable to the markets of other assets. For comparison, the capitalization of the global stock market at the beginning of 2023 was $ 107 trillion, of which 41.1% ($ 44 trillion) accounted for the American stock market; the capitalization of the gold market is estimated at $ 12.34 trillion, and the Russian stock market at $ 0.55 trillion.

This paper presents a retrospective analysis of the development of the cryptocurrency market from the emergence of Bitcoin in 2009 to 2023. This analysis allows, on the one hand, to assess the progress that cryptocurrencies have made in technical terms over 14 years, and on the other hand, to track the emergence of new technologies and features that are the sources of differences between cryptocurrencies.

An important task of this retrospective analysis is also an attempt to classify or, more precisely, to taxonomize cryptocurrencies based on their functional purpose and economic meaning, as this issue appears relevant both from the perspective of attempting to systematize the understanding of the field and from an investment standpoint, since the price dynamics of cryptocurrencies belonging to different classes and categories can be influenced by various factors.

It should be noted in advance that the task of establishing a strict and comprehensive

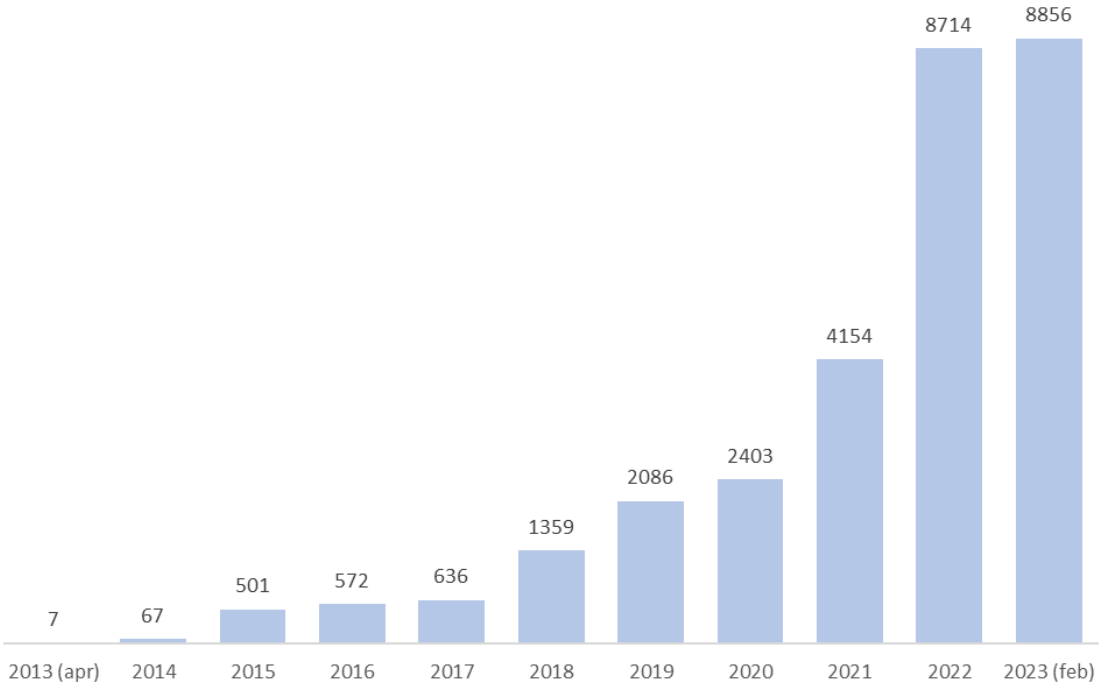

Fig. 1. **The Number of "Active" Cryptocurrencies**

Source: Author's calculations based on [6].

Note: "active" cryptocurrencies are those with a non-zero price and that have quotations on at least one cryptocurrency exchange.

classification of cryptocurrencies is quite difficult, as many cryptocurrencies can combine several properties and functions at once. The classification we propose is based, first and foremost, on the key properties, positioning, and actual application of the mentioned cryptocurrencies. Over time, the number of cryptocurrencies grew, and existing digital coins were technically updated, acquiring new qualities and functions. This, in turn, led to a constant rethinking of the cryptocurrency landscape. Thus, the taxonomy proposed in this work does not claim to be the ultimate truth, but it does comprehensively describe the stages of development in the cryptocurrency sphere and how it looks today.

It is also important to note that almost all of the mentioned cryptocurrencies and tokens[1] share one common function — they are a means of investment and speculation. Despite the fact that individual cryptocurrencies may be positioned as something else and the fact that blockchain projects try to avoid equating their tokens with securities,[2] this does not exclude the fact that a significant portion of the owners of these assets buy them with the aim of selling them at a higher price in the future. That is precisely why economists classify cryptocurrencies as a separate class of financial assets [7].

