

# 2023

# House View

Your crypto  
investment  
playbook

Caleb & Brown

May 2023







## Caleb & Brown: **the crypto investor's expert partner**

We help our investors navigate the complexities of investing in crypto assets with our suite of best-in-class research, personal brokerage and managed fund products.

From our **Research** department comes our **House View** report, giving you client-focused investment research designed to provide views, insights and analysis across the crypto asset industry. With our broad spectrum of sector expertise and extensive network of internal and external industry experts, we provide timely and actionable ideas that enable you to make better investment decisions.

Our **Personal Brokerage** caters to beginners who need assistance buying their first crypto assets, to seasoned investors needing a professional service to make high value, complex trades.

Our **Managed Funds** give sophisticated investors access to the most promising crypto assets through professional, managed portfolios.

Since our founding in 2016, we've put personalised service, transparency, education, and consumer protection at the heart of everything we do.

We're Caleb & Brown, your expert partner for crypto investments.

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# First Words



Welcome to the Caleb & Brown 2023 **House View**. As we celebrate our seventh year of operation, we are proud to continue serving as the crypto investor's expert partner. After years of navigating the high-growth, high-risk crypto market, we are proud to present the culmination of our knowledge and insights in this report. This report provides forward-looking analysis and expert guidance to help investors make informed decisions in the year ahead.

The past year has been characterised by numerous instances of bubbles bursting and entities collapsing due to over-leveraging and poor risk management. However, industry veterans have not been surprised by these events. Over the past decade in this cyclical market, it has become clear that the relationship between transformative technologies and enthusiastic markets is inseparable. Although this characteristic may be challenging for short-term speculators, it presents a valuable opportunity for patient investors. Therefore, we are more excited than ever for the future of the crypto market.

The **House View** serves as the foundational platform for communicating our beliefs, observations, and ideas about the crypto market. In this report, we aim to present our core thesis that reinforces the investability of the crypto asset class, along with an in-depth analysis of the market structure, the trends we observe, and our views on the potential opportunities that lie ahead for investors. We are pleased to announce that, going forward, we will be providing quarterly **House View** updates to keep investors abreast of our evolving insights.

Looking ahead to the future, we anticipate a year brimming with innovation and transformative breakthroughs that will catalyse the recovery of the crypto market. Drawing upon the invaluable lessons we have learned from past market cycles, coupled with our unwavering optimism, we stand resolute in our belief in the boundless potential of crypto assets.

I hope the content in the following pages provides you with valuable insights and sparks your interest.

Sincerely,

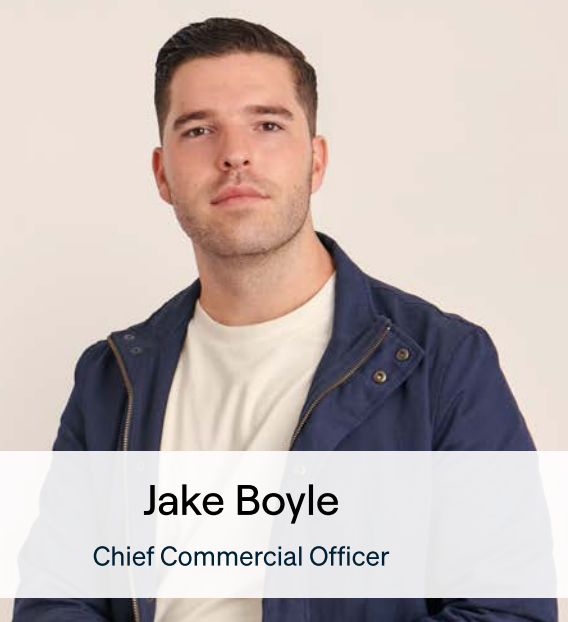
**Jackson Zeng**  
CEO

# Contributors

## Leadership



**Jackson Zeng**  
Chief Executive Officer

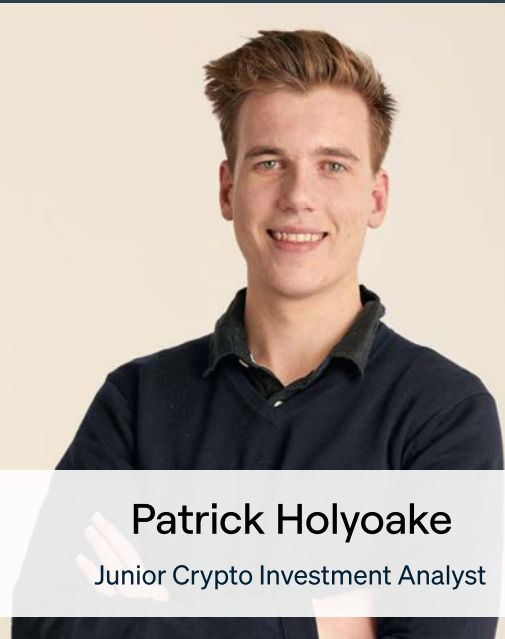


**Jake Boyle**  
Chief Commercial Officer

## Asset Management



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research and Portfolio Manager



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Junior Crypto Investment Analyst

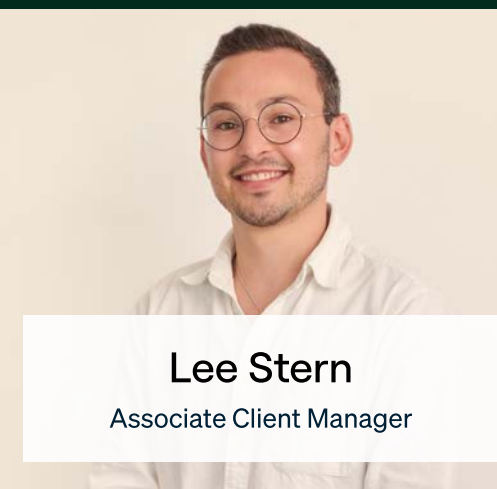
## Research



**Zain Khan**  
Crypto Research Analyst



**Sean Donaghey**  
Crypto Research Analyst



**Lee Stern**  
Associate Client Manager

# Executive Summary

## Foundations

### Classification

The diversity of the crypto market necessitates a framework for categorising its assets into distinct groups. By doing so, we can gain a better understanding of the landscape and make more informed decisions.

### The Case for Crypto

Sharing traits with innovations that have transformed societies, crypto holds the potential to revolutionise faltering financial systems. *Bitcoin* and decentralised finance (DeFi) are amongst the many change drivers that will realise a more autonomous, transparent and fairer distribution of wealth.

### Crypto Market Cycles

The crypto market moves through recurring cycles made up of four phases. We explain and frame each, while highlighting influential market factors, to inform portfolio positioning considerations.

### Academy

*Ethereum* Rollups are quickly becoming integral infrastructure to scale crypto and accommodate further mainstream adoption. The technology overcomes capacity bottlenecks on blockchains and facilitates faster and cheaper transactions by taking on the majority of processing loads on behalf of blockchains they support.

## Insights

### Flight to Quality

The economic impacts of the COVID-19 pandemic and the economic policy responses that followed have resulted in a challenging environment pointing toward recession. Over this period, *bitcoin* has demonstrated its resilience in its price action and network activity. DeFi projects have held fast, too, as participants in the financial system have migrated to decentralised services as centralised institutions have collapsed.

### From Physical Assets to Digital Assets

Tokenisation is the process of converting real-world assets or proprietary rights into digital tokens that can be represented on a blockchain. In its early applications, this technology is already showing its potential to create more transparent, flexible, cost-effective, and accessible markets.

### Balancing Innovation and Protection

Crypto regulation remains inconsistent and ambiguous, which is beginning to paralyse crypto businesses. Lawmakers must provide a clear regulatory framework to simultaneously protect consumers and create an environment that incentivises crypto businesses to flourish globally.

## Strategy

### Crypto Calendar

Over 2023 investors should take note of milestone moments that pass, from major product launches and protocol upgrades, such as *Ethereum's* Proto-Danksharding; as well as regulatory developments, including the ongoing *XRP* case.

### Sector Assessment

We appraise the industry's seven sectors (*Currency, Smart Contract Platforms, Decentralised Finance, Culture & Entertainment, Computing, Digitalisation, and Stablecoin*), based on six criteria (adoption, durability, maturity, potential, risk, and value capture) and evaluate their investment prospects in the short and long terms to inform portfolio positioning.

### Playbook

We present an investment strategy informed by the current phase of the crypto market cycle. This dynamic approach helps investors anticipate market shifts to capture upside and minimise downside risk. In the context of the current Accumulation Phase, we recommend investors consider exposure to safe haven assets and those providing essential infrastructure and services.

### Our Approach to Rating Crypto Assets

We present our research framework, which is built on four fundamental pillars that form the foundation of our investment selections. These pillars include evaluating the fundamentals of crypto assets, assessing their competitive advantage (or "moat"), analysing market sentiment, and evaluating the risks associated with the asset. Additionally, we have developed a proprietary "rating system" that measures a crypto project's potential to generate long-term value.

### Coverage List

Based on our in-depth research and accounting for the current market conditions, we share our analysts' top crypto asset selections for your consideration. Our aim is to provide a clear, forward-looking picture of the market that investors can integrate into their own research and investment plan based on their goals, risk tolerance, and time horizon.

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## Strategy

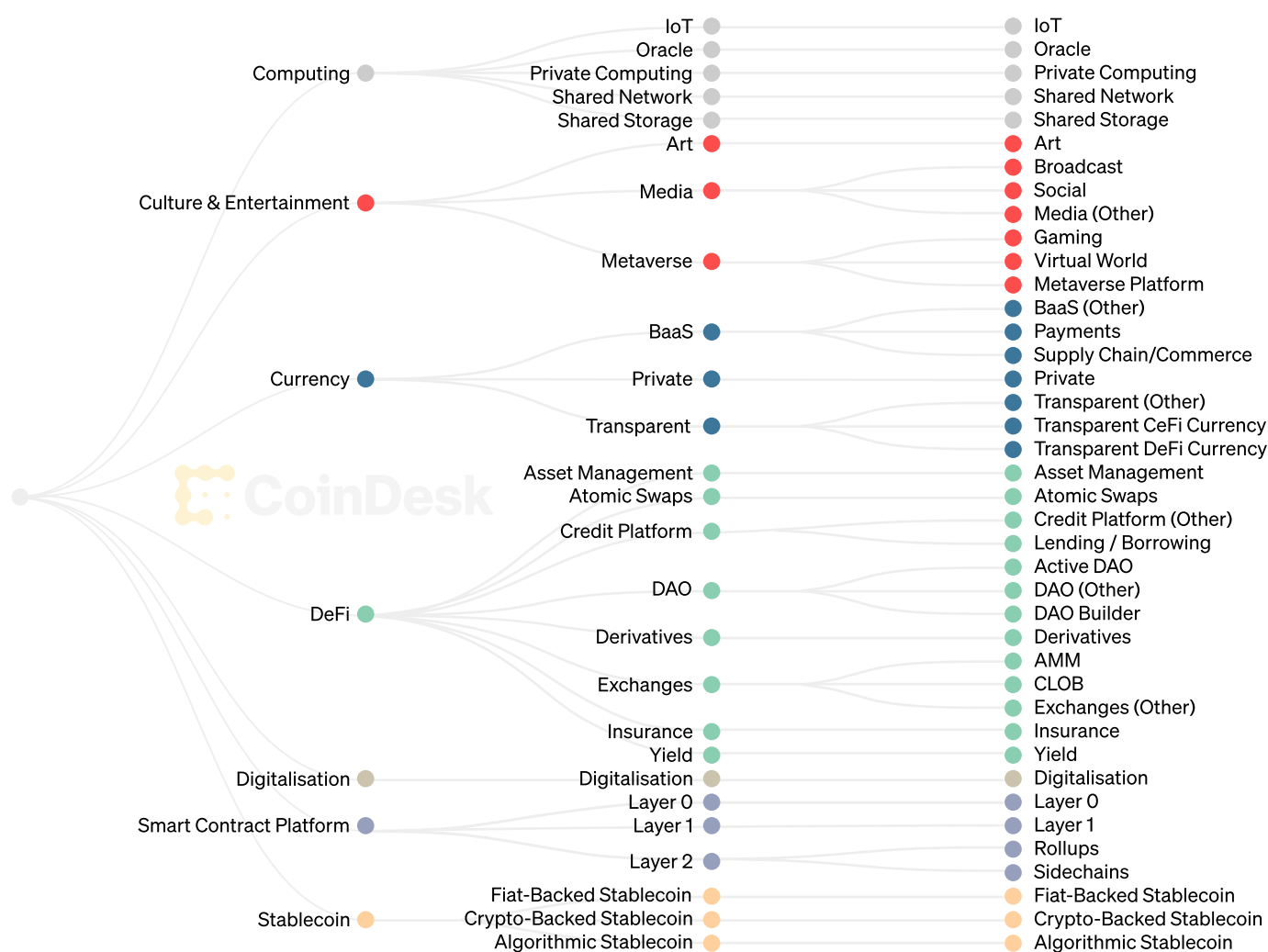
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# Classification

To support our clients in making informed investment decisions, we have adopted a structured approach to classifying crypto assets based on their use case and technology. Our preferred taxonomy is the Digital Asset Classification Standard (DACS) developed by CoinDesk Indices.

DACS is a comprehensive framework that organises crypto assets into 7 sectors, 26 industry groups, and 40 industries<sup>1</sup>. By leveraging this framework, we present our clients with a clear understanding of the market, helping them identify investment opportunities that align with their investment objectives and risk tolerance.

## CoinDesk Digital Asset Classification Standard (DACS)



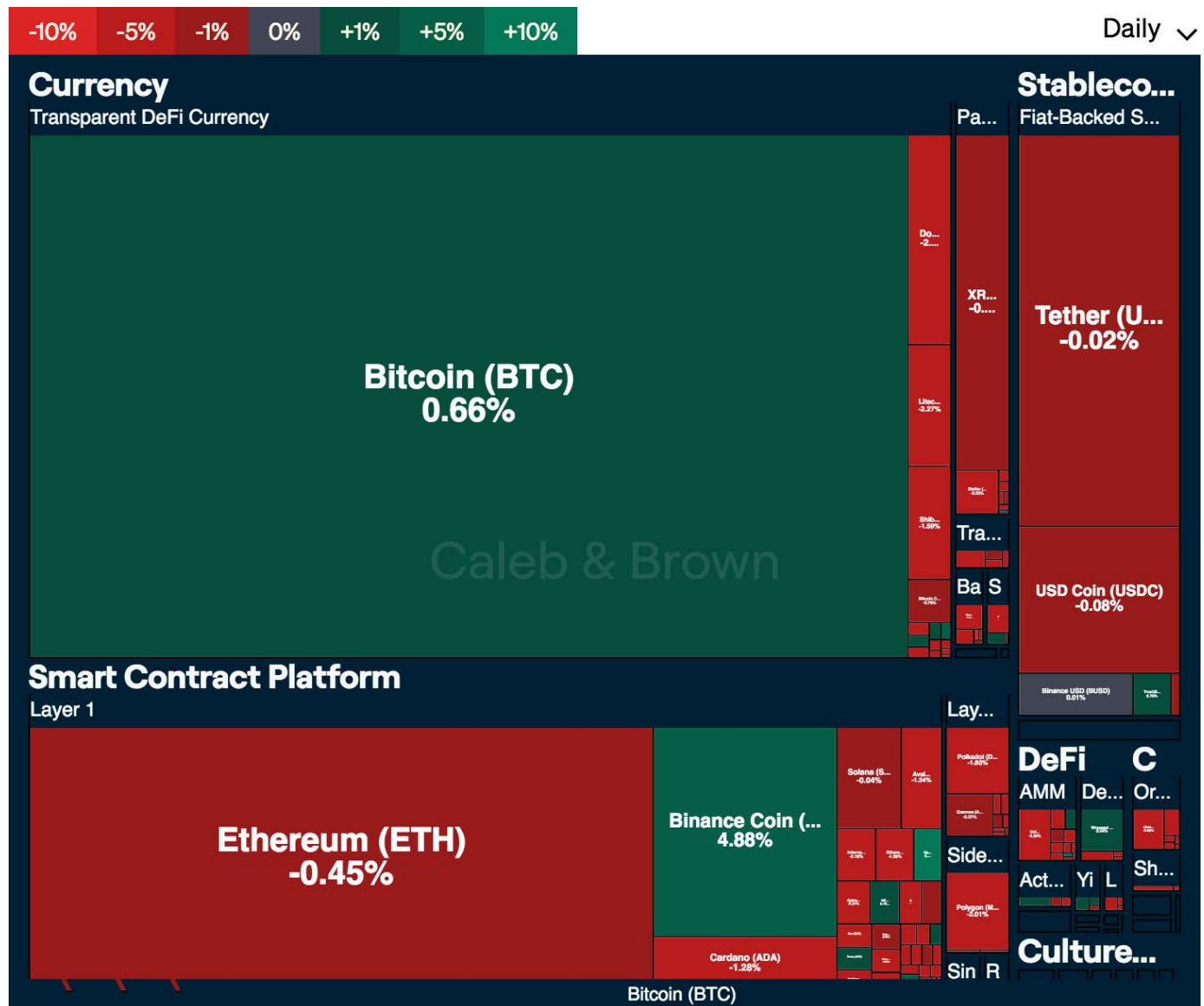
**CoinDesk DACS consists of a three-tiered hierarchy comprising 7 sectors, 26 industry groups, and 40 industries.**

(Source: Caleb & Brown Research. CoinDesk Indices)

<sup>1</sup> Refer to Appendix A. 'Sector/Industry Group Definitions' for more detail.



## Caleb &amp; Brown Crypto Screener



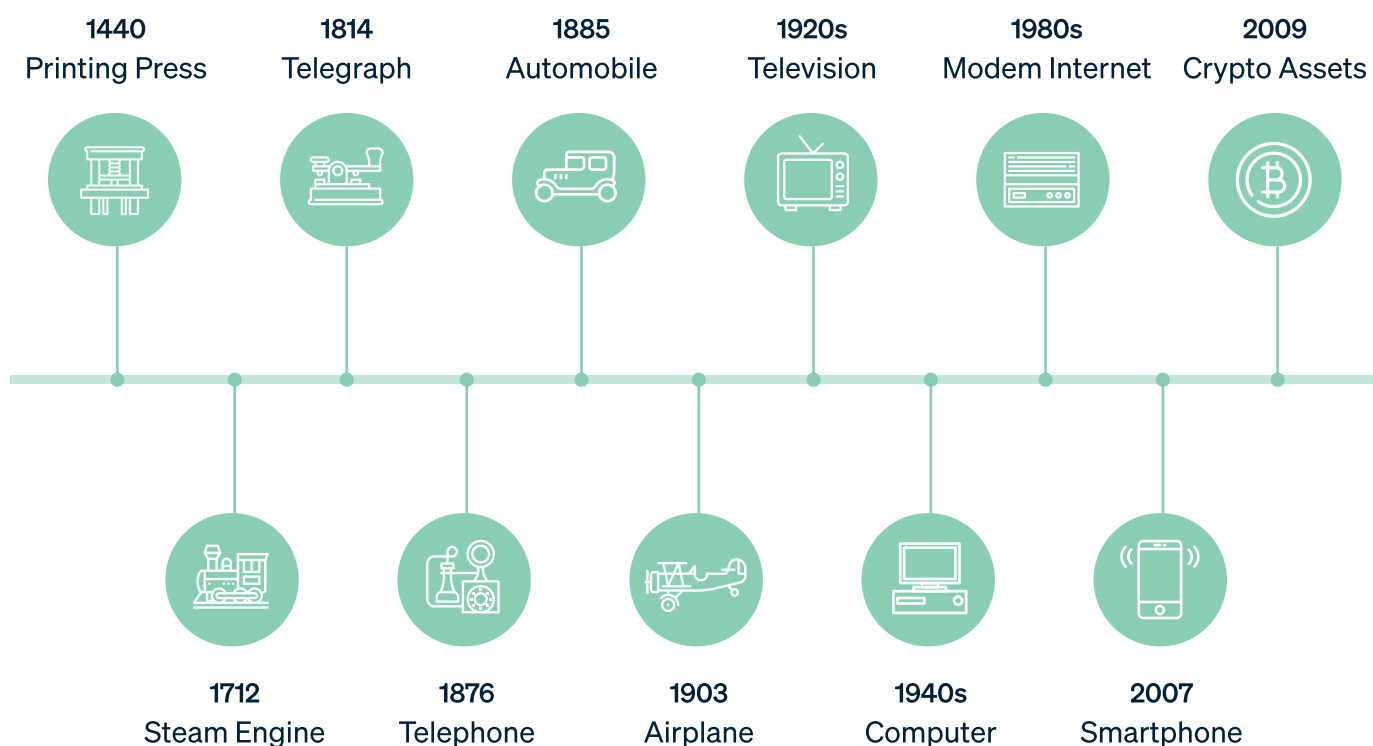
Unlock the full potential of the crypto asset market with Caleb & Brown's easy-to-use screener tool. Harnessing the power of the Digital Asset Classification Standard (DACS) by CoinDesk Indices – as seen on the previous page – our tool provides a comprehensive framework for identifying crypto assets that align with your investment preferences. Check it out now at <https://www.calebandbrown.com/tools/crypto-screener/>



# The Case for Crypto

Throughout history, transformative innovations have had a profound impact on society, revolutionising industries and fueling unprecedented growth and prosperity. The printing press, the steam engine, the telephone, and the internet are among the transformative technologies that have changed the world, shaping economies and cultures.

Today, crypto networks like *Bitcoin* and *Ethereum* that utilise blockchain technology, are already reshaping industries and societies, and are poised to drive the next wave of transformative progress. The decentralised and borderless nature of crypto assets has the power to disrupt traditional financial systems. Additionally, their potential for secure and transparent transactions offers new opportunities for economic empowerment and innovation.



## Crypto Assets Share Characteristics with History's Most Impactful Innovations

As crypto assets continue to evolve and mature, they are demonstrating their potential to join the ranks of history's most impactful innovations, profoundly influencing the way we live. Like all groundbreaking technologies, they share a set of defining characteristics<sup>2</sup> that enable them to drive transformation across industries and societies.



Wide Impact



Network Effects



Provide Accessibility



Disruptor



Interoperable



Accelerator of Innovation



Scalable

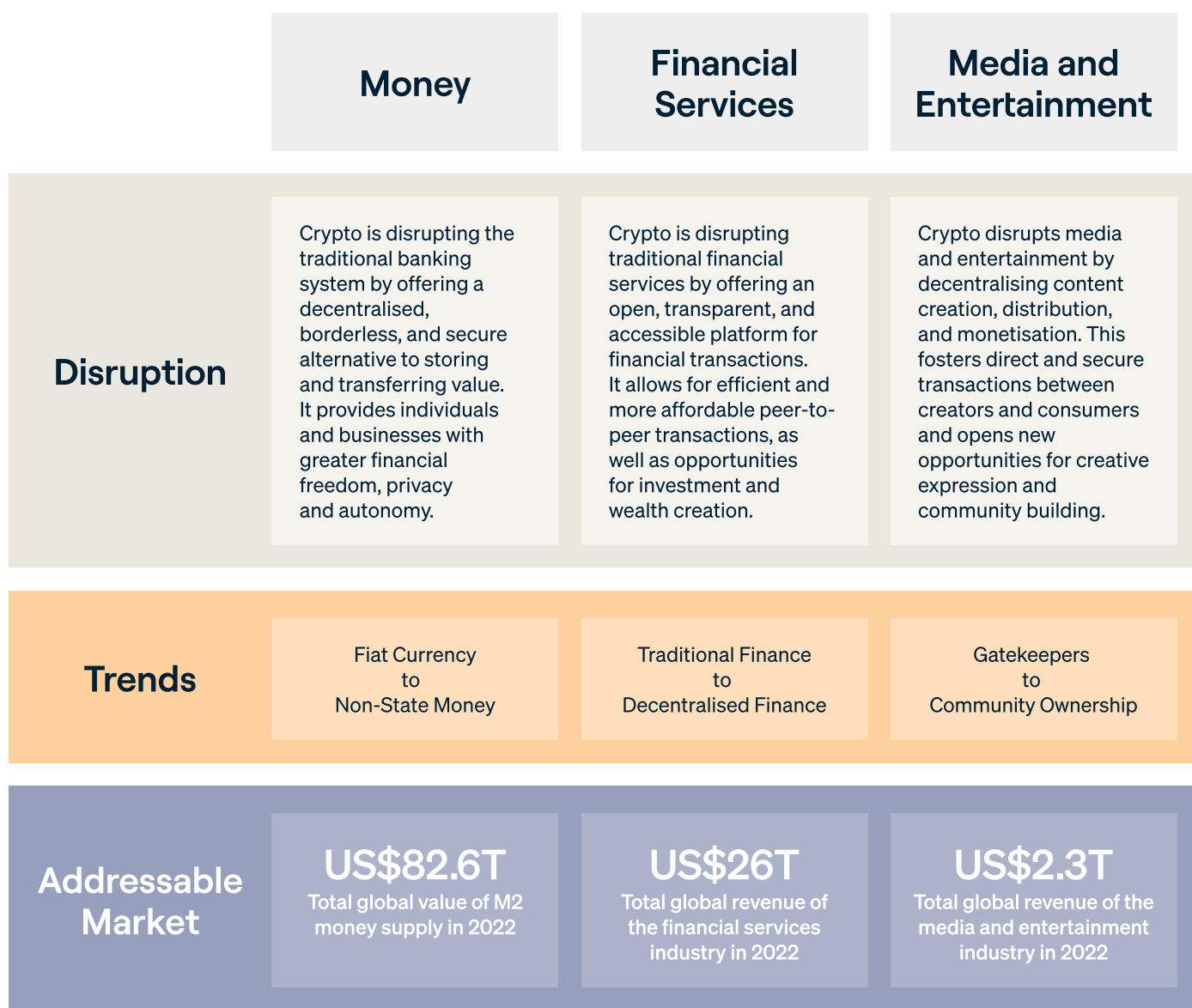


Driver of Societal Change

<sup>2</sup> Refer to Appendix E, 'Defining Characteristics of Impactful Technologies' for more detail.

