SYGNUM

Valuing crypto assets

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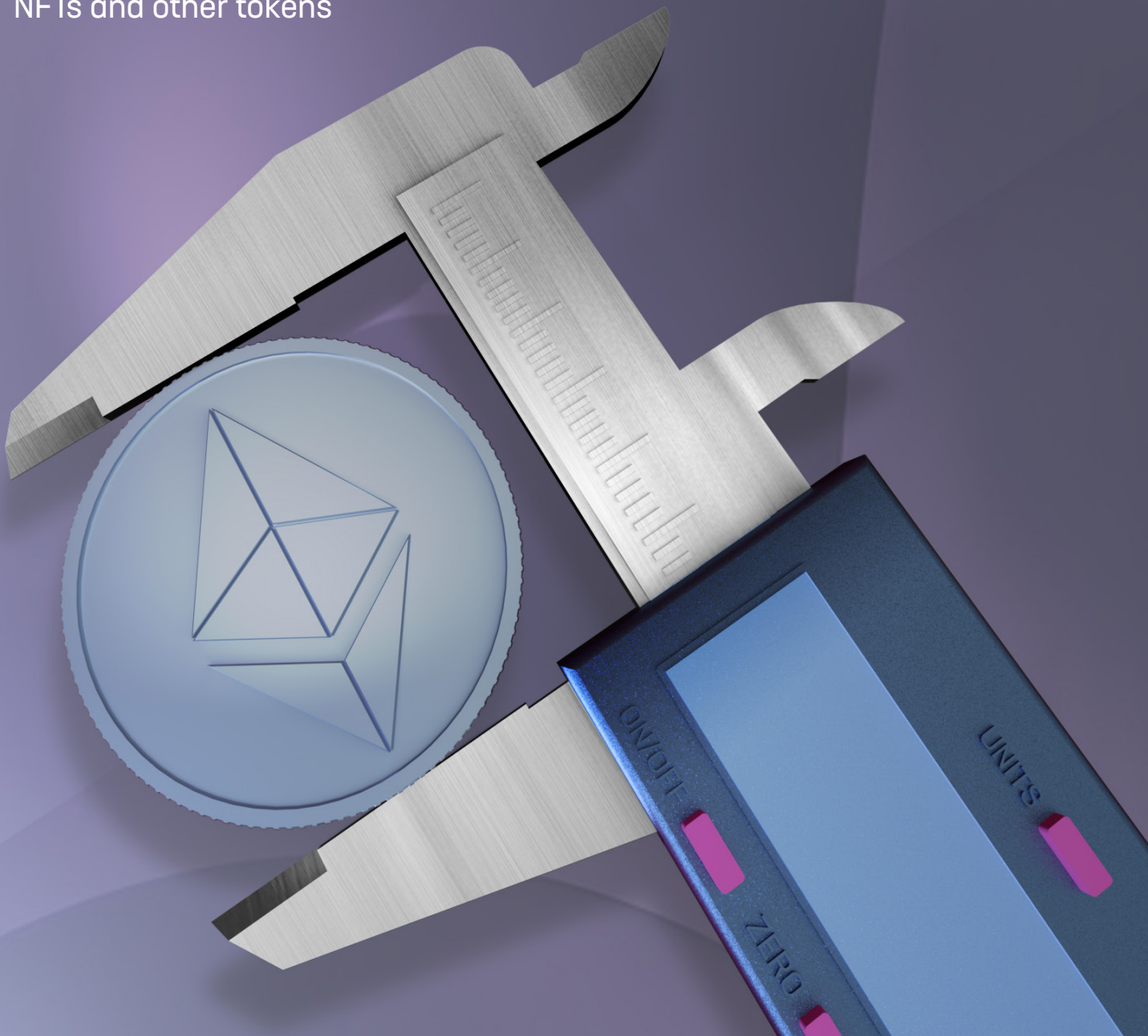
How to effectively forecast growth and build institutional-grade frameworks to value cryptocurrencies, decentralised applications, NFTs and other tokens



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Introduction

The invention of cryptocurrencies created a new type of asset. But how these assets create economic value and how to estimate this value is still poorly understood in the market.

In this report, we assess the economic drivers that give cryptocurrencies value and offer frameworks for analysing the different types of crypto assets.

We cover the questions of whether cryptocurrencies have any intrinsic value, why it is hard to value them and how to assess the opportunity for future growth.

We discuss commonly used valuation methods, offer frameworks for each type of crypto asset and include a few examples.

Chapter one covers the approaches to assessing future growth, as it underpins the opportunity for the entire asset universe. Chapter two covers the valuation of the native tokens of blockchain protocols (often called 'cryptocurrencies'), the largest and most difficult-to-value segment of the crypto market.

Chapter three discusses the valuation of decentralised applications built on top of blockchain protocols, while chapter four covers NFTs and chapter five discusses the valuation-related issues concerning the other types of crypto assets, such as stablecoins or tokenised assets.

Part I

How to forecast growth

Part I: How to forecast growth

Crypto assets represent investments in early-stage transformational technology where the opportunity lies in medium- to long-term growth.

Any valuation methodology ultimately hinges on forecasting this growth. Assessing the fair value of tokens also involves modelling how projects capture value and how this value is transferred to tokenholders, but the starting point in all cases is understanding the size of the opportunity.

Addressable market

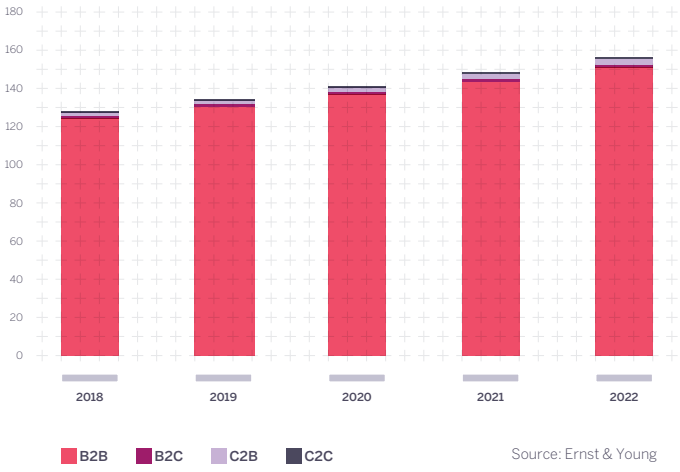
As with valuing traditional businesses, assessing the size of the addressable market is the first point of reference for valuations.

For example, a decentralised exchange that trades crypto assets will see its market grow as:

1. The crypto market grows in size.
2. The preference for decentralised exchanges over centralised exchanges increases.
3. Traditional financial assets are tokenised and traded on crypto exchanges.

Forecasts by various research and consulting organisations provide reference points to establish a reasonable range (best/worst-case scenarios) of what the size of the market may be. The below example of cross-border payment flows is one component of assessing the size of the global payments market, which in turn is a starting point for assessing the potential for cryptocurrencies in payments as well as for projects and decentralised applications that facilitate digital payments.