BITCOIN AND THE FIRST CRYPTOCURRENCIES

Practically any discussion about digital assets features Bitcoin. Many people primarily associate the term cryptocurrency with Bitcoin, the emergence of which in 2009 gave impetus to the formation of the corresponding

[1] Possible only with the exception of stablecoins and some derivative tokens.

[2] By mid-2023, at least 55 cryptocurrencies were known to have been classified as securities by the U.S. Securities and Exchange Commission, including XRP, BNB, TON, BUSD, ADA, and others. URL: https://cryptorank.io/watchlist/747c0b6bd3ef (accessed on 02.05.2023).

sector. The Bitcoin blockchain was conceived as a decentralized payment system, and after some time, the cryptocurrency units themselves began to be perceived as a kind of money/currency, even despite the fact that Bitcoin does not possess all the necessary properties of money [8]. Nevertheless, here and thereafter, we will assume by default (unless stated otherwise) that any cryptocurrency is positioned as a potential medium of exchange and, in some sense, as money.

Since the source code of Bitcoin is open, other cryptocurrencies began to appear over time. Often, all cryptocurrencies other than Bitcoin are referred to as alternative cryptocurrencies or altcoins. Some of the first altcoins were Litecoin and Namecoin, which appeared in 2011. In Litecoin, a slightly modified version of Bitcoin's code is used, while Namecoin is a fork or branch of the main Bitcoin blockchain and is technically almost entirely identical to its predecessor.

These cryptocurrencies still exist, but they have different fates — as of mid-May 2023, Litecoin remains one of the highly capitalized cryptocurrencies, ranking 11th in terms of market capitalization ($ 6.7 billion), while Namecoin ranks 582nd with a market capitalization of only $ 21.8 million. Thus, the first and quite straightforward way to categorize cryptocurrencies is to divide them into Bitcoin and all the others (altcoins).

In 2012, the cryptocurrency Peercoin emerged, using the proof-of-stake consensus mechanism alongside proof-of-work. This mechanism determines the probability of a miner creating a block based on the amount of funds in their cryptocurrency wallet, rather than on computational power. Alternatives to Proof-of-Work, on average, speed up transactions, make the network scalable and environmentally friendly (see, for example, [9]), but reduce the level of resilience of the distributed network to a number of threats, including those related to the safety of funds. Nevertheless, the consensus mechanism itself is not crucial as a defining feature when categorizing cryptocurrencies by their functions.

In the same year, 2012, the Ripple project (now known as XRP) was launched, unique in its focus on working with major international banks. It was assumed that the cryptocurrency XRP would be used as an intermediary asset in interbank settlements. The unique consensus mechanism of the Ripple blockchain ensures fast transaction processing; however, the network itself remains relatively more centralized (compared to Bitcoin) since the validators are organizations approved by the developers (banks, universities, hedge funds). Nevertheless, there is no specific information available to the public as of today regarding whether financial institutions are using any solutions based on the cryptocurrency XRP (11 years after the project's launch).

Thus, from the perspective of categorization, the cryptocurrency XRP can be classified into a narrow group of cryptocurrencies that are positioned as bridge cryptocurrencies. On the other hand, since such cryptocurrencies are used in a specific way exclusively within the framework of the created platform/protocol/product, they are also referred to as utility cryptocurrencies/tokens. Utility tokens, according to their creators' design, are not investment assets and do not serve as a means of payment outside the project, similar to in-game currency purchased with fiat money. XRP became one of the first cryptocurrencies not striving to be a universal, decentralized means of payment.

In 2013, Dogecoin was created based on the source code of Litecoin. Exploiting a well-known Internet meme in its name, Dogecoin was created *as a joke*, as a satire mocking other meaningless cryptocurrencies, and became the first *meme coin*. In May 2023, Dogecoin's market capitalization was around $ 10 billion, ranking 8 in terms of market capitalization. Some online stores and services accept payment in Dogecoin, but this is not a common practice. There is an opinion that meme coins are Ponzi

schemes, which is mentioned, among other things, by one of the creators of Dogecoin (see [10]), discussing other meme coins.

Despite the *seriousness* of meme coins, some of them surpass real projects in terms of capitalization. Thus, in April 2023, the cryptocurrency Pepe quickly reached a market capitalization of $ 1 billion, and then dropped to a level of $ 600 million.

In the same year, 2013, an event occurred that significantly influenced the further development of cryptocurrencies — the emergence of the MasterCoin project (now known as Omni) with the same-name cryptocurrency. This project became the first example of a cryptocurrency appearing on top of an existing cryptocurrency. In Bitcoin blockchain transactions, in addition to information directly related to the transaction of transferring units of the cryptocurrency Bitcoin (who, to whom, how much, etc.), there is a field where any information can be stored. The creator of Mastercoin proposed using this field to create an entire protocol (set of rules), which can be used to build a new user layer on top of the Bitcoin blockchain.[3] The first example of using this layer was the cryptocurrency Mastercoin itself.