## The Multi-Trillion Dollar Shake-Up

Crypto assets are disrupting multiple trillion-dollar industries, including financial services, media and entertainment, as well as transforming the way we store and transfer value in the global economy. With a focus on decentralised, transparent, and community-driven platforms, crypto assets are creating new opportunities for peer to peer transactions, greater autonomy, and a more equitable distribution of wealth.



Sources: Caleb & Brown Research, 2023, Visual Capitalist, data as of November 2022; The Business Research Company: Financial Services Global Market Report 2023, data as of 2023; PWC: Global Entertainment & Media Outlook 2022-2026, data as of 2022. For informational purposes only and should not be considered investment advice or a recommendation to buy, sell, or hold any particular crypto asset. Past performance is not indicative of future results.



## Money | Bitcoin Reimagines the Concept of Money

Traditional finance falls short in offering financial security to individuals; *Bitcoin* emerges as a viable alternative.

Challenges with Traditional Finance	Bitcoin Addresses the Shortcomings
<ul style="list-style-type: none"> <li>✗ <b>High Inflation:</b> 169 countries are experiencing significant inflation rates<sup>3</sup>. This typically leads to a poorer society as rising prices depress the value of savings, investments, and weaken the purchasing power of individuals over time.</li> <li>✗ <b>Authoritarian Rule:</b> 89 countries have electoral or closed authoritarian regimes<sup>4</sup> that impose controls on citizens' financial assets. This can make it difficult for citizens to access their money, and can even lead to their assets being frozen or seized.</li> <li>✗ <b>Restricted Financial Systems:</b> 54 countries<sup>5</sup> are reported to have restricted financial systems that limit individuals access to international financial markets and their choice of financial services.</li> <li>✗ <b>High Corruption:</b> 51 countries<sup>6</sup> are perceived to have high levels of corruption in the financial sector. This undermines the integrity of the financial system and can lead to a lack of accountability and reduced confidence.</li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>Deflationary:</b> <i>Bitcoin's</i> fixed supply of 21 million is immune to inflation. This feature makes it appealing to investors who are concerned about traditional currency debasement and inflation, and provides a hedge against long-term loss of purchasing power.</li> <li>✓ <b>Censorship-Resistant:</b> <i>Bitcoin's</i> decentralised network of nodes validates transactions and maintains blockchain integrity. This makes censorship or network control difficult for any single entity since no central authority exists.</li> <li>✓ <b>Open and Permissionless:</b> The <i>Bitcoin</i> network has no entry barriers or identity verification requirements, enabling anyone with internet access to participate equally, irrespective of location or identity.</li> <li>✓ <b>Transparent:</b> <i>Bitcoin</i> transactions are recorded on a public, decentralised blockchain, allowing for easy tracking and transparency. The network's accountability is ensured, as every transaction can be audited and verified by anyone on the network.</li> </ul>

**Bitcoin: Number of Addresses with a Non-Zero Balance**

This chart illustrates the number of *Bitcoin* addresses with a non-zero balance, a proxy for the growing number of individuals and entities that hold *bitcoin* as an investment or means of exchange. As of March 2023, the number of such addresses surpassed 45 million signalling the continued adoption and mainstreaming of *Bitcoin* worldwide. (Source: Glassnode)

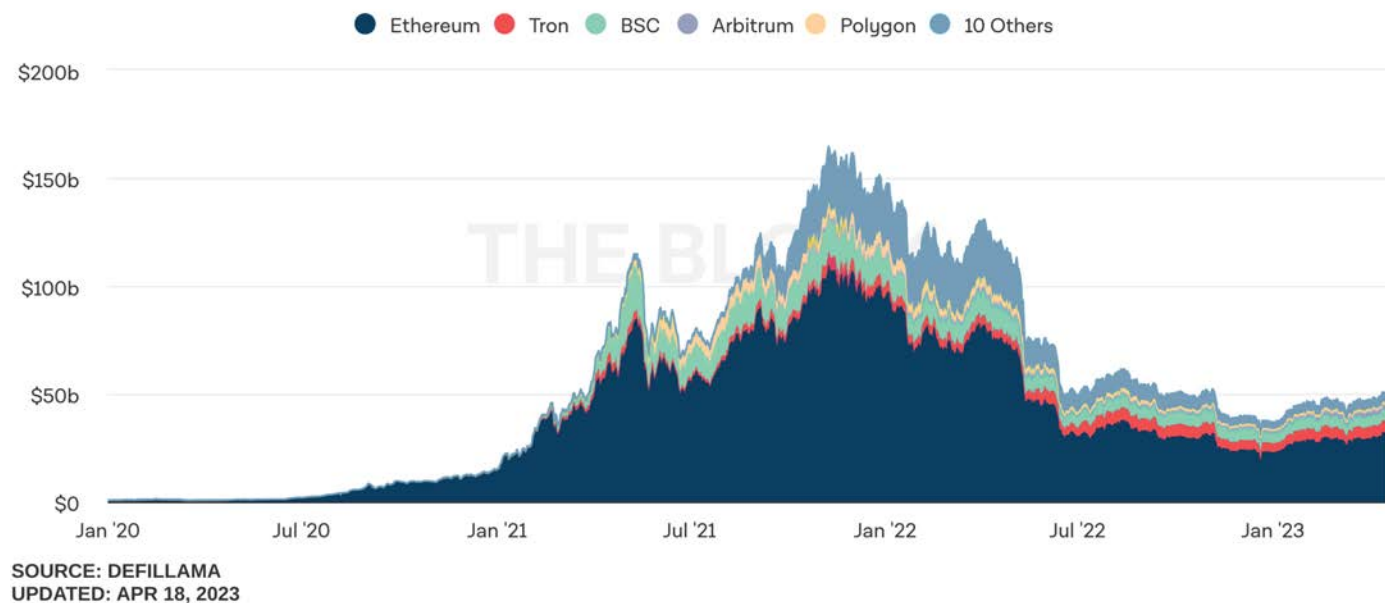


## Financial Services | Decentralised Finance (DeFi) Unlocks New Horizons

Traditional finance limits opportunities and fosters inequality; DeFi offers a groundbreaking alternative.

Challenges with Traditional Finance	DeFi Addresses the Shortcomings
<ul style="list-style-type: none"> <li>✗ <b>Limited Accessibility:</b> Around 1.4 billion adults worldwide are still unbanked<sup>7</sup>, which can prevent them from accessing basic financial services and participating in the global economy.</li> <li>✗ <b>Centralised Control:</b> Centralised control can threaten security, transparency, and privacy in the financial system. This is because a few entities hold the power, making it susceptible to fraud, manipulation, and censorship.</li> <li>✗ <b>High Fees:</b> The burden of high fees, such as the 6.5%<sup>8</sup> average remittance fees, can limit access to essential financial services in developing economies.</li> <li>✗ <b>Slow Transaction Speeds:</b> Traditional finance can be slow in completing cross-border transactions, which can take several days due to intermediaries and legacy infrastructure.</li> <li>✗ <b>Lack of Innovation:</b> Traditional finance's reluctance to adopt new technology hinders innovation, limiting affordable financial services. This leads to outdated processes and higher costs for consumers.</li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>Financial Inclusion:</b> DeFi enables universal access to financial services like lending, borrowing, and trading, promoting equal participation without discrimination.</li> <li>✓ <b>Decentralised Control:</b> DeFi mitigates centralisation risks, enhancing transparency, security, and censorship resistance. No single entity possesses control, fostering a more equitable and resilient financial ecosystem.</li> <li>✓ <b>Lower Fees:</b> DeFi's peer-to-peer structure lowers fees by eliminating intermediaries, enabling cost-effective access to financial services.</li> <li>✓ <b>Improved Transaction Speeds:</b> DeFi allows for faster transaction speeds than traditional banking systems, with settlements taking only seconds instead of days.</li> <li>✓ <b>Innovation:</b> DeFi fosters financial innovation through an open platform that enables the launch of new services and the adoption of advanced financial technologies.</li> </ul>

## Value Locked by Blockchain



This chart illustrates the significant growth of Total Value Locked (TVL) from the beginning of 2020 to April 2023. TVL refers to the total value of assets locked in smart contracts, which is a measure of the size and adoption of the DeFi ecosystem. The chart shows a remarkable growth rate, with TVL increasing from US\$600 million to over US\$47 billion. (Source: The Block)



## Media and Entertainment | Unlocking the Power of the Internet

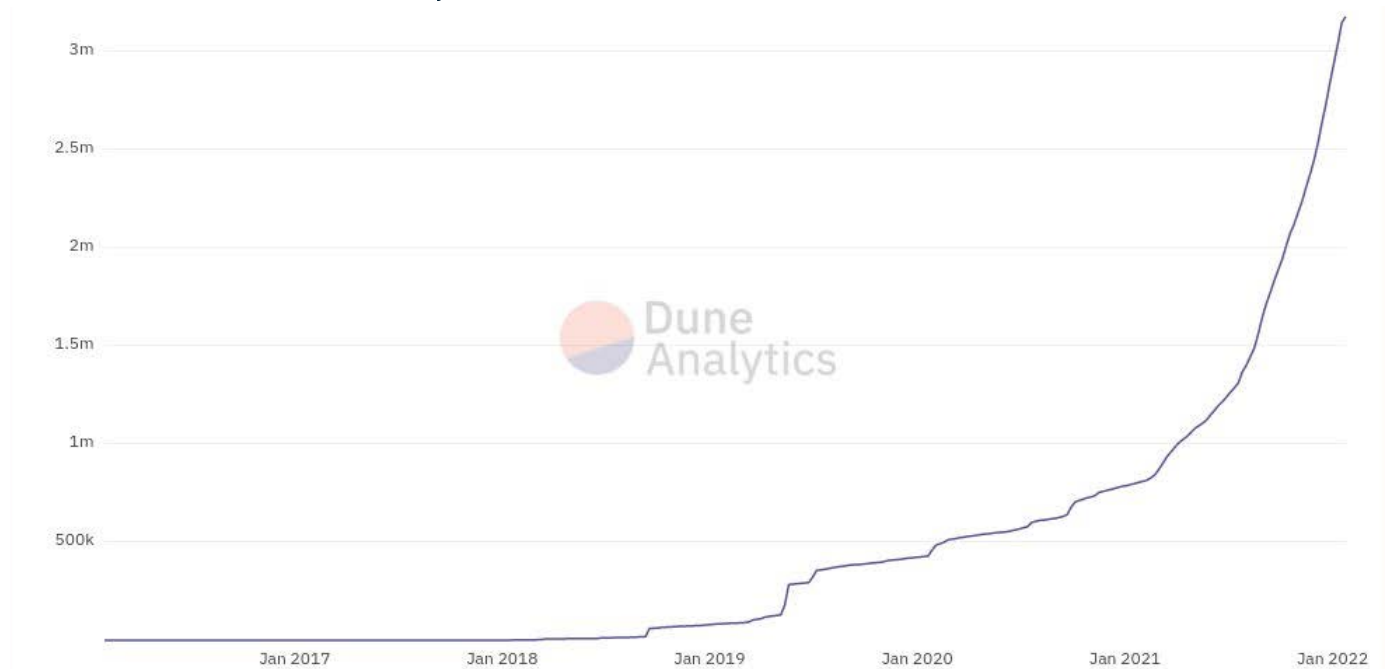
### How Web3 Places Users in Control

Challenges with Web2	Web3 Addresses the Shortcomings
<ul style="list-style-type: none"><li>✗ <b>Monopolistic Control:</b> Tech giants have monopolistic control over user data, raising concerns over privacy and limited control. This can create an uneven power dynamic, with users having limited options to manage their data and being subjected to manipulative advertising.</li><li>✗ <b>Limited Interoperability:</b> Traditional internet platforms are siloed, which slows down innovation and creates inefficiencies. This requires developers to build custom integrations to connect different platforms, further limiting interoperability and hindering progress.</li><li>✗ <b>Fragmented Identities:</b> Online identities are split across multiple platforms, making it difficult to manage and secure personal data. This also increases the risk of security breaches as hackers can exploit vulnerabilities on one platform to access others where the same identity is used.</li></ul>	<ul style="list-style-type: none"><li>✓ <b>Data Ownership:</b> In Web3, users have ownership and control over their personal data, eliminating intermediaries, enhancing security, and providing transparency. With Non Fungible Tokens (NFTs), Web3 enables direct creator monetisation, bypassing traditional advertising models.</li><li>✓ <b>Interoperability:</b> Web3 allows for easy exchange of data and value across the internet, promoting innovation and collaboration. This is enabled by allowing developers to build on existing platforms and create new value propositions.</li><li>✓ <b>Decentralised Identity:</b> Web3 enables users to securely manage their online identity and reputation through decentralised solutions. This removes the need for centralised authorities and provides greater control over personal data.</li></ul>



## Number of Wallets That Have Owned an NFT

Across all ERC-721 and ERC-1155 Projects



This chart illustrates the rapid growth of NFT ownership, as shown by the number of unique crypto wallets that have ever owned an NFT, on a cumulative basis. With the number of NFT owners surpassing 8 million by 2023, this technology is expected to play an increasingly important role in the Web3 economy, creating new opportunities and disrupting traditional business models. (Source: Dune)

# Crypto Market Cycles

## Influential Factors in the Crypto Market Cycle

To invest successfully in the crypto asset market, understanding the cyclical patterns that influence its movements is essential. Like traditional financial markets, the crypto market is subject to factors such as human psychology, market sentiment, macroeconomic forces, and idiosyncratic features. Staying informed and up-to-date with market conditions and trends is critical to navigating this dynamic space as it continues to mature.



**Human Psychology:** The cyclical nature of crypto markets is largely driven by human psychology, with market participants exhibiting herd behaviour. During optimistic periods, the fear of missing out can fuel an uptrend as investors enter the market, while negative attitudes and behaviour can trigger sell-offs, leading to a self-reinforcing downward spiral.



**Market Sentiment:** Market sentiment refers to the overall feeling or mood of investors towards the crypto asset market, influencing the cyclical nature of the market. Optimistic periods drive up asset prices as investors gain confidence and invest, initiating an upward cycle, while pessimistic periods lead to sell-offs, declining prices, and a downward cycle.



**Macroeconomic Forces:** Macroeconomic factors impact the cyclical nature of crypto markets, with global economic conditions, regulatory changes, technological advancements, and external factors influencing asset demand. During economic uncertainty, crypto assets may be sought as alternatives, driving up demand. However, tighter regulations or negative news events can trigger a crash as market participants reevaluate associated risks.



**Unique Features:** The unique features of the crypto asset market, such as *Bitcoin* halving events (scheduled and predetermined events which cut the rewards distributed to *Bitcoin* miners in half) and the launch of new projects and tokens, can affect market cycles. These events often catalyse changes in market sentiment and price trends, driving the cyclical patterns shaping the crypto market.

## Four Phases of a Crypto Market Cycle



## Four Phases of a Crypto Market Cycle

### Phase 1: Accumulation

After a cycle crash, the crypto market enters the Accumulation Phase, a time when prices are relatively oversold and market sentiment is cautious. During this phase, trading volume and price volatility are low, and prices move within a tight range. Smart investors with deep pockets accumulate assets at a favourable price point while retail investors may be disinterested. Meanwhile, startups explore new markets and obtain funding from committed investors, leading to discreet innovation of foundational technologies. This phase sets the foundation for the next bull run. Notable examples of this phase include the rise of *Ethereum* Genesis Block and the first ERC-20 Initial Coin Offering (ICO) - *Augur* in 2015, and the development of DeFi in 2019.

### Phase 2: Growth

The Growth Phase follows the Accumulation Phase and is characterised by a sustained upward trend in asset prices, driven by optimistic sentiment from market participants. During this phase, trading volume and price volatility increase significantly, and user adoption of new technologies plays a crucial role in driving market growth. Significant catalysts, such as early signs of product-market fit, contribute to this phase. Notable examples of this phase include the adoption of *bitcoin* as peer-to-peer electronic cash on Mt.Gox in 2012 and the popularity of yield farming in the DeFi ecosystem in 2020.

## Four Phases of a Crypto Market Cycle

### Phase 3: Bubble

The third phase of the crypto market cycle is the Bubble Phase, characterised by exuberant market sentiment and rapidly rising prices. Retail investors fear missing out, leading to parabolic price action and a self-reinforcing cycle of rising prices that typically ends in a blow-off top. High trading volume contributes to market volatility, often sparked by irrational behaviour from retail investors. This phase is marked by an excess of available capital, leading to oversubscribed capital raises and abundant liquidity in the market. However, the unsustainability of these projects' token economics inevitably leads to a crash in the next phase. Notable examples of this phase include the *bitcoin* price surge in 2013, the ICO Bubble in 2017, and the 2021 bull market.

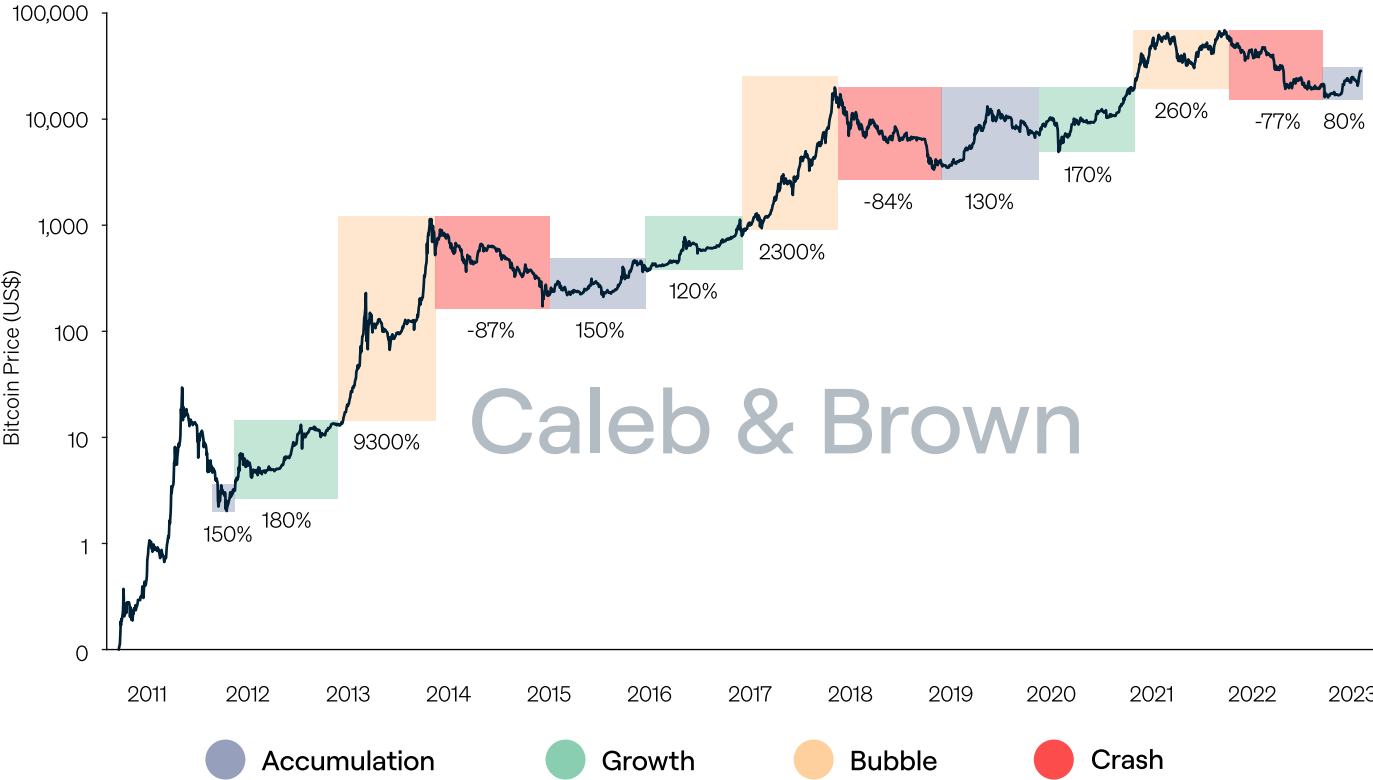
### Phase 4: Crash

The final stage of the crypto market cycle is the Crash Phase, characterised by a sharp decline in asset prices. Market participants sell down their holdings, and retail investors lose interest in assets that no longer deliver the frenzied price-momentum of the Bubble Phase, resulting in a volatile downward trend in prices. This phase is marked by a period of price discovery as the market searches for a new equilibrium point. Fearful sentiment dominates this phase as investors start to acknowledge the market's overvaluation and unsustainability. Recent instances of this phase include the bear markets of 2014, 2018, and 2022.

	Price Action	Sentiment	Volume	Volatility	Smart Money	Innovation
Phase 1: Accumulation	Range-Bound	Cautious	Low	Low	Buying	Discreet
Phase 2: Growth	Upward Trending	Optimistic	Mid	Mid	Buying	Validation
Phase 3: Bubble	Parabolic	Positive	Very High	Very High	Selling	Copycats
Phase 4: Crash	Oversold	Negative	High	High	Selling	Slowdown

An overview of the distinct phases of the crypto market cycle and their defining features. Familiarity with these phases is essential to successfully navigating the market and making informed investment decisions.

