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The Logic of Money: Crypto Mechanics and the Limits of Tokenisation

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Abstract

Cryptocurrencies are widely recognised for catalysing distributed ledger technologies and tokenisation, innovations that are transforming payment systems globally. However, their role as money is often contested and the subject of intense academic and policy debate. Nevertheless, new taxonomies of money allocate a unique place for cryptocurrencies. Described based upon a few high-level features, cryptocurrencies, except for stablecoins, are assumed to be a uniform group that can indeed be studied and categorised as such. Moreover, the logic of their creation is often looked at from a broad decentralisation and disintermediation perspective and remains ambiguous and questionable at best. This paper reports the findings of a clinical investigation into the top 30 cryptocurrencies representing 95.5% of the total crypto market capitalisation. This study is primarily concerned with their logic of creation, and how they compare with that of fiat money and central bank digital currencies. The findings reveal that, unlike fiat money, and CBDCs, crypto mechanics depict a diverse assortment of logics. The evidence suggests that despite widespread technical innovations, the crypto ambition to provide an alternative to centrally controlled debt-based fiat money has managed to add a combination of transaction validation, mathematical guesswork, pseudo-randomness, and size dependent probability as alternative logics of creation and allocation. While centrally managed bank-controlled debt-based fiat money leaves a lot to be desired, protocol-managed, code-controlled, size-dependent probabilistic money does not seem like much of an upgrade. This paper addresses the limits of tokenisation as a transformational tool and argues that cryptocurrencies may have helped trigger improvements in the technology of money, but not in its logic of creation. Indeed, to compete in the emerging monetary landscape it has helped create, i.e., the ubiquitous tokenisation of debt and debt-based fiat money, the crypto revolution will have to extend its value proposition beyond technology and pseudo-randomness.

Keywords: cryptocurrencies; stablecoins; fiat money; central bank digital currencies; debt; puzzles; stakes; cryptoassets; tokenisation

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1. Introduction

Digital money is not a new phenomenon. The digitisation of money has been an integral part of our two-tier monetary architecture for decades. Indeed, central bank reserves and commercial bank deposits have been operating in the digital realm much before the recent wave of digital currencies, i.e., cryptocurrencies, came about (Carstens,

2021). While this is indeed a fact, it is also true that cryptocurrencies, and the technological innovations they introduced, have triggered structural transformations in digital money and how we execute digital payments.

Nakamoto's (2008) foundational work, which established the network architecture of Bitcoin, is credited for enabling secure distributed ledger technologies and ushering in a new reality in digital money. Eighteen years later, we have thousands of cryptocurrencies issued and traded on crypto exchanges, many central banks already exploring or experimenting with central bank digital currencies, and banks offering their own deposit tokens (See Bloomberg, 2025a, 2025b; Atlantic Council, 2025). The Bank for International Settlements recognises that tokenisation could be the catalyst of the "next-generation monetary and financial system" (BIS, 2025b). While such systemic changes will undoubtedly take years to mature, their theoretical and technological foundations are being established at present. This paper aims to contribute to the debate shaping them.

Bitcoin and the cryptocurrencies that followed have been at the forefront of innovations in distributed ledger technologies and tokenisation. This is generally not a contested observation. However, their role, viability, and functional features as money have been the subject of intense academic and policy debate (BIS, 2023, 2025a, 2025b; Carstens, 2021; Baur et al., 2018; Böhme et al., 2015; Yermack, 2013). In fact, cryptocurrencies are often described as speculative cryptoassets (Bank of England, 2025; CPMI, 2015). Carstens (2018) argues that they are a combination of a bubble, Ponzi scheme, and environmental disaster. Shin (2018, p. 1) argues that issues of scalability and finality are significant challenges that limit the potential of cryptocurrencies as a viable alternative that can "oust the conventional monetary system".

While the debate is ongoing, the necessity to describe and understand the changing landscape has led to the development of new taxonomies of money that consider cryptocurrencies to be an integral component of the evolving reality of money (Adrian & Mancini-Griffoli, 2019; Bech & Garratt, 2017; Bjorg, 2017; CPMI, 2015). This is the primary rationale behind the title of this paper and the inclusion of cryptocurrencies alongside fiat money and central bank digital currencies. This does not negate the fact that they are better described as cryptoassets.

The main objective of this study is closely linked to the body of research exploring new taxonomies of money. Extending the botanical analogies of Bech and Garratt (2017) and Adrian and Mancini-Griffoli (2019), the main aim is to offer a more granular understanding of what cryptocurrencies actually represent as a new branch on the 'money tree', or a new petal on the 'money flower'. While their underlying technologies have had a defining role in triggering the payments revolution we are witnessing around the world, their impact on the *logic* of money creation remains relatively ambiguous, and questionable at best.

Except for stablecoins, cryptocurrencies are commonly treated as a uniform group that can be considered or studied as such, similar to how other asset classes have been investigated in the field. A vast body of research on cryptocurrencies assumes that to be the case (Urquhart & Yarovaya, 2023). This is reflected in the recently ratified European Union's Markets in Crypto-Assets (MiCA) Regulation (EU) 2023/1114. The regulatory framework considers only three categories: Asset-referenced Tokens (ARTs), E-Money Tokens (EMTs), and all other crypto (EU-MICA, 2023). This is also true for the many taxonomies of money mentioned above. They consider broad differentiation features when discussing cryptocurrencies as money, such as their account or object-based nature, fixed or variable value, backstop, technology, peer-to-peer, electronic, universally accessible, and non-liability features (Adrian & Mancini-Griffoli, 2019; Bech & Garratt, 2017; Bjorg, 2017; CPMI, 2015). There is an underlying assumption of functional and methodological uniformity, which is probably due to the fact that fiat currencies in all their forms, i.e., currency, bank deposits,

and central bank reserves, follow a universally accepted methodology. This research was motivated by the need to establish whether that is really the case for cryptocurrencies, and to what extent. The main purpose is to dig deeper and investigate their *logic of creation* and compare it with that of fiat and central bank digital currencies.

Unavoidably, the discussion must begin with Bitcoin, about which much has already been written (Kang et al., 2025). Bitcoin and the news title embedded in Block 0, "The Times 3 January 2009 Chancellor on brink of second bailout for banks", symbolised a form of revolt that aimed at providing a new kind of money without financial intermediaries, i.e., banks and central banks. With the 2007/2008 financial crisis as backdrop, Block 0 hinted at the kind of change that the first cryptocurrency aimed to introduce. In his seminal paper that became the foundation of Bitcoin, Nakamoto (2008) described a peer-to-peer network architecture that could do away with financial institutions as key nodes of online payments. He defined an electronic coin as a "chain of digital signatures" and went on to describe how such a system could monitor itself without a trusted third party. In the whitepaper that established the vision of Ethereum, the second largest cryptocurrency by market capitalisation after Bitcoin, Buterin (2014) describes one of Nakamoto's (2008) key contributions as "a decentralized peer-to-peer online currency that maintains a value without any backing, intrinsic value or central issuer". This definition of Bitcoin requires further clarification, and we will get to discuss the exact logic that supports the first cryptocurrency in later sections. The key point of note here is that Bitcoin was born with the ambition to offer an alternative to centrally controlled, debt-backed, fiat money. This is the big picture justification that has motivated the birth of cryptocurrencies.

The cryptographic revolution in payments through distributed ledger technology (DLT) and tokenisation has gone far beyond Bitcoin and Ethereum. The number of cryptocurrencies has grown over time, and we now have different kinds and types of cryptocurrencies that serve a variety of purposes, using a diverse set of technological solutions. A subset of cryptocurrencies, i.e., stablecoins, have attracted significant market and research attention (Dionysopoulos & Urquhart, 2024), culminating in the 2025 Genius Act passed by the US Congress (2025). With a pegged value, hence the reference to 'stable' in their name, they have become a growing medium of payment within and across borders. Their logic, methodology of creation, and pricing are different from most other cryptocurrencies, but the underlying technological transformations remain central.

Whatever the initial vision and ambition of Bitcoin, and all the cryptocurrencies that followed, central banks and commercial banks, through their primary responsibility and role in creating all the forms of fiat money, remain at the heart of our global monetary architecture. However, more than a decade later, blockchain and tokenisation are also transforming the very intermediaries that they were supposed to sideline. In fact, central bank digital currencies (CBDCs) have become a global phenomenon in the making (Auer et al., 2023). A recent Bank of International Settlements report revealed that, from the 93 central banks surveyed, 85 (91%) are exploring either a retail or wholesale CBDC. Retail and wholesale CBDCs tokenise banknotes and central bank reserves respectively. The core motivation behind these initiatives is the preservation of the role of central bank money given the decline of cash and the tokenisation of traditional assets (BIS, 2025a).

In other words, far from removing them from the picture, the crypto phenomenon has triggered a global transformation of the 'third parties' controlling and managing fiat money. From tokenised deposits (Bloomberg, 2025a, 2025b) to retail and wholesale CBDCs, tokenisation is being adopted given its efficiency benefits. Nakamoto's 'third parties' are keeping the logic of fiat money intact as they adopt the infrastructure and technological innovations that can allow them to keep pace and compete in the new landscape. Given the crypto ambition to provide an alternative to centrally managed and controlled money,

and given the adoption of the underlying technology by banks and central banks, and the recognition that tokenisation could be the catalyst of the "next-generation monetary and financial system," (BIS, 2025b), the question that this study seeks to answer is of particular relevance to the future of the crypto market. This paper reports the findings of a clinical investigation into the logic of creation of the top 30 cryptocurrencies representing 95.5% of the total crypto market capitalisation as of the 26 September 2025. The logic of creation is explored through three key questions, for each of the top 30 cryptocurrencies: (a) *why* is it created? (b) *when* are new coins/tokens created? and (c) how are they issued and *to whom*? Note that the why question here refers to their functional purpose and uses, and not the big Nakamoto (2008) 'why', to remove financial intermediaries from the process of money creation and allocation.

Given the topical focus and key purpose, this research was best served through clinical methodology (Jensen et al., 1989). Indeed, the clinical study revealed a number of pertinent findings. Unlike fiat money, and CBDCs, crypto mechanics depict a diverse assortment of logics. While some are created and distributed with the same level of discretionary decision-making that is common to fiat money, others have a unique set of creation and allocation logics. What is most striking, however, is that cryptocurrencies have managed to add a combination of transaction validation, mathematical guesswork, pseudo-randomness, and size dependent probability as alternative logics of money creation and allocation. Compared to the debt logic of fiat and central bank digital currencies (liabilities backed by debt assets), it is hard to see how the crypto methodologies are an improvement. Indeed, centrally managed bank-controlled debt-based fiat money leaves a lot to be desired, but a protocol managed code-controlled size dependent probabilistic money does not look like much of an upgrade at all. Out of the frying pan and into the fire, from bankers to coders, from debt to pseudo-randomness, the logic of money creation remains equally wanting. This paper concludes by discussing the transformational limits of tokenisation. While it is undoubtedly shaping an ongoing revolution in payments, its ability to lead us towards monetary evolution is conditioned by a fundamental re-examination of the core assumptions that underpin our financial and monetary economics (Papazian, 2022, 2023, 2024, 2025). In other words, beyond technology and pseudo randomness, cryptocurrencies will have to offer improvements in the logic of money as well.

The remainder of this paper is organised into four main sections. Section 2 reports the findings of a clinical study of the top 30 cryptocurrencies listed on CoinMarketCap as of the 26 September 2025, representing more than 95% of the total cryptocurrency market capitalisation. The section explores their logic of creation through a thorough investigation of each, looking at all relevant aspects, such as type, technology, supply, rules, and consensus mechanism, using diverse sources like whitepapers, market data, and actual code. The section offers an answer to the why, when, and how and to whom questions that define their logic of creation.

Section 3 addresses the logic of creation of fiat money, in the form of currency, bank deposits, and central bank reserves. It also extends the discussion to the logic of creation of central bank digital currencies, discussing the available evidence from ongoing experiments and pilots and their theoretical and empirical design elements.

Section 4 discusses the limits of tokenisation in relation to the logic of money creation, introducing the changes that cryptocurrencies will have to embrace to stay relevant in the emerging landscape of tokenised debt and debt-based fiat money.

Section 5 concludes this paper and identifies areas of future research.

2. Crypto Mechanics: The Creation Logic of Cryptocurrencies

This section discusses the methodology, data, and findings of a clinical investigation into the logic of creation of the top 30 cryptocurrencies representing 95.5% of the total crypto market capitalisation as of the 26 September 2025. The logic of creation is revealed by answering three key questions: (a) *why are they* created? (b) *when are* new coins/tokens created? and (c) how are they issued and *to whom*? Note that the why question here refers to their functional purpose and usage, and not the philosophical motivation, i.e., to remove third parties and 'decentralise' and 'democratise' finance. The main aim to shed further light on crypto mechanics, assessing their viability as a uniform group that can be considered and studied as such.

2.1. Methodology

In their seminal editorial in the Journal of Financial Economics, 'Clinical Papers and Their Role in the Development of Financial Economics', Jensen et al. (1989) set out the guidelines of clinical research in finance. Since then, various articles have been published using clinical methodology (Scholes & Wolfson, 1989; Mitchell & Netter, 1989; Karpoff & Rice, 1989; Muscarella & Vetsuypens, 1989; Dissanaike & Papazian, 2004; Froot, 2001; Lys & Vincent, 1995; Denis, 1994; Hampson, 1991, DeAngelo & DeAngelo, 1991; Baldwin & Bhattacharyya, 1991).

Jensen et al. (1989, p. 1) argue that "[b]y supplying insights about the world, challenging accepted theory, and using unique sources of data, clinical studies stand on their own as an important medium of research. Like the medical literature from which the term 'clinical' is borrowed, these articles will frequently deal with individual situations or small numbers of cases of special interest".

The choice of clinical methodology for this study is born out of the need to search and reveal information that would otherwise be unavailable through standard financial datasets. The topical focus requires an in-depth analysis of not just financial data and relevant academic research, but also code functions, rules, whitepapers, and issuance documentation. For cryptocurrencies, unlike fiat currency, the logic of creation is often a code defined reality.

2.2. Data

The initial financial data used in this analysis was extracted from CoinMarketCap through a direct API request covering the top 500 cryptocurrencies listed as of the 26 September 2025. The data request covered all key financial metrics including price, volume, supply, market capitalisation, and market capitalisation dominance (CoinMarketCap, 2025). The data were used to narrow the study sample to the top 30 listed cryptocurrencies (Table 1). This choice is based on the fact that the top 30 represented 95.5% of the total crypto market capitalisation. Market capitalisation dominance is measured through Equation (1) and provided as a data point by CoinMarketCap (2021, 2025).

$$Dominance\ of\ Coin\ X = \frac{Market\ Cap\ of\ Coin\ X}{Total\ Market\ Cap\ of\ All\ Crypto} \times 100\% \quad (1)$$

After selecting the sample, the clinical investigation consisted in diving deeper into each of the top 30 cryptocurrencies listed[1]. When relevant, the respective whitepapers, protocol code, smart contracts, individual websites, as well as other relevant reports and publications have been used and referenced. The purpose, as set out in the introduction, was to identify and describe the logic of creation of the top 30 cryptocurrencies representing 95.5% of the total crypto market capitalisation.

The data were further updated by another API request from CoinMarketCap for historical daily prices for the top 30 cryptocurrencies in our sample for the period extending from 26 September 2025, sample selection date, to the 30 November 2025. During the clinical study, the cryptocurrency market experienced a significant downturn, and the vast majority of our sample constituents experienced a fall in their market price. Some lost as much as 62%, 59%, and 52% of their market value between the 7 October and the 23 November 2025. Although prices recovered to some extent, this episode revealed a number of relevant and important facts which warranted further investigation.

Table 1. Top 30 cryptocurrencies by market cap dominance as of 26 September 2025. Source: CoinMarketCap (2025).

	Name	Symbol	Market Cap Dominance %
1	Bitcoin	BTC	58.099
2	Ethereum	ETH	12.8787
3	Tether USDt	USDT	4.5937
4	XRP	XRP	4.4111
5	BNB	BNB	3.5405
6	Solana	SOL	2.9045
7	USDC	USDC	1.9537
8	Dogecoin	DOGE	0.9264
9	TRON	TRX	0.8431
10	Cardano	ADA	0.7478
11	Hyperliquid	HYPE	0.4021
12	Ethena USDe	USDe	0.379
13	Chainlink	LINK	0.3781
14	Avalanche	AVAX	0.3274
15	Sui	SUI	0.3053
16	Stellar	XLM	0.3047
17	Bitcoin Cash	BCH	0.2884
18	Hedera	HBAR	0.2403
19	UNUS SED LEO	LEO	0.2312
20	Litecoin	LTC	0.2116
21	Shiba Inu	SHIB	0.1856
22	Toncoin	TON	0.1852
23	Cronos	CRO	0.1792
24	Polkadot	DOT	0.1701
25	Mantle	MNT	0.1449
26	Monero	XMR	0.1433
27	Dai	DAI	0.142
28	World Liberty Financial	WLFI	0.1353
29	Uniswap	UNI	0.1267
30	Aave	AAVE	0.1094
	TOTAL		95.4883

2.3. Clinical Analysis

The findings of our clinical investigation and analysis of the top 30 cryptocurrencies are reported below through two interconnected sections. Section 2.3.1 reports the sample level analysis of the top 30, and Section 2.3.2 reports the endoscopic analysis of a number of individual cases, namely the top 7 and the 4 stablecoins in our sample. It must be stated that the discussion and evidence presented in both sections are related and based on each other. Furthermore, the endoscopic analysis was done for all 30, and it is the foundational research that underpins the sample level findings. We simply report the individual case analysis for those two groups. The choice of the top 7 is justified by the fact that they

represent 88.3812% of the total market capitalisation, and they are the only ones with a market capitalisation dominance greater than 1%. The choice of the 4 stablecoins is justified by their unique structure, purpose, popularity, and the significant attention they have received from central banks and regulators.

2.3.1. Sample Findings and Discussion: The Top 30

The clinical study of the top 30 cryptocurrencies listed in Table 1 was a highly detailed process that involved the aggregation of a variety of data points and key procedural and methodological facts. We present our findings through a series of tables that aim to uncover their logic of creation. Ultimately, we seek to answer the three questions introduced earlier: why are they created, when are new coins or tokens created, and how are they issued and to whom.

Table 2 provides an initial description which includes their supply data (CoinMarketCap, 2025) and identifies the base unit as well as the smallest unit and its name. Those that do not have a formal name for their smallest unit (NFN—No Formal Name) are usually referred to in the base unit. For example, in the case of Cronos (CRO), 0.00000001CRO. In the case of Bitcoin, 1 Satoshi is equal to 0.00000001BTC. The purpose of identifying the smallest unit of the relevant crypto coins and/or tokens is to reveal the diversity across the top 30. The smallest units range between 10^{-6} to 10^{-18}. This is a unique feature of the cryptocurrency market. It must be clarified here that the differences in the smallest units are not related to how cryptocurrencies are traded on exchanges. In other words, this is not directly linked to the decimalisation and tick size debate and the implications on market liquidity and transaction costs (Goldstein & Kavajecz, 2000). However, this diversity and scale of difference in the smallest units within cryptocurrencies reflects and defines their use and application for transaction fees and as payment for services and other utilities. Given the decimal places used in accounting and other fiat-based market transactions (2, 4, 6), the smallest units, their scales, and their diversity represent unique standardisation challenges in the crypto market. This is true for exchanges and commonly used software as well.