GLOBAL CROSS-BORDER PAYMENTS FLOWS (USD TR)



Source: Ernst & Young

As the crypto industry creates new markets, the uncertainties around forecasting the market size can be significant. But parallels can still be drawn by looking at what service or activity the new market might displace or most closely resemble.

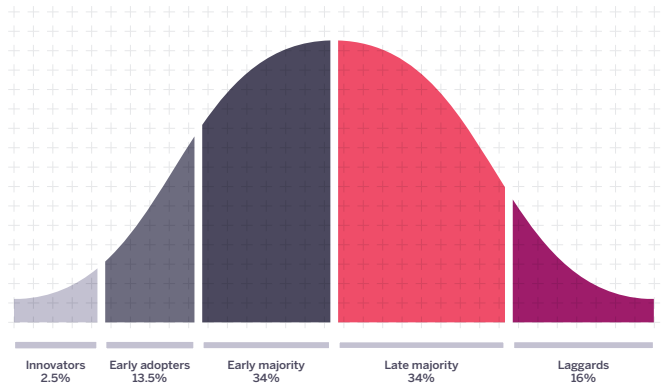
When crypto businesses aim to take market share from traditional counterparts, this may be by offering a lower cost alternative or a more focused solution that better serves a need.

Sector trends

At this point, the crypto market is mature enough to be segmented into sectors. It is important to understand the drivers, challenges, trends and the fundamental value proposition of each sector when forecasting the growth opportunity.

It is also important to understand at what stage a new sector or niche currently stands.

ROGERS'S DIFFUSION OF INNOVATION THEORY



The stage where most regard a new innovation too early, few understand it and many are sceptical whether it will scale is the time when investment leads to exceptional returns for patient money. Both the risks and the potential returns decline as the innovation cycle progresses.

Project specific data

Open decentralised platforms are unique in the amount of data freely available to all. If anything, the sheer quantity of the data available poses the challenge, and it might be more efficient and economical to use service providers that streamline the onchain data.

Onchain data provide insight into the existing growth trends and serve as proof points and verification of prior growth assumptions. The data can be tracked on the project level as well as aggregated to monitor sector trends.

The most important project specific information and data to track are:

- User growth (transaction volume, transaction count, number of active users, etc.)
- Revenues earned by the protocol
- The share of revenues that are channelled to cover costs in some way (for example, paying liquidity providers, adding to a safety reserve to support the protocol, directing it towards the project treasury or a specific development budget)
- Holding and flows in and out of project treasuries
- Token issuance, burn, vesting, distribution as incentives

Below is an example of project specific onchain data.

INCOME STATEMENT - AAVE

	Q1 2023	Q4 2022	Q3 2022	Q2 2022	Q1 2022
Fees	$21.07m	$18.6m	$35.78m	$56.67m	$79.02m
Supply-side fees	$18.29m	$16.34m	$31.68m	$50.51m	$70.56m
Revenue	$2.78m	$2.26m	$4.1m	$6.16m	$8.45m
Token incentives	$1.48m	$4.66m	$11.9m	$27.25m	$80.86m
Earnings	$1.3m	-$2.4m	-$7.79m	-$21.1m	-$72.41m
Treasury	$122.89m	$119.83m	$168.25m	$248.26m	$356.91m

Source: Token Terminal

It is important to remember that often the protocols charge fees in cryptocurrencies (e.g. transaction fees on blockchains). Many other growth metrics (e.g. the volume of tokens locked in a staking protocol) are also measured in cryptocurrency. During crypto bear markets, the translation into fiat may disguise real growth and make it appear muted. To observe the underlying growth trends, we need to strip away the translation effects from the data.

For long term forecasts, it is reasonable to assume that a protocol's success will translate into an appreciation of the price of its token, and this should be reflected in fiat currency-based forecasts.

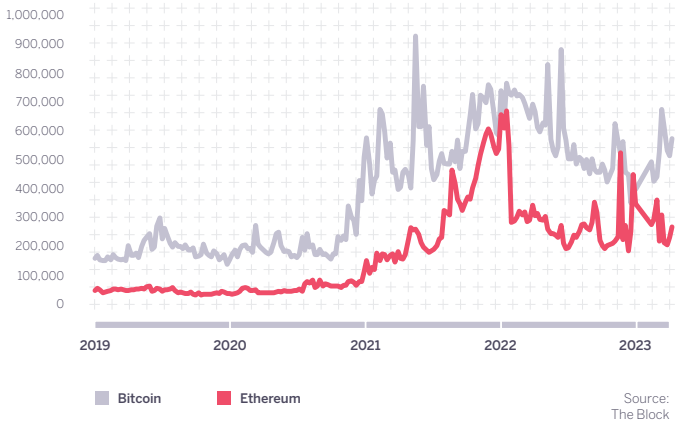
Community engagement

High engagement of a lot of people with a project usually precedes actual user growth.

Projects that succeed in building a strong community and capturing a lot of mindshare early on are usually able to convert it into strong network effects, such as user growth, developer interest and investor interest.

We can track the size of the communities and their activity levels on social media. Data on traditional and social media mentions are also useful indicators, especially when the data also capture whether a comment is positive or negative, whether it is picked up and amplified by others and whether the engagement is predominantly by bots.

BITCOIN AND ETHEREUM TWEET VOLUME



Source: The Block

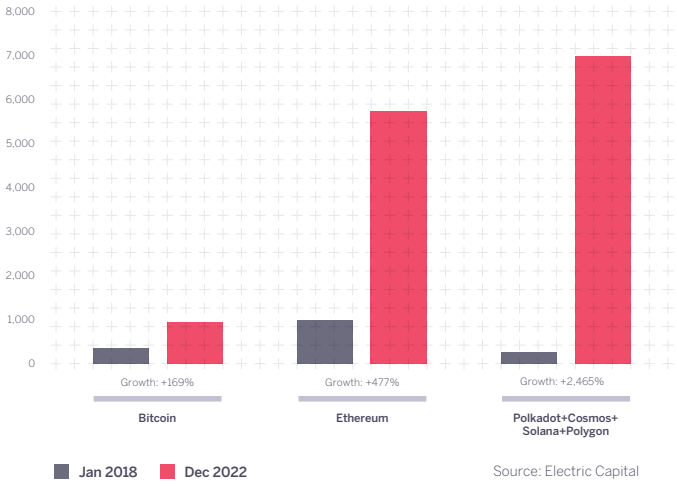
Qualitative aspects

How likely a project is able to execute its potential and convert it into growth and market share also depends on a number of qualitative factors that we need to factor in when forecasting the growth opportunity.