The Crypto Market Cycle: *Bitcoin's* Performance Over Time



This chart illustrates the different phases of the crypto market cycle and their corresponding returns, using *bitcoin* as a proxy for the overall market. As shown, each phase tends to last for around 1 year. Understanding these phases can help investors navigate the market and make informed decisions. (Source: Caleb & Brown)

# Academy

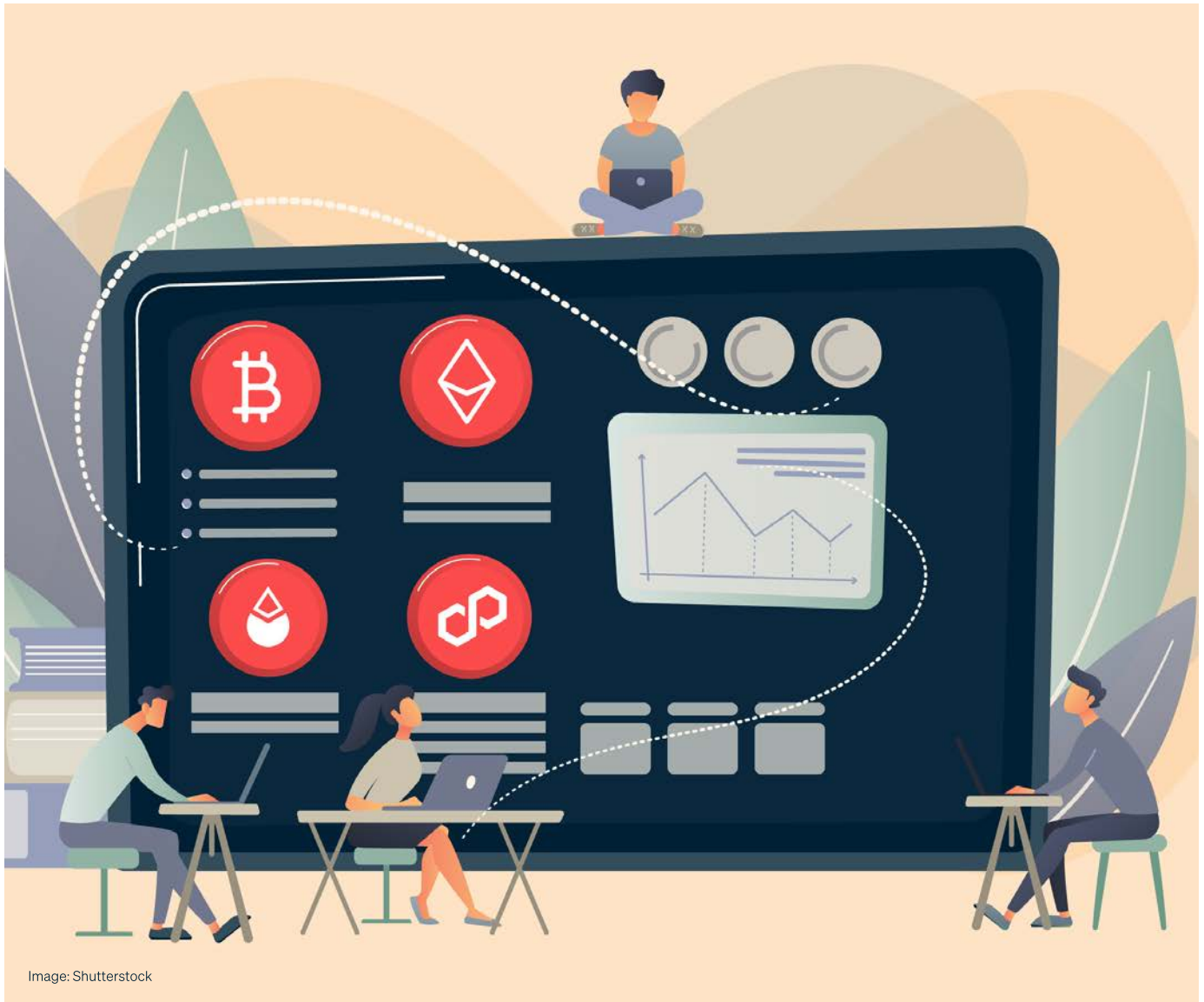


Image: Shutterstock

Welcome to the Caleb & Brown Academy, where we strive to make complex topics in the crypto world more accessible through clear and concise explanations. In this section, we will explore one of the most significant developments in the *Ethereum* ecosystem: Rollups. *Ethereum* Rollups are a vital component of the roadmap for scaling

*Ethereum* and enabling it to reach its full potential as a platform for decentralised applications (dApps). In this section we will provide a comprehensive overview of Rollups, including their workings, benefits, and risks to help readers understand the importance of this technology for the future of *Ethereum*.

# Scaling Ethereum with Rollups: An Overview

## Introduction

The *Ethereum* blockchain has been facing scalability limitations as it strives to balance the three desirable properties of a blockchain system: security, decentralisation, and scalability. *Ethereum* has prioritised decentralisation and security, which has led to scalability limitations. To address this challenge, Layer 2 scaling solutions have emerged, including *Ethereum* Rollups. In this section, we'll explore what *Ethereum* Rollups

are, how they work, and their potential impact on the *Ethereum* ecosystem.

## What are Ethereum Rollups?

Layer 2 scaling solutions are platforms designed to address the scalability limitations of Layer 1, the main *Ethereum* network. These solutions work by processing transactions off-chain (meaning they are not directly processed on the *Ethereum* network), which reduces the computational burden on the *Ethereum* network and allows for more transactions to be processed.

Rollup Types	
ZK-Rollups	Zero-Knowledge Rollups use a cryptographic technique called zero-knowledge proofs to bundle multiple transactions into a single transaction without revealing any details about the individual transactions. This approach offers greater security, privacy, and faster transaction finalisation times. ZK-Rollups are well suited for privacy-focused applications, especially in decentralized finance (DeFi).
Optimistic Rollups	Optimistic Rollups assume that most transactions are valid, allowing them to batch transactions together to reduce fees and improve efficiency. The system relies on a mechanism of dispute resolution to ensure that any invalid transactions are detected and reverted, ensuring the integrity of the transaction data. While Optimistic Rollups may take longer to finalise than ZK-Rollups, they offer a cost-effective solution for applications that do not require immediate finality (such as Web3 gaming).



Rollups are a specific type of Layer 2 scaling solution that bundle multiple transactions together into a single transaction, which is then processed on the *Ethereum* network. By aggregating multiple transactions into a single batch, Rollups reduce the amount of data that needs to be processed on the main *Ethereum* network, which improves transaction speed and reduces gas fees (gas is the fee paid for processing transactions on the *Ethereum* network).

### How do *Ethereum* Rollups Work?

An *Ethereum* Rollup is like a supply chain management system that optimises the movement of goods and services from suppliers to consumers. In a supply chain, different actors such as suppliers, manufacturers, distributors, and retailers are involved in moving products from one place to another. Similarly, on the *Ethereum* network, there are many different actors involved in moving value and data from one place to another.

When there are many small transactions on the *Ethereum* network, it can become congested and slow, leading to higher fees and longer transaction times. However, by using a rollup to bundle many smaller transactions into a larger one, the network can handle fewer, larger transactions instead of many smaller ones. This reduces the load on the network, making it more efficient and cost-effective to process transactions, much like how an efficient supply chain can optimise the flow of goods and services.

Supply chain management systems can reduce costs, improve quality, and increase efficiency by optimising the flow of goods and services. Similarly, *Ethereum* Rollups can reduce fees, improve transaction speeds, and increase scalability on the *Ethereum* network by reducing the number of transactions that need to be processed. By bundling many small transactions into a larger one, rollups create a more efficient and cost-effective way of processing transactions, which is essential for building scalable and sustainable dApps on the *Ethereum* network.






## Benefits and Risks of Ethereum Rollups

Benefits	<ul style="list-style-type: none"><li>• <b>Faster Transaction Processing:</b> Rollups allow for more transactions to be processed off-chain, which reduces the load on the <i>Ethereum</i> network and speeds up transaction processing times.</li><li>• <b>Lower Transaction Fees:</b> By reducing the computational burden on the <i>Ethereum</i> network, Rollups can help to lower gas fees for users, making transactions more affordable.</li><li>• <b>Increased Scalability:</b> With Rollups, <i>Ethereum</i> can handle a greater number of transactions, which can help to alleviate network congestion and improve overall scalability.</li><li>• <b>Improved User Experience:</b> Faster transaction processing and lower fees can result in a better user experience, making <i>Ethereum</i> more accessible and attractive to users.</li></ul>
Risks	<ul style="list-style-type: none"><li>• <b>Interoperability Risk:</b> Rollups are currently being developed by different teams, which could lead to interoperability issues between different rollup solutions. This could potentially limit the benefits of Rollups and lead to fragmentation within the <i>Ethereum</i> ecosystem.</li><li>• <b>Trust Requirements:</b> In some Optimistic Rollups, only a select group of validators can submit fraud proofs (cryptographic evidence used to prove transaction validity), requiring users to trust the platform.</li><li>• <b>Centralisation Risk:</b> Rollups rely on centralised sequencers, which could potentially allow them to censor or reorder transactions. Sequencers are single parties who bundle up transactions and pass them down to <i>Ethereum</i>.</li><li>• <b>Smart Contract Risk:</b> Rollups are vulnerable to hacks due to their core codebases being <i>Ethereum</i>-based smart contracts, making secure coding difficult and hack prevention uncertain.</li></ul>

## State of the Market

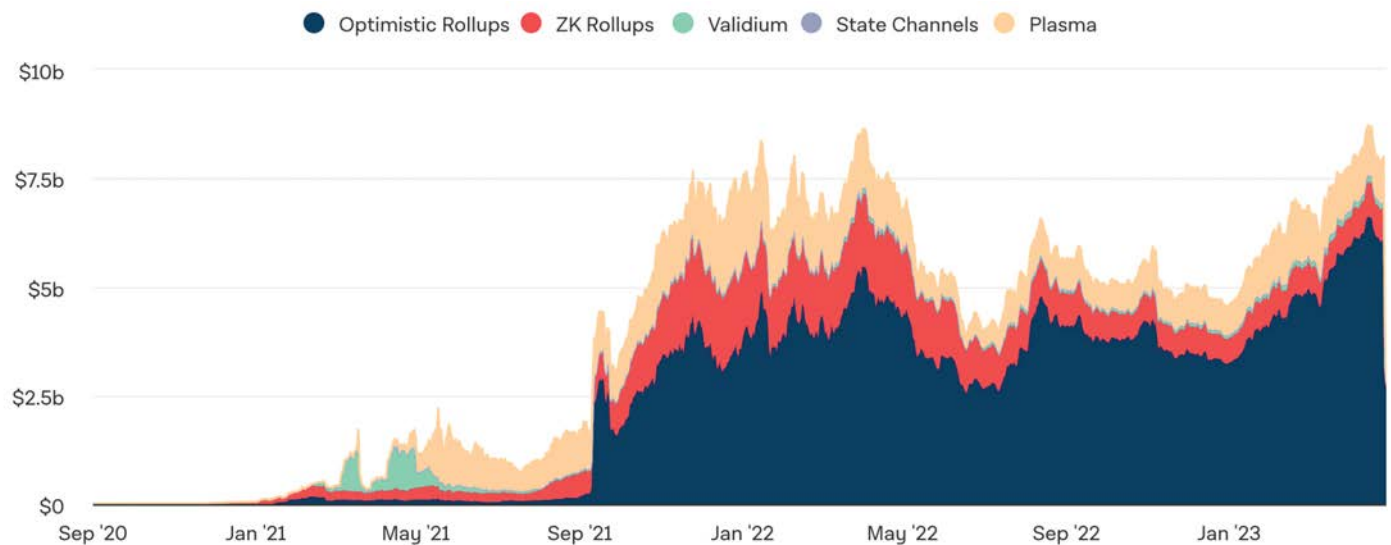
The world of crypto is evolving at a breakneck pace, and *Ethereum* Layer 2 networks are leading the way. As of April 2023, the Total Value Locked (TVL) in these networks has soared to a staggering US\$9.5 billion, representing an increase of around 130% year-to-date<sup>47</sup>. This surge in adoption underscores the growing importance of Layer 2 scaling solutions, which now process 67% of all transactions on the *Ethereum* network.

As these Layer 2 networks compete to offer faster transactions and lower fees, one player remains the undisputed leader in the market: *Arbitrum*. With an 82% year-over-year growth, *Arbitrum* TVL has surged to US\$6.3 billion<sup>48</sup>, making it the go-to choice for many users. In fact, in April 2023, *Arbitrum* processed more transactions than the entire *Ethereum* blockchain itself, highlighting its dominance.

Protocol	Arbitrum 	Optimism 	zkSync Era 	StarkNet 	Polygon zkEVM 
Ticker	ARB	OP	No Token	No Token	MATIC
Fully Diluted Market Capitalisation (US\$)	US\$13.8B	US\$9.38B	Not Listed	Not Listed	US\$10.1B
Launch Date	31/08/2021	19/08/2021	24/03/2023	29/11/2021	27/03/2023
Rollup Type	Optimistic	Optimistic	zkEVM	zkEVM	zkEVM
30 Day Transactions Count	35.5M	10.4M	9.5M	3.5M	0.2M
Total Value Locked (TVL)	US\$6.3B	US\$1.9B	US\$259M	US\$39M	US\$5.5M

**General Purpose Ethereum Rollups.** (Sources: Coingecko, L2beat, as of 30/04/2023)

## Value Locked in Ethereum Scaling Solutions by Type

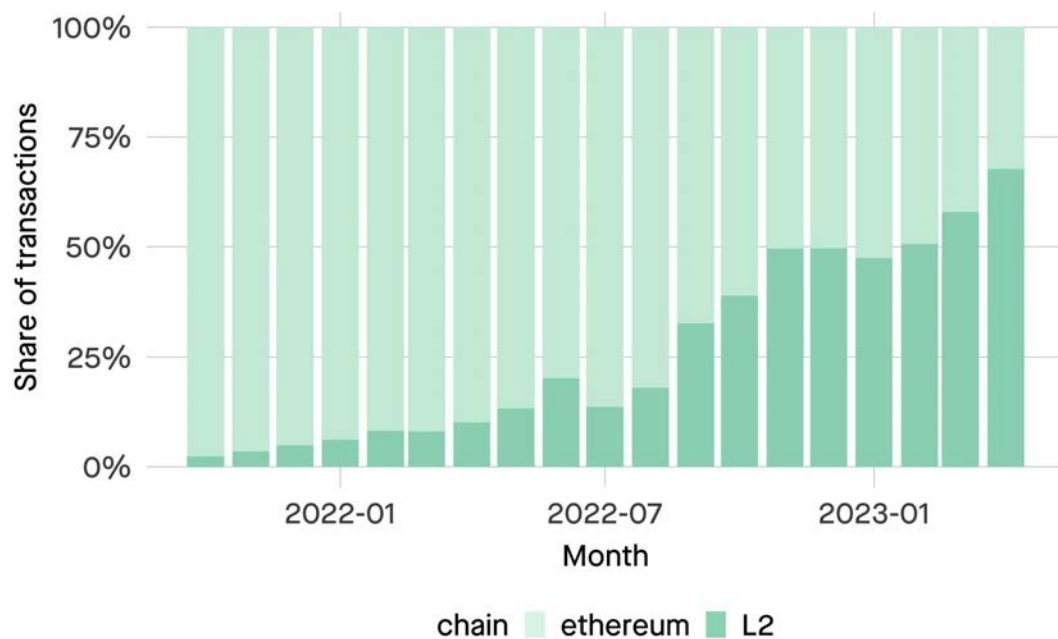


**Optimistic Rollups dominate the Ethereum scaling market, but emerging solutions are taking market share.**

(Source: The Block)

## L2s Now Process 67% of Transactions on Ethereum

Up from 10% 12 months ago



**Layer 2 scaling solutions now account for over two thirds of Ethereum's daily transactions.** (Source: TomTunguz.com)

However, the competition is heating up, and the focus in the *Ethereum* Rollup race has shifted from Optimistic Rollups like *Arbitrum* and *Optimism* to more advanced Zero-Knowledge Ethereum virtual machines (zkEVM). These advanced platforms operate on the same bundle-and-settle principle as optimistic Rollups but rely on zero-knowledge cryptography for enhanced security. *Polygon* and *Matter Labs* have launched beta versions of their ecosystems, generating significant community interest, with *Polygon* launching *Polygon zkEVM* and *Matter Labs* introducing *zkSync Era*.

*Arbitrum's* successful airdrop of its ARB governance token in March 2023 has paved the way for users to seek out other platforms without native tokens that may offer similar rewards for early network participation. As a marketing strategy, airdrops involve distributing tokens for free to a large number of people to incentivise early adoption of a new blockchain platform.

This trend is driving growing support for platforms like *zkSync Era*, which have yet to launch a token, while alternatives like *Polygon zkEVM* are growing more organically. Although airdrops have been effective in acquiring customers for new blockchain projects, their long-term sustainability is uncertain. The focus on these short-term rewards may also obscure early signals about which technological platforms offer the best performance.

## Conclusion

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*Ethereum* Rollups are a promising development in the world of crypto that have the potential to greatly improve the scalability of the *Ethereum* Network. By bundling multiple transactions together into a single transaction on the blockchain, Rollups can help to reduce congestion and lower fees. It's important to note that Rollups are not a perfect solution, and there are still risks associated with their use. However, with careful implementation and ongoing development, Rollups could play a crucial role in the future of *Ethereum*.

## Additional Resources

1. Scaling Overview by *Ethereum* Foundation  
<https://ethereum.org/en/developers/docs/scaling/>
2. *Ethereum* scaling solutions: All you need to know about future plans to scale the *Ethereum* Network  
<https://yield.app/blog/ethereum-scaling-solutions-all-you-need-to-know-about-future-plans-to-scale-the-ethereum-network>
3. L2BEAT – A website that provides up-to-date analytics and research on *Ethereum* Layer 2 scaling solutions.  
<https://l2beat.com>

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## Flight to Quality



As we look back on the financial markets' challenges in 2022, it's clear that the world is still grappling with the aftershocks of the COVID-19 pandemic. Last year, central banks made concerted efforts to stabilise economies and curb inflation, but their actions had unintended consequences that created a turbulent financial landscape. Unfortunately, the crypto industry bore the brunt of these repercussions, with several high-profile companies failing amidst the upheaval.

In early 2023, economists and corporate leaders were cautiously optimistic about the global economic outlook, buoyed by falling energy prices, signs of resilience in Europe and the reopening of China. However, this optimism proved to be short-lived as cracks

began to show in the U.S. banking system by March. Consequently, the International Monetary Fund (IMF) downgraded its forecasts for the global economy<sup>9</sup>, shattering hopes for a robust recovery.

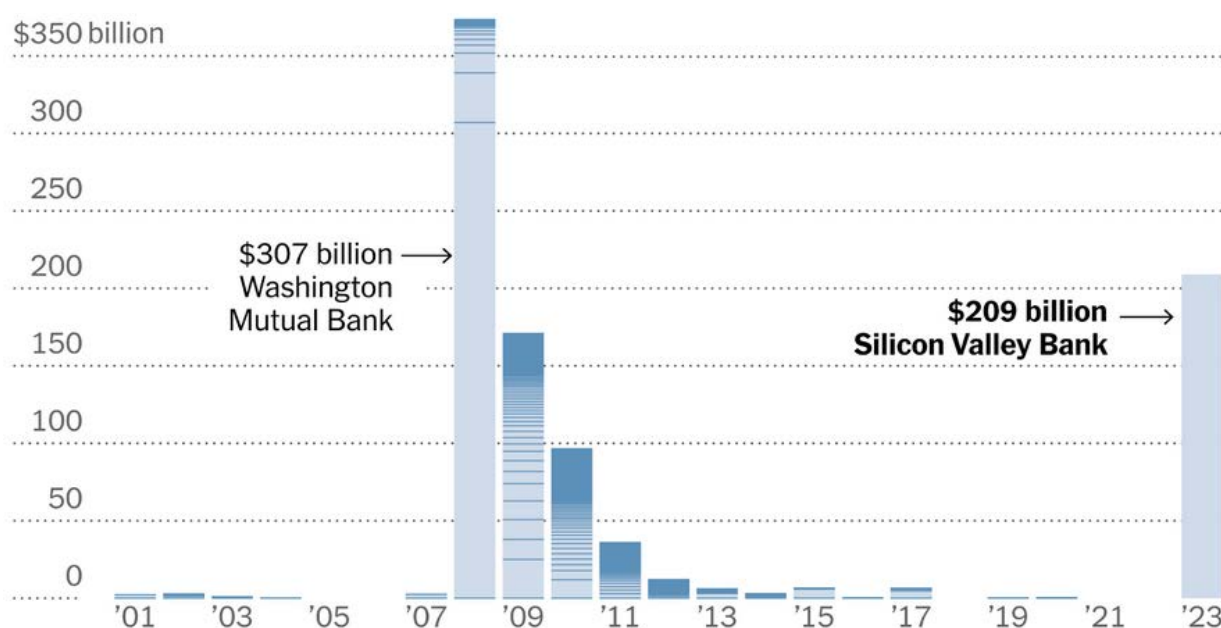
Despite the bleak economic outlook, investors are adapting to the changing market conditions and allocating to crypto assets in their portfolios, reflecting a shift in investor sentiment. The ongoing shift in investor thinking continues to raise pertinent questions about the role of crypto assets in uncertain times. Can *bitcoin* truly provide a reliable store of value, particularly during economic instability? And can decentralised finance (DeFi) provide a reliable alternative to traditional finance during times of market stress?

## Navigating a Shifting Global Economy

The current financial market challenges may be attributed to the ripple effects of the global financial crisis that unfolded in 2008. Following the turmoil caused by the crisis, banks have been operating in a prolonged period of low-interest rates and have relied on periodic cash injections from central banks to sustain their operations. While these injections were initially intended as temporary measures in response to the collapse of Lehman Brothers, the abundance of cheap money has become a persistent feature in the economy.

In recent times, there has been growing concern and speculation surrounding the potential repercussions that may arise from central banks raising interest rates and scaling back the financial support they have been providing. The implications of such actions have been subject of much debate, and now, we are starting to witness the unfolding of the answers to these questions. Specifically, early in 2022, the U.S. Federal Reserve began raising interest rates, resulting in a total increase of 4.5 percentage points in the Fed Funds Rate. In addition, they initiated a US\$573 billion quantitative tightening balance sheet roll-off<sup>10</sup>, which involved selling off bonds that were purchased during quantitative easing to reduce the amount of money in circulation.

Bank Failures in Each year by Total Assets



U.S. bank failures since 2001, showing that Silicon Valley Bank's collapse was the second biggest in U.S. history in terms of assets. (Source: NYTimes)



The actions taken by the Federal Reserve have caused significant dislocations in the banking industry, with crypto-servicing banks and regional banks worst affected. In March 2023, the financial sector was shaken by the collapse of Silvergate Bank, Signature Bank and Silicon Valley Bank. The first two banks served as the primary fiat currency gateways into the crypto market, while the latter was the 16th largest bank in the U.S. and played a crucial role in providing start-up capital and venture funding.

The interest rate hikes saw prices of fixed income securities (bonds) held by the banks decline. Simultaneously, all three banks saw slowdowns in deposits during 2022 and early 2023, which compelled them to sell these bonds, such as the U.S. Treasuries, to maintain liquid reserve buffers. Sold at a loss, the hits taken on these instruments – initially intended to be held until maturity – saw a rapid deterioration in both Silvergate Bank and Silicon Valley Bank's equity capital.

Throughout the course of U.S. economic history, three key indicators have consistently signalled an approaching recession: banking failures, weakness in the housing market, and a rising unemployment rate. With three banks having already failed, building permits experiencing a sharp 22% year-over-year decline<sup>11</sup> and the job market displaying signs of weakness<sup>12</sup>, it is unsurprising that investors are actively looking for strategies to fortify their portfolios during this uncertain period.

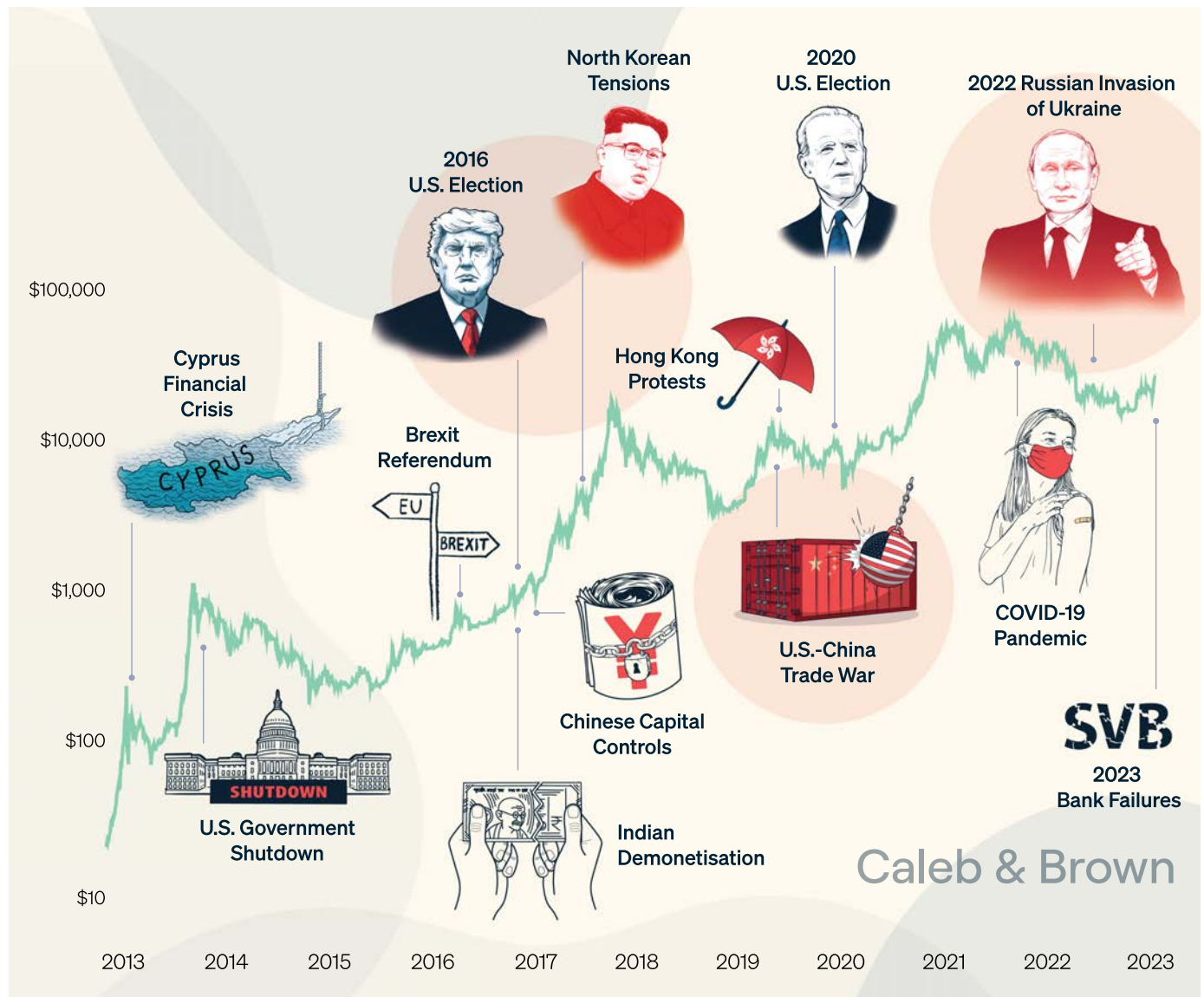
## Bitcoin's Resilience Amid Turmoil

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Throughout its existence, *bitcoin* has showcased an extraordinary capacity to thrive in adverse conditions, and this capacity is particularly relevant in the midst of the current tumultuous global economic landscape. Time and time again, *bitcoin* has confronted various challenges and critiques, only to bounce back stronger. In a period of financial instability, *bitcoin's* antifragility underscores the flaws present in conventional financial systems, while reimagining the notions of value and investment.