Table 2 provides additional data on the supply of each of the top 30 cryptocurrencies. The first data point concerns the nature of their supply, i.e., whether they are 'infinite' or capped. In the API data request from CoinMarketCap we observed that 5 cryptocurrencies that had a response of 'False' for infinite supply did not have a stated limit. They are identified with a question mark (?) in the Max Supply column. We report their Infinite Supply response as it was received. We observed that in the case of Uniswap, which had a response of 'False' without a stated limit, there is no evidence of a limit on the supply. The protocol's core whitepapers do not define any supply cap for UNI, and they do refer to a planned perpetual 'inflation' after the initial period. In other words, the response should have been 'TRUE' for infinite supply. After further investigation, the table was completed with the relevant maximum supply values. In the case of USDC (API response False for infinite supply) we identified that supply, while not infinite, is not capped. USDC uses a dynamic supply model as a pegged stablecoin to the US dollar, USDCs are created 1:1 with deposits of fiat dollars. After the data corrections, we find that 18 out of 30 have a maximum supply, i.e., their supply is capped. We also observe that out of the 18 that do have a maximum supply, 6 have more than 90% in circulation. Bitcoin, with 58.099% market capitalisation dominance, is at 95% of its max supply.

The fact that 18 out of 30 have a capped supply raises a number of questions that have been discussed in the literature under the broader subject of scarcity. Böhme et al. (2015, p. 215) presented the relevance as follows: "Bitcoin can be understood as the first widely adopted mechanism to provide absolute scarcity of a money supply". Meanwhile, Baur et al. (2018, p. 181) wrote: "[Bitcoin] can be defined as synthetic commodity money (Selgin,

2015) sharing features with both commodity monies such as gold and fiat monies such as the US dollar. Whilst commodity money is naturally scarce and has a use other than being a medium of exchange, fiat money is not naturally scarce but issued by a central bank and its main purpose is that of being a medium of exchange". Some cryptocurrencies mimic natural scarcity, and this feature deserves to be considered in the taxonomies of money discussed earlier (Bech & Garratt, 2017; Adrian & Mancini-Griffoli, 2019). Moreover, while fiat money may be artificially scarce, money supply growth is a fundamental factor that supports monetary stability, and output and economic growth. Friedman (1960, 1968) argued for a rate of growth in a 'specified monetary total'. In modern macroeconomics, it is generally accepted that money supply cannot remain fixed while output grows, unless prices fall proportionately. With a capped supply, the medium of exchange function is programmatically constrained, which could lead to price appreciation with increased demand. The scale of the smallest unit programmed into the cryptocurrencies, ranging from 10^{-6} to 10^{-18}, alters the constraint up to a point. The digital nature and divisibility of the base unit, and its relative value to fiat, loosen this constraint to some extent, but do not remove it entirely.

Table 2. Top 30 cryptocurrencies: further details. Source: author and CoinMarketCap (2025).

	Name	Base—Smallest—Name	Infinite Supply	Max Supply	Circulating Supply
1	Bitcoin	1 Bitcoin—10^{-8}—Satoshi	FALSE	21,000,000	19,926,506
2	Ethereum	1 Ether—10^{-18}—Wei	TRUE	-	120,703,418
3	Tether USDt	1 USDT—10^{-6}—NFN	TRUE	-	173,440,544,668
4	XRP	1 XRP—10^{-6}—Drop	FALSE	100,000,000,000	59,777,241,479
5	BNB	1 BNB—10^{-8}—Jager	FALSE	(?) 200,000,000	139,185,804
6	Solana	1 SOL—10^{-9}—Lamport	TRUE	-	543,511,668
7	USDC	1 USDC—10^{-6}—NFN	FALSE	(?) Not capped	73,809,969,236
8	Dogecoin	1 DOGE—10^{-8}—Koinu	TRUE	-	151,103,936,384
9	TRON	1 TRX—10^{-6}—Sun	TRUE	-	94,665,646,068
10	Cardano	1 ADA—10^{-6}—Lovelace	FALSE	45,000,000,000	35,800,453,490
11	Hyperliquid	1 HYPE—10^{-18}—NFN	FALSE	1,000,000,000	336,685,219
12	Ethena USDe	1 USDe—10^{-18}—NFN	TRUE	-	14,310,267,293
13	Chainlink	1 LINK—10^{-18}—NFN	FALSE	1,000,000,000	678,099,970
14	Avalanche	1 AVAX—10^{-9}—nAVAX	FALSE	715,748,719	422,275,285
15	Sui	1 SUI—10^{-9}—Mist	FALSE	10,000,000,000	3,568,833,706
16	Stellar	1 LUMEN—10^{-7}—Stroop	FALSE	50,001,806,812	31,884,872,394
17	Bitcoin Cash	1 BCH—10^{-8}—Satoshi	FALSE	21,000,000	19,930,863
18	Hedera	1 HBAR—10^{-8}—Tinybar	FALSE	50,000,000,000	42,392,926,543
19	UNUS SED LEO	1 LEO—10^{-18}—NFN	FALSE	(?) 1,000,000,000)	922,580,876
20	Litecoin	1 LTC—10^{-8}—Litoshi	FALSE	84,000,000	76,341,483
21	Shiba Inu	1 SHIB—10^{-18}—NFN	FALSE	589,552,695,333,683	589,245,875,301,952
22	Toncoin	1 TON—10^{-9}—NanoTON	TRUE	-	2,545,221,176
23	Cronos	1 CRO—10^{-8}—NFN	FALSE	100,000,000,000	34,831,028,845
24	Polkadot	1 DOT—10^{-10}—Planck	TRUE	-	1,621,211,445
25	Mantle	1 MNT—10^{-18}—NFN	FALSE	6,219,316,795	3,252,944,056
26	Monero	1 XMR—10^{-12}—Piconero	TRUE	-	18,446,744
27	Dai	1 DAI—10^{-18}—NFN	TRUE	-	5,365,382,703
28	World Liberty Financial	1 WLFI—10^{-18}—NFN	FALSE	100,000,000,000	24,608,750,682
29	Uniswap	1 UNI—10^{-18}—NFN	FALSE	(?) TRUE	630,330,528
30	Aave	1 AAVE—10^{-18}—NFN	FALSE	(?) 16,000,000	15,234,519

The rules governing the supply of all the top 30 cryptocurrencies, those *with* and *without* a maximum supply limit, are diverse and closely related to the logic of their creation.

Table 3 summarises the functional category and main usage of each of the top 30 cryptocurrencies. This relates primarily to the *why question* of each of the cryptocurrencies. As mentioned, *why are they created* is a functional question and not a philosophical one. In other words, we are going beyond their initial vision or ambition to offer an alternative to centrally controlled debt-backed fiat currency and exploring their actual purpose and usage.

Table 3. Top 30 cryptocurrencies, coins, tokens, functionality, and usage—the why question. Source: compiled by author.

	Symbol	Coin/ Token	Network Model	Functional Category(ies)	Key Usage
1	BTC	Coin	Permissionless	Payment	Digital Asset, P2P Payments
2	ETH	Coin	Permissionless	Platform, Utility	Gas, Staking, Fees, Collateral
3	USDT	Token	Hybrid	Stablecoin, Payment	Payments, Hedging, Liquidity, Trading
4	XRP	Coin	Permissionless	Payment, Bridge Asset	Transfers, Liquidity, Settlement, Remittances
5	BNB	Coin	Permissionless	Platform, Utility, Exchange, Governance	Gas, Staking, Fees, Payments, DeFi Liquidity
6	SOL	Coin	Permissionless	Platform, Utility	Gas, Staking, Fees, DeFi Liquidity
7	USDC	Token	Hybrid	Stablecoin, Payment	Settlement, Payments, Trading, DeFi Liquidity
8	DOGE	Coin	Permissionless	Meme Coin, Payment	Tipping, Donations, P2P Payments
9	TRX	Coin	Permissionless	Platform, Utility, Payment	Gas, Staking, Fees, Content Monetization
10	ADA	Coin	Permissionless	Platform, Utility	Gas, Staking, DeFi Liquidity
11	HYPE	Coin	Permissionless	Platform, Governance, Utility, Exchange	Exchange, Gas, Trading, Staking/Security
12	USDe	Token	Hybrid	Stablecoin, Payment	Yield, Staking, Delta-hedging, DeFi Liquidity
13	LINK	Token	Permissionless	Utility, Network	Fees, Staking, Cross-Chain Interoperability Services
14	AVAX	Coin	Permissionless	Platform, Utility	Gas, Staking, Fees, DeFi Applications
15	SUI	Coin	Permissionless	Platform, Utility	Gas, Staking, Fees, DeFi Liquidity
16	XLM	Coin	Permissionless	Platform, Payment, Utility	Cross-border Payments, Remittances, Issuance
17	BCH	Coin	Permissionless	Payment	Low-cost P2P Cash, Payments, Remittances
18	HBAR	Coin	Permissioned	Platform, Utility	Gas, Fees, Staking, Network Security
19	LEO	Token	Hybrid	Utility, Exchange	Fees, Service Payments, Liquidity
20	LTC	Coin	Permissionless	Payment	Payments, Remittances
21	SHIB	Token	Permissionless	Meme, Ecosystem, Utility	Payments, Donations, Staking
22	TON	Coin	Permissionless	Platform, Payment, Utility	Gas, Staking, Payments, Fees
23	CRO	Coin	Hybrid	Platform, Utility, Exchange	Gas, Staking, Fees, Ecosystem Utility, Payments
24	DOT	Coin	Permissionless	Platform, Governance, Utility	Staking, Fees, Bonding, Auctions

Table 3. *Cont.*

	Symbol	Coin/ Token	Network Model	Functional Category(ies)	Key Usage
25	MNT	Token	Permissionless	Platform, Governance	Gas, Staking, Fees
26	XMR	Coin	Permissionless	Payment, Privacy	Privacy, Untraceable Payments
27	DAI	Token	Permissionless	Stablecoin, Payment	Payments, Hedging, DeFi Liquidity
28	WLFI	Token	Hybrid	Governance (limited), Utility	Political Alignment
29	UNI	Token	Permissionless	Governance, Exchange	Incentives
30	AAVE	Token	Permissionless	Governance	Staking, Lending, Borrowing

We find that 19 out of 30 are coins, and 11 are tokens. This terminological difference is relevant to identify if the cryptocurrency runs on its own technology or blockchain (then a native coin), or another existing blockchain (then a token) (FSB, 2024). From the 19 coins 4 do not use blockchain, but their own technology. XRP uses the XRP Ledger which runs the Ripple Protocol Consensus Algorithm (RPCA), Stellar (XLM) uses the Stellar Consensus Protocol (SCP), Hedera (HBAR) uses Hedera Hashgraph, and Link uses Chainlink which is a Decentralized Oracle Network (Ellis et al., 2017). The first three use distributed and decentralized ledgers, but no sequential chain of blocks. However, even though they do not use blocks, their ledger updates are verified by consensus. All the 11 tokens run on the Ethereum blockchain platform, although a few, like Tether USDt and USDC, run on multiple blockchains. Note that Ethereum or Ether (ETH) is the native cryptocurrency of the Ethereum blockchain and thus categorised as a coin. Tokens do not have their own consensus mechanism; they rely on the underlying blockchain.

Throughout our clinical investigation, we observed that, like the cryptocurrencies themselves, many conceptual terms and definitions used in the field are still in development, and often in contradiction with each other. This is particularly relevant to the functional role of coins and tokens. It is commonly understood that *coins* refer to cryptocurrencies that run on their own blockchain (like Bitcoin, Solana, Cardano, and others), and *tokens* refer to cryptocurrencies that run on another existing blockchain platform (like USDC, Tether USDt, Mantle, and others). However, when describing the functional categories of different cryptocurrencies, the terms are mixed up. Notice that USDC and Tether USDt are both tokens, but they are referred to as stablecoins. Similarly, when describing functionalities, the industry often uses the term token even when describing a coin. When describing functionality, the term 'token' is not referring to the relationship of the cryptocurrency with the underlying technology. For this reason, in the functional category, we describe them without using the term 'token' (or coin). This terminological muddle is most probably due to the sector's nascent state and evolving frameworks. This is also reflected in the use of the broader term 'tokenisation'.

The next feature we explore is the blockchain network model used by each of the cryptocurrencies on the list. We observe that 23 run on a permissionless model, 1 on permissioned, and 6 on a hybrid model. Note that for tokens, which run on another blockchain, their permissioned/permissionless features depend on the underlying blockchain as well as their own token issuance layer. This is why all hybrid models refer to tokens, running on Ethereum's permissionless network, but with a permissioned monetary layer, or token issuance layer. In the case of USDT, for example, the hybrid model refers to the fact that the token runs on permissionless blockchains, but the creation of the token is centralized and controlled by Tether Ltd. (issuer permissioned). In the case of DAI, a stablecoin issued as a loan, unlike USDT and USDC where the minting is controlled, the issuance is not

permissioned. While there are levels of governance control over what types of assets qualify as collateral, anyone can mint or redeem DAI without central authority approval.

In a permissionless network anyone can start a full node and participate in consensus, without central authority approval. This is not the case for a permissioned network, producing a block usually requires approval, and consensus is dependent on a curated group that is often selected based on specific rules. In the case of Bitcoin, for example, anyone can start a node, become a miner, and participate in the network. In the case of Ethereum, it costs 32 ETH to become a validator node, without approval. In the case of Hedera, the governing council controls node operations and joining the validator set requires council approval. We will of course expand on what miners and validators do, and how they are selected, and the rules that govern network participation and rewards. At this stage, suffice it to observe that a permissionless network does not imply decentralised token creation and distribution process. XRP, for example, runs on a permissionless network model, but the distribution of pre-minted XRPs is highly centralised. We will explore the level of centralisation in each of the 30 coins in the following discussion.

Looking at the functional purpose and main usage of the top 30 cryptocurrencies, we observe a variety of functional categories: platform, utility, payment, governance, exchange, meme, privacy, yield, and stablecoins. Their uses are equally diverse, and include staking, gas, payments, Defi liquidity, incentives, fees, remittances, and political alignment. The picture is diverse, to say the least, and the why question has a very broad set of answers. This finding raises numerous questions on the viability of studying 'cryptocurrencies' as a functionally uniform group. This is often seen in positivist research that investigate conventional finance and investment hypotheses, like volatility, returns, and arbitrage. Unlike other assets, like stocks and bonds, where despite corporate/issuer differences the functional characteristics of the assets are near identical, cryptocurrencies require a fine-tuned approach given the spectrum of functionality they are designed to serve. This is an important and relevant distinction that should inform future research on cryptocurrencies

A few terms used to describe key usages deserve further definition, like DeFi liquidity, gas, and staking. The relevance and many aspects of DeFi (decentralised finance) have been discussed in parallel to cryptocurrencies (Zetzsche et al., 2020). The term DeFi is used in reference to a number of recent transformations that are to some extent linked to the rise and growth of Bitcoin and cryptocurrencies, and the underlying technologies, but they extend far beyond (Schär, 2020). Mainly because the purpose of decentralisation and disintermediation can be achieved through distributed ledger technology and blockchain, but also smart contracts, and other decentralised applications (DApps). DeFi liquidity refers to the availability of the cryptocurrency within and for such applications and platforms, allowing users to trade, borrow, lend without intermediation.

'Gas' refers to a specific kind of fee that relates to computation. For example, all operations on the Ethereum network, from transactions to smart contracts, require a fee paid in ETH, i.e., gas, that compensates the network's validators for the computational work they do in the processing and verification of transactions and smart contracts. 'Staking' is associated with PoS and similar consensus mechanisms and it describes the process of locking up coins to help secure the network and validate transactions. Validators are selected to propose new blocks and they earn rewards, new coins or tokens. We discuss the creation of coins/tokens and the main trigger events, i.e., the *when* question, in Table 4.

We begin by identifying those that have a pre-minted supply, i.e., there is no active new coin/token creation after inception. In the industry, these cases are often referred to as 'pre-mined'. In these cases, of which there are 14, we look at allocation and distribution events of pre-minted supply. The creation of new crypto coins/tokens is described as either 'mining' or 'minting'. Mining is the process associated with those that have proof of

work (PoW) as consensus mechanism, and there are in total 5 such cases out of 30: Bitcoin, Dogecoin, Bitcoin Cash, Litecoin, and Monero. The remaining 11 are split into two groups. 7 have active minting of new coins/tokens but they also had a proportion of their supply pre-minted at inception. They are identified by 'Minting (PreM)'; and 4 have only 'Minting' without pre-minted supply, and they are the 4 stablecoins in our sample: USDT, USDC, USDe, and DAI.

Table 4. Top 30 cryptocurrencies, consensus mechanism, mining or minting—the when question. Source: compiled by author.