Cryptocurrencies created on the basis of other blockchains have come to be called tokens, the first of which was Mastercoin (MSC). Thus, within this framework, a digital coin is considered a cryptocurrency if it is native (i.e., the first and primary) to the blockchain. If a digital coin is created within another blockchain (using smart contracts or a third-party protocol like Mastercoin), then it is a token. Nevertheless, we will not distinguish tokens as a separate type of cryptocurrency, as this fact is also technical and does not reflect the immediate purpose of a particular digital asset.

In March 2015, Mastercoin was renamed to Omni Layer, and the MSC token was renamed to OMNI, which still exists today (with a market capitalization of only $ 1 million). The OMNI token can formally be classified as a utility cryptocurrency/token; however, in practice, no practical application for this token has been found.

Despite the questionable applicability of the OMNI token, the Omni Layer protocol itself has had a significant impact on the entire cryptocurrency sphere. In particular, the most popular feature of Omni Layer became the ability to create other tokens based on the Bitcoin blockchain, which led to the emergence of the first stablecoin[4] from Tether in 2014. The stability of the USDT token's exchange rate is achieved through investors' trust in the promises of Tether Limited Inc. to exchange all USDT tokens for US dollars at any time. Despite the constant criticism of Tether for insufficient transparency (see, for example, [11, 12]), as of May 2023, the Tether USDT dollar stablecoin was the largest stablecoin with a market capitalization of over $ 80 billion. Thus, stablecoins are a separate important category of cryptocurrencies, allowing investors to have a kind of digital dollar within the cryptocurrency market without the need to interact with the traditional banking system each time they sell other cryptocurrencies.

For a long time, Bitcoin and cryptocurrencies were considered completely anonymous, which facilitated their use for trading illegal goods. However, since 2013, it has become clear to most of the crypto community that cryptocurrencies are only anonymous until the wallet owner is identified (i.e., they are pseudo-anonymous), and studies (see, for example, [13–15]) have shown that an identification of owners is possible. This led to the emergence of cryptocurrencies whose goal is to maximize user anonymity. One of them was Dash, launched in 2014. Later, others appeared, including quite well-known ones: Monero (in the same 2014) and Zcash (in 2016). Thus,

[3] As an analogy, the HTTP protocol built on top of TCP/IP and not functioning without the latter is often cited.

[4] Stablecoins are cryptocurrencies/tokens whose exchange rate is pegged in a one-to-one ratio to a certain fiat currency (such as the US dollar, euro, yen, etc.) or to the prices of some other financial assets (for example, gold).

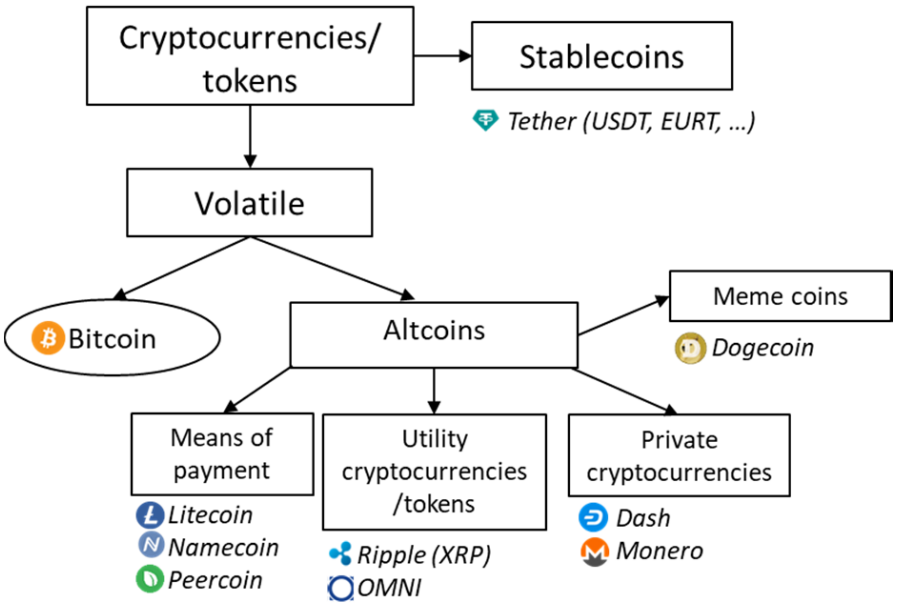

Fig. 2. **Cryptocurrency Categories as of the Beginning of 2015**

Source: Compiled by the authors.

another category of cryptocurrencies can be distinguished — private ones.

Fig. 2 presents a scheme for categorizing cryptocurrencies taking into account the aforementioned categories as of early 2015.