This includes:

- Quality of the team and their track record of successful execution
- Appropriate incentives to encourage adoption (without creating a Ponzi-style bubble in the token price)
- Sufficient funding and sustainable project economics
- Good governance
- A unique product or service with clear USPs
- Quality and security of the technology
- Developer activity and funds available for continuous development
- Investor interest and the quality of the investors
- Convenient customer interface that is accessible for a large number of users
- Catalysts

MONTHLY ACTIVE DEVELOPERS



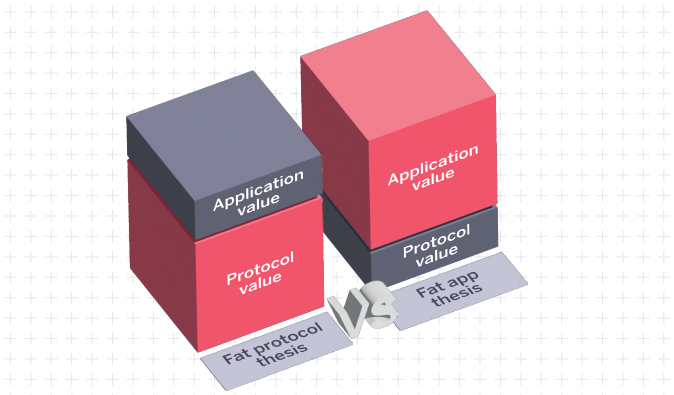
Source: Electric Capital

Protocol thesis

As the projects developing various use cases of crypto build on top of blockchains, part of the value created by the applications trickles down to the underlying blockchains. This happens partly because the applications sitting on top of blockchains need to pay transaction fees to the chain for processing and storing their data, and partly because the sum of the network effects is stronger for the underlying blockchain than for the individual applications that it hosts.

The so-called 'fat protocol' thesis was proposed in 2016, and it intended to highlight the difference between the value capture for internet-based vs blockchain-based applications. The thesis argued that, unlike the case of the internet, most of the value accrues to blockchain protocols.

"FAT PROTOCOL THESIS" VS "FAT APP THESIS"

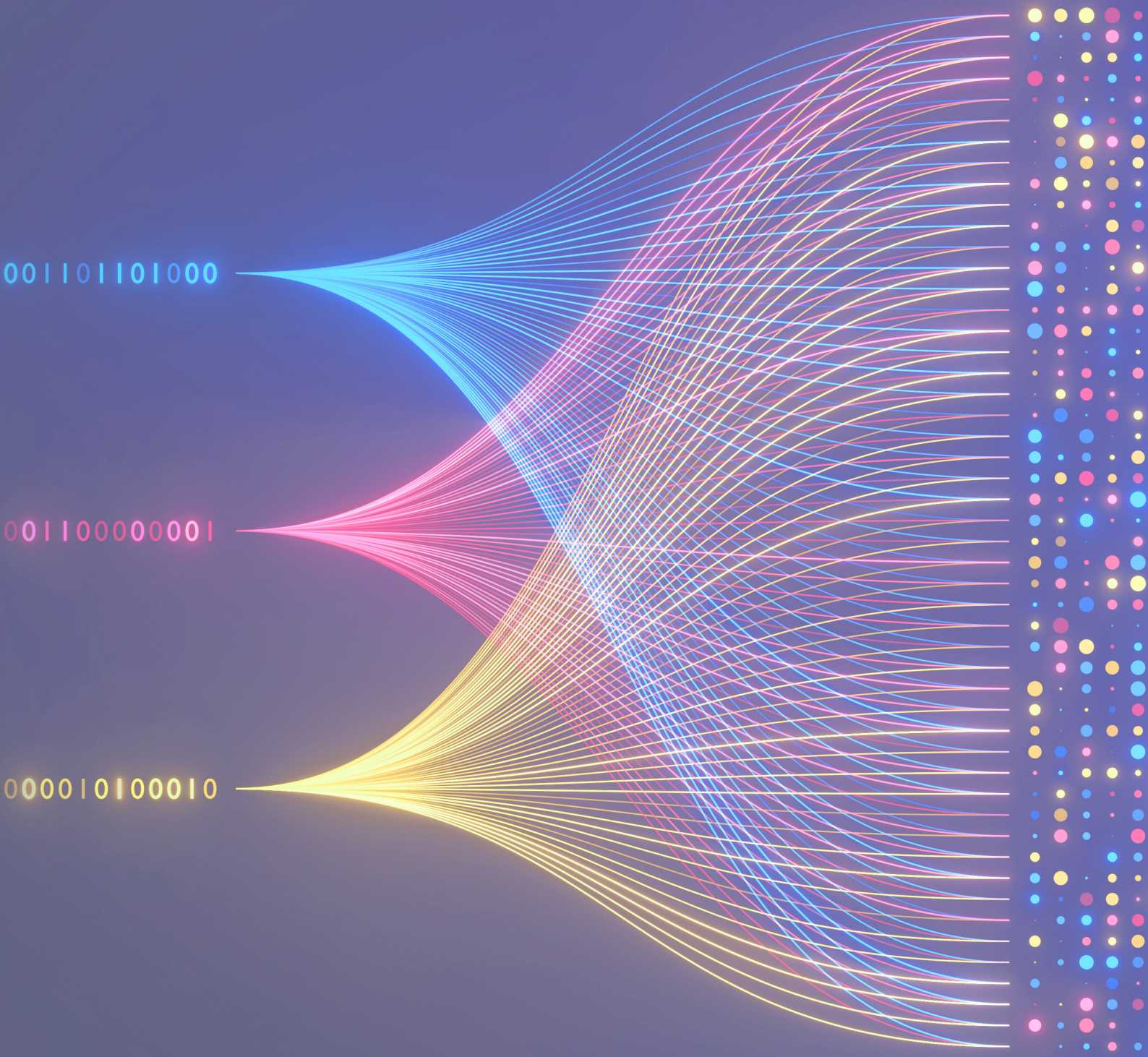


Others have argued that as applications continue to grow their user base, create moats, increase revenue and achieve product–market fit, applications will accrue more value than the networks.
Crosschain mobility is a driver for this as projects can easily relocate to cheaper platforms.

It is important to monitor the developments in the balance of power between protocols and applications to assess which segment is likely to benefit and to what extent from the future economic value created.

Part II

How to value cryptocurrencies



Part II: How to value cryptocurrencies

There are different types of crypto assets, and they create economic value in varying ways, so the valuation methods for different token types are necessarily different.

In the chapters that follow, we will discuss the valuation of the various asset types that make up the crypto market.

We start with the native tokens of blockchain protocols, sometimes referred to as cryptocurrencies, as this segment continues to make up most of the market. It is also the market segment that most think about when they consider whether 'crypto has any value', and if it does, how to determine it.

This segment of the market is also the hardest to value as cryptocurrencies are an entirely new type of asset.

What gives cryptocurrencies value?

A claim that crypto critics often make without backing it up with facts or analysis is that 'crypto has no fundamental value' but is instead pure speculation, traded in the hope that a 'bigger fool' will come along and buy it.

This claim, however, does not hold up when subjected to analysis.

Intrinsic value

Any currency or asset derives its value from one of two things: it generates value (e.g. stocks and bonds through the activity of the issuer) or there is reliable demand for it (e.g. commodities).