*Bitcoin's* endurance is remarkable. Faced with derision, scepticism, and numerous market fluctuations, it continues to not only survive, but thrive. Recent banking failures and a hawkish U.S. Federal Reserve have only enhanced *Bitcoin's* influence on global finance. With the world beginning to understand *Bitcoin*, a shift in perception is occurring, prompting a reevaluation of the fundamental principles of money and the exploration of alternative solutions.

## The Antifragility of Bitcoin

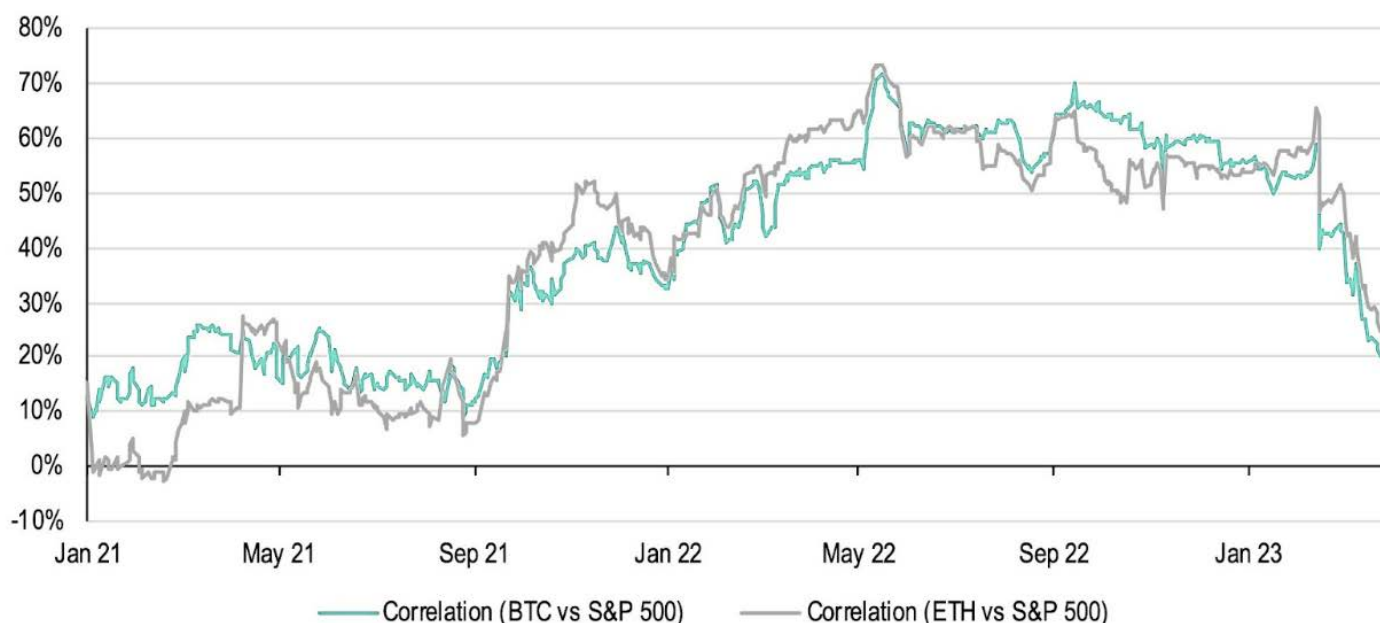


**Bitcoin has been a reliable store of value in dark economic times. Please refer to *Appendix D. Bitcoin's Antifragility* for more detail.** (Source: Caleb & Brown Research)

*Bitcoin* emerged as a response to the flaws exposed in the traditional financial system during the 2008 crisis, which was marked by bank collapses and regulatory failures. Built on open-source and peer-to-peer technology, *Bitcoin*'s innovative technology grants anyone with an internet connection the ability to scrutinise its supply and transactions. Through its decentralised architecture, the network ensures that no single entity holds control. The benefits of *Bitcoin* are clear: it is impervious to manipulation, transparent and resilient through trying economic times. In contrast, fiat currencies are centralised and regulated, resulting in limited transparency and accountability, ultimately fostering a sense of distrust among users.

Given the current macroeconomic climate, it comes as no surprise that *Bitcoin* is once again proving its resilience, as it has in previous periods of market instability<sup>13</sup>. As the Silvergate Bank crisis unfolded on March 8, *bitcoin* began a price surge that saw it rise by 28%<sup>14</sup> by the end of the month. In stark contrast, U.S. banks experienced a significant decline of nearly 22%<sup>15</sup> during the same period. The debate surrounding *bitcoin*'s correlation as an asset has persisted for many years, but the recent events have provided validation for the argument that it is indeed an uncorrelated asset. Notably, its correlation with the S&P/500 Index has dwindled to 25%, reaching its lowest level since September 2021<sup>16</sup>.

### Correlation Between Bitcoin and S&P500



The correlation between *bitcoin* and S&P 500 returns has fallen sharply in 2023. (Source: Coinbase)

<sup>13</sup> Please refer to Appendix D. *Bitcoin's Antifragility* for more detail.

*Bitcoin's* on-chain metrics, which glean insights from the blockchain's activity, are also robust with multiple performance measures showing resounding growth. The network's hash rate is up 47% year-over-year (making the network faster, more secure and efficient), addresses with non-zero balances

are up 10% to over 45 million and (indicating more widespread adoption and usage) and over 67% of all *bitcoin* in circulation have been held in a single wallet for at least a year (implying reduced selling pressure and increased conviction).

On-Chain Metric	Measures	10-Apr-17	10-Apr-19	10-Apr-21	10-Apr-23
Hash Rate (EH/s)	Security	4	46	167	356
Addresses with Non-Zero Balance (millions)	Adoption	15	24	37	45
Addresses with Over 1 <i>Bitcoin</i> (thousands)	Adoption	570	723	819	993
Active Addresses (thousands)	Adoption	689	779	1242	873
Cumulative Number of Transactions (millions)	Adoption	212	400	633	822
Lightning Network Capacity ( <i>Bitcoin</i> )	Adoption	0	1079	1216	4865
Cost Basis per <i>Bitcoin</i> (\$US)	Economic Activity	541	4379	18,055	19,854
Supply of <i>Bitcoin</i> Last Moved Over 1 Year Ago (%)	Economic Activity	58%	58%	55%	67%

***Bitcoin's* on-chain metrics have been showing resounding strength amid macroeconomic uncertainty.**  
(Sources: Caleb & Brown Research, Glassnode)

The recent banking crisis has shone a spotlight on *Bitcoin's* strengths, making it a compelling solution for investors looking to diversify their portfolios. From our perspective, the crisis served as a powerful marketing campaign for *Bitcoin*. It was purpose-built to thrive in scenarios where the traditional financial system shows its weaknesses, the resulting risks of which can be mitigated by owning uncorrelated assets.

As the IMF warns of a prolonged period of economic weakness, institutional investors seem to have taken notice, with the four consecutive weeks of capital inflows into crypto-based funds in mid April 2023 as evidence. Around 90% of these flows went into *bitcoin*-based products, totaling a value of \$345 million<sup>17</sup>. We see this trend carrying through the end of the year and beyond, bolstered by the upcoming *Bitcoin* halving event (estimated to occur a year from now).

*Bitcoin* has proven its resilience time and again, and its ability to thrive in challenging conditions has only become more pronounced in the wake of recent banking failures and macroeconomic uncertainty. As the world begins to recognise *Bitcoin's* potential, we can expect to see a shift in perception and a reevaluation of the fundamental principles of money. The decentralised and transparent nature of *bitcoin* makes it an ideal investment for those looking to diversify their portfolios and safeguard their capital in turbulent times.

“

Bitcoin's  
antifragility  
underscores the  
flaws present in  
conventional  
financial  
systems, while  
reimagining the  
notions of value  
and investment.”



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

## Decentralised Finance Shines

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Amidst a shifting global economy and growing concerns about the reliability of traditional financial systems, investors are seeking refuge in decentralised alternatives. As the recent banking crisis and macroeconomic uncertainty unfolds, decentralised finance (DeFi) has emerged as a shining beacon of transparency, security, and resilience. DeFi has begun attracting users who are eager to explore a new paradigm of financial services that operate free of intermediaries.

DeFi has given rise to a new independent economic system. Financial applications for lending, borrowing, and trading can provide services without relying on restrictive centralised parties such as banks, exchanges, and clearinghouses.

These services are facilitated via smart contracts, which are self-executing agreements that automatically enforce the terms and conditions of a transaction. Smart contracts remove the role of rent-seeking intermediaries, such as banks, reducing transaction costs and increasing efficiencies. These benefits have not gone unnoticed, with over US\$67 billion of user capital currently locked up in smart contracts, up from just US\$600 million at the start of 2020<sup>18</sup>.

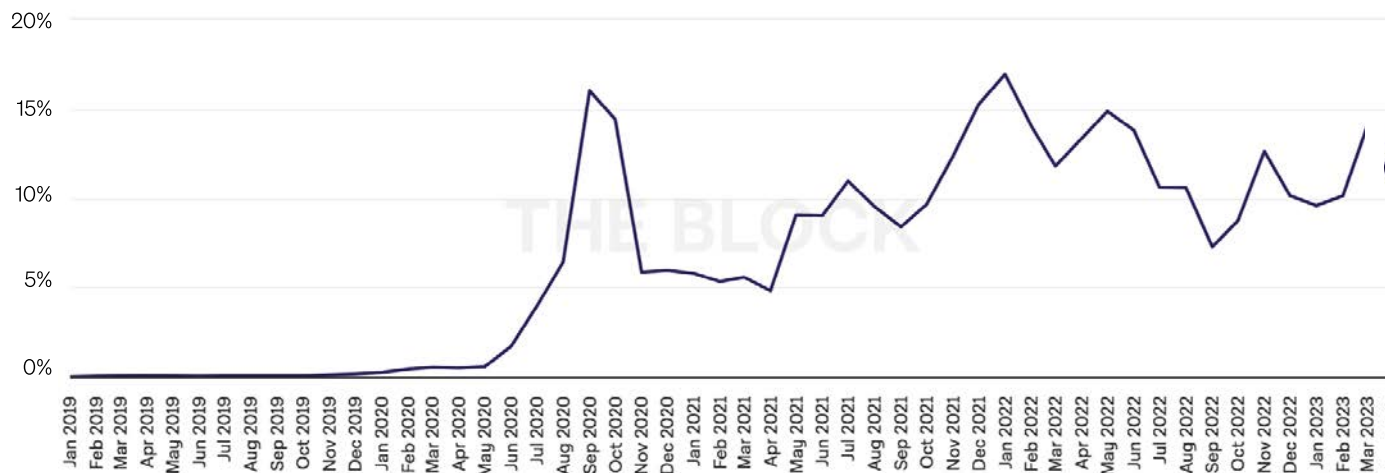
Blockchain's transparency lends itself well to DeFi, as transaction data is on-chain and visible to all. As a result, DeFi applications cannot misappropriate funds without public knowledge. In contrast, CeFi (centralised finance) firms operate behind closed doors, making it challenging to verify their financial integrity and place absolute trust in them. DeFi removes the counterparty trust requirement altogether with smart contracts, which simply execute based on objective rules that prevent unjust human intervention in transactions.

CeFi dominated the high-profile failures in a challenging 2022 for the crypto ecosystem. 3AC's collapse stress-tested the whole market; before FTX, a leading centralised exchange, capitulated. Negligence, distrust and at times fraudulent management practices precipitated these downfalls which saw Celsius and BlockFi file for bankruptcy, too. However, the contagion stopped at DeFi, as it stood firm during this period by leaning on its decentralised makeup.

The contrasting fates of DeFi and CeFi prompted a shift in user activity heading into 2023. Users switched from CeFi providers to DeFi protocols for services such as trading and staking.

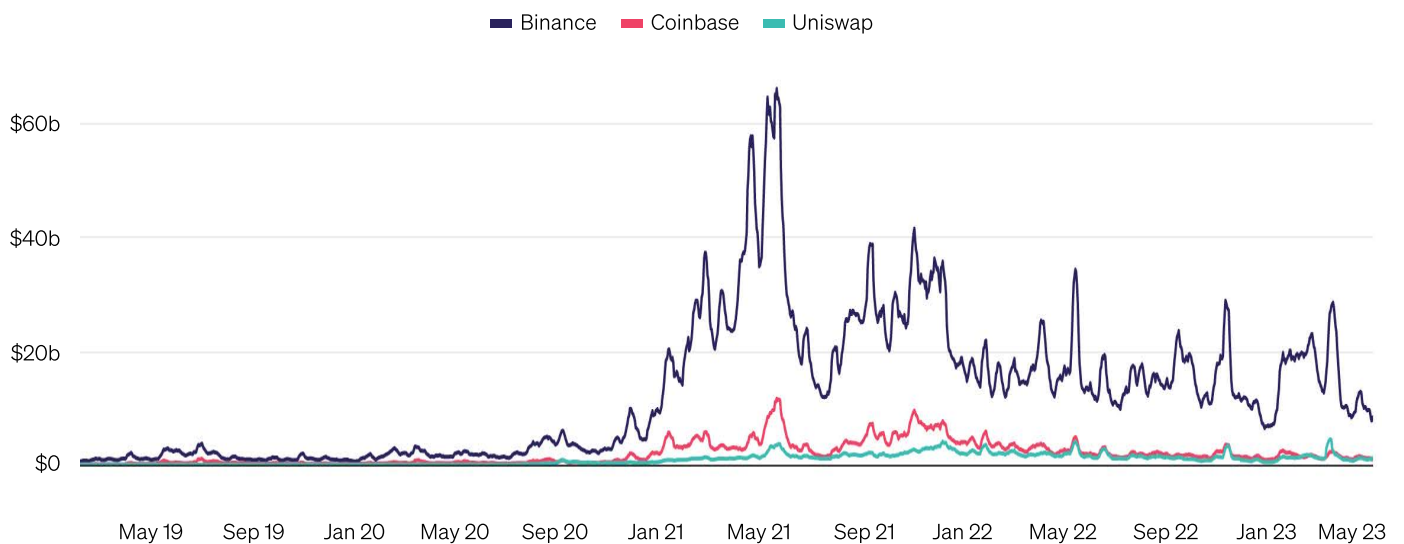


### DEX to CEX Spot Trade Volume (%)



**Decentralised exchanges (DEXes) have seen increasing support since the FTX collapse.** (Sources: The Block, The Graph, CoinGecko)

### Uniswap vs. Coinbase and Binance Trade Volume (7DMA)



**In Q1 2023, Uniswap regularly recorded higher trade volumes than Coinbase despite having far fewer monthly active users.** (Source: The Block)

The migration to DeFi is clear looking at Decentralised Exchanges (DEXs). In March 2023, DEX trade volumes as a percentage of centralised exchange (CEX) volumes reached 13.5%, up from 8.73% in October 2022<sup>19</sup> when the FTX scandal broke. Notably, in Q1 2023, the DEX *Uniswap* regularly recorded higher trade volumes than CEX Coinbase, despite having a significantly smaller user base of 53,067<sup>20</sup> monthly active users compared to Coinbase's 9 million<sup>21</sup>.

Liquid staking protocols have become popular in crypto, providing a means for users to earn rewards by locking-up their crypto assets while retaining liquidity. However, regulators in the United States have recently clamped down on the staking industry. On 8th February 2023, Kraken (a CEX) closed its U.S. crypto staking service and paid US\$30 million in penalties to settle charges pressed by the U.S. SEC that it failed to register the program<sup>22</sup>.

This has driven stakers away to decentralised providers such as *Lido*. The amount of *ether* staked on Lido grew 19.66%, nearly three times as much as Coinbase between 8th February 2023 and 19th April 2023. More than 5.8 million *ether* are now being staked using *Lido*, which amounts to more than 30% market share<sup>23</sup>.

The collapse of SVB (Silicon Valley Bank) had positive, unintended consequences for DeFi. Circle, the issuer of stablecoin *USDC*, faced the prospect of losing more than US\$3 billion which was held with SVB, weakening its position to backstop *USDC* with U.S. Dollar collateral. In turn, concerns over the reliability of centralised stablecoins as stores of value were raised.

Even though Circle recouped the US\$3 billion after government intervention, the US\$133 billion stablecoin market reacted. Capital flowed from centralised to decentralised stablecoins as the latter's market dominance rose from 3.7% to 5.2% at the time<sup>24</sup>. Decentralised stablecoins, such as *LUSD*, are distinguished from centralised stablecoins in that they offer full transparency (on reserves) and they use smart contracts and algorithms to automatically manage the coin's supply. In light of the challenges faced by the industry and the growing demand for decentralisation, we anticipate further support for decentralised stablecoins in the near future. Prominent DeFi projects, such as *Aave* and *Curve DAO*, are actively capitalising on this trend by developing their own decentralised stablecoins, which are set for public launch later this year.



The preceding discussion highlights the rapid progress of DeFi and its transformative potential in reshaping the financial sector. By implementing transparent and secure operating models, DeFi ensures fair treatment for all market participants, bringing robustness to the industry.

## Conclusion

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Against the backdrop of a changing global economic landscape, traditional finance systems are being challenged, forcing investors to seek new opportunities to protect themselves from market uncertainty.

As a result, crypto assets are increasingly finding a place in investors' portfolios, *bitcoin* in particular. Its decentralised architecture, transparency and open-source technology make it impervious to manipulation, from centralised or malicious forces, setting it apart from fiat currencies.

Additionally, DeFi has demonstrated its robustness and viability even during times of market stress. It not only proved to be more sustainable and reliable compared to CeFi equivalents, but also showcased its adaptability and potential to become a global standard in finance. As we navigate through this challenging macroeconomic landscape, it becomes evident that crypto assets will play a crucial role in fortifying portfolios.

"

This migration towards DeFi highlights the industry's adaptability and strong potential to eventually become a global standard."



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

### Associated projects:



Bitcoin



Uniswap



Lido



USDC



# From Physical Assets to Digital Assets



Image: PixelPlex

Blockchain technology and the crypto industry are spearheading the current phase of society's ongoing digital transformation, which global financial institutions are joining in increasing numbers. It's for this reason we expect crypto to deliver structural benefits in 2023, namely through the tokenisation of financial and real world assets (RWA).

Tokenisation is disrupting the investment world, enabling the conversion of assets into tokens stored and traded on blockchains.

It's already unlocked the possibility of fractional ownership and trading of what would be illiquid assets otherwise. Blockchain's transparency, security and efficiency will overhaul the investment landscape for the benefit of investors, allowing them to diversify their portfolios in ways that were previously unimaginable.

Whilst large corporations are already exploring the potential of tokenisation, there are challenges to overcome. Regulatory hurdles once again must be addressed, while consensus on standardisation and interoperability rails across different blockchain platforms will be required. Follow on as we set out the fundamentals of tokenisation and its benefits, going on to unearth real world examples.

## The Fundamentals of Tokenisation

While crypto isn't short on critics, there's growing belief the industry is closing on a critical transformation that will attract billions of users, generating trillions of dollars in value in the process. A key driver of this transformation is tokenisation, arguably crypto's "killer use case".

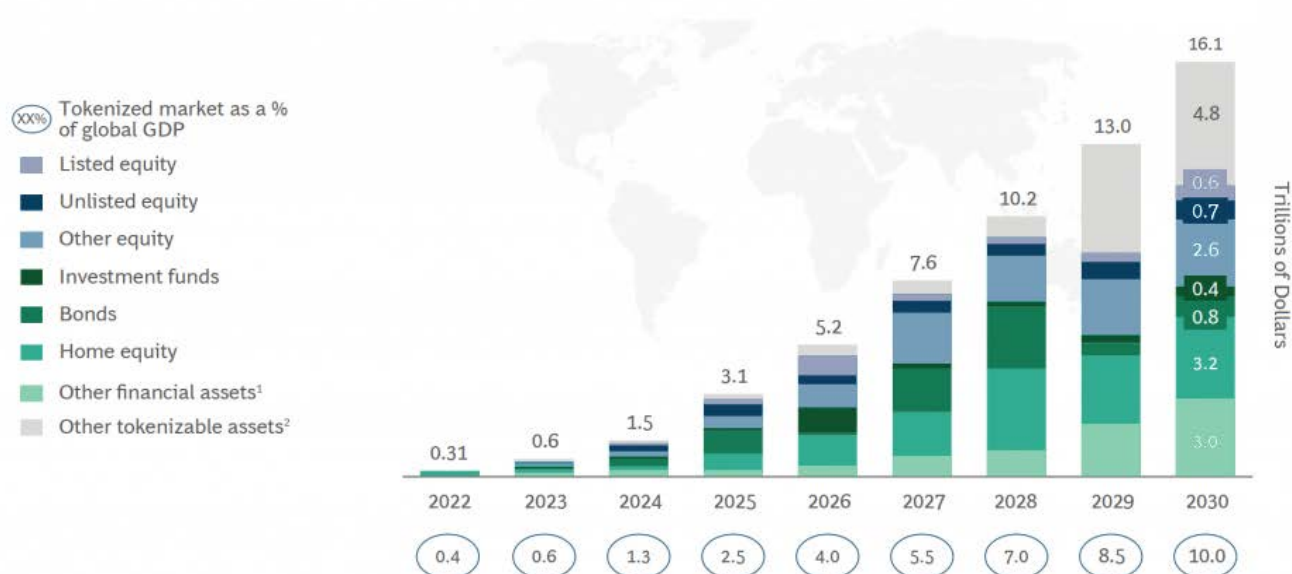
Governments and private industry have moved from simply investigating the benefits of this technology to testing and implementing it in the real-world, suggesting this innovation will thrust crypto into mainstream society, truly.

Tokenisation is a groundbreaking concept that uses blockchain technology to create digital tokens representative of any RWAs, including but not limited to precious metals, carbon credits, real estate, equities and even cars. The traditional financial system comprises over US\$610 trillion worth of assets<sup>25</sup>, many of which are locked and difficult to trade being illiquid in nature. Tokenisation of such assets brings them on-chain, creating market environments that are more flexible, accessible and investor-accommodating. Here, crypto serves as a bridge to these assets in the real world,

proving the broad application and wider benefits of crypto to a much wider audience.

Current projections for tokenisation's growth are staggering. Boston Consulting Group estimates that the cumulative value of tokenised assets could reach US\$16.1 trillion by 2030<sup>26</sup>, primarily driven by financial assets, home equity, and other assets such as infrastructure projects, car fleets, and patents. Citi shares this bullish outlook, forecasting that tokenisation could grow by a factor of 80x, reaching nearly US\$4 trillion in value by 2030<sup>27</sup>. As the adoption of tokenisation increases and more assets become digitised, the potential for unlocking previously untapped value and liquidity in the market is enormous – the way we view and interact with assets could be revolutionised.