ETHEREUM AND SMART CONTRACTS

The next significant milestone in the development of cryptocurrencies was the emergence of the Ethereum blockchain in 2015. The main advantage of Ethereum was the ability to create smart contracts — small computer programs executed not on a separate dedicated server, but distributedly, using the computing power of network participants (miners). The native cryptocurrency of the Ethereum blockchain is Ether,[5] which is used to pay transaction fees on the network, including for the execution of smart contracts.

The emergence of smart contracts, in turn, opened up the possibility of creating decentralized applications (dApps) — a collection of interconnected smart contracts that represent a certain service/software product. Moreover, smart contracts can also be used to create various tokens. The relatively fast Ethereum blockchain turned out to be a more attractive platform for creating a large number of diverse utility tokens for various projects (including Ponzi schemes and outright fraudulent schemes) than Omni Layer and other similar protocols built on top of the Bitcoin blockchain (Counterparty, ColoredCoins, etc.). An advantage was also the unified rules for creating ERC-20 tokens (Ethereum Request for Comments No. 20) released by Ethereum developers in November 2015, which significantly simplified the issuance of digital assets on the Ethereum blockchain. Tokens issued in accordance with these standards are also called ERC-20 tokens.

With the emergence of Ethereum, non-fungible tokens (NFTs) gradually began to gain popularity as well. These differ from standard fungible ERC-20 tokens or cryptocurrencies (such as Bitcoin, Ether, etc.) in that each unit of these tokens is unique due to the specific information contained within them. Since the value and characteristics of almost every NFT are unique, it is quite difficult to categorize them all into a single or even several categories

[5] Quite often, even in scientific literature dedicated to cryptocurrencies, there is confusion when it is said that Ethereum is a cryptocurrency. In fact, Ethereum is the name of a distributed network (blockchain) on which the cryptocurrency Ether circulates.

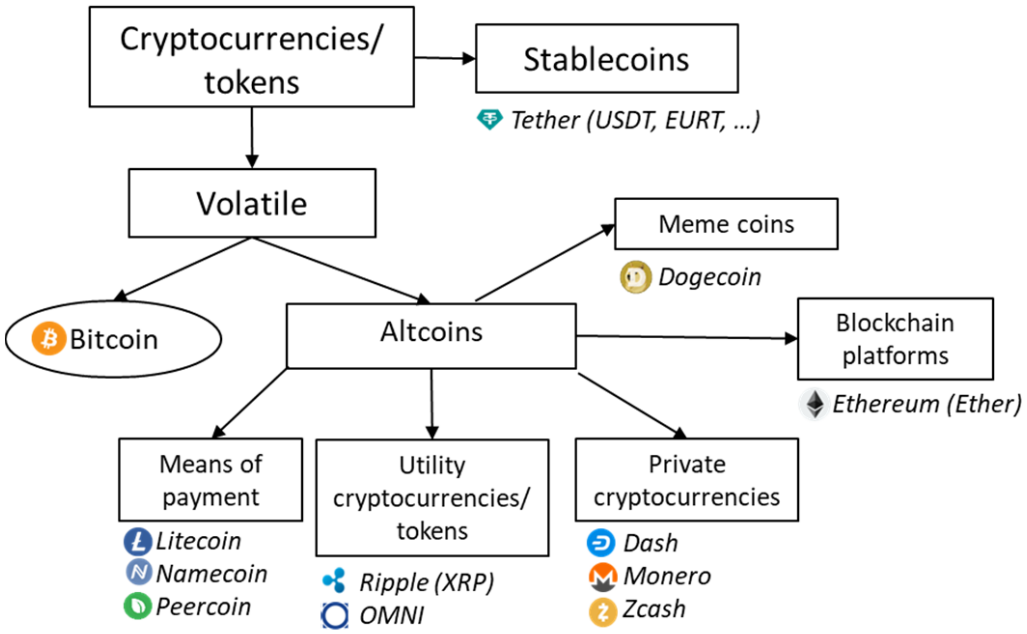

Fig. 3. **Cryptocurrency Categories Including Blockchain Platforms**

Source: Compiled by the authors.

within the cryptocurrency space. In this regard, we will focus only on the categorization of standard fungible tokens.[6]

The Ethereum blockchain became the first, but far from the last, blockchain with the capability to create smart contracts. Native cryptocurrencies circulating on such blockchains can be classified into the category of cryptocurrencies/tokens of blockchain platforms. Formally, such cryptocurrencies can be classified as utility tokens, as they primarily serve as a means of paying fees for the operation of smart contracts and conducting transactions. However, we will place them in a separate category due to the distinct characteristics of the blockchain on which they operate. *Fig. 3* presents the categories of cryptocurrencies taking into account the emergence of blockchain platforms.