Unlike fiat currencies, cryptocurrencies have an intrinsic economic value, derived from the activity of users and projects built on top of the blockchain. Users of the protocol pay transaction fees and this transaction-fee economy provides a baseline for the value of the token.

Tokenholders access this value either by being validators or miners or by the protocol collecting some or all of the transaction fees and burning the corresponding amount of tokens. These mechanisms ensure that value accrues to tokenholders simply for owning the token – either because validators bid the price up to the point where the transaction-fee income still provides an attractive rate of return or if the tokens are burnt by the protocol, then the reduced supply acts to lift the price per token.

No similar intrinsic value exists for fiat currencies. There is no activity using fiat currencies in which the holders of the currency participate or earn a share of. Quite the contrary, because of the inflationary spending of most governments, the purchasing power of fiat currencies tends to erode significantly over time, which represents a de facto stealth tax that holders of the currency are charged.

Interest earned on fiat deposits is a different proposition: the interest paid out is generated by banks through lending out the deposits. When a bank is expected to simply safeguard an asset, this custody service needs to be paid for and no interest is earned. But interest-paying deposits de facto authorise the bank to lend them out, which as recent events underscored also creates the opportunity for bank runs, as banks are unable to liquidate more than a portion of their loans over the short term.

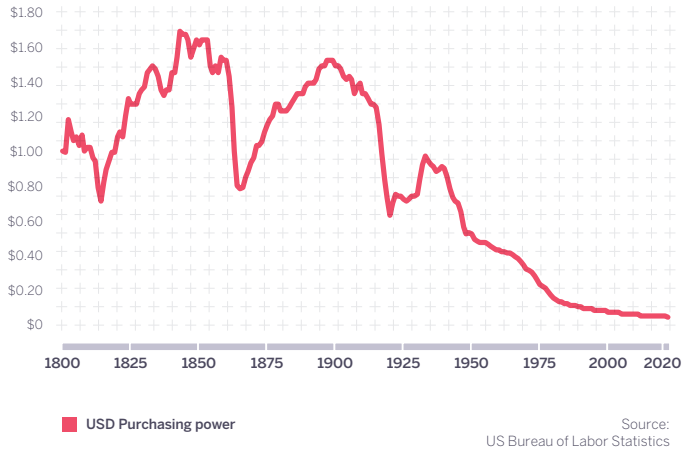
Interest can be earned on cryptocurrencies as well if holders commit them to lending pools or liquidity pools. In this regard, fiat and cryptocurrencies are analogous, with the difference that decentralised lending or liquidity pools typically do not have the same duration mismatch that banks have.

The other argument for the value of fiat currencies is that they are backed by the economy that uses the currency, and therefore there is reliable demand for it. The creation of the petrodollar was based on this concept: compelling a large part of the world economy to transact in dollars, thereby creating demand for the currency.

But for a currency to derive its value from an economy, it has to add value to the economy. Economic activity pivots to the best money available unless a currency's use is enforced by law and the use of alternatives is banned. Even in these situations, if the 'official' money poorly serves the needs of its users, shadow economies using different forms of money can often arise to get around this. Ultimately, when an economy is captive to an inferior currency, it is a fundamentally fragile situation.

In the past, currencies used to be backed by commodities (primarily gold), but the gold reserves of governments now only amount to a tiny fraction of the money supply. Without any intrinsic floor to the value of fiat currencies, their purchasing power has declined dramatically since.

THE DOLLAR'S PURCHASING POWER SINCE 1800



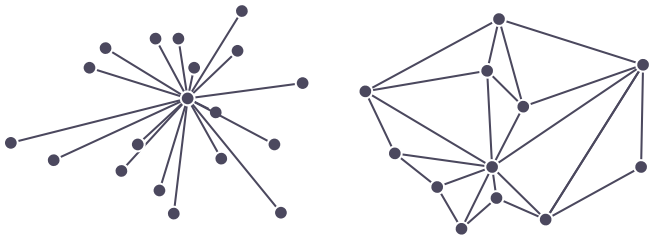
Source: US Bureau of Labor Statistics

Security value

The extent to which a currency or asset can be securely stored affects its value. In the case of fiat currencies, deposit insurance schemes provide this security – up to a certain amount.

Security is one of the core design features of blockchain protocols. The distributed nature of the ledger means a hacker would need to take over more than 50 percent of validator nodes to corrupt the network. For large cryptocurrencies, this requires an extraordinarily large amount of money and without a corresponding profit as a hacked asset would quickly lose its value. Restoring the previous state of the blockchain through a so-called 'fork' (taking a copy of the ledger) can remedy such an attack.

CENTRALISED VS DECENTRALISED SYSTEMS



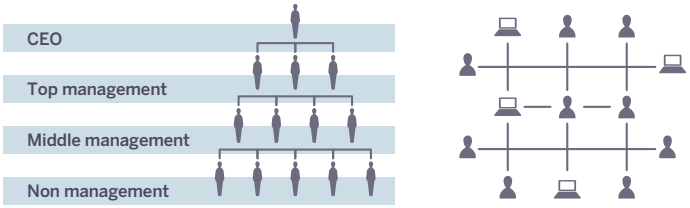
Bugs in a code are another security risk that mostly affect younger protocols. Cryptocurrencies with a long track record of operating without issues have greater security value.

The greater security of a protocol increases its value, as it makes the cryptocurrency more suitable as money and as a store of value. It also makes the platform more attractive for projects to build on, leading to greater ecosystem expansion and user growth.

Value of governance rights

Blockchain protocols and applications are intended to be governed in a decentralised manner. In the case of younger projects, however, it may take time before it is practical to rely on decentralised governance.

TRADITIONAL CENTRALISED SYSTEM VS DECENTRALISED AUTONOMOUS ORGANISATION



Whether the tokenholders' governance rights have any value depends on whether they can make decisions that influence the economic value of the tokens.

For example, the governance rights of a decentralised finance protocol are valuable where decisions can be made about the distribution of platform revenues between liquidity providers, the project's treasury and tokenholders. But 'governance rights' that merely allow tokenholders to decide on matters that have no economic relevance have very little value beyond some indirect impact by encouraging engagement.

Utility value

There is considerable confusion in the crypto space around the concept of a token's 'utility'. This is in part due to the fact that the legal definition of 'utility tokens' has afforded lighter regulatory treatment in several key jurisdictions, encouraging projects to describe their tokens as utility tokens irrespective of their actual utility.