	Symbol	MINING/ Minting	Initial Offering	Consensus Mechanism	When Are They Created or Distributed
1	BTC	MINING	Public Fair Launch	(PoW)	As block rewards, when miners find a valid PoW block
2	ETH	Minting (PreM)	Public ICO	(PoS)	As staking rewards, when validators propose/attest blocks; sync rewards
3	USDT	Minting	Mint-on-Demand	Multichain	As 1:1 mint, when users deposit fiat money with issuer
4	XRP	Pre-Minted	Private Distribution	(RPCA)	At inception, distributed when Ripple releases from escrow
5	BNB	Pre-Minted	Public ICO	(PoSA)	At inception, distributed to team, investors and through ICO, burn only
6	SOL	Minting (PreM)	Public IEO	(PoH), (PoS)	As staking rewards, when validators produce and validate a block
7	USDC	Minting	Mint-on-Demand	Multichain	As 1:1 mint, when users deposit fiat with Circle
8	DOGE	MINING	Public Fair Launch	(PoW)	As block rewards, when miners find a valid PoW block
9	TRX	Minting (PreM)	Public ICO	(DPoS)	As block rewards, when a super representative produces a block
10	ADA	Minting (PreM)	Public ICO	(PoS)	As staking rewards, when validators produce and validate blocks
11	HYPE	Pre-Minted	Public Airdrop	(PoS)	At inception, distributed as airdrops & community rewards
12	USDe	Minting	Mint-on-Demand	(PoS)	As ~1:1 mint, when users deposit crypto collateral and hedge
13	LINK	Pre-Minted	Public ICO	(OCR)	At inception, released through rewards, incentives
14	AVAX	Minting (PreM)	Public ICO	(PoS)	As staking rewards, when a validator proposes or validates a block
15	SUI	Pre-Minted	Public IEO	(DPoS)	At inception, distributed based on fixed vesting schedule
16	XLM	Pre-Minted	Private Distribution/Airdrop	(FBA)	At inception, distributed via programs, partnerships
17	BCH	MINING	Public Fork Distribution	(PoW)	As block rewards, when miners find a valid PoW block
18	HBAR	Pre-Minted	Private SAFT	(PoS), Hashgraph	At inception, distributed through rewards, development
19	LEO	Pre-Minted	Private IEO	(PoS), (DPoS)	At inception, no new distribution, continuously burned

Table 4. *Cont.*

	Symbol	MINING/ Minting	Initial Offering	Consensus Mechanism	When Are They Created or Distributed
20	LTC	MINING	Public Fair Launch	(PoW)	As block rewards, when miners find a valid PoW block
21	SHIB	Pre-Minted	Private Distribution	(PoS)	At inception, no new distribution, continuously burned
22	TON	Minting (PreM)	Giver Smart Contracts	(PoS), Catchain	As staking rewards, when validators produce and validate a block
23	CRO	Pre-Minted	Private Distribution	(PoA), (DPoS)	At inception, distributed through rewards, incentives
24	DOT	Minting (PreM)	Public ICO	(PoS)	As staking rewards, when validators produce and validate a block
25	MNT	Pre-Minted	Private Migration	(PoS)	At inception, distributed through allocation and rewards
26	XMR	MINING	Public Fair Launch	(PoW)	As block rewards, when miners find a valid PoW block
27	DAI	Minting	Mint-on-Demand	(PoS)	As 1:1.5 (value) mint, when users lock collateral in Maker Vaults, loan
28	WLFI	Pre-Minted	Private SAFT	(PoS)	At inception, distributed through airdrops and rewards
29	UNI	Pre-Minted	Public Airdrop	(PoS)	At inception, distributed through governance, grants
30	AAVE	Pre-Minted	Public ICO	(PoS)	At inception, distributed through governance, rewards

The next data point we identify is their initial offering. We find 11 different kinds of distribution events at inception. They are listed and further defined in Table 5.

Table 5. All initial launch distribution events. Source: compiled by author.

	Launch Model	Summary Description
1	Public Fair Launch	A Public Fair Launch begins with zero pre-minted supply, and coins/tokens are produced only through open participation such as mining or staking from the first block. Founders, insiders, or investors do not receive tokens beforehand, ensuring equal access.
2	Public Initial Coin Offering (ICO)	A Public ICO is a global coin/token sale where anyone can purchase pre-minted tokens directly from the project before or during network launch. It functions as both a fundraising method and an early distribution mechanism.
3	Mint-on-Demand	Mint-on-Demand systems create new coins/tokens only when a user deposits collateral or backing assets. It is not a fundraising mechanism and does not involve public or private sales.
4	Private Distribution	Private Distribution means tokens are pre-minted and allocated to or by insiders—such as founders, teams, or institutions—without any public sale. Early supply is concentrated among private stakeholders.

Table 5. *Cont.*

	Launch Model	Summary Description
5	Public Initial Exchange Offering (IEO)	A Public IEO is a coin/token sale run by a centralized exchange, which handles verification, sale mechanics, and token listing. Tokens are pre-minted and offered publicly to users of that exchange.
6	Public Airdrop	A Public Airdrop distributes pre-minted tokens for free to eligible users based on criteria such as past platform usage. It is often used to bootstrap communities and decentralize token ownership.
7	Private Simple Agreement for Future Tokens (SAFT)	A SAFT is a private investment agreement where accredited investors provide funding in exchange for receiving coins/tokens later at launch.
8	Private Initial Exchange Offering (IEO)	A Private IEO is an exchange-administered token sale restricted to approved institutional or accredited buyers. Tokens are pre-minted, but participation is limited, unlike public IEOs.
9	Public Fork Distribution	Public Fork Distribution occurs when a blockchain splits, and holders of the original chain automatically receive tokens of the new chain. Distribution is determined by balances at the fork
10	Private Migration	Private Migration replaces an old token with a new one through a controlled internal swap process managed by the project team.
11	Giver Smart Contracts (IPoW)	This was a unique offering model initiated by Toncoin. After a failed launch via SAFT, Toncoins were placed in Giver smart contracts, and were open for mining. This approach was called Initial PoW, although the blockchain uses PoS. Similar to a Public Fair Launch.

Cryptocurrencies do not yet have a standard market entry event, structure, or procedure. While this is primarily due to the developmental stage of the sector, and lacking regulation, it is also a telling feature. Just like the diversity of functional objectives and uses observed in Table 3, the creation and distribution events of the top 30 cryptocurrencies reveal a hodge podge of approaches, entirely dependent on the discretion of the creators of the respective coins/tokens. While this may leave the impression of 'decentralisation' it is in fact an arbitrarily defined and different kind of 'recentralisation' that changes who controls the process, i.e., coders or bankers.

The 30 cryptocurrencies have a diverse set of consensus mechanisms. As mentioned above, the consensus mechanism of all the tokens refers to the consensus mechanism of the underlying blockchain. Furthermore, for USDT and USDC, given that they run on multiple chains, their mechanism depends on the host blockchain. 5 out of 30 use a proof of work (PoW) consensus mechanism, and the other 25 use proof of stake (PoS) or a combination of different consensus mechanisms. Consensus mechanisms are a fundamental feature of distributed ledger technologies, and how new blocks and transactions are validated and added to the ledger. They are directly linked to how new coins or tokens are created, because new coins are minted or mined given the successful addition of a new block, which is the main reason for the creation of new coins and/or tokens. However, it must be clearly stated and understood that the consensus mechanism defines the transaction validation process, which subsequently defines the recording of a successful new block, which then triggers the creation of new coins/tokens. In the context of Bitcoin, once all

the 21,000,000 Bitcoins have been issued/mined, the PoW consensus mechanism will still be critical for adding new blocks on the ledger, but it will not lead to the creation of new Bitcoins. At that point, miners will be paid for their work in transaction fees. Table 6 provides a basic summary description of all the consensus mechanisms used by the top 30 cryptocurrencies on our list. The list is by no means a comprehensive record of all consensus mechanisms.

Table 6. All consensus mechanisms in our sample. Source: compiled by author.

Consensus Mechanism	Description
Proof of Work (PoW)	Miners compete to solve cryptographic puzzles to validate transactions and add new blocks to the blockchain. (Nakamoto, 2008)
Proof of Stake (PoS)	Validators are selected, based on their stake in the network, to create new blocks based on the number of coins/tokens they "stake" as collateral (blocked). (King & Nadal, 2012)
Delegated Proof of Stake (DPoS)	Token/coin holders vote for a small number of delegates who validate transactions and produce blocks on their behalf. (Larimer, 2014)
Proof of Authority (PoA)	A limited number of authorities (approved validators) generate new blocks, identity replaces 'stake' or 'work'.
Proof of Staked Authority (PoSA)	Hybrid between PoS and PoA where limited number of validators, with verified identities, are approved to produce blocks, based on stake and reputation.
Proof of History (PoH)	Introduced by Solana, uses cryptographic timestamps to verify the passage of time between events, it is integrated with PoS for validation. (Yakovenko, 2017)
Ripple Protocol Consensus Algorithm (RPCA)	Validators or trusted nodes agree on the order and validity of transactions through voting, transaction with at least 80% are added on ledger. (Schwartz et al., 2014)
Hashgraph	Using a "gossip about gossip" protocol and virtual voting (no actual voting) to achieve consensus regarding the order of transactions. (Baird et al., 2020)
Federated Byzantine Agreement (FBA)	Nodes form "quorum slices" of trusted peers vote to reach agreement by majority within each quorum. (Mazières, 2017)
Catchain	A specialized Byzantine Fault Tolerant (BFT) protocol used by The Open Network (TON) that enables validators to exchange votes in rounds to quickly agree on a single, final version of the next block.
Off-Chain Reporting (OCR)	Many independent nodes gather data or observations from off-chain sources and communicate peer-to-peer off-chain. They each sign their data observation, then a single aggregated report signed by a quorum of oracles is submitted on-chain.

The mining and/or minting of new coins/tokens is linked to the consensus mechanism. Mining refers to the process of validating transactions and adding blocks to the blockchain through the Proof of Work mechanism. Minting is associated with the Proof of Stake (PoS) mechanism and refers to the process of staking (lock up) existing coins/tokens in order to be selected as new block validators. In PoW, miners must solve puzzles to be selected as the

next entity that adds a block and receives freshly created coins/tokens. In PoS, validators must be selected to add a block and receive new coins/tokens, and the selection is stake weighted and often random. We will explore these further in the following discussion.

Our clinical investigation revealed a very diverse picture once again. 14 out of the top 30 cryptocurrencies are pre-minted. Thus, their total supply has been created at inception, and there is no new coin or token creation. Instead, the already created coins/tokens are distributed, either at genesis or over time, based on pre-defined rules and conditions and/or as rewards and incentives for ecosystem development, participation, and other network activities and programs. These are often subject to network governance, and in some cases, coin/token holders can participate in changing them. The distribution of already existing coins/tokens is a discretionary process that is managed by the network, the creators, investors, and adopters. Once again, the process is better described as recentralisation with a different centre, or centres.

Tables 7 and 8 summarise our findings on how new coins and/or tokens are issued, and to whom they are allocated. 5 out of the top 30 create new coins as block rewards, i.e., when miners successfully find a valid proof of work block. These are the ones who have PoW as their main consensus mechanism and include Bitcoin (BTC), Dogecoin (DOGE), Bitcoin Cash (BCH), Litecoin (LTC), and Monero (XMR). For those using a PoW consensus mechanism, the selection process of who gets the coins is based on solving the PoW puzzle, which can only be solved by trying different combinations on a trial-and-error basis. The selection rule, therefore, is probabilistic because it depends on the hash power, or the computational power, of the competing miners. In other words, each miner's chance of finding the next block is dependent or proportional to her or his share of the total network hash rate (See Equation (2)).

$$Probability\ (\text{miner finds next block}) = \frac{H_{\text{miner}}}{H_{\text{network}}} \tag{2}$$

Note that the hash rate refers to the number of cryptographic hash computations performed or attempted per unit of time (usually per second). This can be and is measured on the level of a single miner, mining pool, or an entire network. Given that each hash rate is independent and random, the only way to get to a successful result is through trial-and-error. In other words, the more hashes per second a miner can achieve, the more chances she or he will have to be the one that finds the valid solution to the proof of work puzzle. This is why Table 7 identifies the decision rule for all 5 of them to be hash power-weighted chance.

7 out of 30 create new coins as staking rewards, i.e., minting, when validators propose/attest blocks, or when they produce and validate blocks. They are Ethereum (ETH), Solana (SOL), TRON (TRX), Cardano (ADA), Avalanche (AVAX), Toncoin (TON), and Polkadot (DOT). The terminology and role titles and procedures are specific to each network (validators, stakers, delegators, nominators). This is the alternative approach of validating transactions by proof of stake instead of proof of work. Note that new coins are rewards for blocks, but also other duties, and participation. We identify this difference by naming them as staking rewards.

The decision rules of the 7 who issue new coins as staking rewards for validators are diverse in logic, but all stake weighted or related. While in the Proof of Work model the miner is selected for a valid PoW that depends on hash power, in the PoS model a validator is selected based on the stake they put up. How one becomes a validator and which validator is selected to propose or produce a block is determined through a combination of rules. They are often specific to the network and the blockchain in question. In the case of Ethereum, a minimum deposit of 32 ETH is required to start a single validator

node. Which validator is selected to propose a block for a slot x in epoch y is determined through a random stake-weighted process. We discuss the Ethereum case in detail in the next subsection. The roles and their names are different across the 7 that offer staking rewards. Their selection mechanism is also specific. ETH, ADA, and TON select the validator to propose and validate a block through a random stake-weighted lottery. Pseudo-randomness is introduced in lieu of centralisation, i.e., discretionary allocation. SOL uses a deterministic stake-weighted leader schedule and shuffle, which we discuss in detail in the next section. AVAX does not use a random process, and selection is based on participation in the network. DOT uses a voting mechanism. While different, upon a closer look we find that all, ultimately, are stake share or size dependent.

4 out of the top 30 cryptocurrencies are stablecoins (tokens): Tether USDt, USDC, Ethena USDe, and DAI. The first two are pegged to the US Dollar and are created when users deposit fiat money (USD). The issuers, Tether Limited and Circle Internet Group Inc respectively, act as issuers backing each token by one USD or equivalent assets. The other two stablecoins in our sample, USDe and DAI, are very different kinds of stablecoins. USDe is a synthetic dollar issued by Ethena Labs that aims to keep its value pegged to the US Dollar through hedging strategies. USDe is not a fiat based stablecoin, and it is backed by other cryptocurrencies like ETH, USDC, USDT, i.e., the minting process is triggered through the deposit of other cryptocurrencies, instead of fiat. DAI, the fourth and last stablecoin in our sample, is managed by MakerDAO (Decentralized Autonomous Organization) and differs from the previous three. It is generated by users and issued as a loan. It is known as the most censorship resistant stablecoin.

The 14 cryptocurrencies that have a pre-minted supply (Table 8), have a deterministic and discretionary distribution process at inception and later allocations. Some have a DAO that gives token holders significant control over treasury management and allocations. Others do not have as much control but do vote on governance related matters. While some are more decentralised than others, ultimately, the decision making is discretionary.

Table 7. The cryptocurrencies with mining or minting, key roles, selection mechanism, reward and defining factors—the how and to whom question. Source: author.

Rank	Symbol	Key Role(s) in Process	Their Selection Mechanism	Reward and Defining Factor(s)
Those that create new coins/tokens as rewards for new blocks added on chain through PoW				
1	BTC	Miner	Hash power-weighted chance	Per Block, Halves (210,000 B), R = 3.125
8	DOGE	Miner	Hash power-weighted chance	Per Block, Fixed, R = 10,000
17	BCH	Miner	Hash power-weighted chance	Per Block, Halves (210,000B), R = 3.125
20	LTC	Miner	Hash power-weighted chance	Per Block, Halves (840,000B), R = 6.25
26	XMR	Miner	Hash power-weighted chance	Per Block, Fixed, R = 0.6
Those that create new coins/tokens as rewards for staking, when new blocks are proposed or produced and validated on chain through PoS				
2	ETH	Validator, Staker	Random stake-weighted lottery	Per Epoch & Validator Duties, Total Active Stake, Validator Effective Balance, Participation, Network-wide Stake Levels
6	SOL	Validator, Delegator	Deterministic stake-weighted leader schedule, shuffle	Per Epoch, Yearly 'Inflation', Total Staked SOL, Stake Share, Performance
9	TRX	Super Representative, SR Partner, Voter	Deterministic stake & vote weighted election	Per block, Fixed Stake and Vote Share
10	ADA	Stake Pool Operator, Delegator	Random stake-weighted lottery	Per Epoch, Reserve Size, Yearly Monetary Expansion, Pool Stake Share, Saturation, Performance
14	AVAX	Validator/Delegator	Stake-eligible participation	Per Stake period and Duration, Remaining Unissued Supply, Total Stake Share, Effective Consumption Rate, Performance, Uptime

Table 7. *Cont.*

Rank	Symbol	Key Role(s) in Process	Their Selection Mechanism	Reward and Defining Factor(s)
22	TON	Validator/Nominator	Random stake-weighted lottery	Per Validation Round, Reward Pool, Stake Share, Total Stake
24	DOT	Validator/Nominator	Deterministic Voting	Per Era, Yearly inflation, Staking Rate, Staking Share, Performance
Those that create new coins/tokens upon deposit of fiat USD or crypto collateral				
3	USDT	Depositor, Tether Ltd. (iFinex)	N/A	No rewards, N/A
7	USDC	Depositor, Circle Internet Group Inc.	N/A	No rewards, N/A
12	USDe	Depositor, Ethena Protocol, Ethena Labs	N/A	No rewards, N/A
27	DAI	Depositor, Maker Protocol, MakerDAO	N/A	No rewards, N/A

Table 8. The pre-minted cryptocurrencies, decision makers, process, release rules and/or allocations—the how and to whom question. Source: author.

	Symbol	Key Decision Maker(s)	Decision-Making Process	Release Rules and/or Allocations
Those that have their supply pre-minted, and do not create new coins/tokens—they have distributed them or release them over time				
4	XRP	Ripple (board/management)	Deterministic Quorum, Slices	Per month, 1 billion XRP release from escrow for ecosystem needs and sales
5	BNB	Binance, BNB Chain core team, Auto-Burn Mechanism, DAO	Discretionary and Programmatic, BNB Chain Governance DAO	Per Quarter, burn only, scarcity as strategy. Rewards as yield for staking, no new coins.
11	HYPE	Hyperliquid DAO, Hyperliquid Foundation	Discretionary, Hyperliquid DAO (Decentralized Autonomous Organization)	Trading incentives, dividend-style rewards, and compensation for core contributors and ecosystem growth, grants
13	LINK	Chainlink Labs, Chainlink Foundation	Discretionary, no governance DAO	Financing development, incentivising oracle node operators & ecosystem integrations
15	SUI	Sui Foundation, Mysten Labs	Discretionary, no governance DAO	Community reserve, grants, validator delegation, stake subsidies, R&D, ecosystem incentives
16	XLM	Stellar Development Foundation	Deterministic quorum, no governance DAO	Free distributions and partner allocations, grants, and ecosystem support
18	HBAR	Hedera Governing Council, HBAR Foundation	Discretionary, no governance DAO	Network security, ecosystem grants, programs, and strategic partnerships
19	LEO	Bitfinex management (iFinex)	Discretionary, no governance DAO	Ongoing buyback & burn, recapitalize and support the Bitfinex/iFinex ecosystem
21	SHIB	Anonymous founder "Ryoshi", Shiba Inu team, DAO	Discretionary, Doggy DAO	Meme-coin style community token, used to bootstrap a community ecosystem
23	CRO	Crypto.com/Cronos Labs management, DAO	Discretionary, Cronos DAO	Exchange & card rewards, staking incentives, ecosystem grants in the Cronos chain, and corporate treasury/strategic uses (Cronos, 2018)
25	MNT	Mantle DAO	Discretionary, governed by MNT holders, approves major treasury allocations and incentive programs, Mantle DAO	Grants, liquidity incentives, strategic investments, and protocol development
28	WLFI	World Liberty Financial, Aqua 1, Trump Family	Discretionary, no governance DAO	Political alignment, economic exposure to WLF's ecosystem (including its RWA/treasury business).