### Tokenisation of Global Illiquid Assets



**Boston Consulting Group estimates that the on-chain asset tokenization opportunity could reach a staggering US\$16.1 trillion by 2030.** (Source: BCG)

## Revolutionising the Investment Landscape

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Despite its infancy, tokenisation has already taken hold. It's seen previously illiquid assets fractionalised, rendering them easier and cheaper to buy and sell in a similar fashion to equities. This has brought everyday investors to markets formerly off limits to them. With this in mind, it is worth digging deeper into the accessibility, cost efficiency and transparency benefits of tokenisation that are levelling the investment playing field.

### Accessibility

Tokenisation has allowed for greater accessibility, making traditionally illiquid assets more available to a wider range of investors. More shares of an asset can be easily created as digital tokens, allowing ownership of an asset to be split across more holders.

We are seeing this already in real estate investment. For example, if a house is worth \$1 million and an individual only has \$10,000 to invest, they can purchase 1% ownership of the house through digital tokens rather than having to raise the full \$1 million. This opens up options for investors to diversify their portfolio by investing smaller amounts in multiple properties rather than having to invest large amounts in a single property. In addition, tokenisation can potentially increase liquidity for the asset by creating

a market for trading the tokens, allowing investors to easily buy and sell their fractional ownership in the house. The upshot is a more fluid and accessible housing market.

Hamilton Lane, a global investment firm managing over US\$800 billion in assets, brought these virtues to life, announcing its plans to tokenise three of its private equity funds using the *Polygon* blockchain and in partnership with Securitize<sup>28</sup>. Not only did tokenisation of the (US\$2.1 billion) Equity Opportunities Fund V slash the minimum investment requirement from US\$5 million to US\$20,000, but it admitted individual investors who were excluded prior. Hamilton Lane's tokenisation strategy is a win-win for all concerned: individual investors can enjoy the same investment opportunities once reserved for institutions, which in turn increases the investment firm's total addressable market.

### Cost Efficiencies

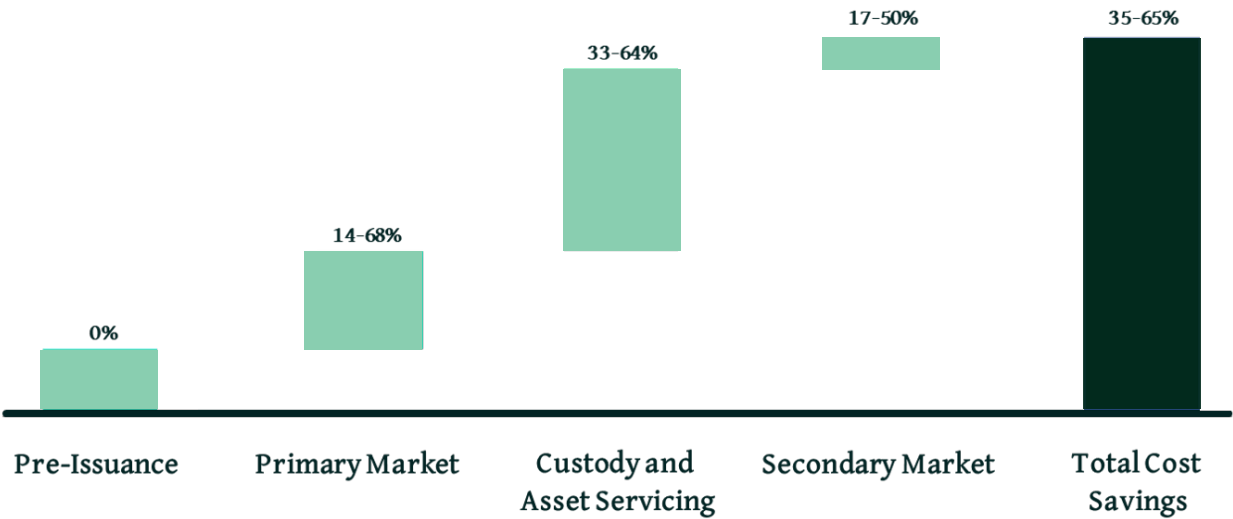
The tokenisation of assets has the potential to reduce the costs associated with trading and managing assets by eliminating intermediaries such as lawyers and custodians who typically charge high transaction fees and administrative costs. This could make more investment classes accessible to investors who have been previously excluded due to the high costs involved.

Tokenisation removes these intermediaries, making for faster and more cost-effective transactions, thanks to blockchain technology. Its operating mechanisms ensure transactions are settled securely, transparently and immutably – guarantees that would typically come at (high) cost courtesy of services provided by these intermediaries.

Another cost-saving from tokenisation can be found in issuing securities. Siemens, the German industrial conglomerate, raised €60 million (~US\$66 million) by issuing its first digital bond on the *Polygon* blockchain in

February 2023<sup>29</sup>. The bond was issued through a smart contract that automated the bond’s terms, ensuring that they were executed in a secure and transparent manner. The result was a streamlined bond issuance process, showing less administrative burdens, costs and increased interest from new investors. According to a study conducted by Cashlink and Finoa, the tokenisation of issuance could decrease expenses by as much as 65%<sup>30</sup> throughout the entire issuance market value chain.

Tokenisation Savings Potential in %



Research conducted by Cashlink and Finoa suggest that tokenisation can reduce costs by up to 65% across the entire issuance market value chain. (Source: Finoa)

## Transparency

Representing assets as tokens on a blockchain provides unfettered public access to transactional information such as ownership and asset transfers. This transparency helps to mitigate the risk of fraud and manipulation, as all parties can verify the legitimacy of transactions. Additionally, investors can monitor their investments directly, without intermediaries, enhancing their confidence in the transaction process. The increased transparency can also result in more efficient pricing of assets, as market participants have greater access to information that will subsequently be reflected in a truer asset value.

## Tokenisation in Action

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Despite achieving early success, decentralised finance (DeFi) has encountered scaling obstacles due to its yield generation mechanism. Users typically earn yield through activities such as yield farming or lending their crypto for rewards. The issue lies in the closed-off nature of the system, whereby the yield is generated from crypto activities and then re-invested elsewhere within the ecosystem (e.g. using crypto as collateral for a loan to purchase more crypto).

These activities generate yield in a bull market but can rapidly lead to a negative feedback loop when asset prices and activity declines (such as in 2022). Yields in the traditional financial system (~5% from U.S. Treasuries) are now higher than from existing DeFi protocols (~2% from DeFi lending).

RWAs serve as the foundation for lending and yield generation in traditional finance, but, their presence on DeFi is still relatively uncommon. Integrating RWAs on-chain could unlock sustainable and low-volatility yields that have not yet been achieved in DeFi. In recent years, the demand for stable income on-chain has fueled the growth of protocols that generate yield from RWAs. Stablecoins, credit platforms, and synthetic assets are among the solutions facilitating this progression.



## Stablecoins

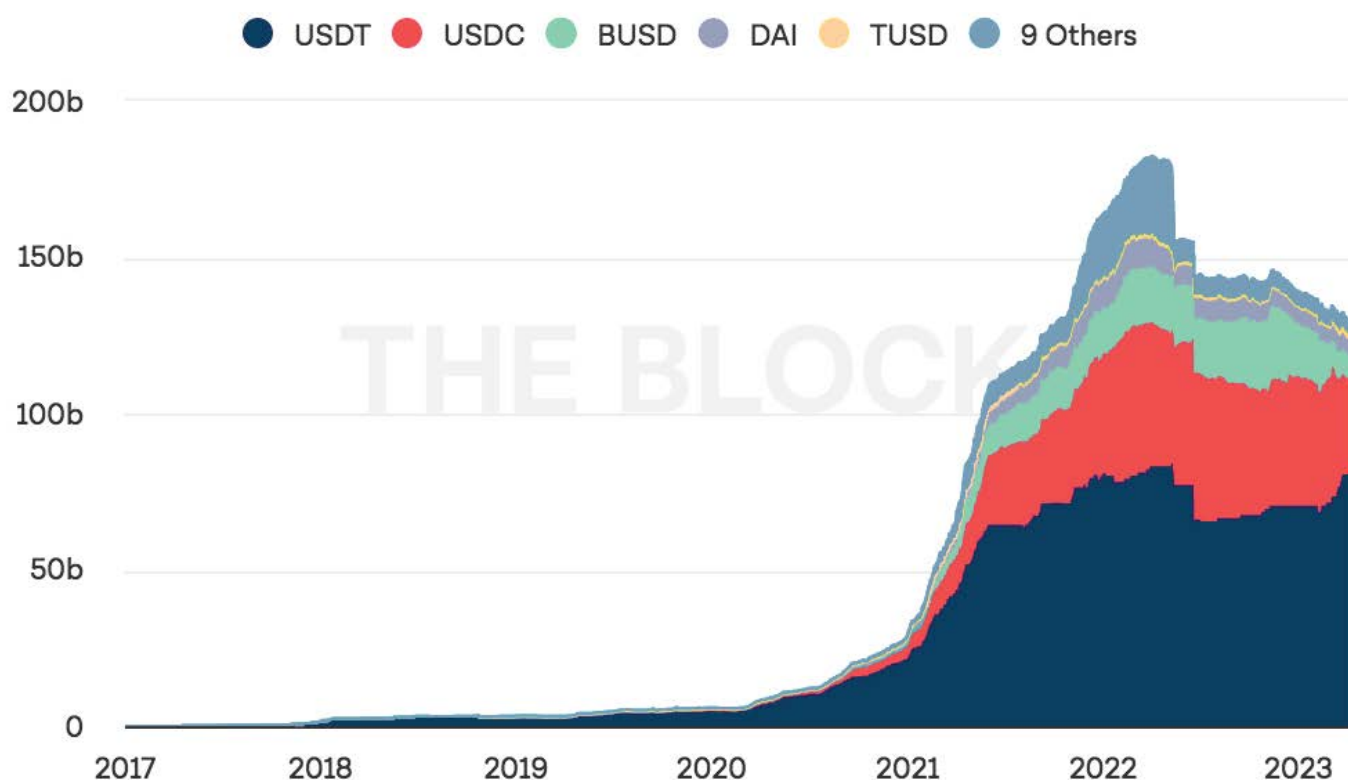
Stablecoins have played a crucial role in the development of crypto, being the first manifestation of RWAs on blockchains.

The supply of stablecoins has skyrocketed to over US\$129 billion<sup>31</sup>, up from less than just US\$6 billion at the start of 2020.

Stablecoins are assets designed to maintain a price pegged to the value of an external asset, such as the U.S. dollar.

The most common stablecoin implementation sees a centralised institution issue a token that is collateralised by the U.S. dollar held off-chain, effectively tokenising the U.S. dollar. However, they are not without trade-offs, specifically because token holders must place trust in the centralised actor to conduct itself in good faith and follow prudent business practice, which isn't always the case.

### Total Stablecoin Supply

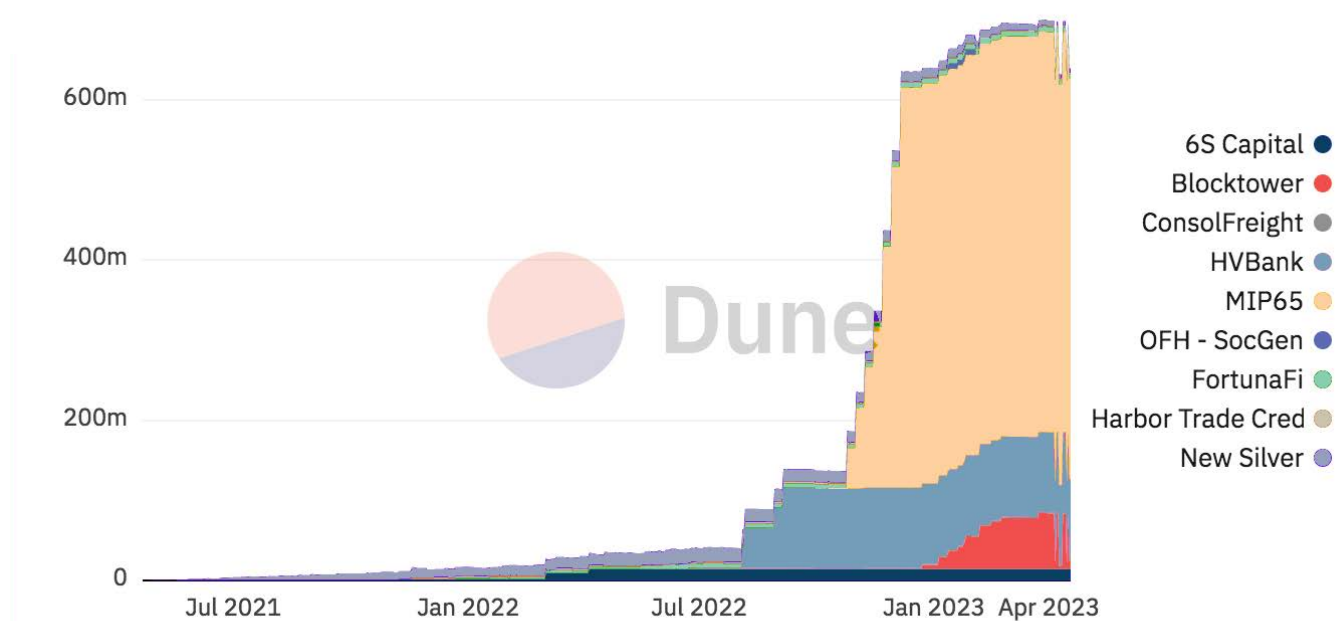


The supply of stablecoins have exploded over the past few years, with over US\$129 billion currently in circulation, up from less than US\$6 billion in 2020. (Sources: The Block, Coin Metrics, CoinGecko)

These concerns have prompted a growth in decentralised stablecoins, such as *MakerDAO's DAI* stablecoin. Instead of being backed exclusively by fiat currency, *DAI* is backed by a diversified pool of assets including *ether*, stablecoins, RWAs and more. This allows *DAI* to maintain its U.S. dollar peg at scale and *MakerDAO* to earn revenue on collateral that would otherwise

be sitting in lower yielding assets. *DAI* is now backed by over US\$600 million in RWAs which contribute to over 56% of *MakerDAO's* revenue<sup>32</sup>. The lion share of *DAI's* collateral comes in the form of U.S. treasury bonds managed by Monetalis (MIP65) with the remainder in commercial loans to institutions such as Société Générale and Huntington Valley Bank (HVB).

### Composition of DAI Stablecoin RWA Exposure



**MakerDAO's decentralised stablecoin DAI is backed up over US\$600 million in RWAs which contribute to over 58% of their revenue.** (Source: Dune)













## Lending Protocols

Crypto lending represents one of the most dynamic segments within the crypto market. Responsible for its rise are the DeFi protocols that allow users to lend to and borrow from one another (free of intermediaries). Demand for such facilities is evident in the presence of 4 lending

protocols in the top 10 DeFi protocols (Aave, MakerDAO, JustLend, Compound Finance). The quartet hold over US\$22 billion in Total Value Locked (TVL)<sup>33</sup> – a metric used to measure the total value of assets deposited within DeFi protocols (and a proxy for network growth and adoption).

### Top 10 Decentralised Finance Protocols by Total Value Locked.

Name	Category	1d Change	7d Change	1m Change	TVL	Mcap/TVL
1  Lido 5 chains	Liquid Staking	+1.75%	+1.71%	+11.66%	\$11.98b	0.15
2  MakerDAO 1 chain	CDP	+0.10%	-1.61%	-2.07%	\$7.44b	0.08
3  AAVE 7 chains		+0.28%	+1.09%	-2.22%	\$5.32b	
4  Curve 12 chains	Dexes	+0.70%	-2.31%	-4.13%	\$4.43b	0.17
5  Uniswap 6 chains		-0.08%	-0.81%	+5.13%	\$4.13b	1
6  JustLend 1 chain	Lending	+0.95%	+3.23%	+3.64%	\$3.82b	0.06
7  Convex Finance 3 chains	Yield	+0.15%	-21.02%	-28.62%	\$2.65b	0.15
8  Coinbase Wrapped S... 1 chain	Liquid Staking	+1.96%	+1.85%	+6.30%	\$2.27b	
9  PancakeSwap 3 chains		+2.05%	-4.97%	-12.11%	\$2.18b	
10  Instadapp 1 chain	Services	+0.79%	+0.50%	+4.55%	\$2.13b	0.01

Of the top 10 DeFi protocols, 4 focus exclusively on lending activities and have a combined Total Value Locked (TVL) of over US\$22 billion. (Source: DeFi Llama)

While big hitters in the ecosystems, crypto lenders pose issues to borrowers, namely overcollateralisation. This refers to the practice of requiring borrowers to deposit collateral worth more than the value of the loan they're seeking. For example, a borrower seeking a 10 *ETH* might need to provide 20 *ETH* worth of *USDC* as collateral (*USDC* is a stablecoin). Designed to protect lenders from defaults, overcollateralisation is neither efficient nor accessible for hopeful borrowers lacking the capital to meet collateral requirements. This *favouring-the-rich* dynamic jars with crypto's ethos of accessibility and equality.

Enter RWA-based lending platforms with a solution – the extension of undercollateralised loans. Typically, the borrowers are real businesses with less risk attached so under collateralization is viable, whereas overcollateralisation is necessary for higher risk borrowers, such as speculative investors seeking leverage. With over US\$4 billion in loans originated (cumulative)<sup>34</sup> by all RWA protocols such as *Maple*, *TrueFi* and *Goldfinch*, these credit platforms are still developing, but show real promise in supporting the maturation of DeFi overtime.

## RWA Protocols

Compare KPIs across major and upcoming RWA protocols.

Protocol	Network	Total Loans	Active Loans	Avg. Base APY	Avg. Rewards APY	Cash Drag	Defaulted Loans Amount	Fees Earned	Token MCap
Centrifuge	Ethereum	\$355,420,895	\$194,266,208	9.13%	2.85%	0.91%	\$8,677,302	\$0	\$93,858,189
Maple	Ethereum	\$1,797,966,972	\$136,109,266	8.25%	0%	0.00%	\$48,405,788	\$3,686,104	\$56,460,050
Goldfinch	Ethereum	\$113,029,773	\$103,754,399	11.06%	5.26%	0%	\$0	\$1,862,512	\$27,800,129
Credix	Solana	\$35,458,286	\$32,708,286	13.99%	0%	0.56%	\$0	\$284,396	\$0
TrueFi	Ethereum	\$1,736,195,553	\$19,647,119	2.06%	0%	32.46%	\$4,437,820	\$4,125,898	\$62,623,911
Clearpool	Ethereum	\$150,787,292	\$7,971,620	6.91%	3.32%	22.28%	\$0	\$248,564	\$15,069,168
HomeCoin	Ethereum	\$7,955,966	\$6,160,577	5.92%	11.49%	3.08%	\$0	\$36,064	\$614
Ribbon Lend	Ethereum	\$55,647,465	\$38	0.01%	68.30%	99.95%	\$0	\$0	\$107,908,435
Clearpool	Polygon	\$80,674,770	\$0.02	0.00%	5.12%	100.00%	\$0	\$248,564	\$15,069,168

RWA-based crypto lending platforms have provided over US\$4 billion in loans over time to businesses operating in various sectors, including real estate, fintech, consumer, and carbon projects. (Source: [www.rwa.xyz](http://www.rwa.xyz))

## Synthetic Assets

A (synthetic asset) synth is simply a tokenised derivative that mimics the value of another asset. Imagine that you wanted to trade Apple stock without holding \$AAPL. Using a synth, you can trade a tokenised version of Apple instead, which behaves like the underlying asset.

In February 2023, Swarm Markets, a crypto exchange announced the launch of tokenised U.S. stocks and bonds on the *Polygon* blockchain<sup>35</sup>. These synths provide investors with new possibilities, such as price exposure to Apple, or the ability to use it as collateral to borrow *USDC* from a lending protocol.

The possibilities of synthetic assets go beyond the traditional financial markets (stocks, commodities, currencies). Blockchain can accommodate synth markets of tokenised carbon credits for example; infinite markets and new combinations of sources of value can be raised, establishing new and innovative methods of generating on-chain yield.

## Looking Forward

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While tokenisation shows potential in revolutionising the investment landscape, there are still challenges to overcome. The lack of a regulatory framework, or even rules and guidelines for tokenisation is pertinent. Additionally, there is a need for standardisation and interoperability of tokenisation mechanisms across different blockchain platforms to avoid compatibility issues and encourage adoption. Tokenisation can also present security concerns, such as the risk of hacks and attacks.

While the challenges are not to be underestimated, we believe its potential will see tokenisation becoming foundational in finance in the years to come. It has the latent power to unlock significant value, promote liquidity flows in markets and create a more inclusive investment landscape. With the projected exponential growth of on-chain asset tokenisation over the next decade, the potential impact of tokenisation on the financial industry cannot be ignored.

## Conclusion

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The transformation of physical assets into digital assets through tokenisation is a groundbreaking development that is changing the investment landscape. The potential benefits of tokenisation, including accessibility, cost efficiency, and transparency are driving its adoption, with leading players in the industry already engaging the sector ahead of exponential growth in the space.

While there are challenges to overcome, the potential for unlocking significant value and liquidity in the market is enormous. As tokenisation continues to evolve, it has the potential to revolutionise the way we view and interact with assets in the financial world.

"

Tokenisation has the latent power to unlock significant value, promote liquidity flows in markets and create a more inclusive investment landscape.



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

### Associated projects:



Polygon



MakerDAO



Aave



Maple



# Balancing Innovation and Protection



Over the past few years, the crypto industry has evolved at a rapid clip. The growth has brought with it increased scrutiny from regulatory bodies and law enforcement agencies, particularly in the United States. Fast forward to 2023, the crypto market is currently experiencing a significant crackdown with several leading firms facing charges for allegedly violating securities laws.

The crackdown follows a slate of crypto bankruptcies last year, with regulators taking a 'no stone left unturned' approach, scrutinising staking providers, exchanges, centralised service providers and even banks. While some jurisdictions such as the European Union have been more

progressive in regulation, approving landmark crypto proposals<sup>36</sup>, the U.S. remains behind the curve. A lack of consensus on the regulatory framework among federal agencies and elected officials only makes matters worse, while crypto companies are calling for regulatory clarity.

The ongoing argument over crypto token classification – whether they are securities or commodities – dominates the regulatory discussion in the U.S. This debate could slow or stunt the industry's progress and development. Therefore, it is essential the U.S. implements clear regulation, quickly, which protects investors and users without quashing industry innovation.

## Crypto Firms Face Regulatory Scrutiny

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The appointment of Gary Gensler to Chair of the U.S. Securities and Exchange Commission (SEC) was seen as a boon to the crypto industry in 2021. Gensler was considered to be open-minded and receptive about the future of crypto assets, recognising the role enlightened regulators can play in boosting innovation. Gensler instead became one of the crypto industry's foremost detractors, regularly talking about the dangers of the asset class, placing it in the regulatory crosshairs of the SEC.

In 2022, the SEC charged 79 defendants or respondents in crypto asset enforcement actions, representing over 60% of all crypto-related actions since 2013<sup>37</sup>. This SEC hasn't stopped in 2023, issuing Wells Notices to companies including Coinbase to investigate alleged breaches of securities laws. While the SEC has announced settlements with several firms, including crypto exchange Kraken and crypto exchange and lending platform Nexo, it still remains to be seen whether New York trust company Paxos, and Terraform Labs would opt to settle or challenge the regulator over alleged violations of securities laws.

While enforcement action ramps up, the prospect of clearer regulations and legal frameworks appear no closer. The resulting operating environment has become hostile and continues to plague market participants, limiting growth potential in the sector.

In the U.S., the two primary regulatory agencies that may have authority over crypto assets are the SEC and the Commodity Futures Trading Commission (CFTC). However, it's not clear which has the primary mandate to regulate crypto, adding to confusion amongst market players as to which body they should report to and take direction from.

## Regulatory Ambiguity Clouds the Industry

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The SEC is responsible for regulating the securities market in the United States. To determine what qualifies as a security the SEC runs the Howey test, which comprises four elements; if all are met the asset's deemed a security. The elements are: whether there is an investment of money, whether the investment is in a common enterprise, whether there is an expectation of profits, and whether those profits come solely from the efforts of others.