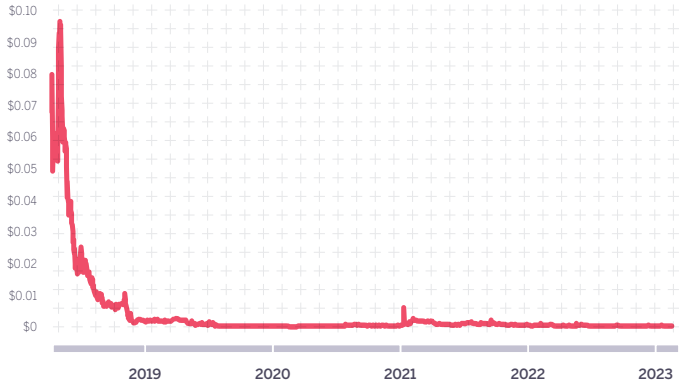
Whether a token derives any value from its purported utility depends on the economic impact of the activity. Native tokens of blockchain protocols such as Ethereum provide genuine utility by securing the network. Tokens that carry rights to discounts or other economic benefits have a value equal to the value of those rights.

But claims that a token has utility simply because it can be used as a means of payment on the project's own platform are meritless. This type of 'utility' represents no economic value since no one needs to purchase the token to have access to the utility.

Projects that mandate that only their own tokens can be used on their platform as a means of payment attach negative utility to the token. It is an inconvenience, a cost and a risk to have to purchase a token that otherwise has no utility.

We provide an example below from the ICO Boom era. A project that mandated payment for their property rental services in its own tokens was initially embraced during the hype but then converged to zero as that sort of 'utility' had no actual value.

RENTBERRY TOKEN PRICE HISTORY



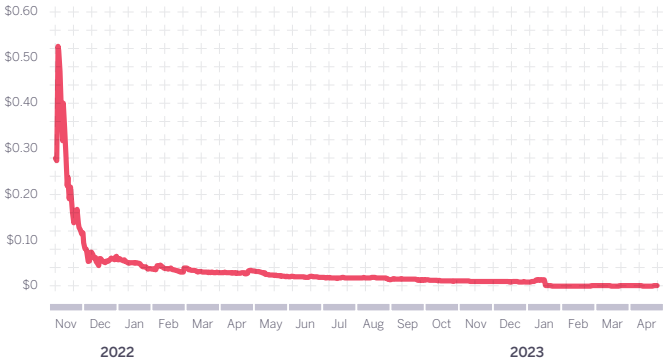
Source: CoinMarketCap

Memetic value

Sometimes a community converges around a 'meme', occasionally inspired by endorsement by a celebrity. But such a community only has economic value if there is an intention, and actions taken, to convert it into some productive activity.

SHIBA INU, for example, has been seeking to leverage its following into launching various applications (decentralised exchange, layer 2 protocol, etc.). Most meme coins, however, do not attempt to create anything productive and in that case their memetic value is close to zero

DOGS OF ELON TOKEN PRICE HISTORY



Source: CoinMarketCap

Why is it hard to value cryptocurrencies?

There is little consensus so far about how to value cryptocurrencies. This lack of understanding has also led to investors occasionally bidding up the prices of largely meritless tokens, such as a number of meme coins as well as tokens that claimed to have a utility but actually had none.

There are a number of reasons why it is difficult to value cryptocurrencies:

- Decentralised ecosystems represent entirely new business models, and the value creation and value accrual to the tokens is still poorly understood.
- The crypto market encompasses a disparate universe of different token types that require different valuation methods, and this creates further confusion.
- Most of the value of cryptocurrencies is premised on significant future growth, and valuing growth is typically difficult, as there are few tangible data points.
- Crypto assets often have various unique features that influence their value, making their valuation even more complex – at this point the understanding of the value of security, governance and utility is limited.
- Crypto assets allow entirely new models for incentive structures, funding growth and innovation and the distribution of the economics, and the industry is constantly experimenting with various new models, which further complicates the valuation.
- While there are data points that can be used as inputs for valuation models, the availability, accessibility and quality of data are further obstacles.

THE CHALLENGES OF VALUING CRYPTO ASSETS

Commonly used valuation techniques

There have been several various methodologies proposed, but many of these give only limited and incomplete insight into the fundamental value of cryptocurrencies.

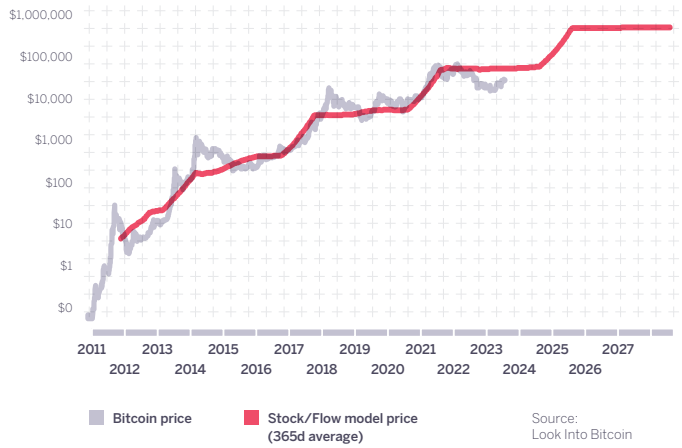
Many of these techniques are useful and provide important pointers, but on their own, they do not constitute comprehensive valuation models.

We discuss several of these methodologies below, focusing only on models for fundamental valuation. In this report, we do not cover any sentiment indicators or trading signals such the MVRV ratio (market value vs realised value).

Stock-to-flow

A valuation technique borrowed from the commodities market, it assesses the relative scarcity of an asset by comparing its existing stock (supply) to newly created supply (flow).

BITCOIN STOCK-TO-FLOW RATIO



But unlike commodities whose demand is largely predictable, ignoring the demand side when valuing Bitcoin is not a reasonable valuation methodology. Indeed, valuing cryptocurrencies involves assessing the fair market capitalisation, and the token supply is used merely to translate this into a fair price per token. The supply in itself does not drive the fair market capitalisation.

And while scarcity is a necessary requirement for a good store of value, scarcity itself is not valuable. There are many things that are in very scarce supply that no one wants and therefore they have no value.

A change in the rate of supply growth (e.g. Bitcoin halving) may have an impact on sentiment, but it does not in itself increase the value. If demand stays constant, a slower rate of supply growth is still growth, i.e. it is still dilutive rather than value enhancing.

The fact that cryptocurrencies' supply models are transparent and well-known also means that there is no positive or negative surprise, except when there is a change to the monetary policy of the cryptocurrency (as was the case with Ethereum recently). Barring such a change, the supply side of the valuation is perfectly predictable.

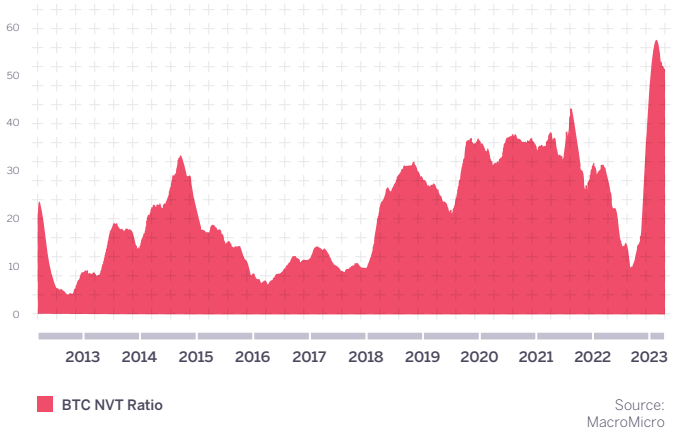
Ultimately, assessing the value of cryptocurrencies lies in assessing future demand and value creation.