Table 8. *Cont.*

	Symbol	Key Decision Maker(s)	Decision-Making Process	Release Rules and/or Allocations
29	UNI	Uniswap DAO	Discretionary, treasury disbursements are governed by token holders, Uniswap DAO	Grants, strategic partnerships, incentives
30	AAVE	Aave DAO	Discretionary, token-holder votes decide how reserve tokens are allocated, AAVE DAO	Ecosystem reserves, grants, development

This brings us to the final sample level analysis that includes the price performance of the top 30. During the clinical analysis, the crypto market experienced a significant downturn (FT, 2025; Reuters, 2025). Explained by a flight from risk and speculative assets and led by Bitcoin, the entire crypto market experienced the price reversal. This is the primary reason why we supplemented our data with historical price data for the period starting from our sample selection date, 26 September 2025, to the study completion date, 30 November 2025. We do not report all daily prices for the entire sample. Table 9 provides price data for the key dates that cover the market decline. Column A identifies the change in price between the 7 October and the 23 November 2025, and column B describes the change from the 2 September to the 30 November.

Table 9. Top 30 prices, changes, %, between 7 October–23 November 2025, and 26 September–30 November 2025. Source: CoinMarketCap (2025).

Symbol	26 September 2025	7 October 2025	23 November 2025	30 November 2025	7 October to 23 November (A)	26 September to 30 November (B)
BTC	109,028.658	124,724.660	84,679.150	90,836.715	−32.1071%	−16.6855%
ETH	3873.399	4686.296	2768.518	2990.836	−40.9231%	−22.7852%
USDT	1.000395	1.000176	0.999409	1.000311	−0.0767%	−0.0084%
XRP	2.743	2.991	1.950	2.203	−34.7969%	−19.6738%
BNB	945.755	1223.624	833.356	873.596	−31.8944%	−7.6297%
SOL	192.497	232.513	127.565	136.074	−45.1364%	−29.3108%
USDC	0.999886	0.999529	0.999771	0.999929	0.0242%	0.0043%
DOGE	0.2228	0.2663	0.1403	0.1486	−47.3137%	−33.3121%
TRX	0.3319	0.3462	0.2741	0.2810	−20.8214%	−15.3420%
ADA	0.7629	0.8718	0.4046	0.4153	−53.5902%	−45.5544%
HYPE	40.35	47.38	30.03	34.38	−36.6167%	−14.7906%
USDe	0.999606	1.000084	0.998702	0.999495	−0.1382%	−0.0112%
LINK	20.1150	23.3750	12.1728	13.0020	−47.9239%	−35.3617%
AVAX	28.6607	30.7103	13.2283	14.2434	−56.9256%	−50.3033%
SUI	3.1094	3.6281	1.3451	1.4999	−62.9269%	−51.7631%
XLM	0.3502	0.4087	0.2303	0.2542	−43.6459%	−27.4108%
BCH	536.20	599.39	556.62	521.70	−7.1349%	−2.7041%
HBAR	0.2074	0.2302	0.1317	0.1434	−42.8107%	−30.8434%
LEO	9.4839	9.6511	9.4491	9.8160	−2.0936%	3.5022%
LTC	102.19	118.34	82.17	84.06	−30.5655%	−17.7351%
SHIB	0.0000	0.0000	0.0000	0.0000	−39.3182%	−26.6029%
TON	2.6601	2.8556	1.5315	1.5799	−46.3686%	−40.6095%
CRO	0.1856	0.2107	0.1001	0.1072	−52.4890%	−42.2499%
DOT	3.8015	4.3886	2.3096	2.2603	−47.3717%	−40.5426%
MNT	1.6062	2.4636	0.9855	1.0876	−59.9962%	−32.2875%
XMR	288.51	310.59	369.38	413.14	18.9289%	43.1996%
DAI	0.999746	0.999698	0.999633	0.999903	−0.0064%	0.0157%
WLFI	0.1923	0.1993	0.1521	0.1604	−23.6773%	−16.5907%
UNI	7.4405	8.3479	6.1694	6.0658	−26.0963%	−18.4757%
AAVE	259.85	297.34	161.18	182.36	−45.7933%	−29.8220%

Between the 7 October and the 23 November (Table 9, column A), 28 out of the top 30 cryptocurrencies in our sample saw their prices decline, some dramatically. Bitcoin lost more than 32% of its value, Ethereum more than 40%, XRP more than 34%, BNB more than 31%, SOL more than 45%. Others, like SUI lost more than 62%, CRO more than 52%, MNT more than 59%. This kind of volatility is the very reason why cryptocurrencies are considered speculative cryptoassets. While the market recovered to a certain extent by the end of the month, 30 November 2025, most were still below their price at the start of this study.

The 2 cryptocurrencies that had a positive price performance in the same time window were USDC and XMR. All the others experienced negative price performance to different degrees. While USDC's positive performance is negligeable and reveals its stablecoin nature, XMR's performance stands out. It is the only outperformer, achieving more than an 18% increase between 7 October and 23 November 2025, and more than a 43% increase between 26 September and 30 November 2025. After further investigation into XMR (Monero), we identified one main reason that may explain its contrarian positive performance as the market was crashing. Monero (XMR) is a privacy coin. Unlike many of the other cryptocurrencies, XMR is dedicated to the privacy of its users and has a non-negotiable position when it comes to the untraceable anonymous nature of its payments. The price collapse in other cryptocurrencies and the search for more privacy must have contributed to its positive performance.

Monero runs a permissionless network with a proof of work (PoW) consensus mechanism, just like Bitcoin, but its reward equation for mining new blocks is different. Miners earn 0.6 XMR per block. What is also unique about Monero is that it uses its own cryptographic algorithms to hide the 'sender', the 'receiver', and the 'amount' of every transaction. Ring signatures hide the sender, by mixing the real input with decoys (called "mixins") so observers cannot know which input is the real one. The sender signs a transaction using one real input and many fake inputs taken from the blockchain. This achieves sender ambiguity. Stealth addresses hide the receiver. Monero creates a one-time address for every transaction. The sender uses the recipient's public view key + public spend key to generate a unique stealth output. Only the recipient—using their private view key—can detect that an output belongs to them. Observers can only see a random address, not the real wallet. This ensures receiver anonymity. RingCT (Ring Confidential Transactions) hides the amount being transferred, providing amount confidentiality. See Van Saberhagen (2013) and Alonso (2018) along with other Monero Research Lab papers for the cryptographic solutions used for optimal anonymity and privacy.

This brings us to the next subsection of our clinical findings, where we discuss a selected number of cases (endoscopic analysis).

2.3.2. Endoscopic Analysis: The Top 7 and the 4 Stablecoins

Up to this point, our analysis was focused on the top 30 cryptocurrencies all together, reporting the findings of our clinical investigation. In this subsection, we look at two unique subsets on an individual case level: (1) the top 7 by market capitalisation dominance and (2) the 4 stablecoins in our sample. The motivation and reasoning for the selection of these two groups is straightforward. The top 7 are the only ones that have a market capitalisation dominance greater than 1% and the 4 stablecoins represent a unique group that diverge from the remaining 26 due to their functional purpose and price features. Interestingly, these groups have two cryptocurrencies in common, USDT and USDC.

As depicted in Table 1, from the top 30 cryptocurrencies only 7 had a market dominance above 1%, namely Bitcoin, Ethereum, Tether USDt, XRP, BNB, Solana, and USDC. As of September 2025, Bitcoin still dominated the market with more than 58%, followed by

Ethereum at 12.87%, Tether USDt at 4.59%, XRP at 4.41%, BNB at 3.54%, Solana at 2.9%, and USDC at 1.95%. We discuss them next. Given that 2 of the top 7 are stablecoins, they are discussed as the first two cases of the stablecoin section.

Bitcoin (BTC)

It is only fitting that our first case is Bitcoin, the first cryptographic currency that triggered the entire crypto revolution. Bitcoin has 58.099% of the total cryptocurrency market capitalisation, and it is the pioneering cryptocurrency that introduced the distributed ledger technology (Nakamoto, 2008). Given that our focus here is on defining the logic of creation of Bitcoin, the analysis must begin by scrutinising the self-description of Bitcoin. We use Bitcoin.org, the site that was originally registered and owned by Bitcoin's first two developers, Satoshi Nakamoto and Martti Malmi. The below paragraph from Bitcoin.org is telling:

> Bitcoins have value because they are useful as a form of money. Bitcoin has the characteristics of money (durability, portability, fungibility, scarcity, divisibility, and recognizability) based on the properties of mathematics rather than relying on physical properties (like gold and silver) or trust in central authorities (like fiat currencies). In short, Bitcoin is backed by mathematics. (Bitcoin, 2021c)

One could debate the above statement *ad infinitum*. As introduced and argued earlier, this paper does not focus on qualifying Bitcoin and other cryptocurrencies as money. Our focus is on the logic of their creation, and the statement 'Bitcoin is backed by mathematics' seems to suggest that mathematics may somehow explain the logic of creation. In fact, as the discussion will reveal, this is inaccurate. Looking into the creation process further, we read:

> New bitcoins are generated by a competitive and decentralized process called "mining". This process involves that individuals are rewarded by the network for their services. Bitcoin miners are processing transactions and securing the network using specialized hardware and are collecting new bitcoins in exchange. (Bitcoin, 2021a)

Mining is the process through which a new Bitcoin is created and awarded, and it is the process through which the logic of creation can be revealed.

> Anybody can become a Bitcoin miner by running software with specialized hardware. Mining software listens for transactions broadcast through the peer-to-peer network and performs appropriate tasks to process and confirm these transactions. Bitcoin miners perform this work because they can earn transaction fees paid by users for faster transaction processing, and newly created bitcoins issued into existence according to a fixed formula.
>
> For new transactions to be confirmed, they need to be included in a block along with a mathematical proof of work. Such proofs are very hard to generate because there is no way to create them other than by trying billions of calculations per second. This requires miners to perform these calculations before their blocks are accepted by the network and before they are rewarded. As more people start to mine, the difficulty of finding valid blocks is automatically increased by the network to ensure that the average time to find a block remains equal to 10 min. (Bitcoin, 2021b)

Based on the above, the key process through which Bitcoins are created/awarded is directly dependent on the proof of work (PoW) that is contingent on solving mathematical 'puzzles' by "trying billions of calculations per second". In other words, miners are rewarded with newly created Bitcoins for validating transactions and are selected based on

mathematical *guesswork.* This is very different from Bitcoin is "backed by mathematics". Grunspan and Pérez-Marco (2020) describe the process as a "decentralised lottery". Their discussion of the process is relevant.

> The mining/validation procedure is a sort of decentralised lottery. A miner (this is a node engaging in validating transactions) packs together a block of floating, not yet validated transactions, and builds a header of this block that contains a hash of the previous block header. The hash algorithm used is SHA-256 (iterated twice), that outputs 256 bits. Mathematically, a hash function is a deterministic one way function: it is easy to compute, but practically impossible to find pre-images or collisions (two files giving the same output). It also enjoys pseudo-random properties, that is, if we change a bit of the input, the bits of the output behave as uncorrelated random variables taking the values 0 and 1 with equal probabilities. The mining procedure consists of finding a hash that is below a pre-fixed threshold, which is called the difficulty. The difficulty is updated every two weeks (or more precisely every 2016 blocks) so that the rate of validation remains at 1 block per 10 min. The pseudo-random properties of the hash function ensure that the only way to find this hash is to probe many hashes, therefore changing a parameter in the header (the nonce). The first miner to find a solution makes the block public, and the network adopts the block as the last block in the blockchain. (Grunspan & Pérez-Marco, 2020, p. 31)

One important feature of the 'puzzle' that Bitcoin miners have to solve is that it does not really depend on any kind of puzzle solving ability. It also does not depend on probabilistic analysis. As Grunspan and Pérez-Marco (2020) describe, "the only way to find this hash is to probe many hashes". This is further described by Buterin (2014, p. 7) as follows: "because SHA256 is designed to be a completely unpredictable pseudorandom function, the only way to create a valid block is simply trial and error, repeatedly incrementing the nonce and seeing if the new hash matches".

Given the importance of Bitcoin, both as the first and the largest cryptocurrency by market capitalisation, we investigate how the trial and error-based proof of work is checked by the Bitcoin protocol. This is relevant given that a successful pass of the proof of work leads to the successful addition of a block and thereby to the creation (mining) of new coins as subsidy. In Table 10 we can see the check proof of work segment of the Bitcoin code.

The purpose here is to reveal that while miners are trying to find the solution to the puzzle by trial and error, the code that is checking the submitted solutions is checking for the specific value of the submitted hash. There is no assessment of a mathematical solution or method. The check on the proof of work compares the provided hash value with the target value (*bnTarget*), if it is greater, it rejects as false (*UintToArith256(hash) > bnTarget*), if smaller or equal, it accepts as true. In other words, while the solving of the mathematical 'puzzle' is about trying different values, the checking of a submitted proof of 'work' is a simple comparison of values. While the difficulty level increases, the essential logic of creation is built on guesswork by trial and error and a single value comparison. This echoes what Dai (1998, p. 1), the first to discuss cryptocurrencies, said in his note on cypherpunks' mailing list: "Anyone can create money by broadcasting the solution to a previously unsolved computational problem. The only conditions are that it must be easy to determine how much computing effort it took to solve the problem and the solution must otherwise have no value, either practical or intellectual". This is why, 'Bitcoin is backed by mathematics' is an exaggeration to say the least.

Table 10. Bitcoin Core target generation and check proof of work function segment. Source: Github (2025a).

Row	Code
146	std::optional<arith_uint256> DeriveTarget(unsigned int nBits, const uint256 pow_limit)
147	{
148	bool fNegative;
149	bool fOverflow;
150	arith_uint256 bnTarget;
151	
152	bnTarget.SetCompact(nBits, &fNegative, &fOverflow);
153	
154	// Check range
155	if (fNegative || bnTarget == 0 || fOverflow || bnTarget > UintToArith256(pow_limit))
156	return {};
157	
158	return bnTarget;
159	}
160	
161	bool CheckProofOfWorkImpl(uint256 hash, unsigned int nBits, const Consensus::Params& params)
162	{
163	auto bnTarget{DeriveTarget(nBits, params.powLimit)};
164	if (!bnTarget) return false;
165	
166	// Check proof of work matches claimed amount
167	if (UintToArith256(hash) > bnTarget)
168	return false;
169	
170	return true;
171	}

The total supply of Bitcoin is set at 21,000,000, and the reward equation for each successfully added block is set by a formula that halves the subsidy or reward every 210,000 blocks. The block reward, or subsidy, started at 50 Bitcoin and is now 3.125 BTC per block. Table 11 provides the code segment that describes the halving function. The key observation here is that the reward for mining is reduced over time depending on the number of blocks that have already been recorded (*nHeight*) and a rule based defined variable (*consensus.nSubsidyHalvingInterval* = 210,000). In other words, the creation of new Bitcoins is designed by a formula that periodically devalues the service that miners are providing to the network. The number of new coins created and rewarded, therefore, is inversely related to the difficulty of providing the PoW. Whatever the projected explanations, deflationary or other, this logic in the creation of new coins distorts the risk return equation of the coin. Such that, if it were not for the extreme appreciation of its market value, mining new coins would become highly unprofitable.

On top of the subsidy (new Bitcoins), miners who have managed to solve the mathematical 'puzzle' and add a block also receive transaction fees. Given that subsidy awards (new Bitcoins) will eventually reach 0 through the halving of subsidies, the system is designed to eventually compensate miners only with transaction fees. Thus, the logic of creation of the Bitcoin cryptocurrency is transaction validation coupled with mathematical guesswork by trial and error. Moreover, this logic is finite, as it is applied up to the point where all 21,000,000 Bitcoins have been created. A limit that is based on the halving equation (Table 11).

Table 11. Bitcoin Core Get Block Subsidy halving code. Source: Github (2025b).

Row	Code
1919	CAmount GetBlockSubsidy(int nHeight, const Consensus::Params & consensusParams)
1920	{
1921	int halvings = nHeight/consensusParams.nSubsidyHalvingInterval;
1922	// Force block reward to zero when right shift is undefined.
1923	if (halvings >= 64)
1924	return 0;
1925	
1926	CAmount nSubsidy = 50 * COIN;
1927	// Subsidy is cut in half every 210,000 blocks which will occur approximately every 4 years.
1928	nSubsidy >>= halvings;
1929	return nSubsidy;
1930	}

Ethereum (ETH)

The second largest cryptocurrency by market capitalisation dominance is Ethereum, or Ether (ETH). The Ethereum blockchain network was proposed in late 2013 by Vitalik Buterin as a programmable blockchain capable of running smart contracts. The officially disseminated whitepaper (Buterin, 2014), discusses the architecture and purpose of Ethereum, albeit before the 'Merge'. The ETH coin was first issued through a public presale (ICO) in 2014. It aimed to raise funds for the project's development. The Ethereum network's first live version, also known as 'Frontier', was launched on the 30 July 2015, when the genesis block was mined and the cryptocurrency became actively tradable on exchanges. Thus, initially, Ethereum used a proof of work (PoW) consensus mechanism, like Bitcoin. However, from the start, Ethereum's roadmap envisioned a transition to proof of stake (PoS) mechanism, aimed mainly at improving energy efficiency and scalability. The first major step was the launch of the Beacon Chain on the 1 December 2020. It was a parallel PoS chain running alongside the initial PoW chain but without processing transactions. On the 15 September 2022, during an event known as the 'Merge', Ethereum fused its PoW execution layer with the PoS consensus layer, eliminating mining entirely.

After the Merge, once the proof of stake (PoS) consensus mechanism was established, given its minting functions, new coins have been and are created as staking rewards for the validators who are selected to propose and attest blocks on the chain. In parallel, validators are also rewarded for the work they do as part of 'sync committees'. On Ethereum, a sync committee is a group of 512 validators selected randomly every ~27 h (256 epochs)[2]. Their task is to provide 'sync committee signatures' that allow clients to confirm which block is the current head of the chain. This, in turn, is linked to the concept of syncing, which describes the 'process of downloading the entire latest version of a blockchain to a node' (Ethereum, 2025b). From the 30 cryptocurrencies on our list, only Ethereum has sync committees and rewards.

The methodology of minting new ETH coins is very different from the methodology used in Bitcoin, i.e., a fixed amount that is reduced through a halving formula. Moreover, unlike Bitcoin, Ethereum (ETH) does not have a fixed maximum supply. "Validators receive rewards when they make votes that are consistent with the majority of other validators, when they propose blocks, and when they participate in sync committees. The value of the rewards in each epoch are calculated from a base_reward. This is the base unit that other rewards are calculated from. The base_reward represents the average reward received by a validator under optimal conditions per epoch. This is calculated from the validator's effective balance and the total number of active validators" (Ethereum, 2025a)[3].

$$\text{base_reward}_i = \text{effective_balance}_i \cdot \frac{\text{base_reward_factor}}{\text{base_rewards_per_epoch} \cdot \sqrt{\sum_j \text{effective_balance}_j}} \tag{3}$$

$$Effective\ Balance\ i = 32\ ETH$$

$$Base\ Reward\ Factor = 64$$

$$Base\ Rewards\ per\ Epoch = 4$$

$$\sum_j effective_balancee_j = T = 32{\cdot}N$$

$$T = 32{\cdot}N = Total\ Effective\ Stake$$

$$N = Number\ of\ Active\ Validators$$

The reward equations of the largest two cryptocurrencies by market capitalisation dominance, Bitcoin and Ethereum, are very different in concept and execution. While one imposes a maximum limit on the amount of total supply, the other has no limit. Interestingly, they also diverge in the methodology of selection, i.e., the decision process that selects which miner or validator gets to add the block and earn the rewards, the newly created coins. While in the case of Bitcoin the selection is built on solving a 'puzzle' by trial and error, the other selects who is to propose and attest a block through its own random process. Ethereum selects exactly one validator to propose the block for each slot. Every validator node requires the staking of 32 ETH to participate and be eligible for block proposer selection, attestation committees, sync committee rotation, and rewards. The probability of a validator being selected to propose a block is given by 1/N, the probability of being selected for an attestation committee is 128/N, and the probability of being selected for a sync committee is 512/N.