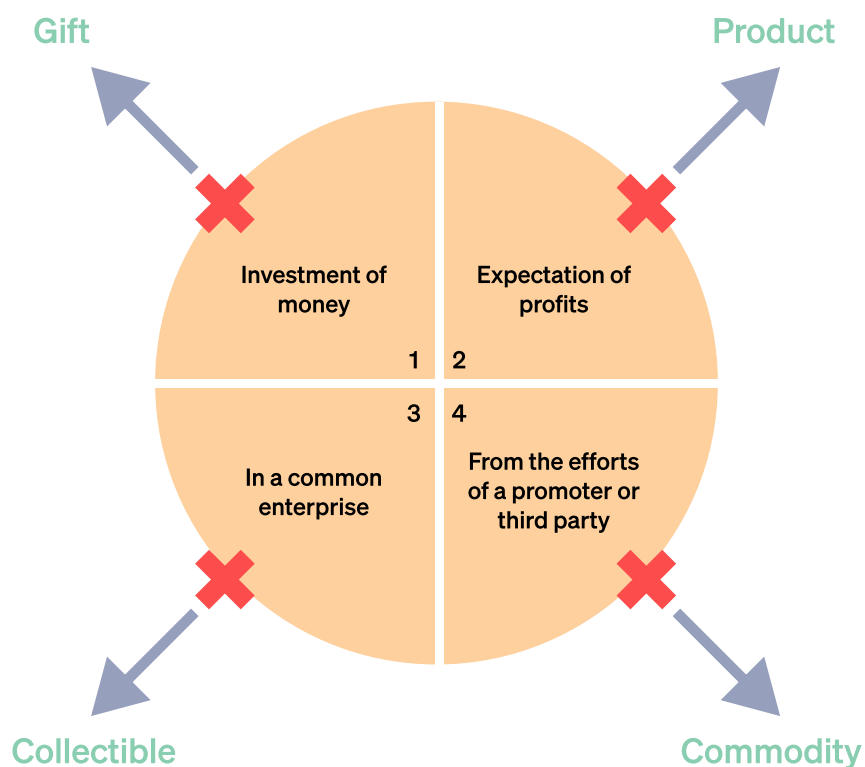
Established by the Supreme Court in 1946 in the context of traditional investments, the Howey test fails to account for crypto's unique characteristics, proving it an insufficient regulatory tool in a crypto context – it's a square peg in a round hole. The lack of considered regulation is cause for concern among experts and industry participants, who argue that regulation by the Howey test could hinder innovation and investment in crypto.



In 2018, then-Director of Corporate Finance for the SEC stated that neither *bitcoin* nor *ether* were securities<sup>38</sup>. This was seemingly echoed by then SEC Chair Jay Clayton in 2019<sup>39</sup>. However, SEC Chair Gensler, recently indicated that everything other than *bitcoin* are securities<sup>40</sup>. Not long after and somewhat confusingly, the CFTC discounted Gensler, declaring that *bitcoin*, *ether* and *litecoin* were commodities that fell under its purview<sup>41</sup>.

Further ambiguity came during Gensler's testimony in front of Congress on April 18, 2023. Facing questions on the crypto market, Gensler evaded a Congressman Patrick McHenry's query as to whether *ether* is a security or not, stumbling over words in his convoluted response. This only added to the regulatory mystery and uncertainty in the industry.

#### The 'Howey Test' for an 'Investment Contract'



**The Four Prongs of the Howey Test.** (Source: Nickgrossman.xyz)

## The High Cost of Regulatory Ambiguity

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The regulatory crackdown in the United States is taking a toll on the industry. Crypto firms including miners, exchanges and lenders are turning more cautious about conducting business stateside. DeFi protocol, credit platform Aave, is an example having restricted U.S. users from accessing its products due to the regulatory ambiguity<sup>42</sup>.

Restricting U.S. users from participating in DeFi contradicts the core principle of it, which is to provide access to an open and permissionless financial system for people around the world without exception.

The U.S. government's crackdown on the crypto asset industry could have severe consequences for American interests. By taking a hostile stance towards the crypto sector, the U.S. risks losing businesses and entrepreneurs to countries with more favourable regulatory environments, potentially causing a brain drain of talent and a loss of economic opportunities. This could also see other countries or jurisdictions such as Hong Kong and Dubai, who have rolled out the welcome mat to the crypto industry, gain a strategic and economic advantage over the U.S.

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...if we don't see that regulatory clarity emerge in the U.S. we may have to consider investing more elsewhere.”



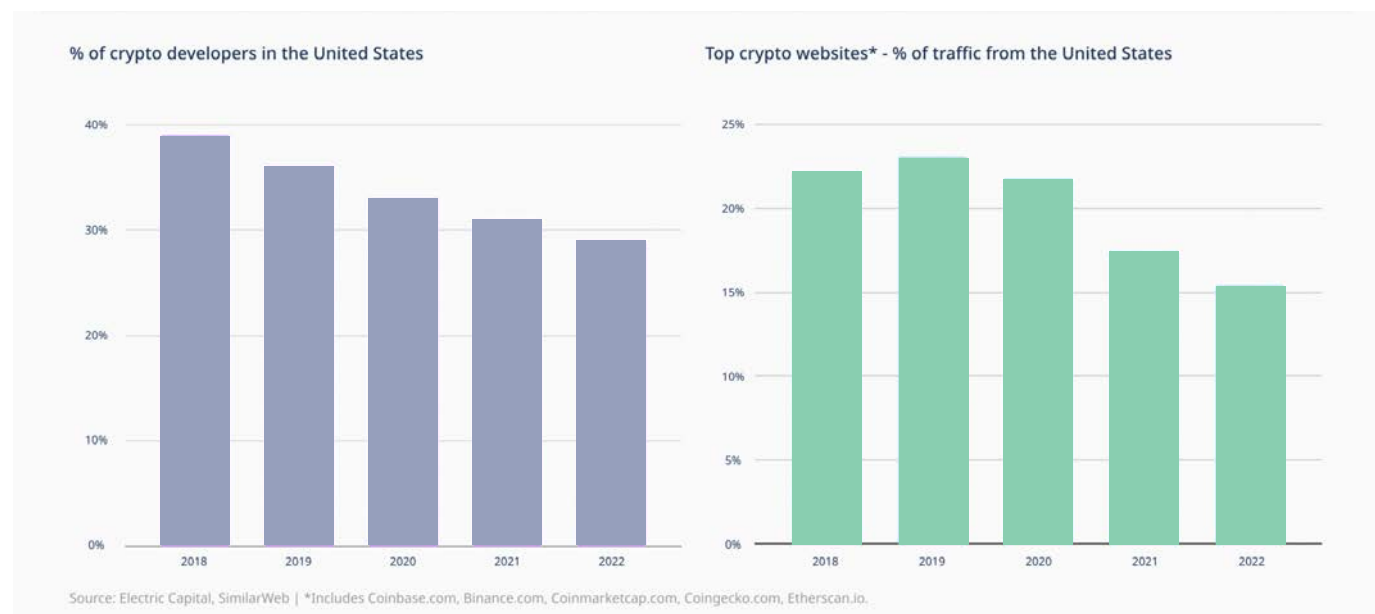
**Brian Armstrong**  
CEO of Coinbase



The exodus of crypto companies from the U.S. is already underway. In December 2022, crypto lender Nexo announced that it would phase out its products and services in the U.S.<sup>43</sup>, citing the lack of a clear regulatory path for blockchain businesses. Binance, the largest global crypto exchange, is also considering cutting ties with its U.S. business partners due to difficulties with banking partners and intense scrutiny from authorities<sup>44</sup>. Furthermore, research by Electric Capital suggests that the U.S. is rapidly losing crypto developers to more accommodating countries and jurisdictions<sup>45</sup>.

In April 2023, the world's second-largest crypto asset exchange Coinbase, hinted that it was considering moving away from the States with CEO Brian Armstrong proclaiming *"I think the U.S. has the potential to be an important market for crypto, but right now we are not seeing that regulatory clarity that we need. I think in a number of years if we don't see that regulatory clarity emerge in the U.S. we may have to consider investing more elsewhere in the world"*<sup>46</sup>. If regulators fail to clarify the rules of the road, Coinbase will not be the only leading U.S. crypto firm to consider brighter pastures anew.

### The U.S. is Losing its Lead in Web3



**The U.S. is already losing its advantage in crypto.** (Source: a16z)

## Crypto Firms Need Clarity to Thrive

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The regulatory obscurity in the crypto industry has been a major obstacle for crypto firms seeking to expand their services. Firms have often been left to navigate a regulatory minefield on their own, leading to legal disputes and increased compliance costs. This lack of clarity has also deterred traditional financial institutions from entering the crypto market, thereby limiting its potential for growth.

As the crypto industry continues to mature, the need for regulation has become more apparent and necessary to foster mainstream adoption. However, authorities must strike a fine balance, implementing legal frameworks that minimise risks to investors and participants, without suppressing the innovation that can see the sector realise its immense potential.

In the 1990s, the U.S. Congress established a regulatory framework for the internet through the Communications Decency Act of 1996. While far from perfect, it enabled a flexible regulatory environment that encouraged the growth of many technology companies. This approach paved the way for the U.S. to become a global tech hub, with giants like Microsoft and Amazon headquartering within its borders, reaping the economic benefits of this thriving industry.

Given the tech success story in the U.S., lawmakers should strive for a dual-purpose, legal framework that regulates the crypto industry to safeguard consumer interests and simultaneously encourages innovation and economic growth, onshore. Failure to do so could provoke users to engage offshore crypto entities that offer a more diverse suite of services, but lack the necessary consumer protections to limit potential losses, like those suffered following FTX's demise. If another similar instance came to pass, this could constitute regulatory negligence and oversight.

A clear regulatory framework will not only benefit crypto firms but also foster public trust and confidence, which is crucial for the industry's mainstream adoption. Greater clarity on regulations will provide investors with an understanding of the risks and benefits associated with the industry. Furthermore, legal disputes and compliance costs could decrease, allowing firms to focus more on innovation and expansion, for the better of all, rather than resource-intensive compliance. Ultimately, a comprehensive regulatory framework accommodating innovation and consumer protection is essential for the growth and success of the crypto industry.

## Conclusion

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It is clear that the regulation of crypto assets in the U.S. is a complex issue that requires careful consideration. However, we do not believe that regulation by enforcement is a sustainable path for the crypto industry. Policymakers must recognise that the benefits of crypto, like many emerging technologies, far outweigh the risks, so promoting responsible innovation is imperative.

By doing so, the U.S. can continue to lead the world in technological advancements and reap the economic rewards that come with it. Neglecting crypto regulation puts the U.S. at risk of losing out on this transformative technology and driving talented entrepreneurs to more welcoming environments. Law and policy makers must reconcile crypto's innovation and regulation in a fashion that ensures the U.S. is in the driving seat of this technological revolution.

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A clear regulatory framework will not only benefit crypto firms but foster public trust and confidence, which is crucial for the industry's mainstream adoption.”



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

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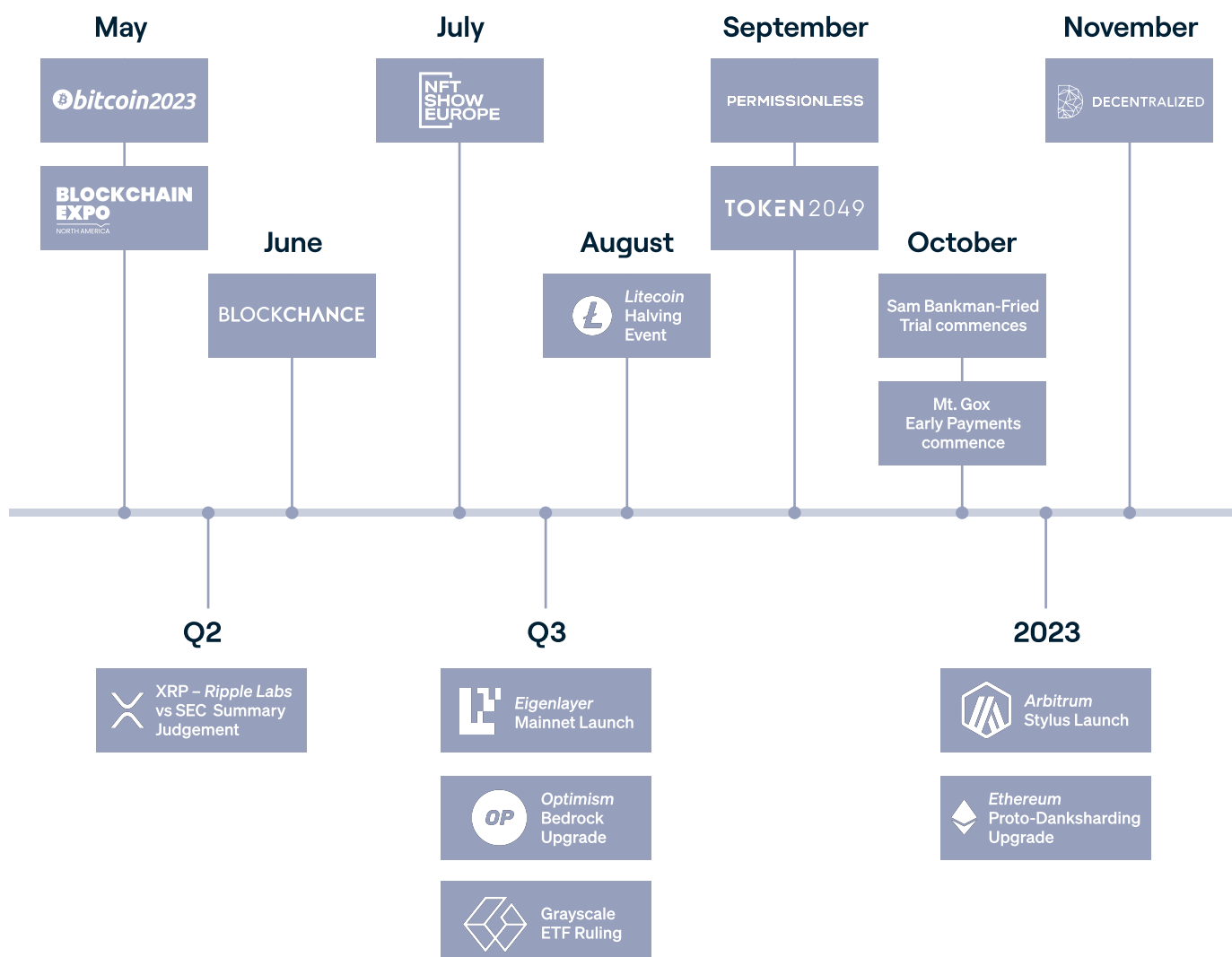
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# Crypto Calendar

As the crypto market continues to mature and evolve, keeping track of the latest developments and trends is essential for investors. We highlight some of the most significant developments in the crypto industry for the remainder of the year. From major platform upgrades and protocol improvements to new product launches and regulatory changes, these events could have a significant impact on the overall direction and sentiment of the market. Whether you're a seasoned crypto veteran or a newcomer to the space, this table provides a useful roadmap for navigating the dynamic and ever-changing world of crypto assets in 2023.



## Quarter 2 2023

Event	Est. Date	Type	Description
Blockchain Expo North America	May 17-18	Industry Event	The Blockchain Expo North America is a leading event that brings together industry experts, thought leaders, and innovators in the blockspace space.
<i>Bitcoin 2023</i>	May 18-20	Industry Event	<i>Bitcoin 2023</i> is a global conference that brings together experts and innovators in the Bitcoin and crypto asset space to discuss the latest advancements and opportunities in the ecosystem.
Blockchance 2023	June 28-30	Industry Event	Blockchance 2023 is a premier international conference focused on blockchain technology and its transformative potential. This event brings together industry leaders, entrepreneurs, investors, and experts to discuss the latest developments, trends, and innovations in the blockchain space.
XRP – <i>Ripple Labs</i> vs SEC Summary Judgement	Q2	Legal	The SEC vs <i>Ripple Lawsuit</i> is a high-profile legal battle between the US Securities and Exchange Commission (SEC) and <i>Ripple Labs</i> , the blockchain company behind the XRP crypto asset. The SEC alleges that <i>Ripple</i> conducted an unregistered securities offering through the sale of XRP, while <i>Ripple</i> maintains that XRP is a currency and not a security. The lawsuit has significant implications for the classification of crypto assets and could have a lasting impact on the regulatory environment for the industry. The summary judgement for the case is expected to be delivered in June, which could provide further clarity on the legal status of XRP and other crypto assets.

## Quarter 3 2023

Event	Est. Date	Type	Description
NFT Show Europe	July 14-15	Industry Event	The NFT Show Europe is a premier event focused on non-fungible tokens (NFTs), bringing together experts, collectors, and investors to discuss the latest trends and opportunities in the NFT space. The conference features keynote speeches, panel discussions, and workshops designed to provide valuable insights into the future of NFTs.
<i>Litecoin</i> – Halving	August 3	Technical Event	The <i>Litecoin</i> Halving event involves a significant reduction in the amount of new <i>Litecoin</i> that is created through mining rewards, as the issuance rate is cut in half. Following the halving, the new issuance rate for <i>Litecoin</i> will be reduced to 6.25 <i>Litecoin</i> per block. This reduction in supply has historically had an impact on the supply and demand dynamics of the crypto assets, leading to price appreciation.
Permissionless 2023	September 11-13	Industry Event	Permissionless 2023 is a leading conference focused on blockchain technology, bringing together industry leaders, developers, investors, and policymakers. Hosted by Blockworks, the event explores the decentralised, permissionless nature of blockchain technology through keynote speeches, panel discussions, and workshops, providing a valuable platform for networking and collaboration.
Token2049	September 13-14	Industry Event	Token2049 Asia is a premier conference focused on the crypto asset and blockchain industry in Asia, bringing together industry leaders, investors, and entrepreneurs to explore the latest trends and opportunities in the blockchain space. Hosted by Token2049, the event features keynote speeches, panel discussions, and workshops, providing valuable insights into the future of digital assets.

## Quarter 3 2023

Event	Est. Date	Type	Description
<i>EigenLayer</i> – Mainnet Launch	Q3	Product Launch	<i>EigenLayer</i> is a blockchain protocol that aims to address scalability and security issues facing many existing blockchain networks. The Mainnet Launch is expected to provide a solid foundation for the development of complex decentralised applications, leveraging <i>EigenLayer</i> 's unique consensus mechanism and scalability features. As a result, <i>EigenLayer</i> has the potential to drive innovation and adoption in the blockchain industry.
<i>Optimism</i> – Bedrock	Q3	Protocol Upgrade	<i>Optimism</i> , a Layer 2 scaling solution for <i>Ethereum</i> , is set to launch its Bedrock platform. Bedrock is designed to make it easy for developers and users to deploy decentralised applications on the <i>Ethereum</i> network. The platform includes a suite of developer tools and services, leveraging <i>Optimism</i> 's optimistic rollup technology to improve the scalability and usability of decentralised applications on the network. The launch of Bedrock is highly anticipated by the <i>Ethereum</i> community and is expected to be a major milestone for the project.
Grayscale Awaits Ruling on Proposed <i>Bitcoin</i> ETF Conversion	Q3	Legal	Grayscale Investments awaits a ruling on its proposed <i>Bitcoin</i> ETF conversion. If approved, Grayscale <i>Bitcoin</i> Trust (GBTC) would convert to an ETF, providing investors with another way to invest in <i>Bitcoin</i> . Approval of a <i>Bitcoin</i> ETF would be a significant milestone for the industry, increasing accessibility for traditional investors.



## Quarter 4 2023

Event	Est. Date	Type	Description
Sam Bankman-Fried Trial Commences	October 2	Legal	The upcoming legal proceedings of Sam Bankman-Fried, Former CEO of FTX exchange, will be a significant event for the crypto asset industry. Bankman-Fried recently pleaded not guilty to charges of fraud and other offences, and the outcome of this case is eagerly anticipated by market participants. If found guilty, it could have far-reaching implications for the regulation of the crypto asset market and could potentially impact investor sentiment. As a result, industry observers will be closely monitoring developments in this case.
Mt. Gox Early Payments Commence	October 31	Legal	Mt. Gox, once the largest exchange for crypto assets, declared bankruptcy in 2014 after being hacked for 850,000 <i>bitcoins</i> . The distribution of assets to creditors is a crucial aspect of the ongoing bankruptcy proceedings, overseen by the bankruptcy trustee. Mt. Gox recently announced an extension to the final payment deadline, which now falls in October 2023. Once the distribution of funds is finalised, the potential sale of the <i>bitcoins</i> by creditors could impact the market for crypto assets, including <i>bitcoin</i> .
Decentralised 2023	November 1-3	Industry Event	Decentralised 2023 will bring together top professionals and experts in the blockchain and crypto asset industry, including investors, developers, entrepreneurs, and thought leaders.

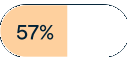

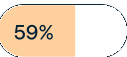
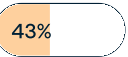
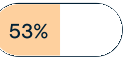



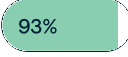
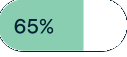
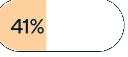
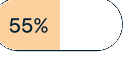
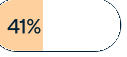
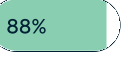
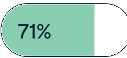
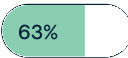


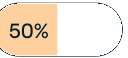

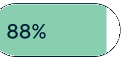
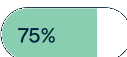
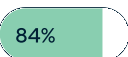
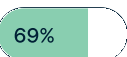

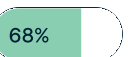
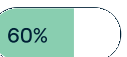
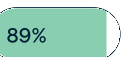
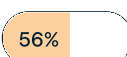
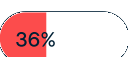
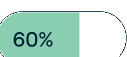
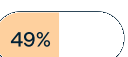
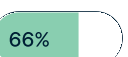

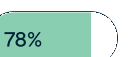
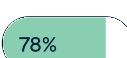
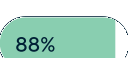
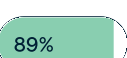

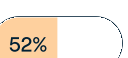
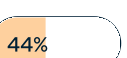

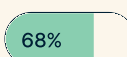
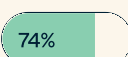
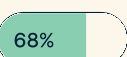
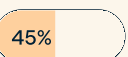
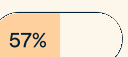

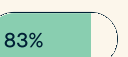
## 2023 Unspecified

Event	Est. Date	Type	Description
<i>Arbitrum – Stylus</i>	2023	Product Launch	Offchain Labs, the team behind <i>Arbitrum</i> , is set to launch a new programming environment called Stylus. This tool is designed to simplify the development of smart contracts on the <i>Arbitrum</i> rollup solution, providing a more user-friendly experience for developers. Stylus is expected to have a significant impact on the <i>Ethereum</i> network, making it easier for developers to build decentralised applications with improved scalability and reduced gas fees.
<i>Ethereum – Proto-Danksharding</i>	2023	Protocol Upgrade	Danksharding, an <i>Ethereum</i> improvement proposal (EIP 4844), is being developed by the <i>Ethereum</i> community to enhance the scalability of the <i>Ethereum</i> network. The technology aims to improve transaction processing efficiency by enabling nodes to work in parallel. Danksharding is expected to increase the <i>Ethereum</i> network's capacity, leading to faster transaction times and reduced gas fees for users. This development has generated excitement within the blockchain community, with many anticipating the positive impact that Danksharding will have on the <i>Ethereum</i> ecosystem.

## Sector Assessment

At Caleb & Brown, we recognise that the crypto market is still in its early stages and lacks established norms that can be found in traditional finance. To overcome this challenge, we have developed a systematic and disciplined approach to evaluate all crypto market sectors based on objective criteria.

Our crypto research team evaluates all 26 DACS industry groups<sup>49</sup> across 6 criteria: adoption, durability, maturity, potential, risk, and value capture<sup>50</sup>. Analysts assign a score for each of these criteria, ranging from 0 to 100%, with 100% representing the highest score. These industry group scores are then used to compute overall sector scores. With these scores we aim to offer insights into the dynamics of crypto sectors, which is crucial in the fast-evolving landscape.

	Currency	Smart Contract Platforms	Decentralised Finance	Culture & Entertainment	Computing	Digitisation	Stablecoin
Adoption							
Durability							
Maturity							
Potential							
Risk							
Value Capture							
<b>Overall Score</b>							

<sup>49</sup> Please refer to Appendix A. Sector/Industry Group Definitions for more detail.

<sup>50</sup> Please refer to Appendix B. Sector Rating Criteria for more detail.

## Our Views

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We are dedicated to providing comprehensive insights on the short and long-term prospects of all crypto sectors. Drawing on our extensive knowledge of fundamentals, protocol developments, and regulatory changes, we offer expert guidance for strategically positioning and capitalising on market catalysts in the dynamic world of crypto assets.