NVT

The network value to transactions ratio compares the market value of a cryptocurrency to the volume of transactions processed by the network.

The metric can highlight valuation anomalies across tokens or for the same token over time.

BITCOIN NVT RATIO



Source: MacroMicro

Its limitation is similar to that of the P/E ratio for stocks in that a high multiple can express either the market's actual expectation of high future growth or overvaluation. As it is a combination of both, it is hard to disentangle.

It can, however, be used for reverse enquiry: is the growth implied by the NVT ratio higher or lower than the investor's reasonable expectation.

It is also important to note that the NVT ratio only assesses a protocol's value based on the volume of transactions it processes, and it ignores other growth drivers, such as the use of a cryptocurrency as a store of value.

In addition, to the extent that it assesses value based on the activity on the network, it is important to keep in mind that network activity translates into value very differently for Proof-of-Work vs Proof-of-Stake protocols, so their NVT ratios are not comparable.

Fees, revenues or profits vs market capitalisation

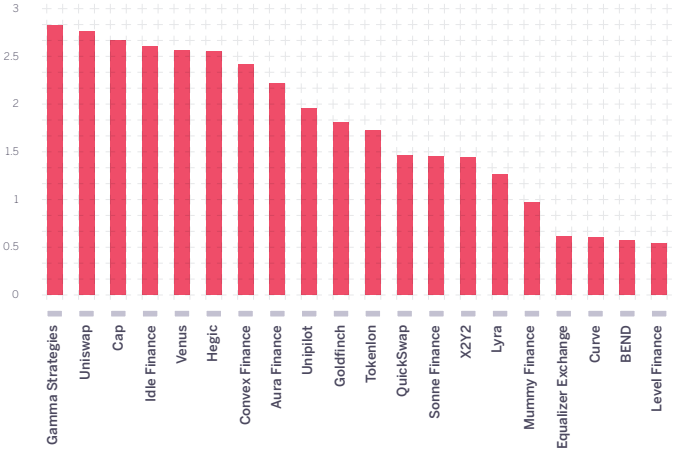
There are other metrics that more precisely target the value that accrues to a protocol than the NVT ratio. Instead of using the transaction volume, similar ratios can be calculated by using the fees paid to the protocol, the revenues or the profits earned and comparing them to the token's market capitalisation.

These metrics have a higher information content because a high volume of transactions at very low fees may generate less economic value than lower volume at higher fees, and, ultimately, the token's fundamental value is driven by the value it captures.

Revenues earned are even more precise, as they subtract any fees paid out by the protocol. For example, in the case of a decentralised finance platform, they subtract the fees the protocol pays to liquidity providers.

Profits of decentralised platforms are often close to platform revenues, as the cost of operating these platforms is typically very low. Some Proof-of-Work blockchains are an exception, however, there both the costs and the revenues accrue to the miners, and they affect the token's value through a different mechanism.

PRICE TO FEES RATIO OF SELECT DEFI PROTOCOLS (AS OF 18/4/23)



Source: Token Terminal

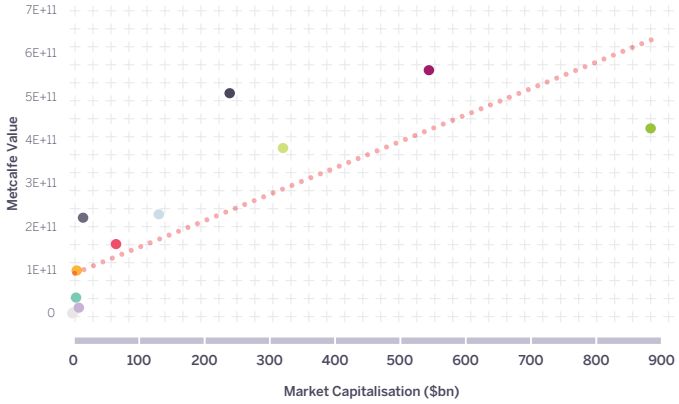
These metrics are similar to P/S and P/E metrics for stocks and have the same limitations as those ratios. As in the case of the NVT ratio, they signal the market's growth expectation, and they are useful for reverse enquiry, spotting outliers or tracking a token's market valuation over time.

Network effect – Metcalfe's Law

'Metcalfe's Law' says that a network's value is proportional to the square of the number of nodes in the network. It is an important insight for valuing blockchain protocols, as it highlights that the value of a network grows considerably faster than its user base.

Metcalfe's Law tells us that forecast growth in user numbers translates into exponentially greater network activity. It also tells us that a protocol with a larger existing network will capture a disproportionate share of the total economic value available to the sector.

BITCOIN'S MARKET CAPITALISATION VS METCALFE VALUE AT YEAR END 2009-2022



Source: CoinMarketCap, Sygnum Bank

However, as a valuation metric, Metcalfe's Law has its limitations, as it fails to consider how a protocol's market share translates into value for the token. Proof-of-Work vs Proof-of-Stake protocols capture value differently. Some platforms have very low fees relative to others. Consequently, on its own, Metcalfe's Law is simply a tool but not a valuation methodology.

Miners' cost

Some have proposed that the cost of producing a cryptocurrency puts a floor under its valuation. This is no more true for cryptocurrencies than for any other product. If the market does not pay a price that is higher than the production cost, the latter needs to adjust or the company in question will go out of business. We saw this recently when Bitcoin miners' costs exceeded their revenues. This did not lift the price of Bitcoin, nor did it give Bitcoin any 'value', rather miners started going out of business.

Bitcoin has a built-in mechanism to adjust the cost of mining if the amount of hash power committed to the network falls. It does this through adjusting the 'difficulty' which drives the amount of computing power required. So rather than providing a floor to the Bitcoin price, the marginal cost of production will adjust downwards. This will also make the network less valuable as its security levels decline as the number of miners falls.

Although the 'marginal cost of production' is not a valuation methodology of any sort for cryptocurrencies, it is still an important metric to track as it provides information about fundamental trends for the protocol, including network security and potential selling pressure for the token.

BITCOIN AVERAGE MINING COSTS

Source: MacroMicro

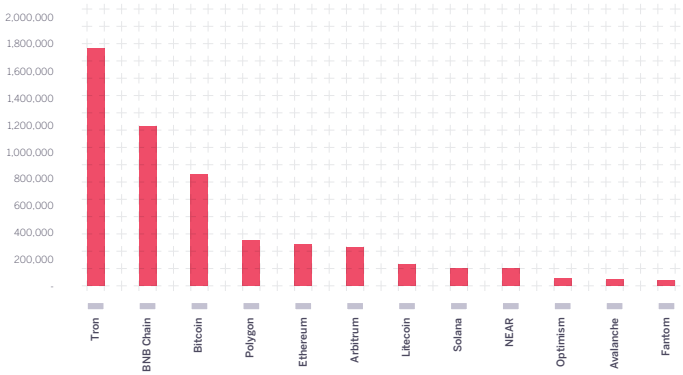
Comparables

Although not a technique to assess the absolute value of a token, comparables provide useful pointers for the relative value of cryptocurrencies.