With the development of the field, the number of blockchain platforms has increased. Moreover, some utility tokens over time could acquire their own blockchain platforms. A striking example is Binance Coin (BNB), launched in 2017 as an ERC-20 token, and in 2019 migrated to its own blockchain with smart contract support, making BNB similar to Ether. Another example is the Stellar project, positioned as a competitor to Ripple, which is currently introducing a smart contract creation feature.[7]

GOVERNANCE TOKENS AND DECENTRALIZED AUTONOMOUS ORGANIZATIONS

Besides the ability to create tokens and various dApps, smart contracts have opened up the possibility of organizing so-called decentralized autonomous organizations (decentralized autonomous organization, DAO). A DAO is usually understood as a distributed ledger-based system in which member interactions and management decisions are made in a decentralized manner through the mediation of smart contracts [17]. In some sense, a DAO can be compared to a joint-stock company. To participate in a DAO, it is necessary to acquire tokens that grant the right to vote on further development or even

[6] Detailed information in the paper [16].

[7] Note that XRP is also currently preparing to introduce the function of creating smart contracts.

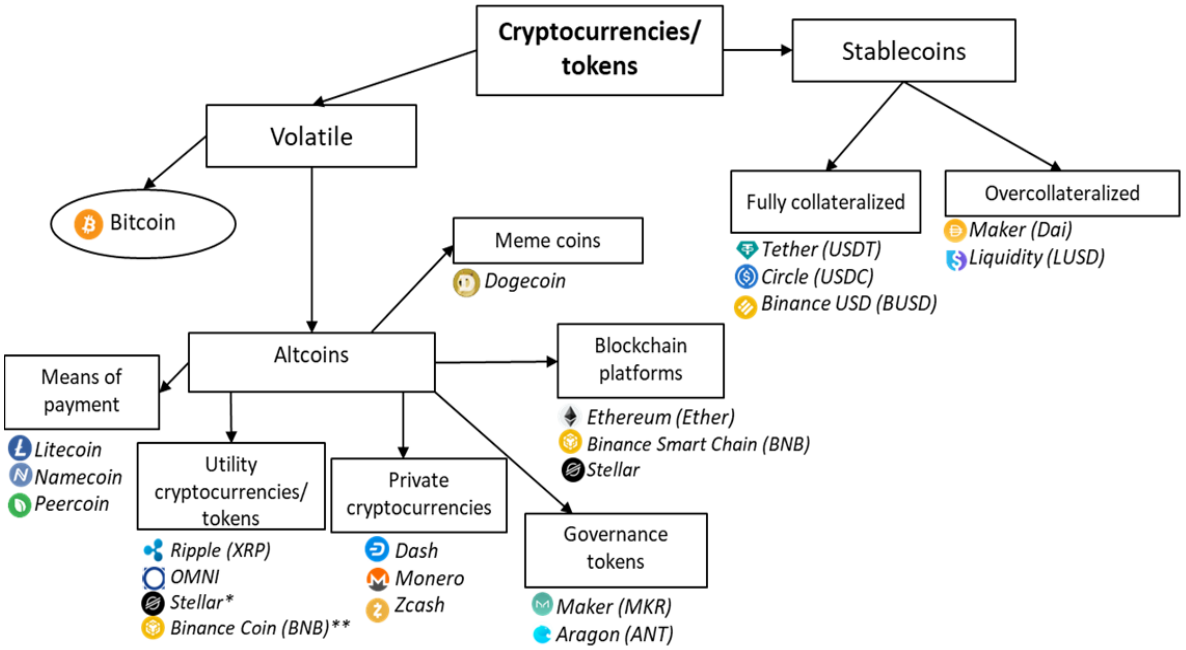

Fig. 4. **Cryptocurrency Categories**

Source: Compiled by the authors.

Notes: * Stellar before the introduction of full-fledged smart contracts in 2023; ** before the launch of its own blockchain Binance Smart Chain in April 2019.

specific actions of the community, including issues related to the distribution of the DAO's profits. Just like with an initial public offering (IPO), the initial distribution of tokens goes through a similar procedure — an initial coin offering (ICO), as a result of which the collected funds (a kind of equity) are accumulated in DAO wallets, and the management of the funds is carried out through voting by token holders.[8]

One of the first DAOs was the project TheDAO, launched in April 2016 on the Ethereum blockchain. TheDAO was conceived as a kind of hedge fund, where the funds raised during the ICO[9] would be managed through voting by token holders. Investors who participated in the ICO received DAO tokens in exchange for their investments.[10] However, as early as June 2016, a malicious actor discovered a vulnerability in the code of TheDAO's smart contracts, which led to the theft of one-third of their funds ($ 50 million).