Every active validator with 32 ETH effective balance has equal probability. The selection process is randomised through a RANDAO mix. In Ethereum's own words:

> A single validator is pseudo-randomly chosen to propose a block in each slot. There is no such thing as true randomness in a blockchain because if each node generated genuinely random numbers, they couldn't come to consensus. Instead, the aim is to make the validator selection process unpredictable. The randomness is achieved on Ethereum using an algorithm called RANDAO that mixes a hash from the block proposer with a seed that gets updated every block. This value is used to select a specific validator from the total validator set. The validator selection is fixed two epochs in advance as a way to protect against certain kinds of seed manipulation.
>
> Although validators add to RANDAO in each slot, the global RANDAO value is only updated once per epoch. To compute the index of the next block proposer, the RANDAO value is mixed with the slot number to give a unique value in each slot. The probability of an individual validator being selected is not simply 1/N (where N = total active validators). Instead, it is weighted by the effective ETH balance of each validator. The maximum effective balance is 32 ETH (this means that balance < 32 ETH leads to a lower weight than balance == 32 ETH, but balance > 32 ETH does not lead to higher weighting than balance == 32 ETH). (Ethereum, 2024)

While a stake weighted process, the maximum effective balance required to start a validator node (32 ETH) equalises everyone's probability of selection through a random process. However, given a permissionless network, entities are allowed to run *multiple validator nodes* by staking 32 ETH. Indeed, the market share distribution reflects significant

concentration of validator nodes and staked ETH. As of the 11 November 2025, there were 999,203 validators on Ethereum (KuCoin, 2025). The firms with the largest pool of validator nodes include Lido Finance (24.7%), Coinbase (11.7%), Binance (8.4%), Ether.fi (6.7%), Figment (3.4%), Kraken (2.6%), Abyss Finance (2.3%), OKX (1.9%), and Rocketpool (1.8%) (Lido Finance, 2025).

The question that is blatantly obvious here is: how can this be described as decentralised finance? In what sense exactly is this democratising finance? When the creation/allocation process of new coins can be monopolised by entities creating validators and staking 32ETH, the flow of new money is just as managed as it is in the case with fiat money. The only difference is that the managers have changed. From bankers and credit policies to coders and protocols, the logic of money creation and distribution remains managed and even more opaque. A permissionless network with a layer of pseudo-randomness and a publicly available code do not guarantee fairness or transparency. The 'fine print' of the legal contracts used by banks may be off putting, but at least they are in English. The code-based nature of crypto contracts introduces an entirely new level of accessibility issues for the layperson and untrained user.

Tether USDt (USDT)

USDT was originally launched in October 2014 as 'Realcoin' by Tether Limited co-founders Brock Pierce, Reeve Collins and Craig Sellars. It rebranded to "Tether" later in 2014. It is the third largest cryptocurrency by market capitalisation dominance, and it is issued across many blockchains. USDT is a token, i.e., runs on exiting blockchains and not its own technology. New USDT tokens are created when users deposit fiat USD or equivalent collateral with Tether. Tether then mints new USDT tokens and issues them to the relevant users. When USDT tokens are redeemed for USD, those tokens are destroyed, i.e., burned, and removed from circulation. USDT has a dynamic supply mechanism that mints/burns on demand. As per Tether's own definition, Tether tokens are blockchain assets that are pegged to real-world currencies on a 1:1 basis (Tether, 2014, 2025). USDT is backed by its reserves, which include currency, cash equivalents, and other liquid assets. The collateralised issuance is central to maintain the USD peg, and the token trades very close to one dollar. The logic of creation of USDT is 1:1 USD deposit based, issued and centrally managed by Tether Ltd. There are no rewards, no randomness, no probability-based coin creation and allocation.

XRP (XRP)

The XRP Ledger (XRPL) was developed starting around 2011 by engineers including Jed McCaleb, Arthur Britto and David Schwartz. It has its own consensus mechanism, the Ripple Protocol Consensus Algorithm (Schwartz et al., 2014). The native coin XRP launched in 2012. Ripple Labs, originally OpenCoin, was founded to promote the protocol and received most of the initial token allocation. Ripple Labs became Ripple in 2015. From inception, it was designed as a high-speed consensus protocol (settles transactions in 3–5 s), low-cost settlement network rather than a mining or minting-based digital currency.

XRP was pre-minted at launch with a fixed supply of 100 billion XRP. After launch, coins are distributed from escrow as allocations by Ripple. They are not minted or mined. From the initial 100 billion, 80 billion XRP were allocated to Ripple for ecosystem use, and around 20 billion to founders/early contributors. This was done through a private distribution. Ripple uses an escrow mechanism and releases 1 billion XRP each month. It decides how much of the released XRP is needed for operational expenses, institutional sales, and ecosystem support. Unused XRPs are re-escrowed, to be released at a later date. The main purpose of this mechanism is to ensure a predictable and transparent supply

schedule. However, Ripple's discretionary control in the process is significant, and its role as a major holder is often scrutinised for centralisation and risk considerations.

XRP and RippleNet, a global payments platform operated by Ripple, enable banks and payment providers to use XRP as a bridge asset, which allows for low cost and efficient international money flows, between currencies and across borders. Given transaction speeds, 3–5 s, low costs, often less than $0.01, and easy exchange with major currencies, XRP has attracted major banks as clients. In a recent article (5 November 2025), the CEO of Ripple, Brad Garlinghouse, is quoted as saying: "[w]e started in 2012 with one use case—payments—and have expanded that success into custody, stablecoins, prime brokerage and corporate treasury, leveraging digital assets like XRP. . . [t]oday, Ripple stands as the partner for institutions looking to access crypto and blockchain" (Crunchbase, 2025).

XRP is a very different kind of cryptocurrency. Unlike Bitcoin and Ethereum, pseudo-randomness and probabilistic decision rules do not govern its logic of creation and distribution. While its discretionary framework may raise questions about its degree of decentralisation, its value proposition as a bridge asset seems to, for now, be the primary driver of its value and circulation.

BNB (BNB)

BNB was launched in July 2017 by Binance as part of its public ICO, raising approximately USD $15 million. Binance is a centralized cryptocurrency exchange, launched in 2017 by Changpeng Zhao (Binance, 2017). Originally issued as a token on Ethereum, BNB was later migrated, i.e., burned on Ethereum and re-issued on Binance Chain, when Binance Chain launched in 2019. BNB became the native coin used for transaction fees, staking, validator rewards, and governance across Binance's exchange architecture. Hence, it is primarily a utility and exchange coin.

BNB was pre-minted, and its entire supply was created at inception. The total original supply was 200 million BNB, created before the public ICO, which was distributed at launch, 50% to Public ICO participants, 40% to the Binance team, and 10% to angel investors. BNB cannot be mined or minted. BNB is not a stablecoin, so it is not backed by external reserves such as USD. Instead, supply decreases over time through regular burns, including an 'auto-burn' mechanism. BNB is burned each quarter based on the number of blocks produced. This was introduced in December 2021, to make the process more transparent to users. The long-term goal is to reduce circulating supply from 200 million to 100 million BNB. The equation used for the auto-burn function is the following: $B = (N \cdot K)/(P + K)$, where B is the amount of BNB to burn in the quarter, N is the total number of blocks produced on the BNB Chain during the calendar quarter, P is the average price of BNB (in USD) for that quarter, and K is a constant value initially set at 1000 (Binance, 2017, 2022).

Validators still earn BNB as rewards, but mainly as transaction fees and gas. These are not rewards as in the case of Ethereum, where new coins are created for the purpose. This is an important distinction that is worth considering when describing how we categorise cryptocurrencies in the taxonomies of money. Can coins/tokens that have a capped maximum supply that is programmatically designed to shrink in quantity over time be treated in the same theoretical and empirical group as those that have no capped supply and are programmatically set to grow in supply?

Solana (SOL)

Solana was developed by Solana Labs founded by Anatoly Yakovenko, Raj Gokal, and Greg Fitzgerald, and launched its Mainnet-beta in March 2020. The architecture of the blockchain was developed three years earlier by Yakovenko (2017). The large part of the coin SOL was pre-minted at genesis. After launch, additional coins are created via

rewards for staking. Solana has a hybrid PoS and PoH consensus mechanism and rewards validators for new blocks, but the process through which validators are determined and selected is very different from Ethereum. Solana's process is described as deterministic because it follows a clear set of rules. However, as described below, it is still stake-weighted and involves a random shuffle. To become a validator on Solana one must run a validator software with specific hardware specifications, register to vote, acquire stake (own or delegated by others), participate in PoH verification (vote on blocks and track timestamps). When an epoch starts, a leader schedule is created, after a random shuffle (based on stakes), that assigns slots proportionally to stakes. In other words, the selection is not entirely random as it is based on a fixed schedule. However, the chance to produce blocks is still linked to stakes. The equation that determines the chance of being selected as a leader is still stake dependent. Leader slots are assigned pseudo-randomly in proportion to stake. For a validator I with an effective stake S_i, the expected number of leader slots in an epoch is given as per the below equation. Actual slot assignments vary around this expectation due to randomness in the leader schedule.

$$\mathbb{E}[slots_i] = w_i \times total\ leader\ slots\ per\ epoch,\ \text{where}\ w_i = \frac{S_i}{\sum_j S_j}.$$

Delegators and validators receive rewards via new issuance. The reward equation per epoch is given by:

$$R_{epoch} = Current\ Total\ SupplyS \times \frac{Inflation\ Rate}{Epochs\ per\ Year} \tag{4}$$

The 'inflation rate' was initially set at 8% and was scheduled to decline 15% per epoch year until reaching a long-term floor of 1.5%. Currently, the Solana 'inflation rate' is around 4%. The reward for staking by delegators is given by the below equation (Solana, 2025).

$$\begin{gathered} Staking\ Yield = \\ Inflation\ Rate\ \times Validator\ Uptime\ \times (1 - Validator\ Fee) \times \left(\frac{1}{\%\ SOL\ Staked}\right) \end{gathered} \tag{5}$$

$$\%\ SOL\ Staked = \frac{Total\ SOL\ Staked}{Total\ Current\ Supply}$$

The Solana process raises another important question. What is the economic justification for fixed 'inflation' rates? What is the economic and theoretical framework behind a fixed 'disinflation' rate? The first issue in the crypto market is that inflation is used as a proxy term to describe supply growth, not price increases. This reveals yet another terminological confusion plaguing the crypto market. Inflation does not refer to money supply growth, but price level increases. Similarly, disinflation refers to a decline in inflation rates, referring again to price levels, not money supply levels. While inflation targeting is a common central bank policy framework, it is a dynamic process that responds to real life fluctuations in prices and output. Where do these fixed rates come from? And why? These are creator/coder defined factors, and there are no in-depth economic discussions or justifications provided. These questions are further evidence that the mechanics of cryptocurrencies are unique to each, and diverse across the top 30. Thus, considering them as a branch or a petal in a money taxonomy may lead us to omit important features that are relevant to the functional relevance of the cryptocurrencies as money.

USDC (USDC)

USDC was introduced in 2018 via the Centre consortium (Circle, 2018), by Circle Internet Group and Coinbase Global, and launched in September that year on the Ethereum

blockchain as a token. Over time, Circle Internet Group took sole governance of USDC after dissolving the Centre consortium (Circle, 2018). USDC is available on multiple blockchains beyond Ethereum (e.g., Solana, Avalanche) to enhance accessibility. USDC uses a mint-on-demand issuance model, when a user deposits fiat USD with Circle, USDC tokens are minted and issued on supported blockchains. When USDC is redeemed for fiat, the tokens are destroyed, i.e., burned, to ensure the supply matches reserve backing. USDC is designed to be fully backed by cash and highly liquid cash-equivalent assets, held in regulated bank accounts and money-market funds. Reserve backing is publicly disclosed via regular independent attestations rather than full audits. USDC is marketed as a stablecoin pegged to the U.S. dollar (1 USDC ≈ USD 1.00). The logic of creation of USDC is 1:1 USD deposit based, issued and centrally managed by Circle. There are no rewards, no randomness, no probability-based coin creation and allocation. Table 12 summarises our findings for the top 7, aggregating from previous tables.

Figure 1 depicts the price performance of Bitcoin, Ethereum, BNB, Solana, and XRP—5 out of the top 7 (without the stablecoins). The price performance of the cryptocurrencies in our sample became relevant given the downturn experienced during the clinical analysis.

Table 12. Top 7 key features. Source: compiled by author.

Feature	Bitcoin (BTC)	Ethereum (ETH)	Tether USDt (USDT)	XRP (XRP)	BNB (BNB)	Solana (SOL)	USDC (USDC)
Market Cap Dominance %	58.099	12.8787	4.5937	4.4111	3.5405	2.9045	1.9537
Network Model	Permissionless	Permissionless	Hybrid	Permissionless	Permissionless	Permissionless	Hybrid
Functional Categories	Payment	Platform, Utility	Stablecoin (USD-pegged)	Payment	Platform, Utility Exchange, Governance	Platform, Utility	Stablecoin (USD-pegged)
Key Uses	Digital Asset, P2P Payments	Gas, Staking, Fees	Payments, Hedging, Liquidity, Trading	Bridge Asset, Liquidity, Settlement, Remittances	Gas, Fees, Staking, Payments, DeFi Liquidity	Gas, Staking, Fees, DeFi Liquidity	Settlement, Payments, Trading, DeFi Liquidity
Minting/ Minging	MINING	Minting (PreM)	Minting	Pre-Minted	Pre-Minted	Minting (PreM)	Minting
Initial Offering	Public Fair Launch	Public ICO	Mint on Demand	Private Distribution	Public ICO	Public IEO	Mint on Demand
Consensus	(PoW)	(PoS)	Multichain	(RPCA)	(PoSA)	(PoH), (PoS)	Multichain
Created	As block rewards	Inception and as staking rewards	As 1:1 mint	At inception	At inception	Inception and as staking rewards	As 1:1 mint
Key Role(s), Decision Makers	Miner	Validator/ Staker,	Depositor, Tether Ltd.	Ripple	Binance/BNB Chain, Auto-Burn Mechanism	Validator/ Delegator	Depositor, Circle Internet Group Inc
Decision Rule	Probabilistic (hash power-weighted)	Random (stake-weighted) lottery	N/A	Deterministic quorum	Discretionary and Program-matic	Deterministic stake-weighted leader schedule, shuffle	N/A

Table 12. *Cont.*

Feature	Bitcoin (BTC)	Ethereum (ETH)	Tether USDt (USDT)	XRP (XRP)	BNB (BNB)	Solana (SOL)	USDC (USDC)
Reward and Defining Factor(s)	Per Block, Halves (210,000 B), R = 3.125	Per Epoch & Validator Duties, Total Stake, Validator Eff. Balance, Participation, Stake Levels	No rewards	Per month 1 billion XRP release from escrow for ecosystem needs and sales	Per Quarter, burn only, scarcity as strategy. Rewards as Yield for staking, no new coins.	Per Epoch, Yearly 'Inflation', Total Staked SOL, Stake Share, Performance	No rewards

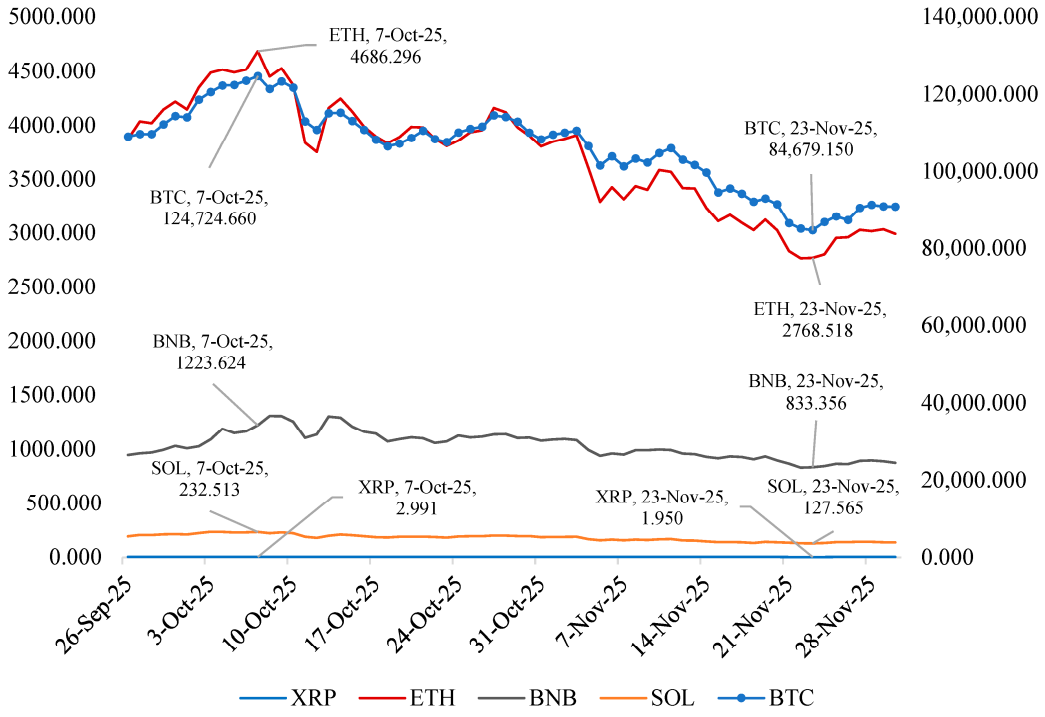


Figure 1. Bitcoin (right axis), Ethereum, BNB, Solana, and XRP price performance. Source: CoinMarketCap (2025).

Between the 7 October and the 23 November 2025 Bitcoin experienced more than 32% fall in its market value. Ethereum (ETH) fell by more than 40%, XRP by more than 34%, BNB by 31%, and Solana by 45%. The recent downturn is explained by a flight from risk and speculative assets (FT, 2025; Reuters, 2025), reenforcing the many questions surrounding their role and reliability as money.