Various metrics such as the number of active users, connected wallets, unique visitors and so on can be tracked and compared across protocols and over time.

The caveats are that the same number of users may generate more economic value on one platform vs another and that the price of a token discounts the expectation for future growth rather than reflects the current level of activity. These comparables are nonetheless useful as they provide proof points on the project's success over time and relative to other projects.

DAILY ACTIVE USERS OF SELECT LAYER 1 AND LAYER 2 PROTOCOLS (AS OF 18/4/23)



Source: Token Terminal

Measuring protocol quality

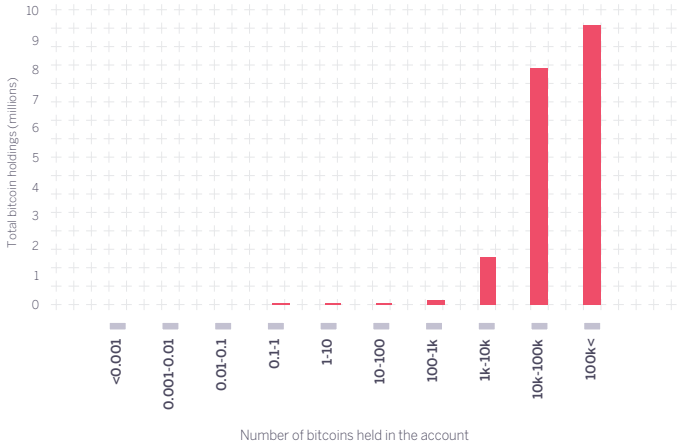
Although not valuation methodologies as such, metrics that measure a protocol's quality across various metrics nonetheless provide useful insights that can be used to assess whether a platform has better or worse growth prospects.

For blockchain protocols, the qualities that certain metrics seek to measure relate to the level of decentralisation and the likelihood of attacks.

The Nakamoto coefficient measures decentralisation and represents the minimum number of nodes required to disrupt a blockchain's network. A high Nakamoto coefficient implies greater security, making the network more valuable.

The Gini coefficient, originally used to measure income or wealth inequality in countries, is used to track the concentration of cryptocurrency holdings. Although higher concentration is considered a negative, it is important to understand the full context when comparing projects, such as the stage of maturity.

BITCOIN'S WEALTH DISTRIBUTION



Source: Glassnode

The longevity of a protocol is also highly relevant as a proof point, and we need to take it into consideration when comparing younger projects to more established ones.

How to value a currency

Cryptocurrencies derive part of their value from their use as a currency. For some cryptocurrencies such as Bitcoin or Litecoin, this is currently an important or even dominant part of their value.

Valuing currencies relative to each other is done by comparing their purchasing power parity. This, however, is not applicable to cryptocurrencies since prices are currently not set in crypto almost anywhere, so there is no baseline that can be used for cross-currency comparisons.

The quantity theory of money can help, however. This states that within an economy served by a currency, the money supply times the velocity of money must equal the economic activity times the price levels in the economy: M * V = Q * P. This equation provides a simple demonstration that if the velocity of money stays constant and economic activity does not increase, an increase in the money supply must lead to an increase in the price levels, i.e. inflation and a decline in the purchasing power of the currency.

We can apply this to cryptocurrencies by estimating the size of the economy where the cryptocurrency is expected to displace a fiat currency (Q * P). As mentioned previously, until price levels are set in a cryptocurrency, the 'P' is determined by the price levels in the economy the cryptocurrency takes market share from.

The velocity of currencies depends on how specialised an economy is (the more specialised the economy, the more transactions need to take place) and on the rate of savings (the more people save, the lower the velocity of money). As cryptocurrencies take market share, the displaced economy's level of specialisation is an extraneous factor, simply inherited by the cryptocurrency.

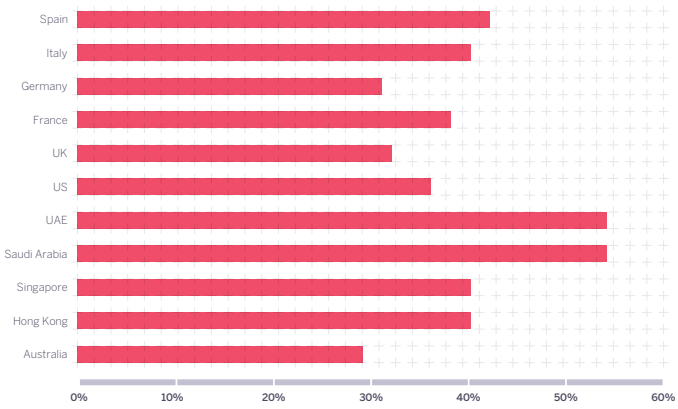
This 'inherited' velocity should be used in valuations of crypto assets as payment currencies rather than the observed velocity of the cryptocurrency because the latter combines the effect of its use in transactions and as a safe haven asset. Additionally, certain cryptocurrencies have some of their supply vesting or locked, or held by entities such as the project's treasury, and this also affects the observable velocity without impacting the payment habits of those who might use the token as a payment currency.

Once estimates are made for the size of the economic activity where a cryptocurrency is expected to take market share from fiat currencies and velocity is computed, the fair market capitalisation of the cryptocurrency can be calculated by M = Q * P / V.

The key driver of the valuation estimate is how much market share in global payments the cryptocurrency is expected to achieve. This market share in turn is driven by:

- The number of investors in the cryptocurrency who hold it as a store of value – those with savings held in crypto also represent a demand for crypto payment services
- Legal tender laws
- Laws in various countries with regard to the use of cryptocurrencies in payments
- The number of major payment service providers who offer crypto payment services
- Cryptocurrencies' prevalence in cross-border payments
- The existence and size of any shadow economy that transacts in crypto
- Prevailing reasons in certain economies for seeking alternatives to fiat currencies, such as high levels of inflation, currency controls, restrictions on the use of fiat currency accounts or cash, fiat currency accounts or payment mechanisms used for surveillance

SHARE OF CONSUMERS AGED 18-35 WHO BELIEVE CRYPTOCURRENCY SHOULD BE USED AS A CURRENCY (AS OF 2022)



Source: checkout.com

Fiat currencies also have very strong network effects, and the entrenched market share of a currency is hard to shift unless there are good reasons for people to look for alternatives. The current fragility of the global financial system, which has not only prevailed but deepened since the 2008 financial crisis, was the reason for the creation of Bitcoin in the first place and continues to provide the motivation for a growth of cryptocurrencies in payments.