Another extremely important event for the development of the entire cryptocurrency industry was the emergence in December 2017 of another DAO on the Ethereum blockchain — MakerDAO. This DAO manages the decentralized application (protocol) Maker, whose function is the issuance of an over-collateralized stablecoin Dai. Unlike fully collateralized stablecoins like USDT, Dai is backed by other cryptocurrencies (primarily Ether and other ERC-20 tokens). Due to the high volatility of cryptocurrencies, Maker uses special collateralization ratios exceeding one. Accordingly, when depositing collateral into the protocol, for example, Ether worth $ 100, the user can receive a maximum of $ 58.8 in Dai (at a ratio of 170%). For the issuance of Dai, the user is charged an equivalent interest rate (stability fee), which is paid upon returning Dai to the protocol, after which the user regains access to their pledged assets.

[8] The paper [18] is dedicated to a detailed analysis of the principles of DAO functioning.

[9] During the ICO of the TheDAO project, approximately $ 150 million was raised.

[10] The phrase "DAO token" specifically refers to a token that certifies the owner's right to participate in the TheDAO project. Unfortunately, the creators of TheDAO decided not to be very creative with names, which often leads to confusion in discussions specifically about the case of TheDAO.

MKR tokens allow participation in the governance of the MakerDAO protocol, including voting on issues such as changing collateralization ratios, interest rates, profit distribution, and more. These tokens, like TheDAO tokens, can be classified as governance tokens, allowing participation in the management of decentralized organizations. MKR tokens are often also classified as DeFi tokens due to the Maker protocol's affiliation with this sphere. Nevertheless, MKR tokens are governance tokens and are not much different from other tokens in this category (for example, from the ANT token of the Aragon project, a platform for creating other DAOs).

Fig. 4 demonstrates the updated scheme of cryptocurrency categories, taking into account governance tokens as well as over-collateralized stablecoins.[11]

DEVELOPMENT OF THE DEFI SECTOR AND CRYPTOCURRENCY DERIVATIVES

One of the areas of cryptocurrency that gained popularity after the market crash in 2017 was decentralized finance. (DeFi). In this field, there are currently a large number of various services, among which one can highlight lending protocols (Maker, Compound, Aave, etc.), decentralized spot exchanges (Uniswap, Balancer, PancakeSwap, etc.), decentralized exchanges with margin trading support (dYdX) and options trading (Opyn), tokenized ready-made investment strategies (TokenSet). Prediction markets (Augur) allow to bet on the occurrence of any event in the world, which opens up opportunities for hedging open positions, while insurance services (Nexus) enable to take out an insurance smart contract against undesirable events in the world of cryptocurrencies (for example, excessive deviation of a certain dollar stablecoin from the price of 1 dollar).

The development of the DeFi sector has also led to the emergence of a large number of new types of tokens, which are derivatives not only of certain real assets (such as stocks or even real estate) but also of other cryptocurrencies and even entire portfolios consisting of them. Formally, the first class of derivative tokens can be considered stablecoins, in which the underlying asset is fiat currency or a basket of other cryptocurrencies (in the case of cryptocurrency-backed stablecoins).

An important infrastructural category of derivative tokens is wrapped tokens, the most popular of which is the wrapped Bitcoin (WBTC) that appeared in 2019 — an ERC-20 token on Ethereum. Many blockchains are incompatible in the sense that they do not allow the transfer of cryptocurrencies between blockchains. To solve this problem, the Wrapped BTC project was organized, which brings together a number of specialized agents (merchants) who accept the cryptocurrency Bitcoin on the Bitcoin blockchain and issue an equivalent number of WBTC tokens on Ethereum, allowing Bitcoin to be used in DeFi services on the Ethereum blockchain. In May 2023, the capitalization of WBTC was around $ 4.3 billion, meaning that about 1% of all bitcoins are circulating on Ethereum in the form of WBTC tokens.

Another type of derivative tokens serves as a kind of receipt and is a digital confirmation of the fact that the user's funds have been transferred to DeFi services for the purpose of earning income on the deposited funds. In turn, such receipt tokens can be divided into two major groups: liquidity provider tokens (LP-tokens) and interest-bearing tokens (or yield tokens). The former are used within various decentralized exchanges and swap platforms.

Any exchange requires a market maker to ensure liquidity and depth of the order book for each instrument. On decentralized exchanges (for example, Uniswap or Balancer), liquidity pools replace market makers. Users contribute funds to the pools, receiving a portion of the

[11] The attempt to create algorithmic stablecoins, such as TerraUSD (UST) of the Terra blockchain, which collapsed in 2022, has not yet been successful, so their classification as a separate category does not seem justified.

transaction fees for a specific trading pair in return. When creating a pool (for example, BTC/USDT), users deposit both assets in a specific ratio, receiving an LP token in return that confirms their share in the pool and their right to a portion of the transaction fees.[12] Such LP tokens are automatically issued when funds are deposited and destroyed when withdrawn.