The Other Two Stablecoins: USDe and DAI

The idea of asset pegged cryptocurrencies was first popularized by Willett (2012), in a whitepaper titled 'The Second Bitcoin Whitepaper'. They are very different from all other cryptocurrencies because they aim at price stability as a primary objective. Indeed, stablecoins are the only subgroup within cryptocurrencies that have been studied as a unique subgroup (Dionysopoulos & Urquhart, 2024). The Genius Act of 2025 (US Congress, 2025) stressed their uniqueness, risks, and potential.

The stablecoins in our sample aim to maintain a $1 USD value. Interestingly, how they achieve this is not based on an identical strategy. Some, like USDT and USDC, are pegged to the US Dollar, the fiat currency, through a 1:1 backing by USD fiat deposits and liquid securities, others aim to maintain a $1 USD value through cryptocurrency collaterals

and hedging strategies. The stability of stablecoins has already been the subject of price and volatility-based investigations (Duan & Urquhart, 2023) that reveal strong evidence of instability. However, as Duan and Urquhart (2023, p. 1) reveal, deviations from "the 1$ mark are gradually corrected at different speeds for all stablecoins except for DAI". Their study happens to include 3 out of the four stablecoins in our sample. Our findings reveal a unique picture that we discuss next.

The 4 stablecoins (tokens by definition) in our sample are Tether USDt, USDC, USDe, and DAI. Tether USDt and USDC are part of the top 7, in 3rd and 7th place, and we have discussed them in the previous subsections. The other two stablecoins, USDe and DAI, respectively 12th and 27th on the top 30 list, are different in structure and strategy. Even the four stablecoins reveal a diversity that cannot be ignored or overlooked.

Figure 2 depicts the prices of the 4 stablecoins during our clinical study period, between the 26 September and the 30 November 2025. We can see all four of them holding their near 1$ value with some fluctuations. As mentioned previously, this price investigation was motivated by the downturn experienced in the crypto market during the clinical analysis. The fact that the 4 stablecoins deviated from their intended peg, but gradually corrected themselves, echoes the findings of Duan and Urquhart (2023), albeit in a very short but significant time window. We discuss their logic of creation, and the unique nature of their peg, and the strategies that help them maintain it, next.

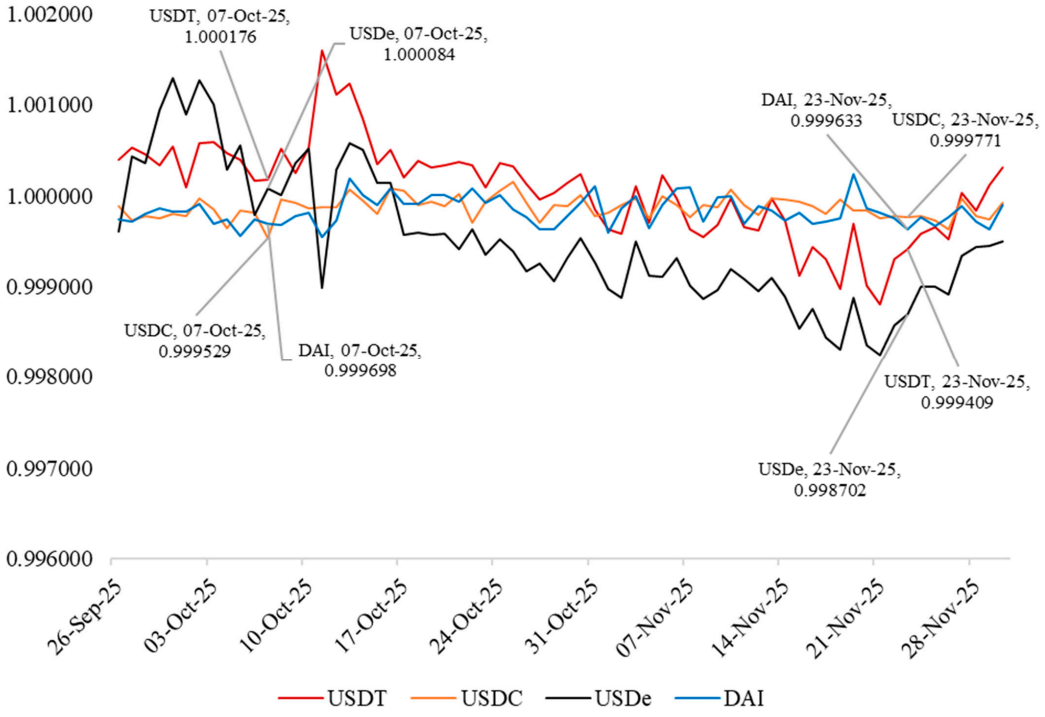


Figure 2. Stablecoin prices 26 September to 30 November 2025, USD. Source: CoinMarketCap (2025).

Ethena USDe was launched in early 2024 under Ethena Labs as a 'synthetic dollar' stablecoin built on Ethereum. Unlike USDC and USDT, USDe is not backed by fiat dollars (cash deposits or securities). It is a crypto backed stablecoin. Users deposit approved collateral (crypto assets and futures positions) through the Ethena protocol. The protocol mints USDe when approved counterparties deposit the required collateral and simultaneously establish offsetting derivative positions through the Ethena protocol (Ethena Labs, 2024). USDe is collateralised by a basket of cryptoassets like staked ETH (stETH), and other stablecoins. The protocol uses derivatives strategies to hedge exposure and stabilise the peg. Given the crypto backed nature of USDe, the stablecoin is exposed to a variety of risks,

such as collateral value volatility and derivatives counterparty risk. USDe is designed to maintain a 1:1 peg with the U.S. dollar. Because of its synthetic/backed-by-crypto model, the peg depends upon the health of collateral and hedging strategies. Delta-neutral hedging aims to keep the value stable by offsetting the price exposure of a derivative or collateral position with an opposite position in the underlying asset. Thus, the combined portfolio (collateral and hedge) has zero first-order sensitivity to price changes (Δ). Small price movements cause gains on one side and losses on the other that cancel out, maintaining a relatively stable net value. While this works for USDe, it is not without serious risks given wide jumps and falls in the value of different collaterals in the crypto market. Indeed, as can be seen in Figure 2, USDe dipped the most during the recent market upheaval.

DAI was launched in December 2017 as a token on Ethereum, as part of the MakerDAO ecosystem, originally known as Single-Collateral DAI (SCD) backed only by ETH (MakerDAO, 2017). In November 2019, MakerDAO upgraded to Multi-Collateral DAI (MCD), allowing a wider range of crypto assets to be used as collateral. DAI differs from USDe because upon the provision of collateral, DAI is minted as a *loan*. DAI is minted on demand through Maker Vaults when users lock approved collateral (ETH, WBTC, stETH, USDC, etc.) and borrow newly minted DAI against that collateral. Given the permissionless network model of DAI, users issue DAI without central authority approval, it is managed through the Maker protocol. When the user repays the DAI and stability fees, the DAI is burned and collateral is released. DAI is backed by over-collateralized crypto assets held in smart contracts. This model can be explained by the loan-based nature of the mint. Vaults must maintain a collateralization ratio above a required threshold (130–170%), often minted on a 1:1.5 basis. In other words, DAI is minted on demand as a collateralised loan, and its supply expands/contracts automatically based on vault activity. DAI uses a liquidation mechanism to safeguard its value. Each collateral type has a predefined liquidation ratio, which triggers liquidation given collateral value fluctuations.

To conclude this subsection, Table 13 describes the key features if the 4 stablecoins together, also reporting their S&P stability ratings. Given their price stability objective, they differ from all other cryptocurrencies. However, even the stablecoins are not identical in methodology. Unlike speculative assets, which most cryptocurrencies are, stablecoins have been recognised and studied for their unique potential. While all the stablecoins involve a depositor, the assets being deposited are not all the same. Moreover, there is no protocol defined or issuer defined random selection. USDe is the only one that has approved counterparties. As long as the deposited assets are approved assets, the issuance of stablecoins is allocated to the depositor. This is fundamentally different from the creation logic of the other cryptocurrencies in our sample. Between the probabilistic and random selection involved in those who create new coins as block rewards or as staking rewards, and those who distribute pre-minted coins at their discretion, the logic of creation of the stablecoins stands out.

Table 13. Stablecoins: key features. Source: compiled by author.

Feature	USDT	USDC	USDe	DAI
Type	Centralised fiat-backed stablecoin	Centralised fiat-backed stablecoin	Synthetic delta-neutral stablecoin	Overcollateralised crypto backed loan-based stablecoin
Issuer	Tether	Circle	Ethena Protocol, Ethena Labs	Maker Protocol, MakerDAO
Launch Year	2014	2018	2024	2017

Table 13. *Cont.*

Feature	USDT	USDC	USDe	DAI
Minting Logic	1 USDT minted for every $1 deposited (fiat via Tether)	1 USDC minted for every $1 deposited (fiat via Circle)	Minted by depositing crypto collateral	Minted as loan when users lock collateral into Maker Vaults
Minting Ratio	1:1 fiat	1:1 fiat	~1:1 net exposure	Typically 130–170% collateral ratio (depends on asset type)
Reserve Composition	U.S. T-bills, cash, repos, precious metals	U.S. T-bills, cash, bank deposits, overnight repos	Staked ETH (LSTs), ETH futures, USDT, USDC	Mix of ETH, WBTC, real-world assets (RWAs), USDC, and LSTs
Peg Mechanism	Fully backed by collateral	Fully backed by collateral	Delta-neutral hedging maintains stable value	Overcollateralisation + liquidation mechanism
Stability (S&P Global, 2025)	5 (Weak)	1 (Very Strong)	5 (Weak)	4 (Constrained)
Hedging Strategy	None, collateralised	None, collateralised	Delta-neutral: long staked ETH + short ETH perpetual futures	None, overcollateralised, liquidation mechanism
Main Use Cases	Global payments, crypto trading	Trading, corporate treasury, fintech payments	On-chain yield-bearing stable liquidity	DeFi collateral, lending, borrowing
Main Audience	Traders, emerging markets, exchanges	Institutions, regulated entities, fintech	Approved counterparties, Yield-seeking DeFi users	DeFi users + decentralised finance protocols
Who Gets the Tokens	Depositor	Depositor	Depositor, Hedger	Depositor, Borrower
Redemption Method	Direct with Tether	Direct with Circle	Redeemable via Ethena mechanism	Burn DAI to unlock collateral

2.4. Clinical Summary

This section reported the findings of our clinical investigation of the top 30 cryptocurrencies listed on CoinMarketCap as of the 26 September 2025. The purpose was to explore and reveal their logic of creation. We explored their logic of creation through three key questions: (a) *why* are they created? (b) *when* are new coins/tokens created? and (c) *how* are they issued and *to whom*? The evidence extracted from the whitepapers, codes, strategies, and actual events surrounding the top 30 cryptocurrencies in our sample revealed a very unique and diverse picture. Crypto mechanics is an assortment of methodologies with varying degrees of centralisation. We summarise the key findings and conclusions of the clinical study below.

Unlike other asset classes, whether traded in public or private markets, cryptocurrencies reveal a level of diversity that raises questions on the viability of studying them as a uniform group. The top 30 cryptocurrencies in our sample have different scales when it comes to their smallest unit, (<1 Base Unit), ranging between 10^{-6} and 10^{-18}. 19 are native coins, 11 are tokens. 23 have a permissionless network model, 1 permissioned, and 6 hybrid. 18 out of 30 have a capped supply.

The 'why' question, which aimed at understanding their functional purpose and uses, revealed an equally diverse picture. We observed a variety of functional categories: platform, utility, payment, governance, exchange, meme, yield, privacy, and stablecoins.

Their uses are also diverse, and include staking, gas, payments, Defi liquidity, incentives, fees, remittances, and political alignment. We also found 11 different kinds of distribution events at inception: (1) Public Fair Launch, (2) Public Initial Coin Offering (ICO), (3) Mint-on-Demand, (4) Private Distribution, (5) Public Initial Exchange Offering (IEO), (6) Public Airdrop, (7) Private Simple Agreement for Future Tokens (SAFT), (8) Private IEO, (9) Public Fork Distribution, (10) Private Migration, and (11) Giver Smart Contracts (IPoW).

The 'when' question revealed yet more diversity. 14 out of 30 have a pre-minted supply. 5 have mining as the process of new coin creation, which is the process associated with those that have proof of work (PoW) as consensus mechanism. The other 11 are split into two groups. 7 have active minting of new coins/tokens but they also had a proportion of their supply pre-minted at inception. 4 have only 'Minting' without pre-minted supply, and they are the 4 stablecoins in our sample.

The 14 out of the top 30 that are pre-minted have a supply that has been created at inception, i.e., there is no new coin or token creation. Instead, the already created coins/tokens are distributed, either at genesis or over time, based on pre-defined rules and conditions and/or as rewards and incentives for ecosystem development, participation, and other network activities and programs. Their decision-making process is primarily discretionary, although some have Decentralised Autonomous Organisation (DAO) that have a varying degree of control. The 4 stablecoins, Tether USDt, USDC, Ethena USDe, and DAI, are all pegged to the US Dollar. The first two are created when users deposit fiat money (USD) and the latter two are crypto backed, i.e., new tokens are minted when users deposit relevant crypto collateral. The remaining 12 are further divided into two groups. 5 create new coins as block rewards, i.e., when miners successfully find a valid proof of work block. These are the ones who have PoW as their main consensus mechanism. The remaining 7 create new coins as staking rewards, i.e., minting, when validators propose/attest/produce/validate blocks, and when they perform network duties. They have PoS as their main consensus mechanism. The key observation here is that transaction validation is the key trigger event for new coin/token creation.

The 'how and to whom' question revealed yet more diversity. Consensus mechanisms are directly linked to how new coins or tokens are created because new coins are minted or mined given the successful addition of a new block, which is a function of consensus. However, consensus mechanisms do not define how they are created. The reward decision is a protocol level decision, or an issuer decision. Even when random and probabilistic, these decisions are coded in through a discretionary choice by the coders of the relevant blockchain and coin/token. For the 5 using a PoW consensus mechanism, the reward equations, i.e., new coin creation equations, are similar. The selection process of who gets the coins is identical, and based on solving the PoW puzzle, which can only be solved by trying different combinations on a trial-and-error basis. The selection rule is probabilistic, and hash power weighted. In other words, each miner's chance of finding the next block is dependent or proportional to her or his share of the total network hash rate. The decision rules of the 7 that issue new coins as staking rewards for validators/stakers/nominators are diverse in logic, but all stake dependent. How one becomes a validator and which validator is selected to propose or produce a block is determined through a combination of rules that are often specific to the network and the blockchain in question. Many, including Ethereum (ETH), use pseudo-randomness to ensure 'fairness'. However, like in the case of Ethereum (ETH), validator nodes are controlled by a handful of entities. This contradicts the claimed grand thesis of decentralisation and disintermediation. Its seems that coders are replacing bankers, protocols are replacing banks and their policies. Ultimately, however, they are even more inaccessible to the layperson.

The cryptocurrencies that use mining or minting (except stablecoins) to create new coins, use some form of randomness as a tool or methodology through which they achieve their grand vision of 'decentralisation' or 'disintermediation'. In other words, mathematical guesswork and pseudo-randomness are being offered as a 'better' decision making rule compared to the discretionary policies of banks. The 14 cryptocurrencies that have a pre-minted supply do not follow this approach, as they have their own discretionary methods, which raises questions on their relevance to the grand crypto vision. Indeed, in those cases, the coders and the protocol creators are replacing bankers and the discretionary policies of banks.

Between the 7 October and the 23 November, 28 out of the top 30 cryptocurrencies in our sample saw their prices decline, some dramatically. Bitcoin lost more than 32% of its value, Ethereum more than 40%, XRP more than 34%, BNB more than 31%, SOL more than 45%. The 2 cryptocurrencies that had a positive price performance in the same window were USDC and XMR. While USDC's positive performance is negligeable and reveals its stablecoin nature, XMR's performance stands out, achieving more than 18% increase between 7 October and 23 November 2025, and more than a 43% increase between 26 September and 30 November 2025. After further investigation into XMR, we identified one main reason that may explain its singular positive performance. Monero (XMR) is a privacy coin with untraceable payments, and its performance, given the price decline of the other 28, reflects a flight to anonymity given growing scrutiny and regulation in the sector.

Unlike other asset classes, such as bonds and stocks, where a bond is a bond and a stock is a stock, representing a specific investment rationale, i.e., debt and ownership respectively, cryptocurrencies do not represent identical rationales. Their logic of creation and distribution is diverse, and their 'payout' is structured differently—some use chance-based probabilistic models and pseudo-randomness to select who gets the new coins, others distribute them at their own discretion. Some are programmatically designed to reduce supply, others to increase it. Unlike central and commercial banks, which follow a near identical methodology when creating the three forms of fiat money, i.e., currency, bank deposits, and central bank reserves, the creation logic of cryptocurrencies is more diverse and dependent on the rules and code of each one. Furthermore, even on the level of terminology, the crypto market reveals diversity and some level of confusion—where 'inflation rate' means money supply growth, and a stablecoin is a token. To further contextualise our clinical findings, we discuss the logic of creation of fiat money and CBDCs next.

3. The Debt Logic of Fiat Money

In this section, we discuss the logic of creation of fiat money. This is neither a history of money nor a literature review of money creation and banking. The purpose of this section is to describe how money is created within our current two-tier monetary system managed by banks and central banks. The why question of fiat money is widely discussed and well understood. Whether one subscribes to Jevons' (1875) four functions of money, or its more recent formulation, i.e., a means of exchange, a unit of account, and a store of value, ultimately, the most critical function of money, out of which the others are derived, is a means of exchange. As a tool through which trade can be executed without requiring the double coincidence of wants, a scenario that would be unavoidable in a barter economy, fiat money facilitates the exchange, accounting, and storing of value. This, in brief, is the *why* of fiat money.

In his widely discussed paper, Money is Memory, Kocherlakota (1998, p. 232) argues that "from a technological point of view, money is equivalent to a primitive form of memory". Carstens (2021, p. 3) summarises Kocherlakota's main proposition as follows:

"[by] substituting for an otherwise complex web of bilateral IOUs, money is a substitute for a publicly available and freely accessible device that records who owes what to whom". This formulation is particularly relevant because it also reveals the debt logic of fiat money. It must be noted that the functional roles of money are not dependent on its debt logic. In other words, the 'IOU backed by debt assets' logic of fiat money is not a requirement that is born out of its functional roles as medium of exchange, unit of account, and store of value. It is, instead, an architectural choice, much like transaction validation and pseudo-randomness are a choice for cryptocurrencies.