Our sector views are presented in a heatmap format, utilising a three-point scale (less favourable, neutral, or favourable) to succinctly capture our outlook for each industry group, both in the short-term (up to 12 months) and long-term (beyond 12 months). This enables our clients to gain a clear understanding of the market environment and identify investment opportunities within each sector.

## Currency

We believe that investors looking to hedge against macroeconomic uncertainty should consider allocating to the *Currency* sector. Select crypto assets within the *Transparent* industry group exhibit favourable characteristics such as supply caps, predictable inflation rates, and robust network security, providing a safe haven for investors seeking capital protection.

We believe that select crypto assets linked to established exchanges also appeal due to their favourable token economics, such as token burns and utility incentives, further strengthening the appeal of the sector. In anticipating demand for these resilient crypto assets to remain strong in the challenging macroeconomic climate, we recommend positioning portfolios to take advantage of these opportunities.

"

We believe investors looking to hedge against macroeconomic uncertainty should consider allocating to the Currency sector."



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

### Illustrative Sector Crypto Assets:



Bitcoin



XRP



Monero



OKB

## Smart Contract Platform

With *Ethereum's* proof of stake transition now fully complete, we recommend clients maintain a positive outlook on the ecosystem. The success of the landmark Shanghai upgrade reinforces the network's dominant position as the leading player in the hotly contested *Layer 1* space. It also strengthens the case for the *Layer 2* industry group, which we believe will garner robust support this cycle.

We anticipate a migration of users and projects from blockchains competing with *Ethereum* to solutions facilitating its scaling efforts. Key catalysts that are expected to drive significant interest in the *Layer 2* sector include anticipated token launches from leading zero-knowledge rollups, as well as upcoming product launches and/or network upgrades from industry-leading optimistic rollups, like *Arbitrum* and *Optimism*.

"

The success of the landmark *Ethereum* Shanghai upgrade reinforces the network's dominant position as the leading player in the hotly contested *Layer 1* space."



**Tommy Rogulj** CFA, CAIA  
Head of Crypto Research  
and Portfolio Manager

### Illustrative Sector Crypto Assets:



Ethereum



Arbitrum



Polkadot



Polygon

## Decentralised Finance

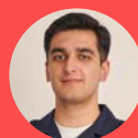
As the *Decentralised Finance* (DeFi) sector entered 2023 more battle-tested after successfully navigating numerous market stress events, we are upbeat on its near term prospects. This resilience has attracted institutional interest<sup>51</sup>, with increased experimentation in permissioned liquidity pools and tokenisation efforts expected later this year.

We are particularly optimistic about both *DAO* and *Credit Platform* industry groups, where leading projects have achieved product-market fit and are now expanding their established ecosystems with new offerings to strengthen their competitive advantages.

Additionally, we foresee strong support for the *Yield* industry group following *Ethereum's* Shanghai Upgrade in April 2023, which in our opinion will expedite the staking industry's adoption and participation. With JP Morgan projecting the staking industry to reach US\$40 billion by 2025<sup>52</sup>, we believe the leading projects will see significant growth in the years to come.

"

DeFi's resilience in 2022 has driven increased institutional interest, with further experimentation efforts expected throughout the year."



**Zain Khan**  
Crypto Research Analyst

### Illustrative Sector Crypto Assets:



Lido



Aave



GMX



Uniswap

## Culture & Entertainment

We see long term growth potential in the convergence of finance with culture and entertainment. Crypto technologies can give rise to innovative business models that promote fair(er) distribution of outcomes for participants; contributors such as content creators can expect greater financial rewards, which benefits content consumers who can expect higher quality content in return.

However, we believe that few projects within this sector have realised this vision being experimental, or even gimmicky, exhibiting poorly structured or unsustainable token economics. Our take may change as projects with definitive use cases, clearer token value accrual mechanisms, and stronger competitive moats appear.

Although we recommend clients to exercise caution and largely remain on the sidelines here, emerging trends including decentralised social media, which aims to upend traditional platforms by rebalancing revenue distribution and enabling user data ownership, have piqued our interest. In the *Metaverse* industry group, we observe a growing focus on sustainable token economics, and an emphasis on developing engaging games, moving away from merely incorporating NFTs into mediocre gaming experiences.

“

Few projects have realised the vision of promoting fairer outcomes for participants, but this may change as stronger projects emerge.”



**Patrick Holyoake**  
Junior Crypto  
Investment Analyst

### Illustrative Sector Crypto Assets:



Immutable



Theta



The Sandbox



Illuvium



## Computing

The crypto industry's heavy reliance on centralised cloud computing was underscored in November 2022, when *Layer 1* blockchain Solana's main service provider abruptly ceased services for Solana node operators, taking them offline. This incident served as a warning for the industry, emphasising the importance of reducing dependence on centralised infrastructure and transitioning to decentralised physical infrastructure.

Consequently, we maintain a positive view on the *Storage Network* industry group, specifically decentralised file storage protocols offering long-term data storage and archiving solutions. As the crypto market continues to mature, these protocols are expected to benefit from a shift away from centralised equivalents.

Elsewhere, we are optimistic about the *Oracle* industry group, which comprises protocols responsible for bringing data on-chain to protocols from off-chain sources. As the demand for DeFi services grows, demand for data on-chain will rise commensurately. To that end, oracles would enjoy increased appetite for their services, which could spur on higher valuations over the coming decade.

"

The incident with Solana's main cloud computing provider underscored the importance of reducing reliance on centralised services in the crypto industry."



**Sean Donaghey**  
Crypto Research Analyst

### Illustrative Sector Crypto Assets:



Chainlink



Filecoin



Arweave



Render Token

## Digitalisation

We maintain a neutral position on the frontier *Digitalisation* sector, which focuses on bringing real-world documents, contracts, public names, and more to blockchains. A key challenge for mass adoption of blockchain technologies has been accessibility and the user experience.

While certain projects within the sector, particularly those centred around on-chain identity, show promise, many others are yet to achieve product-market fit, display weak token accrual mechanisms and lack significant user traction. As such, we advise clients to exercise caution and conduct thorough due diligence when considering investments in this emerging sector.

"

A key challenge for mass adoption of blockchain technologies has been accessibility and the user experience."



**Sean Donaghey**  
Crypto Research Analyst

### Illustrative Sector Crypto Assets:



Ethereum  
Name Service



Braintrust



Medibloc



Galxe

## Stablecoin

*Stablecoins* have long been hailed as the breakthrough innovation of the crypto asset industry, offering stability, accessibility and faster, cheaper transactions. However, recent events have demonstrated that even these seemingly infallible assets are not immune to vulnerabilities. The *USDC* unpegging crisis caused by the collapse of Silicon Valley Bank in 1Q23 shook the industry and led to a crisis of confidence among users reliant on stablecoins for stability and ease of use.

While we remain positive on *Fiat-Backed Stablecoins* and see them coming out the other side of this crisis stronger and battle-tested, we are cognisant of the challenges, particularly regulatory ones, facing stablecoin operators. In light of recent developments, we have witnessed renewed demand for *Crypto-Backed Stablecoins*, less dependent on centralised intermediaries to custody collateral. In the event of further economic deterioration, we would expect to see uptake of these assets increase as investors seek out alternatives.

"

Stablecoins have been hailed as the breakthrough innovation of crypto, but recent events have shown that these seemingly infallible assets aren't immune to vulnerabilities."



**Zain Khan**  
Crypto Research Analyst

### Illustrative Sector Crypto Assets:



Tether



USDC



DAI



USDD

## Our Views

● More Favourable
 ● Neutral
 ● Less Favourable

Sector	Industry group	Shorter term	Longer term
Currency	Blockchain as a Service (BaaS)	<span style="color: gray;">●</span>	<span style="color: gray;">●</span>
	Private	<span style="color: red;">●</span>	<span style="color: gray;">●</span>
	Transparent	<span style="color: green;">●</span>	<span style="color: green;">●</span>
Smart Contract Platforms	Layer 0	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Layer 1	<span style="color: green;">●</span>	<span style="color: gray;">●</span>
	Layer 2	<span style="color: green;">●</span>	<span style="color: green;">●</span>
Decentralised Finance	Asset Management	<span style="color: red;">●</span>	<span style="color: gray;">●</span>
	Atomic Swaps	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Credit Platform	<span style="color: green;">●</span>	<span style="color: green;">●</span>
	DAO	<span style="color: green;">●</span>	<span style="color: green;">●</span>
	Derivatives	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Exchanges	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Insurance	<span style="color: red;">●</span>	<span style="color: gray;">●</span>
	Yield	<span style="color: green;">●</span>	<span style="color: green;">●</span>
Culture & Entertainment	Art	<span style="color: red;">●</span>	<span style="color: gray;">●</span>
	Media	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Metaverse	<span style="color: red;">●</span>	<span style="color: green;">●</span>
Computing	Internet of Things (IoT)	<span style="color: red;">●</span>	<span style="color: gray;">●</span>
	Oracle	<span style="color: green;">●</span>	<span style="color: green;">●</span>
	Private Computing	<span style="color: gray;">●</span>	<span style="color: gray;">●</span>
	Shared Network	<span style="color: gray;">●</span>	<span style="color: gray;">●</span>
	Shared Storage	<span style="color: green;">●</span>	<span style="color: green;">●</span>
Digitalisation	Digitalisation	<span style="color: gray;">●</span>	<span style="color: gray;">●</span>
Stablecoin	Fiat-Backed Stablecoin	<span style="color: green;">●</span>	<span style="color: green;">●</span>
	Crypto-Backed Stablecoin	<span style="color: gray;">●</span>	<span style="color: green;">●</span>
	Algorithmic Stablecoin	<span style="color: red;">●</span>	<span style="color: gray;">●</span>

# Playbook

To help investors succeed in the complex landscape of the crypto market, we have developed a playbook, presented in the accompanying matrix, that guides investment strategy depending on the specific stage of the crypto market cycle. This approach enables investors to anticipate market shifts and stay ahead of the curve, capitalising on emerging trends and mitigating potential risks.

Drawing parallels with traditional markets, our playbook resembles how certain sectors tend to outperform at different stages of the business cycle. By applying a similar strategy to the crypto market, investors can take advantage of the unique opportunities presented by the cyclical nature of this asset class.

At present, we find ourselves in the Accumulation Phase of the crypto cycle. As we discussed in *Crypto Market Cycles*, this stage is characterised by a few critical features that investors should be aware of:

- The market may bounce off prior cycle lows, indicating a potential bottom, but it might struggle to establish a clear direction in the short term.
- Market sentiment remains relatively low, and investors often seek safety in assets that offer stability or perceived value.
- Trading volume and price volatility tend to be relatively low as the market begins to establish a base for the next bull run.

There are clear similarities in the Accumulation Phase of crypto and traditional markets. Investors opt for more secure options amidst market uncertainty – *Transparent* and *Exchanges* in the crypto market's case as they provide exposure to safe haven assets and those that provide essential infrastructure and services. In this phase, select frontier markets also gain support as investors seek out emerging technologies to position themselves for the next phases. This is similar to traditional markets, where small cap stocks tend to lead the rally off bear market lows as investors seek out growth when sentiment begins to turn (more positive).



<sup>53</sup> This references industry groups that typically see relative strength during this phase of the crypto market cycle.

# Our Approach to Rating Crypto Assets

## Research Methodology

At Caleb & Brown, we believe that crypto assets represent more than just digital tokens, but rather an opportunity to invest in innovative technologies that have the potential to drive significant growth and create value for investors. Our approach to rating crypto assets is grounded in a proprietary research framework that combines meticulous analysis with a focus on long-term value. This methodology is built on four fundamental pillars that form the foundation of our investment selections.

<b>Fundamental Assessment</b>	We conduct in-depth analysis of a crypto project's underlying fundamentals, including its technology, team, market positioning, competitive landscape and potential for adoption. This assessment helps us understand the strength and viability of the project and its potential to deliver long-term value to investors.
<b>Moat Assessment</b>	We evaluate the moat of a crypto project, which refers to its competitive advantage or unique value proposition that sets it apart from other projects in the market. This includes factors such as intellectual property, network effects, switching costs and cost advantages. A strong moat can be a key driver of a project's success and sustainable competitive advantage.
<b>Sentiment Assessment</b>	We analyse the sentiment around a crypto project, considering market sentiment, investor sentiment and community sentiment. This assessment helps us gauge the overall perception and sentiment towards the project, which can impact its market performance and investor interest.
<b>Risk Assessment</b>	We assess the risks associated with a crypto project, reviewing regulatory risks, technological risks, market risks, governance risks and more. This assessment allows us to identify and understand the potential risks and challenges that a project may face, and to incorporate them into our overall rating.

## Ratings Assignment






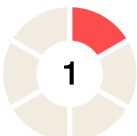
Based on the findings from our research process, we assign ratings to crypto assets on a scale of 1 to 6 “confirmations”, with 6 being *Bullish* and 1 *Bearish*. As such, crypto assets trading at a meaningful discount to our fair value estimate earn a higher confirmation rating, as we recognise them as potentially undervalued opportunities. For higher-quality crypto projects, we require a smaller discount than for mediocre ones, as we have greater confidence in our forecasts for stronger projects.

In contrast, if a crypto asset’s market price is significantly above our fair value estimate, it will receive a lower confirmation rating, regardless of how promising the project may be. Our focus is on the long-term value of crypto assets, rather than short-term price movements. We believe that this approach allows us to better serve our clients, providing them with a more accurate and nuanced view of the market.

Our analysts continually monitor market developments and adjust ratings accordingly to ensure they reflect our analysts' current opinions. This means our ratings may appear out of step with the overall crypto asset market from time to time. However, we believe our focus on the long-term value of crypto assets ultimately benefits our clients, empowering them to invest with confidence courtesy of robust, comprehensive and forward-looking research.



## Ratings Assignment



Caleb & Brown Crypto Asset Rating	Description
<b>Bullish</b> 	<b>6 Confirmations:</b> This indicates a crypto asset that is trading at a significant discount to its fair value based on our fundamental, moat, sentiment, and risk assessments. We believe this asset has strong fundamentals, a competitive moat, and significant growth potential, which will lead to long-term price appreciation. While there may be some short-term volatility, this asset represents a promising investment opportunity.
<b>Positive</b> 	<b>5 Confirmations:</b> This indicates a crypto asset that is trading at a discount to its fair value based on our fundamental, moat, sentiment, and risk assessments. We believe this asset has strong fundamentals, a competitive moat, and solid growth potential, which will lead to long-term price appreciation. While there may be some short-term volatility, this asset represents a promising investment opportunity with solid potential for growth.
<b>Neutral</b> 	<b>4 Confirmations:</b> This indicates a crypto asset that is trading at or near its fair value based on our fundamental, moat, sentiment, and risk assessments. We believe this asset has solid long-term potential and is a reasonable investment option for those seeking long-term growth. While there may be some short-term volatility, this asset represents a good investment opportunity.
<b>Cautious</b> 	<b>3 Confirmations:</b> This indicates a crypto asset that is trading at a premium to its fair value based on our fundamental, moat, sentiment, and risk assessments. We believe this asset may have limited upside potential in the long term and could experience near-term turbulence due to market trends or other factors. While the asset may have some positive qualities, investors should exercise caution and carefully assess the risks before investing.
<b>Negative</b> 	<b>2 Confirmations:</b> This indicates a crypto asset that is trading at a significant premium to its fair value based on our fundamental, moat, sentiment, and risk assessments. We believe this asset has weak fundamentals, high risks, or limited growth potential, which will lead to underperformance in the long term. The asset may also experience significant near-term turbulence, and investors should be wary of investing in such assets.
<b>Bearish</b> 	<b>1 Confirmation:</b> This indicates a crypto asset that is significantly overvalued based on our fundamental, moat, sentiment, and risk assessments. We believe this asset has weak fundamentals, high risks, or limited growth potential, which will lead to significant price depreciation in the long term. The asset may also experience significant near-term turbulence, and investors should avoid investing in such assets.



## Our Approach to Rating Crypto Assets



# Coverage List

We share our analysts' top crypto asset selections for your consideration. Please note that our analysts' opinions and ratings are subject to change based on evolving market conditions and fundamentals. As always, we encourage investors to conduct their own research and assess their risk tolerance before making investment decisions.

Ticker		BTC	
Name			Bitcoin
Price		US\$27, 201	
Market Capitalisation		US\$527b	
Fully Diluted Market Capitalisation		US\$571b	
Sector		Currency	
Industry Group		Transparent	
Caleb & Brown Rating			Bullish
Analyst Notes		<p>With its unique characteristics, such as its capped supply, predictable inflation rate, and transparent blockchain, <i>bitcoin</i> has proven to be a highly attractive store of value. Moreover, we are optimistic about the innovation being driven by projects such as Ordinals, which we believe will catalyse new use cases on the network and enhance its utility over time.</p> <p>However, investors should remain mindful of potential risks, including the possibility that the network may fail to establish a persistent fee market over the next decade, which could potentially compromise the network's security. Despite these risks, we believe that <i>bitcoin's</i> growth potential and its position as the preeminent crypto asset make it an important component of any well-diversified crypto portfolio.</p>	

Ticker	ETH
Name	 Ethereum
Price	US\$1826
Market Capitalisation	US\$224b
Fully Diluted Market Capitalisation	US\$224b
Sector	Smart Contract Platforms
Industry Group	Layer 1
Caleb & Brown Rating	 Bullish
Analyst Notes	<p>With its proven track record of successful network upgrades and ambitious scaling roadmap, <i>Ethereum</i> is poised to continue leading the industry in innovative endeavours. The platform has already cemented itself as a critical infrastructure for rapidly growing verticals like decentralised finance and non-fungible tokens, serving as the gateway for the next wave of users into the crypto space.</p> <p>We predict a migration of users and projects from competing blockchains to <i>Ethereum's</i> scaling solutions, which will further strengthen its competitive advantage. While <i>Ethereum</i> does face risks such as scalability issues, regulatory uncertainty, and competition from other platforms, its growth potential and unique value proposition make it an attractive long-term investment for a diversified crypto portfolio.</p>

Be sure to keep an eye out for future editions of the  
House View report for further additions to the coverage list.

# Glossary

Term	Definition
Account Abstraction	Account abstraction is an upgrade that makes smart contract wallets natively supported on <i>Ethereum</i> . Smart contract wallets unlock many benefits, letting users flexibly program more security and better user experiences into their accounts.
Anti Money Laundering (AML)	Laws and regulations intended to stop criminals from disguising illegally obtained funds as legitimate income.
Appchains	Purpose-built blockchains designed specifically for dApps
<i>Bitcoin</i>	The first modern crypto asset; a form of permissionless, hard money.
<i>Bitcoin Halving</i>	Every 210,000 blocks (approximately 4 years), the block reward for the Bitcoin network is cut in half. This event is known as the <i>Bitcoin Halving</i> , and the next halving is set to occur in April 2024. After this event, the Bitcoin block reward will be 3.25 BTC.
Block Reward	A block reward is the incentive given to miners in a blockchain network for verifying transactions and creating new blocks. It is typically in the form of new coins or tokens and serves to incentivise miners to secure the network and ensure transaction integrity.
Blockchain	A distributed database that maintains a continuously growing list of ordered records, called Blocks.
Blockchain Bridge	In crypto assets, a bridge is an application which connects two or more blockchains together, allowing users to send crypto from one chain to another.
Centralised Exchanges (CEXs)	Platforms that act as a trusted intermediary between buyers and sellers, allowing the trading of crypto assets. Examples include Coinbase and Binance.
Centralised Finance (CeFi)	Centralised Finance (CeFi) offers financial instruments such as yield generation and loans, through centralised intermediaries. With CeFi, there is an inherent need for trust and belief with centralised intermediaries, that they will operate with integrity.
Challenge Period	After an optimistic rollup batch is submitted on <i>Ethereum</i> , there's a time window (called a challenge period) during which anyone can challenge the results of a rollup transaction by computing a fraud proof . If the fraud proof succeeds, the rollup protocol re-executes the transaction(s) and updates the rollup's state accordingly.

Term	Definition
Coins	Coins are digital assets that operate on their own blockchain. Examples include <i>ether</i> and <i>bitcoin</i> .
Commodities Futures Trading Commission (CFTC)	An independent agency created in 1974, that regulates the U.S. derivatives markets.
Commodity	A commodity is an economic good, typically a resource, that is largely fungible and can be exchanged for like-goods. Examples include metals and agricultural goods, such as gold and wheat.
Congestion	When the number of transactions on a blockchain exceeds its capacity.
Consensus	The process by which nodes on a network agree on the current state of the ledger.
Counter-terrorist financing (CTF)	Seeks to stop the flow of funds to terrorist organisations.
Crypto Asset	A cryptographically secured digital representation of value or contractual rights, that uses a form of distributed ledger technology and can be transferred, stored, or traded electronically. In everyday terms, these are the coins / tokens of protocols.
Crypto Asset Miners	Individuals / Entities that mine crypto assets and produce blocks, by solving complex mathematical problems,
Decentralisation	The transfer of control and decision-making from a centralised entity, to a distributed network.
Decentralised Applications (dApps)	Applications or programs that run autonomously on a blockchain, through the use of smart contracts.
Decentralised Exchanges (DEXs)	Platforms that enable trading of crypto assets without relying on an intermediary. Examples include <i>Uniswap</i> and <i>Curve</i> .
Decentralised Finance (DeFi)	Decentralised Finance (DeFi) offers financial instruments without relying on intermediaries, leveraging smart contracts and blockchain technology.
Distributed Ledger Technology (DLT)	A decentralised database which is managed by multiple participants, across different nodes. Blockchains are an example of distributed ledger technology.

Term	Definition
Ecosystem	In crypto assets, an ecosystem refers to the different parts that make up a network, and how they interact.
Equity Capital	Funds that are collected by a company, in return for stocks or shares. These funds are free of debt.
Execution	The process by which transactions are processed and recorded on the blockchain.
Externally Owned Accounts (EOA)	An EOA is controlled by a private key, has no associated code, and can send (and receive) transactions. Examples include your Metamask account, Ledger <i>Ethereum</i> App, and any wallet you hold ether or ERC-20 tokens in.
Federal Deposit Insurance Corporation (FDIC)	A United States government corporation founded in 1933, which provides deposit insurance to depositors in American commercial and savings banks.
Fee Market ( <i>Bitcoin</i> )	In order to remain secure, <i>Bitcoin</i> transaction fees need to be sufficiently high to incentivise miners to continue to create blocks and secure the network. A poor fee market will leave <i>Bitcoin</i> more susceptible to potential attacks.
Fiat currency	Government-issued currency that is not backed by a commodity. Instead, it is backed by the full faith and trust in the government that issued it.
Fixed-Income Securities	Fixed-income securities are debt instruments issued by a government, corporation or other entity to finance and expand their operations. They pay a fixed amount of interest to investors, in the form of coupons.
Forks	A fork is a change in the blockchain's protocol, and how it operates. There are two main types of forks; <i>Hard</i> forks, and <i>Soft</i> forks. A hard fork is a backward-incompatible upgrade to the blockchain, whereas a soft fork is a rule modification that is forward-compatible. Hard forks result in a new chain along with the original, such as <i>Bitcoin</i> and <i>Bitcoin Cash</i> .
Governance	A system for managing decision making and control over changes of a protocol.
Hash Rate	The hash rate is a measure of the computational power per second used when mining. A higher hash rate corresponds to a more secure network, with more computational work being used to produce each block.
Hawkish	Hawkish refers to an aggressive and harsh stance in policy-making.

Term	Definition
Initial Coin Offering (ICO)	A capital-raising activity, whereby crypto asset projects sell their own token to investors.
Interoperability	The ability of different systems to connect and communicate in a coordinated way.
Know Your Customer (KYC)	Standards used to verify customers and know their risk and financial profiles.
Layer 1 (L1)	This refers to the foundational blockchain where blocks are produced, transactions are finalised, and a native crypto asset is used to pay fees and reward validators or miners. Examples include <i>Ethereum</i> , and the <i>Bitcoin</i> Network.
Layer 2 (L2)	A network or channel that sits on top of a Layer 1 network. Layer 2's are designed to increase the speed and reduce the transaction fees on the blockchain.
Ledger	A digital or physical log that records transactions.
Liquid Staking (Soft Staking)	Liquid staking allows stakers to access their locked funds for other crypto-based activities while still earning staking rewards from their initial deposit. This is achieved by providing stakers with a derivative token.
Liquidity Pools	A smart contract which contains holdings of crypto assets which can be used to facilitate trading on-chain.
Maximal Extractable Value (MEV)	MEV refers to the revenue earned by validators, who are responsible for verifying and securing transactions on the blockchain, through activities such as transaction reordering, inclusion, and exclusion within a block.
Modular	Refers to a blockchain architecture that delegates certain functions to specific networks.
Mt. Gox	Early <i>Bitcoin</i> exchange, created in 2010, based in Tokyo. At its peak, the exchange was responsible for 70% of all <i>Bitcoin</i> trade volume, before it abruptly shut down in 2014 after being hacked for thousands of <i>bitcoin</i> .
Multi-signature Wallet (Multi-Sig)	A type of wallet where more than one private key is needed to authorise a transaction.
Node	A computer connected to a network of other computers, which follows rules and shares information.