In lending protocols such as Compound (launched in September 2018), users can receive so-called interest-bearing tokens or yield tokens for depositing funds into them. In Compound, they are designated as cTokens. For example, if a user deposits 100 USDC, they receive an equivalent amount of cUSDC. At first, these cUSDC correspond to the deposit amount, but over time they increase in value, reflecting the accumulated interest. If the user decides to redeem cUSDC, they will receive back more than their initial deposit, including interest. The recalculation of the cUSD price occurs every 13–15 seconds with each Ethereum block.

The Compound protocol earns by issuing secured loans at an interest rate higher than the deposit rate. Unlike Maker, it allows borrowing different cryptocurrencies, not just stablecoins.[13] Thus, the cTokens of the Compound project (like the aTokens of the AAVE protocol and the yTokens of the yearnFinance protocol) act as a kind of deposit certificates and are definitely a separate class of derivative tokens. Moreover, these interest-bearing tokens can be traded on the secondary market or even used as collateral in other DeFi protocols. Repeatedly re-staking such tokens and profiting from the interest rate differences across various protocols is called yield farming.

Another interesting category of derivative tokens is structured tokens (analogous to structured products in traditional finance), the dynamics of which reflect a chosen investment strategy. These can be simple followings of the return index of a cryptocurrency portfolio, similar to exchange-traded funds (ETFs), as well as more complex strategies reflecting inverse (analogous to inverse ETFs) or leveraged (analogous to leveraged ETFs) asset dynamics. Examples of such tokens include the tokens of the Index Coop project — DeFi Pulse Index (DPI), which reflects the dynamics of a market-weighted portfolio of governance tokens from various DeFi protocols; Metaverse Index (MVI), which reflects the dynamics of a portfolio of tokens related to the concept of metaverses; as well as margin tokens ETH-2x Flexible Leverage Index and BTC-2x Flexible Leverage Index, which reflect the doubled dynamics of Ether and Bitcoin, respectively. Among the more sophisticated structured tokens, the tokens of the decentralized options platform Opyn stand out. One of them, Squeeth (Squared Ether), is an ERC-20 token and functions similarly to perpetual futures contracts; however, in the case of Opyn, all clearing and variation margin calculation functions, which are usually performed by an exchange, are carried out using smart contracts.

The Opyn options protocol (Opyn V2) also offers a separate module (Gamma Protocol) that allows the creation of full-fledged options contracts in the form of ERC-20 tokens. Although the Opyn project has shifted its focus to creating structured tokens, the Gamma Protocol continues to operate and is used, for example, by another DeFi service for issuing structured tokens, Ribbon Finance, which hedges its positions using options created on the Gamma Protocol. Thus, these option tokens are quite specialized and are usually not available on any exchanges. Nevertheless, it seems important to note the very existence of such concepts in this field.[14]

[12] More details on the operation of decentralized exchanges can be found in the paper [19].

[13] The Compound protocol includes various risk management mechanisms, including automatic liquidation of positions if the collateral value falls below a certain threshold.

[14] Let's note that on another options DeFi protocol, Hegic, options are issued in the form of NFTs.