The debt-based nature of fiat money has been a fundamental feature of money creation for more than a century, but it has not always been well understood. In a paper discussing the 2008 financial crisis as well as the subsequent sovereign debt crisis, Papazian (2011) argues for the necessity to address the debt-based nature of our monetary system, offering non-debt alternative monetisation instruments as a viable way to avoid falling victim to a system chasing its own tale. Werner (2014, 2016) provides an in-depth literature review and discussion of the three theories of money and banking, i.e., financial intermediation, fractional reserve, and credit creation theories. Werner's empirical findings support the credit creation theory: "[t]he bank does not loan any existing money, but instead creates new money" (Werner, 2014, p. 16). In articles published by the Bank of England Quarterly Bulletin, McLeay et al. (2014a, 2014b) summarise the *how* and *when* and to *whom* logic of fiat money succinctly:

> There are three main types of money: currency, bank deposits and central bank reserves. Each represents an IOU from one sector of the economy to another. Most money in the modern economy is in the form of bank deposits, which are created by commercial banks themselves. (McLeay et al., 2014b, p. 4)

> In the modern economy, most money takes the form of bank deposits. But how those bank deposits are created is often misunderstood: the principal way is through commercial banks making loans. Whenever a bank makes a loan, it simultaneously creates a matching deposit in the borrower's bank account, thereby creating new money. (McLeay et al., 2014a, p. 1)

All the forms of money, i.e., currency, bank deposits, and central bank reserves, represent an IOU from one sector of the economy to another, and they are created and backed through IOU securities, i.e., loans, bonds, credit facilities, and other debt instruments. Discussing broad money (bank deposits and currency), the authors go on to observe that "bank deposits make up the vast majority—97% of the amount currently in circulation" (McLeay et al., 2014a, p. 15). Table 14 provides the balance sheet of HSBC Plc and reveals the liability backed by debt assets logic of bank deposits.

Table 14. Balance sheet, assets, and liabilities, and capital of HSBC Plc, 2023–2024, (£m). Source: HSBC (2024).

	31 December 2024	**31 December 2023**
Total Assets	340,877	332,876
Cash and balances at central bank	52,276	65,719
Financial assets mandatory measured at fair value through profit and loss	174	135
Derivatives	298	178
Loans and advances to banks	7263	7980
Loans and advances to customers	217,604	211,887
Reverse repurchase agreements—non-trading	11,776	7686
Financial investments	37,801	26,315
Other assets	13,685	12,976

Table 14. *Cont.*

	31 December 2024	31 December 2023
Total Liabilities	314,906	306,806
Deposits by banks	11,144	10,843
Customer accounts	280,366	268,345
Repurchase agreements—non-trading	420	4652
Derivatives	107	108
Debt securities in issue	2044	1988
Other liabilities	20,825	20,870
Total Equity	25,971	26,070
Total shareholders' equity	25,911	26,010
Non-controlling interests	60	60

To expand on the logic of creation for currency and central bank reserves, we look at the balance sheet of the US Federal Reserve for 2024–2025, Table 15. We observe that ' Federal Reserve Notes', i.e., currency, and 'Deposits held by depository institutions', i.e., central bank reserves, are both liabilities backed by assets which are primarily loans and debt securities on the asset side.

Table 15. Assets, liabilities, and capital of the US Federal Reserve System ($ billions). Source: FED (2025b).

	26 March 2025	25 September 2024
Total Assets	6740	7080
Securities held outright	6429	6669
U.S. Treasury securities	4237	4384
Federal agency debt securities	2	2
Agency mortgage-backed securities	2189	2282
Repurchase agreements	0	0
Foreign official	0	0
Other	0	0
Loans	4	90
Discount window	2	1
Bank Term Funding Program	0	86
Other credit extensions	0	0
Paycheck Protection Program Liquidity Facility	0	0
Other loans	2	2
Net portfolio holdings of Corporate Credit Facility LLC	0	0
Net portfolio holdings of Main Street Facilities LLC	7	10
Net portfolio holdings of Municipal Liquidity Facility LLC	0	0
Net portfolio holdings of Term Asset-Backed Securities Loan Facility II LLC	0	0
Central bank liquidity swaps	0	0
Other assets	300	311
Total liabilities	6696	7037
Federal Reserve notes	2322	2299
Deposits held by depository institutions other than term deposits	3451	3142
Reverse repurchase agreements	629	833
Foreign official and international accounts	387	417

Table 15. *Cont.*

	26 March 2025	25 September 2024
Others	241	416
U.S. Treasury, General Account	316	779
Treasury contributions to credit facilities	3	5
Other liabilities	−25	−21
Total capital	44	43

Figure 3 depicts selected assets and liabilities of the FED over the 2007–2025 period, also identifying the key periods when the Fed implemented its Quantitative Easing (QE) liquidity injection program during the 2007/2008 financial crisis and the Covid pandemic. The chart also identifies instances of Quantitative Tightening (QT).

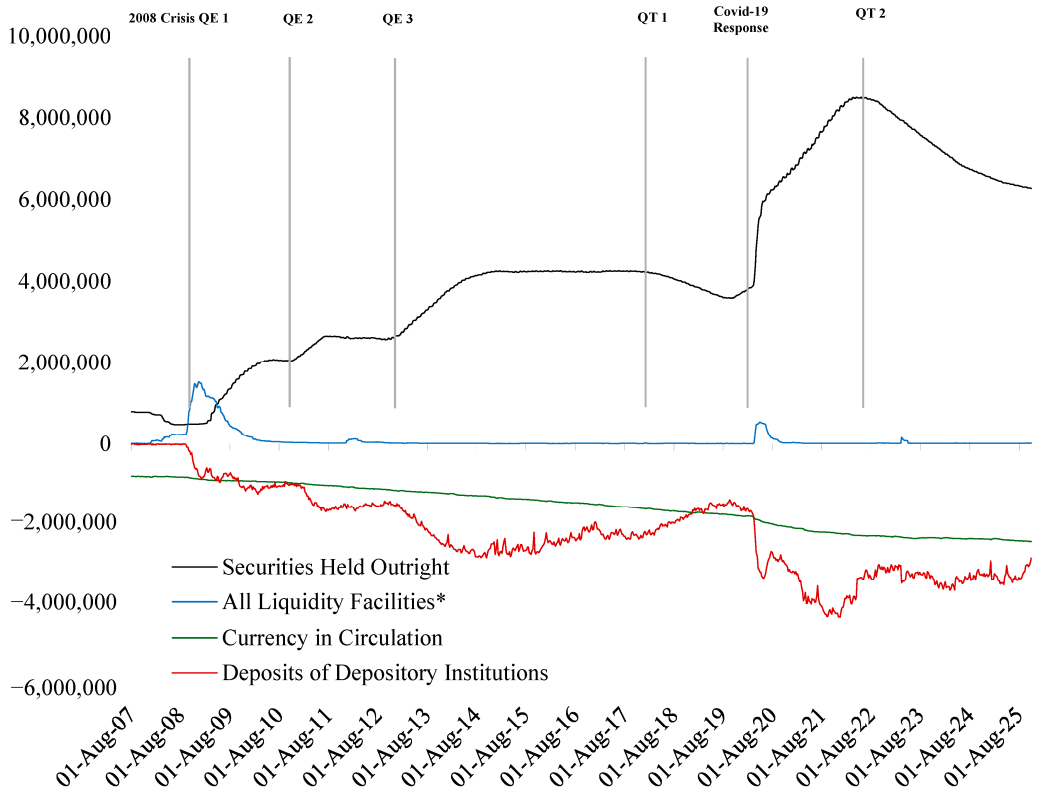


Figure 3. Selected US FED assets & liabilities, weekly, in millions of USD, 2007–2025. Source: FED (2025a). * All Liquidity Facilities includes: Term Auction credit; primary credit; secondary credit; seasonal credit; Primary Dealer Credit Facility; Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility; Term Asset-Backed Securities Loan Facility; Commercial Paper Funding Facility; Money Market Mutual Fund Liquidity Facility; Paycheck Protection Program Liquidity Facility; Bank Term Funding Program; and central bank liquidity swaps. Securities Held Outright includes: U.S. Treasury securities, federal agency debt securities, agency mortgage-backed securities.

The Bank of England describes the Quantitative Easing (QE) strategy as follows: "The money we used to buy bonds when we were doing QE did not come from government taxation or borrowing. Instead, like other central banks, we can create money digitally in the form of 'central bank reserves'. We use these reserves to buy bonds. Bonds are essentially IOUs issued by the government and businesses as a means of borrowing money" (Bank of England, 2024).

Once again, the debt-based logic of money creation is self-evident. To shed further light on the process, Quantitative Easing in the UK was achieved through specific institutional

initiatives like the Asset Purchase Facility (APF). APF was assigned the responsibility to buy assets and instruments in order to improve liquidity in the market. APF was used by the Monetary Policy Committee (MPC) for monetary policy objectives. In the 2021 Bank of England Financial statements notes we can read: "The APF transactions are undertaken by a subsidiary company of the Bank of England—the Bank of England Asset Purchase Facility Fund Limited (BEAPFF). The transactions are funded by a loan from the Bank." (Bank of England, 2021, p. 117).

Central banks and banks create the three forms of money, i.e., currency, bank deposits, and central bank reserves, as liabilities (claims) backed by debt assets. Central banks create and issue currency and reserves backing them on their asset side with debt securities, and banks create bank deposits backed by the loans they provide. Between the printing of currency and the 'typing' of central bank reserves and bank deposits, debt instruments and transactions make up the core logic of our two-tier monetary system. The why, when, how, and to whom logic of fiat money creation is defined by the loans and debts that allocate them either to the borrowers directly (by banks and central banks), or to those holding the debt instruments purchased on the open market and intermediated through the banks holding reserve accounts. (by central banks).

Given the recent and growing interest in central bank digital currencies, this discussion would be incomplete without a review of their logic of creation. We discuss them next.

CBDCs: Tokenising Liability-Based Debt-Backed Money

In a recent publication released in August 2025, the Bank of International Settlements reported the findings of its 2024 survey on central bank digital currencies (CBDC). 91% of the 93 central banks who participated in the survey are revealed to be exploring either a retail or wholesale CBDC, or both. The report identifies one key strategic reasoning behind the widespread consideration of CBDCs: "preserving the role of central bank money amid the decline of cash and the rise of tokenisation of traditional assets" (BIS, 2025a, p. 1). The Atlantic Council (2025) CBDC tracker reveals that a total of 137 countries and/or currency unions are already looking into CBDCs at different levels of engagement. Table 16 lists the main categories of development status across the 137 tracked jurisdictions.

Table 16. Atlantic Council Tracker on CBDCs. Source: Atlantic Council (2025).

Category	Description	Number
Launched	Issued a CBDC for widespread retail and/or wholesale use	3
Pilot	Initiated small-scale testing of a CBDC in the real world with a limited number of participants	49
Research	Established working groups to explore the use cases, impact, and feasibility of a CBDC	36
Development	Initiated technical build and early testing of a CBDC in controlled environments	20
Cancelled	CBDC initiative decommissioned	2
Other	No formal CBDC research but ongoing development of digital wallets and new payments infrastructure	6
Inactive	Inactive	21
Total	Number of Countries & Currency Unions Tracked	137

We take a deeper look into the 'Launched' and 'Pilot' categories next. The data provided reflects the state of affairs in the field, i.e., efforts are being invested to develop CBDCs but many aspects and components are still unspecified or missing. Table 17 reveals

that CBDCs are now a global phenomenon in the making, identifying 3 launched and 49 pilot CBDCs and their respective countries and/or currency unions. The distribution of Retail and Wholesale use cases reveals that the 3 launched CBDCs are all retail, and in the 49 pilot CBDCs 24 are considering both (R & W), 8 are only wholesale (W), and 17 only retail (R). The technology column names the technology being used. 34 out of 52 do not yet have a specified technology. The most commonly used technology, with 8 cases, is Fabric, or Hyperledger Fabric, which is an open source blockchain framework hosted by the Linux Foundation. The next most used, with 6 cases, is Ethereum blockchain. There are three individual cases where Ripple, R3 Corda, and NZIA's technology are used. The infrastructure column describes if the infrastructure uses distributed ledger technology (DLT), a 'Centralised' infrastructure and ledger management, or 'Both' (combines centralised and decentralised systems). We observe that 22 out of 52 are using distributed ledger technologies (DLT), 10 are using both, 19 are unspecified, and one, Jamaica's Jam-Dex, is referred to have a 'Conventional' infrastructure, implying the use of traditional centralized technology rather than blockchain or distributed ledger technology (DLT) (Noll, 2024; Garratt & Shin, 2023).

Table 17. Launched and pilot CBDCs. Source: compiled by author from Atlantic Council (2025).

Country and/or Currency Union	Status	Use Case	Name	Technology	Architecture	Infrastructure
Bahamas	Launched	Retail (R)	Sand Dollar	NZIA Ltd.	Intermediated	Both
Jamaica	Launched	Retail	JAM-DEX	Unspecified	Intermediated	Conventional
Nigeria	Launched	Retail	e-Naira	Fabric	Intermediated	DLT
Anguilla	Pilot	Retail	DCash	Unspecified	Intermediated	DLT
Antigua and Barbuda	Pilot	Retail	DCash	Fabric	Intermediated	DLT
Australia	Pilot	R & W	eAUD	Ethereum	Unspecified	Unspecified
Brazil	Pilot	R & W	DREX	Ethereum	Intermediated	DLT
China	Pilot	R & W	Digital Renminbi	Unspecified	Intermediated	Both
Dominica	Pilot	Retail	DCash	Unspecified	Intermediated	DLT
Eswatini	Pilot	Retail	Digital Lilangeni	Unspecified	Intermediated	Unspecified
Euro Area	Pilot	R & W	Digital Euro	Unspecified	Intermediated	Both
France	Pilot	R & W	Digital Euro	Unspecified	Intermediated	Unspecified
Ghana	Pilot	Retail	eCedi	Unspecified	Intermediated	Unspecified
Grenada	Pilot	Retail	DCash	Fabric	Intermediated	DLT
Hong Kong	Pilot	R & W	e-HKD	Ethereum	Intermediated	Unspecified
Hungary	Pilot	Retail	Student Safe	Unspecified	Unspecified	Unspecified
India	Pilot	R & W	Digital Rupee	Unspecified	Intermediated	Both
Indonesia	Pilot	R & W	Digital Rupiah	Unspecified	Unspecified	DLT
Iran	Pilot	Retail	Digital Rial	Unspecified	Unspecified	Unspecified
Israel	Pilot	R & W	Digital Shekel	Ethereum	Intermediated	Both
Italy	Pilot	R & W	Digital Euro	Unspecified	Intermediated	Both
Japan	Pilot	R & W	Digital Yen	Unspecified	Intermediated	Unspecified
Kazakhstan	Pilot	R & W	Digital Tenge	R3 Corda	Intermediated	Both
Laos	Pilot	R & W	DLak	Soramitsu	Unspecified	Unspecified
Luxemburg	Pilot	R & W	Unspecified	Unspecified	Unspecified	Unspecified
Madagascar	Pilot	Retail	e-Ariary	Unspecified	Unspecified	Unspecified
Malaysia	Pilot	Wholesale (W)	Unspecified	Unspecified	Unspecified	DLT
Mauritius	Pilot	R & W	Unspecified	Unspecified	Unspecified	Unspecified
Montenegro	Pilot	Retail	Unspecified	Unspecified	Unspecified	Unspecified
Montserrat	Pilot	Retail	DCash	Unspecified	Intermediated	DLT
Norway	Pilot	R & W	Unspecified	Ethereum	Unspecified	Unspecified
Oman	Pilot	R & W	Unspecified	Unspecified	Unspecified	Unspecified

Table 17. *Cont.*

Country and/or Currency Union	Status	Use Case	Name	Technology	Architecture	Infrastructure
Palau	Pilot	R & W	Unspecified	Ripple	Unspecified	DLT
Papua New Guinea	Pilot	Wholesale	Digital Kina	Unspecified	Unspecified	DLT
Philippines	Pilot	Wholesale	Unspecified	Unspecified	Unspecified	DLT
Qatar	Pilot	Wholesale	Unspecified	Unspecified	Unspecified	DLT
Russia	Pilot	R & W	Digital Ruble	Unspecified	Intermediated	Both
Saint Kitts and Nevis	Pilot	Retail	DCash	Fabric	Intermediated	DLT
Saint Lucia	Pilot	Retail	DCash	Fabric	Intermediated	DLT
Saudi Arabia	Pilot	Wholesale	Unspecified	Fabric	Unspecified	DLT
St Vincent & Grenadines	Pilot	Retail	DCash	Fabric	Intermediated	DLT
Singapore	Pilot	R & W	Digital Rupiah	Unspecified	Unspecified	Unspecified
Solomon Islands	Pilot	R & W	Bokolo Cash	Unspecified	Unspecified	DLT
South Africa	Pilot	Wholesale	Unspecified	Unspecified	Unspecified	Unspecified
South Korea	Pilot	R & W	Unspecified	Ethereum	Intermediated	DLT
Spain	Pilot	Wholesale	Digital Euro	Unspecified	Unspecified	Unspecified
Sweden	Pilot	Retail	E-Krona	Unspecified	Intermediated	DLT
Switzerland	Pilot	Wholesale	Unspecified	Unspecified	Unspecified	DLT
Thailand	Pilot	R & W	Unspecified	Unspecified	Intermediated	Both
Turkey	Pilot	Retail	Digital T Lira	Unspecified	Intermediated	Both
Ukraine	Pilot	Retail	e-hryvnia	Unspecified	Unspecified	Unspecified
United Arab Emirates	Pilot	R & W	Digital Dirham	Fabric	Unspecified	DLT

In the US, the argument regarding CBDCs is not settled yet, and the benefits and risks of CBDCs are still being debated. Anthony and Michel (2023) at the Cato Institute argue that the costs far outweigh the benefits and that a CBDC threatens Americans' freedom, like a 'digital tether' that links citizens to the central bank. Anthony and Michel (2023) argue that the focus on an 'intermediated' architecture can be explained by this concern, but the policy implications remain the same. In the 52 cases under launched and pilot we have 28 cases with an 'Intermediated' architecture, and 24 unspecified. 'Intermediated' refers to the scenario where "the CBDC is a direct claim on the central bank but payments and real-time transactions are facilitated by financial intermediaries including commercial banks". This model often combines account-based and object or token-based features.

Our purpose in this section is to establish the logic of creation of retail and wholesale CBDCs. As such, we do not delve into the different arguments for or against CBDCs. Bech and Garratt (2017), going beyond the taxonomies provided by CPMI (2015) and Bjorg (2017), offer the 'money flower' taxonomy, see Figure 4. A key feature of CBDCs is that they are issued by the central bank, and thus, are and remain a liability of the central bank. Note that in Figure 4, Bech and Garratt (2017) refer to CBDCs as CBCCs, central bank crypto currencies. In fact, all three of the launched CBDCs (in Bahamas, Jamaica, and Nigeria) are identified and listed as a liability on the balance sheet of the respective central banks (Bank of Jamaica, 2024; CBOB, 2024; CBN, 2024). Adrian and Mancini-Griffoli (2019) discuss their own taxonomy, the 'money tree', following Bech and Garratt's (2017) botanical analogy. While different in approach, they classify CBDCs, similar to cash, as central bank money (liability backed by debt assets).