Term	Definition
Non-fungible Tokens (NFTs)	Unique cryptographic tokens that exist on a blockchain and cannot be replicated.
Office of the Comptroller of the Currency (OCC)	An independent bureau which charters, regulates, and supervises all US banks.
On-chain	Refers to anything that occurs on the blockchain and is verifiable through the public ledger e.g. transactions, data.
Optimistic Rollups	Optimistic Rollups are a type of layer 2 scaling solution for blockchains that batches transactions off-chain for verification, uses off-chain computation for fee reduction, and relies on a fraud proof system for security. It assumes transaction and state validity by default but allows for challenges with fraud proofs if incorrect or falsified data is detected.
Ordinals (Bitcoin)	Ordinals is a crypto project which inscribes individual Satoshis with numbers, allowing them to take on a unique identity and be tracked and transferred specifically. Essentially it makes the satoshis non-fungible in nature.
Peer-to-Peer	Where two individuals interact directly with each other, without intermediation by a third party.
Permissioned (blockchain)	Refers to protocols which are closed, and can only be accessed by users with the right permissions.
Private Key	A secret cryptographic key used for decrypting or signing digital data in a public-key cryptography system. It must be kept confidential and is used for authentication and secure communication in various cryptographic protocols like blockchain technology.
Proof-of-Stake (PoS)	A consensus mechanism used to confirm transactions and create new blocks, through randomly selected validators.
Proof-of-Work (PoW)	A consensus mechanism that requires miners to exert effort, solving complex computational problems in order to confirm transactions and create new blocks.
Public Address	A public address is a cryptographic code that allows a user to receive crypto assets into their account, akin to a locked mailbox.

Term	Definition
Public Key	A public key allows you to receive cryptocurrency transactions. It's a cryptographic code that's paired to a private key.
Real World Assets (RWA)	Real World Assets refer to physical or digital assets from the real world that are represented on the blockchain through tokenisation. Tokenization involves converting the ownership rights of real-world assets into digital tokens that can be traded, transferred, and stored on a blockchain.
Satoshi	The smallest denomination of <i>Bitcoin</i> , equivalent to 100 millionth of a Bitcoin.
Scalability	One prong of the blockchain trilemma; the ability of the network to support more transactions, as well as an increasing number of nodes.
Security	One of the three points of the blockchain trilemma; how protected the network is against attacks, hacks, and malicious actors.
Security (Financial Asset)	A security is generally considered as any tradable financial asset, such as stocks, bonds or ETFs. While the official definition varies across jurisdictions, the SEC refers to the Howey Test to determine whether an asset is a Security or otherwise.
Seed Phrase	A string of randomly generated words that represent all private keys within a crypto wallet.
SegWit	An upgrade to the <i>Bitcoin</i> network in August 2017, allowing more transactions to be included in the same block.
Session Key	A session key is an encryption and decryption key that is randomly generated to ensure the security of a communications session between a user and another computer or between two computers.
Sidechain	A separate blockchain that runs independent of a smart contract platform (such as <i>Ethereum</i> ) and is connected to the by a two-way bridge.
Silk Road	An online black market platform that was popular for hosting money laundering activities and illegal drug transactions using <i>Bitcoin</i> . The website was operational from 2011 up until 2013, where the founder Ross Ulbricht was arrested.
Smart Contract Accounts	An account in blockchain technology, specifically in <i>Ethereum</i> , created using a smart contract instead of a regular user account (EOA). It has its own logic for transaction verification, providing flexibility and security in managing accounts and transactions.

Term	Definition
Social Recovery	A method of wallet recovery that does not require a seed phrase, while also ensuring that the recovery process remains fully non-custodial.
Software Development Kit (SDK)	Software tool bundles which provide developers with necessary components to build on a specific platform.
Soul Bound Token	Non-transferable, Non-fungible tokens which represent the identity of an individual or entity. Amongst other information, they can include the traits, features, and achievements of the holder.
Stablecoin	Stablecoins are crypto assets whose value is pegged to that of another currency, commodity, or financial instrument. The most popular stablecoins, are US Dollar pegged variants. Generally, stablecoins can be categorised into 3 sections: <ol style="list-style-type: none"> <li>1. Fiat backed (centralised) e.g. <i>USDT</i>, <i>USDC</i></li> <li>2. Crypto collateralised (decentralised) e.g. <i>DAI</i>, <i>LUSD</i></li> <li>3. Algorithmic (decentralised) e.g. <i>UST</i>, <i>BAC</i></li> </ol>
Staking	Staking is the process of supporting a network or protocol, by locking up crypto assets. In return, stakers earn a yield on their staked assets. The main version of staking is <i>Protocol Staking</i> . This is when a network user locks their crypto assets to a validator node to support the consensus mechanism (Proof-of-Stake), validate transactions, and ensure that the network continues to run securely.
Taproot	An upgrade to the <i>Bitcoin</i> network in November 2021 that enables more private and secure transactions, and also improves scalability.
Throughput	The rate at which valid transactions are committed to the blockchain.
Token Economics (Tokenomics)	The study of the parameters that determine the characteristics of crypto assets to create economic value.
Tokenisation	The process of transforming ownerships and rights of particular assets into a digital token.
Tokens	Digital assets, that unlike coins, do not have their own blockchain and operate on others. Examples include stablecoins and ERC-20 tokens.
Transaction	A transfer of value.

Term	Definition
U.S. Securities and Exchange Commission (SEC)	An independent agency, created by Congress off the back of the 1929 Wall Street Crash, with the mission to regulate the securities markets and protect investors.
U.S. Federal Reserve	The central bank of the United States, responsible for setting interest rates, managing the money supply, regulating financial markets, as well as being a lender of last resort.
U.S. Treasuries	Debt obligations issued by the United States Government and secured by the full faith and credit (the power to tax and borrow) of the United States.
Validators	Parties who are responsible for verifying and securing transactions on PoS blockchains.
Web3	Web3 refers to the third generation of the internet, which utilises decentralised, blockchain-based technology to enable direct peer-to-peer interactions without intermediaries. This new paradigm offers greater security, transparency, and control over personal data, and has given rise to innovative use cases such as decentralised finance, non-fungible tokens (NFTs), and digital identity management.
Yield Farming	Yield Farming is a practice in decentralised finance (DeFi) where investors provide liquidity to a protocol in exchange for rewards. These rewards come in the form of tokens, which can be sold or reinvested to generate even more rewards. Yield farming typically involves using complex financial strategies to maximise returns and minimise risk. The goal of yield farming is to earn a high return on investment by taking advantage of the incentives offered by DeFi protocols.
Zero Knowledge Proof (ZKP)	A digital method that allows one person, known as the prover, to assure another person, called the verifier, that they possess certain information without revealing the specifics of that information.
ZK-Rollups	Zero-Knowledge Rollups use a cryptographic technique called zero-knowledge proofs to bundle multiple transactions into a single transaction without revealing any details about the individual transactions. This approach offers greater security, privacy, and faster transaction finalisation times. ZK-Rollups are well suited for privacy-focused applications, especially in decentralized finance (DeFi).

# Appendix

## A. Sector/Industry Group Definitions (Source: CoinDesk Indices)

Name	Description
Currency	Currency sector refers to any non-pegged digital asset acting exclusively as a medium of exchange and unit of account, running on a blockchain network with the ability to complete cross-border transactions without restriction. Digital assets in the Currency sector serve the narrow purpose of being transacted on a network and tend not to have additional utility.
BaaS	BaaS enables businesses, entrepreneurs, or governments to leverage cloud-based, permissioned blockchain services to build, use, and host various blockchain applications and develop permissioned blockchains with a closed-source node selection structure sometimes referred to as master nodes. All BaaS projects lack the Byzantine Fault Tolerant (BFT) consensus mechanism that most projects utilise to ensure a trustless, decentralised network.
Private	Any digital asset whose ledger does not display the deposit addresses of the sender or the receiver. In addition, the ledger does not reveal the wallet balances of any holder. This can include blockchains that utilise Zero Knowledge Proofs (zkSNARKs, zkrollups), Schnorr signatures, and any similar innovations that hide the addresses of users, while maintaining trust.
Transparent	Any digital asset whose ledger displays the deposit addresses of both senders and receivers and may reveal wallet balances publicly.

Name	Description
Smart Contract Platforms	<p>Smart contracts are computerised blockchain protocols that execute terms of a contract. Smart Contracts represent computer code that ensures when the terms of the contract are met by both parties. It, executes automatically, allowing for peer-to-peer trustless transactions. Smart contract platforms are designed for the building of decentralised applications, layer 2 scaling solutions, DAO's, and custom protocols. Each platform has a unique open-source user and miner incentive structure and utilises BFT consensus mechanism. Each platform utilises a native token for the payment towards building on the platform, providing liquidity, and allowing interoperability between the native token and newly created tokens built on the platform.</p>
Layer 0	<p>Layer 0 smart contract platforms act as the foundational layer for blockchain ecosystems. They serve as blockchain builders and relayers, facilitating interoperability between multiple chains on the same network. Layer 0 blockchains typically act as the “hub” of a “hub and spoke” blockchain ecosystem, providing consensus, maintaining a unified ledger, and in some cases validating blocks for the entire network. Layer 0s allow multiple blockchains on the same network to communicate and transact with each other.</p>
Layer 1	<p>Layer 1 smart contract platforms act as the primary settlement layer of a blockchain and decentralised application (dApp) ecosystem. Most on-chain transactions and smart contract activities take place on Layer 1. A decentralised network of validators processes transactions in blocks and are compensated for their services in the form of gas fees, paid for as a fee denominated in the protocol's token. These gas fees fluctuate relative to the computational demand that the transaction imposes on the network and reflect the overall network congestion at any given time.</p>
Layer 2	<p>Layer 2 smart contract platforms are designed as scaling solutions for Layer 1 blockchains. Layer 2s allow for significantly less expensive transactions, faster settlement and higher throughputs. This system facilitates processes that would otherwise be too costly on a Layer 1 such as high-frequency trading, and more complex smart contract capabilities. Several Layer 2 blockchains can exist “on top” of a Layer 1 blockchain, using a system of side chains or rollups to bundle large quantities of transactions and settle them into significantly more manageable batches on the Layer 1 network.</p>

Name	Description
Decentralised Finance (DeFi)	DeFi refers to digital assets that support financial products and services that are not facilitated or controlled by any central entity. These financial products and services are accessible without any barrier to entry or identification requirements. All DeFi tokens must be created on smart contract platforms and offer open-sourced liquidity with the ability for token holders to reserve governance rights.
Asset Management	Protocols that provide access to different investment strategies on a single platform with no barrier to entry.
Atomic Swaps	Cross-chain peer-to-peer trading enabling trustless, atomic trade execution with smart contracts.
Credit Platform	Decentralised credit programs where participants can lend out their tokens and earn an interest rate determined by an automated protocol.
DAO	DAOs are open source blockchain protocols governed by a set of rules, embedded in smart contracts that are created by its elected members who can automatically execute certain actions without the need for intermediaries. A DAO can be defined as a protocol with the intended goal of securing a basket of digital assets while allowing the contributors to that basket to have direct governance rights over that basket. The governance rights allow contributors to vote to approve or deny proposals.
Derivatives	Derivatives include tokens that support options, futures, perpetual swaps, margin trading, and leverage. Derivatives can also include synthetic derivatives that tokenize real-world assets.
Exchanges	Decentralised exchanges allow token holders to do peer-to-peer trading that cannot be controlled, censored, or altered by any central authority.
Insurance	DeFi Insurance protocols enable users to hedge risk within a decentralised governance framework by purchasing insurance through a staking protocol that can match lost funds in case of a claim.
Yield	Includes all DeFi vaults in which depositors can stake assets in a yield bearing vault that aggregates a positive yield from various DeFi platforms and assets.



Name	Description
Culture & Entertainment	Culture & Entertainment includes all projects that aim to decentralise social media platforms, create decentralised gaming worlds, and increase direct peer-to-peer interaction between content creators and their audience, while at the same time maintain user privacy, security, and ownership of data and digital assets.
Art	All platforms for minting Non-Fungible Tokens (NFTs) intended for digital artistic creations and collectibles. This industry also includes decentralised marketplaces for NFT artwork as well as native tokens for NFT marketplaces.
Media	All projects that aim to decentralise social media platforms including broadcast streaming and video sharing as well as create direct links among content creators, consumers, and advertisers.
Metaverse	A loose network of virtual worlds with social connections and interactions as a primary function. Based on blockchain technology, it encompasses virtual worlds and augmented reality. Metaverse includes gaming realms, GameFi, and virtual worlds. Virtual worlds must maintain a decentralised marketplace and offer the ability to tokenize and trade digital assets within the metaverse.
Currency	Currency sector refers to any non-pegged digital asset acting exclusively as a medium of exchange and unit of account, running on a blockchain network with the ability to complete cross-border transactions without restriction. Digital assets in the Currency sector serve the narrow purpose of being transacted on a network and tend not to have additional utility.
BaaS	BaaS enables businesses, entrepreneurs, or governments to leverage cloud-based, permissioned blockchain services to build, use, and host various blockchain applications and develop permissioned blockchains with a closed-source node selection structure sometimes referred to as master nodes. All BaaS projects lack the Byzantine Fault Tolerant (BFT) consensus mechanism that most projects utilise to ensure a trustless, decentralised network.
Private	Any digital asset whose ledger does not display the deposit addresses of the sender or the receiver. In addition, the ledger does not reveal the wallet balances of any holder. This can include blockchains that utilise Zero Knowledge Proofs (zkSNARKs, zkrollups), Schnorr signatures, and any similar innovations that hide the addresses of users, while maintaining trust.
Transparent	Any digital asset whose ledger displays the deposit addresses of both senders and receivers and may reveal wallet balances publicly.



Name	Description
Computing	The Computing sector consists of projects that aim to decentralise the sharing, storing, and transmission of data by removing intermediaries and ensuring privacy for all users. All projects that aim to gather, transmit, store, and share data and web services in a decentralised manner play a key factor in building the infrastructure of Web 3.0. This includes on-chain and off-chain data transmission, social data platforms, peer-to-peer secure data transactions, open networks, free market private computation, and decentralised file storage and file sharing.
IoT	IoT projects contribute to the development of the Internet of Things and Web 3.0 real world, off-chain connections. IoT platforms allow for application interoperability between IoT networks and blockchain DApps. They allow interconnectivity on a trustless network with no reliance on any central entity or centralised database of user info that can be subject to manipulation. IoT can allow the execution of smart contracts using oracles and real-world data.
Oracle	Oracle refers to any project with the primary ability to gather, organise, and transmit either on-chain to on-chain data or off-chain to on-chain data in real time. It typically operates with a native token to cover transaction costs and governance rights.
Private Computing	Private computing refers to the free market buying and selling of cloud computing power, surplus bandwidth, and other computational services. Private computing markets are decentralised, global, and pseudonymous with no barriers to entry.
Shared Network	Shared Network refers to an open-source market of distributed cloud computing that allows participants (miners) to offer energy and computation resources at a variable cost to pseudonymous buyers. Shared Network also includes open networks that provide miners with a low cost, decentralised alternative to the existing web service providers. The decentralised upholding of the network and its growth aligns with Metcalfe's law of networks, and relinquishes the need for large, centralised cloud service providers.
Shared Storage	Shared storage refers to the decentralisation of storage servers which are traditionally owned and operated by a central organisation. Shared storage decentralises the storage responsibilities across an open-source network of miners with a system of economic incentives. This allows for pseudonymous, private file sharing on a decentralised network. The centralization of data storage is a high risk for potential hacks and bad actors to access sensitive information. Shared storage platforms increase security of data storage by running on a blockchain network that allows for privacy and pseudonymity of data transmitters.

Name	Description
Digitalisation	Digitisation refers to the process by which real world documents, contracts, public names, etc. are uploaded to a blockchain for the purpose of transparency, publicly verifiable ownership, and immutability. Proof of ownership, identity, and authenticity are both valuable traits that are made possible by blockchain technology.
Digitalisation	Digitisation refers to the process by which real world documents, contracts, public names, etc. are uploaded to a blockchain for the purpose of transparency, publicly verifiable ownership, and immutability. Proof of ownership, identity, and authenticity are both valuable traits that are made possible by blockchain technology.
Stablecoin	Stablecoins are a set of protocols whose native token is pegged to a fiat currency, most commonly the US dollar. Stablecoin issuers may use one of several methods to maintain their peg such as 1:1 dollar-backed reserves, multi-asset treasuries, collateralized lending, or mint-and-burn mechanisms, etc. Stablecoins allow for frictionless transfer and exchange of fiat-pegged assets on the blockchain.
Fiat-Backed Stablecoin	Fiat-backed stablecoins refer to stablecoins whose collateral typically consists of fiat currencies (e.g., US dollar) or their equivalents (e.g., US Treasury Bills). The entities that issue stablecoins are often centralized organisations that operate primarily off-chain in order to manage their reserves. The reserve's primary function is to maintain the peg between the token and the target fiat currency, such as the US dollar, Euros, or other currencies.
Crypto-Backed Stablecoin	Crypto-backed stablecoins are stablecoins in which the collateral is made up of other cryptocurrencies. This can include other types of stablecoins, Bitcoin, Ether, and non-fungible tokens (NFTs). Crypto-backed 11 stablecoins tend to operate on-chain, where their reserves can be transparently verified by anyone, and are typically over-collateralized in order to accommodate the greater volatility of their reserves.
Algorithmic Stablecoin	Algorithmic stablecoins refer to stablecoins in which there is a dynamic change in supply to maintain the peg, either through a rebasing or seigniorage mechanism. Rebasing is a mint-and-burn mechanism that distributes the change in supply proportionally across all token holders. Seigniorage is a mint-and-burn mechanism where there is an alternative token used to maintain the peg. If the price is above or below its peg, tokens will be minted (burned). Stablecoins that are partially algorithmic are also classified as algorithmic stablecoins.

## B. Sector Score Criteria

Criteria	Description
Adoption	This criterion measures the degree to which a crypto asset sector has gained acceptance and usage within the industry, indicating the sector's real-world adoption and overall awareness, and understanding.
Durability	This criterion assesses the long-term viability and prospects of a crypto asset sector, considering its strength and resilience in the face of challenges and changes within the broader industry.
Maturity	This criterion evaluates the level of development and advancement of a crypto asset sector, considering its progress within the broader industry.
Potential	This criterion gauges the potential for growth and success of a crypto asset sector, considering the opportunities and possibilities available within the broader industry.
Risk	This criterion evaluates the level of risk and uncertainty associated with a crypto asset sector, considering the potential for negative outcomes or loss for investors and users of the sector.
Value Capture	This criterion measures the extent to which a crypto asset sector is able to generate value for its users and participants, considering the level and distribution of value created within the sector.

## C. Sector Score Scale

Score	Description
Excellent 80 - 100	The crypto asset industry assessed is performing exceptionally well across all criteria assessed and has significant potential for growth opportunities. This industry may have a strong market position, high user adoption, clear use cases for its protocols, strong network effects, and robust partnerships, among other positive indicators. Investors should actively be seeking out investment opportunities within this space.
Above Average 60 - 79	The crypto asset industry assessed has strengths that may support its potential for growth opportunities. This industry may be experiencing rapid user growth, high market share, strong investor interest, or have a clear use case for its protocols, with relatively low risk factors. Investors may find attractive investment opportunities within this industry but should still carefully consider the potential risks.
Fair 40 - 59	The crypto asset industry is generally meeting the standards of the evaluation criteria but may have some risks or challenges that could limit its growth opportunities. This industry may have some strengths, such as moderate adoption or a reasonable level of investor interest but may also face challenges such as competition or regulatory hurdles. Investors may find some promising investment opportunities within this industry.
Below Average 20 - 39	The crypto asset industry assessed has several areas of weakness that could impact its potential for growth, but it may still have some positive indicators for future growth opportunities. This industry may be facing challenges such as slow user growth, low market share, or regulatory uncertainty. Investors should carefully consider the potential risks and rewards of investing in this industry.
Poor 1 - 19	The crypto asset industry assessed has significant weaknesses that may negatively impact its growth potential. This industry may be facing issues such as low adoption, limited market share, lack of support from key players, or significant regulatory or security risks. These weaknesses may make it difficult to find promising investment opportunities within this industry.

## D. Bitcoin's Antifragility

Event	Date	Market Response
Cyprus Financial Crisis	April 2013	Bitcoin's price rose from around US\$50 to US\$266, representing an increase of 432%
U.S. Government Shutdown	November 2013	Bitcoin's price rose from around US\$200 to US\$1176, representing an increase of 488%
Brexit Referendum	June 2016	Bitcoin's price rose from around US\$530 to US\$750, representing an increase of 42%
Indian Demonetisation	November 2016	Bitcoin's price rose from around US\$670 to US\$780, representing an increase of 17%
2016 US Presidential Election (Trump Elected)	November 2016	Bitcoin's price rose from around US\$670 to US\$780, representing an increase of 17%
Chinese Capital Controls	Jan 2017	Bitcoin's price rose from around US\$750 to US\$1,180, representing an increase of 57%
North Korean Tensions	August 2017	Bitcoin's price rose from around US\$3,000 to US\$4,700, representing an increase of over 57%
US-China Trade War	July 2019	Bitcoin's price rose from around US\$7500 to US\$10,000, representing an increase of 33%
Hong Kong Protests	July 2019	Bitcoin's price rose from around US\$7500 to US\$10,000, representing an increase of 33%
2020 US Presidential Election (Biden Elected)	November 2020	Bitcoin price rose from US\$13,000 to US\$20,000, representing an increase of 54%
COVID-19 Pandemic	November 2021	Bitcoin's price rose from around US\$5000 to US\$68,000, representing an increase of 1100%
2022 Russian Invasion of Ukraine	April 2022	Bitcoin price rose from around US\$38,000 to US\$46,000, representing an increase of over 20%
2023 Bank Failures	March 2023	Bitcoin price rose from around US\$23,000 to US\$28,000, representing an increase of over 20%

## E. Defining Characteristics of Impactful Technologies

Characteristic	Description
Wide Impact	The rise of crypto assets is both transforming traditional industries as well as creating new opportunities for innovation and growth. Crypto assets have the potential to disrupt traditional industries such as finance and real estate by enabling new business models, lowering transaction costs and reducing fraud through increased transparency.
Interoperable	The interconnectedness of crypto assets enables new forms of collaboration and innovation between users and networks, fostering growth and development in the ecosystem. Crypto assets can be transferred seamlessly across different platforms and networks, creating a borderless financial system that can operate 24/7, without the need for intermediaries.
Network Effects	As more individuals and businesses adopt crypto assets, the potential for value and impact increases, fueling innovation and growth in the ecosystem. The network effects of crypto assets enable exponential growth, increasing the value of the network as more participants join and transact, creating a self-reinforcing feedback loop.
Accelerator of Innovation	Crypto assets have inspired new forms of innovation across various industries. As adoption continues to increase, so does the potential for groundbreaking advancements in finance, art, and beyond, as crypto assets facilitate new business models, such as NFTs and decentralised finance.
Provide Accessibility	Crypto assets are a catalyst for financial inclusion and promote a more equitable playing field for emerging businesses. Crypto assets enable anyone with an internet connection to access financial services, lowering the barrier to entry for emerging markets and underserved communities.
Scalable	New blockchain platforms are being developed to address scalability limitations, enabling greater adoption and use cases. As scalability improves, the potential for crypto assets to be used in more industries and applications increases, creating new opportunities for innovation and growth.
Disruptor	Crypto assets are driving transformation across industries and societies, offering new opportunities for innovation, growth, and democratisation of financial systems. By providing alternative financial systems, crypto assets challenge traditional systems, offering greater transparency, lower fees, and increased accessibility.
Driver of Societal Changes	Crypto assets are driving long-term societal changes by democratising finance and enforcing transparency in governance processes. By providing greater financial access and transparency, crypto assets offer the potential to create more equitable and fair systems, reducing inequalities and promoting greater social and economic justice.

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No.	Reference
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