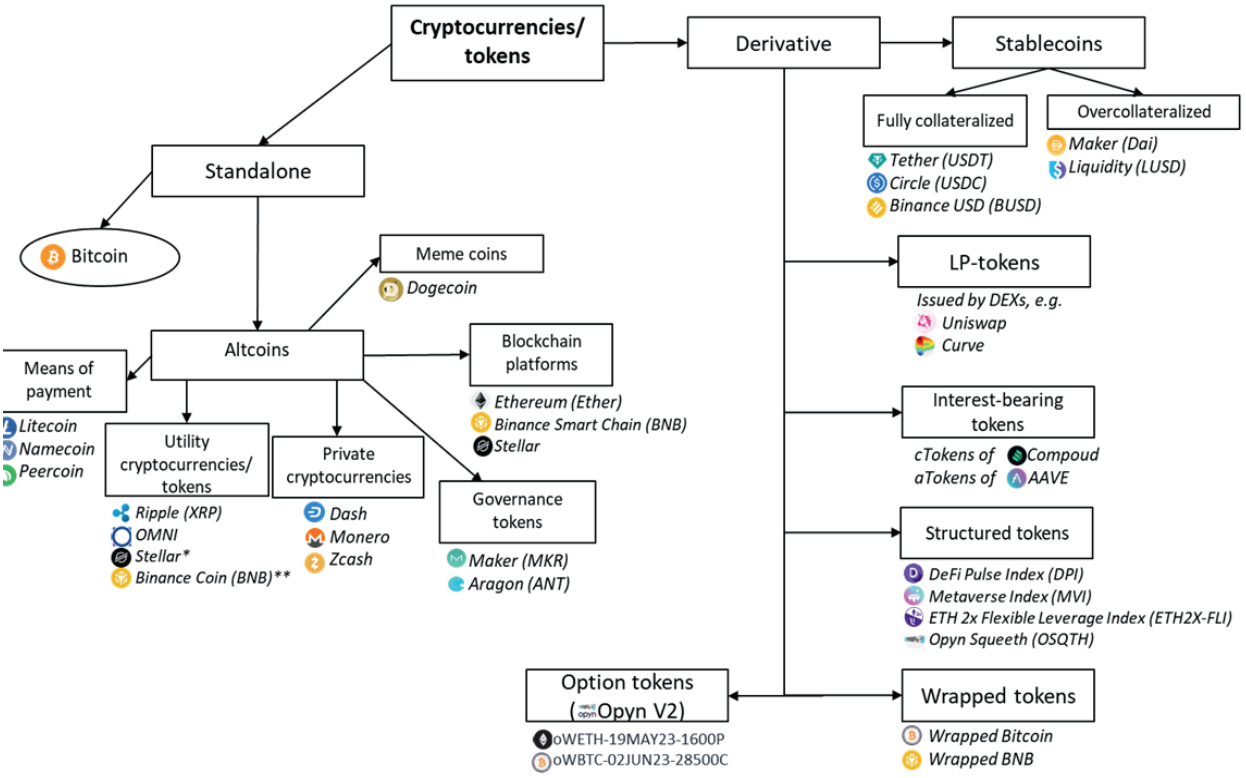

Fig. 5. **Final Taxonomy of Cryptocurrencies**

Source: Compiled by the authors.

Note: see the note to *fig. 4.*

Table

The Top 10 Cryptocurrencies by Market Capitalization as of May 14, 2023

No.	Name (ticker)	Category	Creation date	Market capitalization	% from market
1	Bitcoin (BTC)	Means of payment	09.01.2009	521 billion	46.5%
2	Ethereum (ETH)	Blockchain platform	30.07.2015	222 billion	19.8%
3	Tether (USDT)	Stablecoin	26.02.2015	83 billion	7.4%
4	BNB	Blockchain platform	26.07.2017	49 billion	4.3%
5	USD Coin (USDC)	Stablecoin	05.10.2018	30 billion	2.7%
6	XRP	Utility token	05.08.2013	22 billion	2.0%
7	Cardano (ADA)	Blockchain platform	02.10.2017	13 billion	1.1%
8	Dogecoin (DOGE)	Mem-coins	06.09.2013	10 billion	0.9%
9	Solana (SOL)	Blockchain platform	11.04.2020	8,3 billion	0.7%
10	Polygon (MATIC)	Blockchain platform	29.04.2019	7,9 billion	0.7%
Total cryptocurrency market capitalization				1121 billion	86.2%

Source: Compiled by the authors based on coinmarketcap.com data.

CONCLUSION

Fig. 5 presents the final version of the cryptocurrency categorization proposed by us. Today, cryptocurrencies represent a rather extensive space of diverse digital assets, especially compared to how the market looked even in 2015. In this work, we have only considered fungible tokens, leaving NFTs aside, just as we have not examined the many possible categories of services and products existing in the cryptocurrency space. Nevertheless, we have made an attempt to highlight the main essential characteristics inherent to individual groups of cryptocurrencies, doing so, on the one hand, through the lens of market development, and on the other hand, without overly complicating the proposed taxonomy with technical aspects. It is quite difficult to analyze the entire market, which is also constantly evolving. Nevertheless, the obtained taxonomy, in our opinion, largely covers most of the cryptocurrency space to date.

We have identified categories of tokens that closely resemble various financial instruments from the realm of traditional finance. For example, there are governance tokens, which function similarly to simple voting shares and can even distribute profits. Another interesting category is the designated class of cryptocurrency derivatives, which reflect the dynamics of certain other assets or certify the users' right to receive income from the managed funds. Moreover, with the help of smart contracts and on a decentralized basis, entire analogs of exchange-traded funds (ETFs) and more complex structured products, and even options contracts, have begun to emerge. All of this indicates the establishment of some alternative decentralized financial system in the realm of cryptocurrencies. It is unlikely that we will see rapid growth in this sector in the near future due to the significant increase in pressure from financial regulators, especially in light of the collapse of several major projects in this area (TerraUSD, the FTX cryptocurrency exchange) and the bankruptcy of several American commercial banks (Silvergate, Silicon Valley Bank, Signature Bank) that were actively involved in this sector, as well as the close attention of the U.S. Securities and Exchange Commission to cryptocurrencies in 2023.

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ABOUT THE AUTHORS

Kirill D. Shilov — Researcher, Department for Digital Finance Gaidar Institute for Economic Policy, Moscow, Russia
https://orcid.org/0000-0002-2149-3946
Corresponding author:
shilov@iep.ru

Andrei V. Zubarev — Can. Sci. (Econ.), Senior Researcher, Department for Digital Finance Gaidar Institute for Economic Policy, Moscow, Russia
https://orcid.org/0000-0003-2945-5271
texxik@gmail.com

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