To conclude on the logic of Central Bank Digital Currencies (CBDCs), they are conceptualised as tokenised central bank money that will be no different in logic from central bank reserves (wholesale), or banknotes (retail). The logic of creation remains debt-based and

debt-backed through the balance sheet of the central bank in question. Given the primary motivation behind the exploration and development of CBDCs, i.e., preserve the role of central bank money, this conclusion is not surprising.

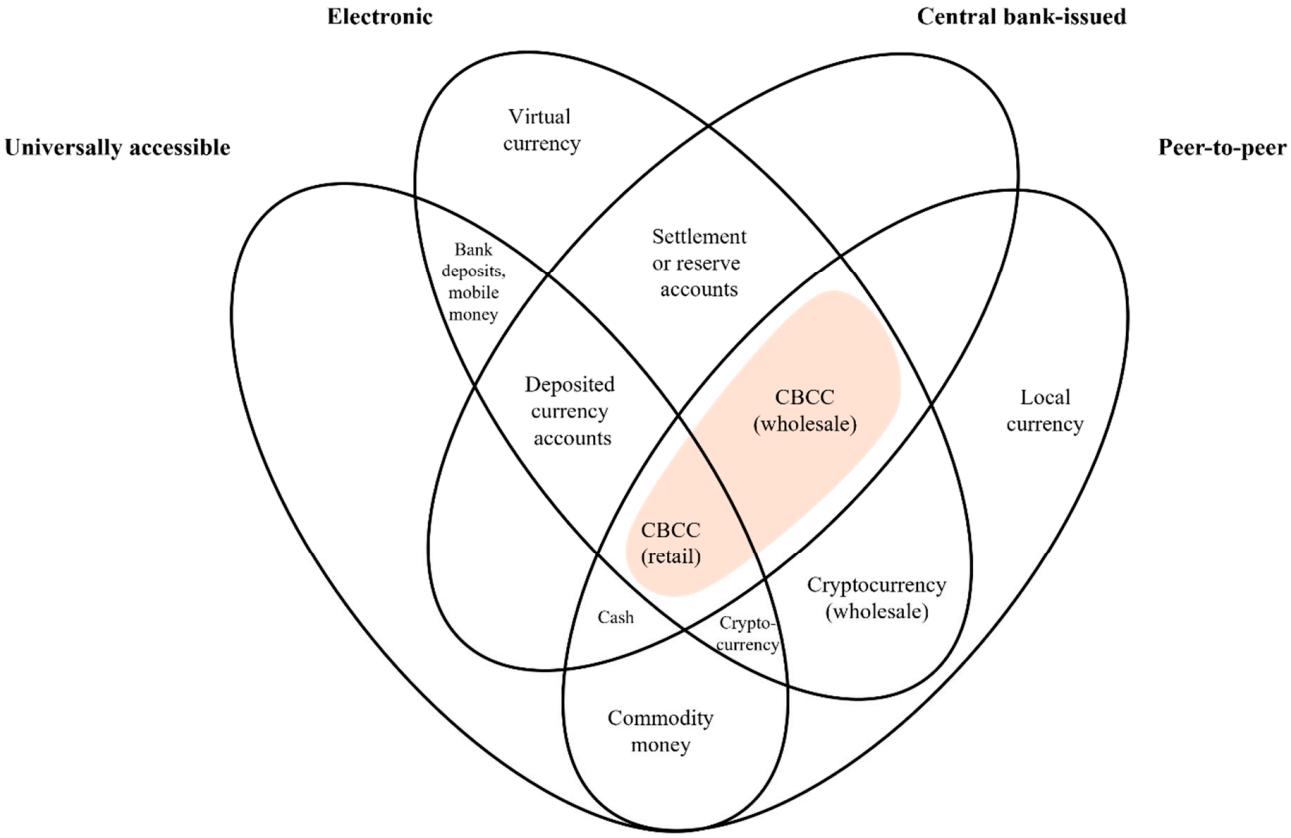


Figure 4. The money flower: a taxonomy of money. Source: adapted by author from Bech and Garratt (2017).

4. The Limits of Tokenisation

The clinical analysis of the top 30 cryptocurrencies in section two revealed a diverse set of creation logics. 14 have a pre-minted supply and allocate coins and tokens through discretionary distribution events and strategies, at launch or later. 4 are stablecoins and mint new coins or tokens on demand, using different methodologies. The remaining 12 use a combination of transaction validation, pseudo-randomness, mathematical guesswork, and size-dependent probability as their creation and allocation logic (See Tables 7 and 8). Meanwhile, Nakamoto's 'third parties', banks and central banks, are adopting the underlying technological innovations introduced by cryptocurrencies, i.e., distributed ledgers and tokenisation, but keeping the debt-based logic of fiat money intact.

This emerging and often conflicting monetary landscape begs the question: can tokenisation redefine the logic of money? A token is a digitally represented unit of value, right, or claim recorded on a distributed ledger or blockchain. It can be fungible or non-fungible, and, through smart contracts, can be programmable, verifiable, and transferable peer-to-peer without centralized coordination. Tokens may either represent native blockchain assets or be tokenized representations of external on or off-chain assets or rights. Aldasoro et al. (2023) provide a high-level representation of a token as a packaged digital entity that has a definitional core and a service layer (See Figure 5). Tokenisation, as per BIS-CPMI (2024, p. 4), is broadly defined "as the process of generating and recording a digital representation of traditional assets on a programmable platform". BIS-CPMI goes

on to argue that this definition "reflects that the issuance, recording and transfer of tokens relies on the execution of applications that exist on programmable platforms". In line with the above, digital tokens are "entries in a database that are recorded digitally and that can contain information and functionality within the token themselves". Meanwhile, programmable platforms are defined as "the technologies that allow eligible participants to develop and execute applications that update a common ledger", like distributed ledger technologies (DLT).

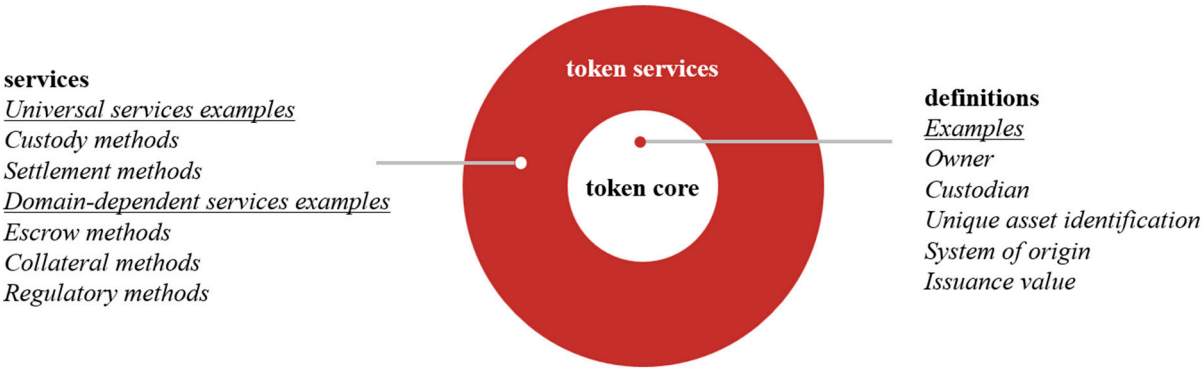


Figure 5. The anatomy of a token: core and service layer. Source: adapted by author from Aldasoro et al. (2023).

In one of its recent publications the Bank for International Settlements foresees and prepares us for the new tokenised financial system, where not only central bank money will be tokenised, but also government debt securities, as well as commercial bank deposits, and loans. Aldasoro et al. (2025) report about more than 60 tokenised bonds in July 2025. BIS (2025b, p. 91) depicts a future monetary system where "[t]he key elements of the blueprint are tokenised central bank reserves, tokenised commercial bank money and other tokenised claims on financial and real assets, brought together in a new type of financial market infrastructure".

The key driver behind the tokenisation of the financial system are efficiency gains. The examples of the efficiency benefits of tokenisation for our current messaging-based two-tier domestic and international monetary system are many. In cross-border as well as domestic payments, the two-tier monetary system, managed by banks and central banks, depends on a complex chain of messages that update accounts for customers as well as banks. Tokenisation could potentially replace the message-based banking system with an integrated process. A process that could combine not only execution, but also compliance and monitoring, thus reducing risks, delays, as well as costs (BIS, 2025b). While the benefits are real and relevant, BIS (2025b) also recognises the transformative limits of tokenisation.

> New technologies *do not change the economics of these arrangements*[4], but they bring important opportunities to strengthen the features of money. The persistent demand for new functionalities of money signals societal appetite for the benefits that such technologies promise. Public authorities may neglect this reality at their peril. The advent of tokenisation can change how records of ownership and transfers of claims are done. In this respect, new programmable platforms that leverage tokenisation of money, such as unified ledgers, could be as transformative as the move from physical to digital ledgers. (BIS, 2025b, p. 81)

In other words, tokenisation can transform the process of money creation, but does not, as such, define its logic. Indeed, these technological enhancements are being adopted by the very 'third parties' they were originally invented to sideline (Nakamoto, 2008; Buterin, 2014). The 'third parties' are transforming the process of money, without changing its debt-

based and debt-backed logic. In the case of cryptocurrencies, as revealed and discussed in the previous section, the alternative logics of money creation on offer replace debt with transaction validation, mathematical guesswork, pseudo-randomness, and size dependent probability. *On the one hand an old logic is being redeployed in a new architecture, and on the other, a new architecture is being used to deploy economically random and opportunistic logics.*

The ubiquitous tokenisation of our debt-based and debt-backed monetary system is creating a mutant of great contradictions. While not specifically about tokenisation, Papazian (2022) identifies the key challenge as follows:

> Digitisation does not automatically imply improvement. An unfair and unequal process can remain so after digitisation. The architecture of our markets, the procedural mechanisms behind money creation, the principles and equations of a valuation model change not when they are digitised, but when they are reinterpreted in their fundamental assumptions, and are rebuilt upon an entirely new value framework. In the age of digital transformation, we are more than ever exposed to the risk of digitising confusion, and reinforcing suboptimal frameworks, structures, and models. (Papazian, 2022, p. ix)

The improvements that distributed ledger technologies and tokenisation can bring to digital fiat money are therefore purely technological and cannot lead to monetary evolution without a radical rethink of the assumptions that underpin our financial and monetary economics (Papazian, 2022, 2023, 2024, 2025). Money mechanics is transformed not through new payment technologies, but through a reinvented analytical and theoretical framework. While this is beyond the scope of this paper, suffice it to note that it is only through a radical change in our financial value framework and mathematics that the debt logic of fiat money can be transformed, allowing for non-debt instruments to be used for monetisation purposes. In other words, distributed ledger technologies and tokenisation may have transformed our payments infrastructure, but they cannot transform our monetary architecture without reinventing the value framework that underpins the debt-based logic of fiat money. As argued in Papazian (2025), given a two-dimensional value framework built on risk and calendar time, our debt based monetary architecture monetises the same, and ignores our physical context of matter, i.e., space. In The Space Value of Money, Papazian (2022) states:

> Our current money creation methodology, i.e., debt-based money, imposes several limitations on our potential in space. Due to the logic and calendar time-linked nature of debt instruments, debt-based money chains our species to an artificially created imaginary calendar, acting like monetary gravity that chains us to the surface of the planet. Meanwhile, given that money is continuously created via debt, in any economy, there always is a large number of households, businesses, corporations, banks, and government institutions forced to chase banknotes and deposits in order to fulfil their debt obligations—a monetary hunger that stimulates growth on the one hand, but also consumes our planet unnecessarily. (Papazian, 2022, p. 246)

Ultimately, tokenisation is powerless when it comes to the limiting assumptions of our financial and monetary economics. For the latter to change, we must be ready and able to transform our financial value framework and mathematics in a way that better serves human and planetary sustainability. Interestingly, neither cryptocurrencies nor fiat money consider the latter to be of particular relevance to their logic. Our ecosystem and physical context, i.e., space, is unaccounted for across the board (Papazian, 2022, 2023, 2024, 2025).

5. Conclusions

This study was motivated by emerging research on new taxonomies of money where cryptocurrencies are recognized as an integral component. While cryptocurrencies have had a major role in triggering the technological innovations that are transforming global payments, their impact on the logic of money creation is still relatively ambiguous, and questionable at best. The aim was to shed further light on the creation logic of cryptocurrencies and establish the viability of considering them as a uniform group that can be studied as such. We explored their logic of creation in the relative context of the logic of creation of fiat money and CBDCs, through a clinical investigation into the top 30 cryptocurrencies by market capitalisation dominance, representing 95.5% of the total crypto market capitalisation as of the 26 September 2025. The data were extracted from CoinMarketCap, and supplemented by a close scrutiny of their code, whitepapers, and actual events.

The clinical examination of the top 30 cryptocurrencies sought to answer three key questions: (1) why are they created? (2) when are new coins/tokens created? and (3) how are they issued and to whom? These questions facilitated the close scrutiny of their creation logic, going beyond the big picture 'why' behind their creation, i.e., removing financial intermediaries like banks and central banks as key nodes of online payments. The grand vision of sidelining trusted 'third parties' provides an insight into the philosophical motivation behind cryptocurrencies, but leaves the details of their creation logic, and the diversity of their mechanics relatively unexplored.

The first contribution of this study is the clinical evidence on the diversity of logic across the top 30 cryptocurrencies in our sample, raising questions on the viability of considering them a uniform group that can be studied as such. With the exception of stablecoins, this has been common practice in the field. Unlike other asset classes, cryptocurrencies are different in their mechanics. Some are programmatically designed to shrink their capped and limited supply; others have no limit and are programmatically designed to increase their supply. Moreover, unlike the logic of creation of fiat money, which follows universally accepted and unfirm methodology, cryptocurrencies are functionally and methodologically diverse. Hence, future taxonomies of money and positivist research addressing different crypto market level hypotheses may benefit from this observation and the provided evidence. The questions we raise throughout the analysis concern the logic of creation and allocation of cryptocurrencies, but also their description and units.

Another important finding and observation is the terminological muddle that seems to be plaguing the industry and the field. Stablecoins are tokens, and coins are platform tokens. Inflation rates do not describe price increases anymore, but 'money' supply increases. 'Monetary policy', as the crypto market often refers to the process of crypto supply management, is being devised based on the most arbitrary decisions, often aimed and designed to mimic scarcity and lead to price appreciation in the short and long run. Monetary parameters are hardly discussed or explained, and much of the 'tokenomics' being sold to the public is shrouded in coder jargon. If legal documents, regulatory and policy constraints, and the 'fine print' were issues for the institutions that create fiat money, code defined jargon or 'dev-speak' seems to be even more opaque for the untrained layperson. This increases the risks involved for investors and can potentially lead to significant losses for the uninformed enthusiasts. Indeed, the recent cryptocurrency market downturn that occurred during the clinical analysis emphasised their volatility and their speculative nature.

The clinical investigation revealed that cryptocurrencies seem to have replaced the debt-based logic of fiat money (liabilities backed by debt assets) with a combination of transaction validation, mathematical guesswork, pseudo-randomness, and size dependent probability as alternative logics of money creation and allocation. We observe that 'randomness' is often used as a proxy for 'decentralisation'. Probabilistic hash power or stake

based random selection rules seem to be offered as a 'superior' and more 'democratic' way of choosing who gets the new coins/tokens created. While the rewards (new coins/tokens) are being offered for computational 'work' and for transaction validation, or services to the network, they are ultimately being distributed based on chance, random selection, or some size dependent probability. Far from 'democratising finance', a significant proportion of cryptocurrencies are pseudo-randomising finance. Interestingly, this is only an impression, because there is also a high level of concentration of those who have access to those 'random' distribution and allocation events. This is most evident in the case of Ethereum, where a handful of entities control the validator nodes, and thus have a larger stake in the network, and get the highest probability of receiving the staking rewards. This raises serious questions on the 'decentralisation' and 'disintermediation' objectives.

A significant proportion of the cryptocurrencies in our sample (14) have their supply pre-minted, and do not create new coins. Instead, they allocate them as per discretionary rules, much like the third parties they were allegedly replacing. While some give degrees of control to their community, only a few have a Decentralised Autonomous Organisation (DAO) that controls their treasury and thus the distribution and allocation of existing coins. It seems that decentralisation is actually a euphemism for *recentralisation* around different 'centre(s)'.

The evidence suggests that cryptocurrencies are engaged in reintermediation, with new rules and new managers. The scheme is changing, coders are replacing bankers, protocols are replacing banks and credit policies. In some cases, like XRP, which has no mining or minting, there is a service value being offered. However, it is one of the most centralised and centrally controlled cryptocurrencies in the sample.

Despite their random logic, and often discretionary allocation, at inception or later on, cryptocurrencies seem to have proven one important hypothesis: it is possible to change the technology and logic of money creation. This may be the most important contribution of cryptocurrencies from a long-term perspective, even if the alternative logics they provide at the moment may not be solid enough to replace fiat money. Carstens (2018) describes them as a Ponzi scheme. Ultimately, they are a scheme, much like debt-based and bank managed money.

Meanwhile, Nakamoto's (2008) third parties are adopting the new technologies, i.e., distributed ledgers and tokenisation, and keeping the debt logic of fiat money intact. This is possible thanks to the inherent limits of tokenisation. While it is undoubtedly a powerful trigger of technological transformation, it is powerless when it comes to reinventing the logic of money. Cryptocurrencies have led to a payments' revolution, but they cannot lead to monetary evolution without a fundamental re-examination of the principles and equations that underpin our financial and monetary economics (Papazian, 2022, 2023, 2024, 2025).

Thus, between debt and pseudo-randomness, it seems we are only now beginning to see what is possible in money mechanics. Cryptocurrencies may still have a second, or third, act. Having demonstrated that it is possible to reinvent and improve the technology of money, they can now revisit their offering in the logic of money creation. Given the emerging landscape of tokenised debt, and tokenised fiat money, cryptocurrencies will have to address the deeper questions of value. Their long-term viability will depend on their ability to complement the technological transformations they have triggered, with a less random and less opportunistic mechanics that aim to serve human and planetary sustainability. Given that the latter is equally unaccounted for in the current debt-based logic of fiat money, the opportunity for improvement is still readily available.

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Conflicts of Interest: The author declares no conflicts of interest.

Notes

1 It is worth noting that at the start of this study, a narrower sample size (the top 10) was considered. This was warranted by the fact that the top 10 cryptocurrencies represented nearly 91% of the total crypto market capitalisation. However, given market volatility, the skewed nature of the market, and the dynamic and ongoing changes in the composition of the top 10, the top 30 was considered to be a more representative sample. This choice minimised the sample composition impact of short-term and temporary price fluctuations, which are commonly observed in the crypto market.

2 On Ethereum an epoch is approximately 6.4 min long and is composed of 32 slots, with each slot lasting 12 s. The slots are the time window within which validators propose and attest to blocks to secure the network.

3 The base reward factor (64) and the base rewards per epoch (4) are fixed consensus constants in the Ethereum protocol, defined in the consensus specifications and only changeable through a protocol upgrade.

4 Emphasis added.

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