In this regard, a severe outcome for the macro environment can be a favourable setting for cryptocurrencies to take market share in payments. Although economic activity declines overall, it can be more than offset by the growth in cryptocurrencies' market share.

Cryptocurrencies can also function as private money for communities, similar to historic examples where private money on occasion allowed a community to thrive against the backdrop of a severe economic environment – such as in the case of 'the miracle of Wörgl'.

In addition to cryptocurrencies taking market share from fiat currencies, they are also used within the crypto ecosystem, for example as the currency of fundraising for ICOs.

It is important to note that a cryptocurrency that is not considered a good store of value is not likely to derive much value from being a payment currency either, as everyone would seek to convert it as quickly as possible. This would drive the velocity towards infinite, devaluing the token, with its price approaching zero.

How to assess a store of value asset

Store-of-value assets such as gold are not productive and do not generate an income. In fact, they attract a negative income, as they typically incur storage costs. The fundamental drivers of the value of these assets are supply and demand.

While supply and demand both fluctuate in the case of precious metals, the supply of cryptocurrencies is perfectly predictable, so valuing them as store-of-value assets hinges on estimating the demand.

The drivers of demand are partly the same for all store-of-value assets, namely the overall need for safe-haven assets based on the (actual or perceived) state of global or certain local economies and the financial system. Governments' decisions to use certain assets as reserves also play a pivotal part.

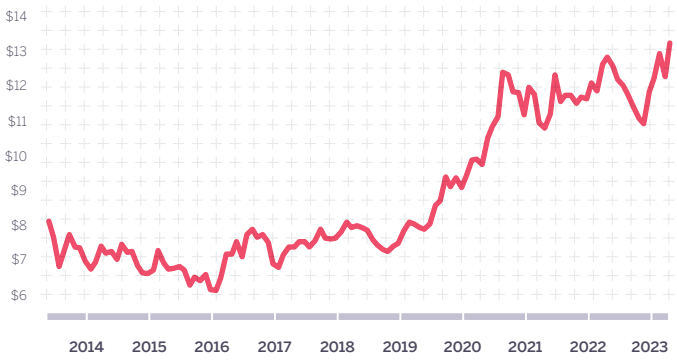
When there is a high interest in safe-haven assets, the demand for both precious metals and cryptocurrencies can rise without a change in their relative market shares.

A second source of demand for cryptocurrencies as stores of value is taking market share from traditional safe-haven assets. This may be driven by an assessment of the qualities of the various alternatives or it may be simply a decision to diversify.

As safe-haven assets are by definition bought to provide security in a crisis, and the precise nature of crises is hard to predict, it makes good sense to use a combination of store-of-value assets.

When cryptocurrencies are assessed on the required qualities for a good store-of-value asset, some cryptocurrencies compare favourably to gold. Bitcoin in particular does better on scarcity, authenticity (difficulty to forge), portability, divisibility and storability than gold. It is similarly permanent but has lesser widespread acceptance than gold.

GOLD MARKET CAPITALISATION (USD TRILLIONS)



Source:
In Gold We Trust Report

The valuation of cryptocurrencies as store-of-value assets involves an assessment of the overall demand for safe-haven assets and any expectation of the cryptocurrency taking market share from other store of value assets.

How to value native tokens of smart contract platforms

The value cryptocurrencies derive from their blockchains acting as platforms for decentralised applications and other token types is based on the cashflow from the transaction fees paid to the protocol.

Estimating the amount of future transaction fees ultimately hinges on estimating the future market share of the platform in combination with the total market size. How much fee revenue this translates into depends on the formula the protocol uses to determine the fees payable. In turn, transaction-fee levels impact on the protocol's market share – it is by no means the only determining factor, but it is one consideration. Certain activities, for example, become uneconomical above a certain level for transaction fees.

It is very important to recognise that different consensus mechanisms and tokenomic models translate the transaction-fee economy into value for the token in different ways.

If the protocol collects some or all of the transaction fees and burns (destroys) the corresponding amount of tokens, then the transaction fees earned translate directly into value for the tokenholders. (The same fair market capitalisation needs to be divided by a lower number of outstanding tokens, giving a correspondingly higher fair valuation per token.)

When the transaction fees are paid to the validators and miners, the relationship is direct in the case of Proof-of-Stake protocols but only indirect in the case of Proof-of-Work blockchains.

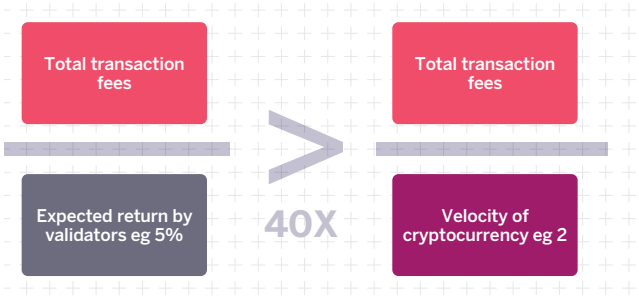
Proof-of-Stake protocols can be valued with discounted cashflow models based on the cashflows from the transactions fees that are paid to validators or burnt. The discount rate is a function of the risk factors such as protocol security or regulatory risk and the uncertainty around the growth forecasts.

In the case of Proof-of-Work protocols where the transaction fees are paid to external parties ("miners") rather than holders of the token, the transaction fees only have an indirect impact on the value of the token. This impact is through the transaction -fee economy creating demand for the token as currency. The valuation of this is the same as valuing crypto assets as payment currencies, as discussed in chapter 2.

It is important to note that the same total value of transaction fees expected to be earned by a Proof-of-Stake protocol gives a lot more value to the token than is the case with Proof-of-Work protocols.

The example below demonstrates this. In this example, the cryptocurrency has a 2x velocity and validators expect to earn a five-percent return on their stake. This means Proof-of-Stake validators will bid up the price of the token to 20 times the volume of transaction fees to achieve their five-percent target return, while the money supply required to support this transaction-fee economy for a Proof-of-Work protocol will amount to half of the transaction fees (total volume divided by the velocity of the cryptocurrency). This would give 40 times more value to a Proof-of-Stake cryptocurrency vs a Proof-of-Work token, with exactly the same amount of transaction fees earned by the two protocols.

VALUE GENERATION BY PROOF-OF-WORK VS PROOF-OF-STAKE PROTOCOLS



Protocols with zero transaction fees should be valued at zero, as there are no payments to validators, nor is any money supply required to support the protocol's operation. These tokens may have value as a currency or store of value (see above) but not as a platform for use cases.

Low transaction fees in themselves may generate greater revenue in the long run by catalysing far greater use. But microscopically low transaction fees are unlikely to accrue significant value to the token.

It is important to note that protocols that do not reward the miners or validators are fundamentally unsustainable even if they burn transaction fees, as there is no economic incentive for validators to participate in the network. The claim that 'having a functioning network is valuable' and this in itself serves as an incentive ignores the fact that economically rational actors do not carry a disproportionate share of the costs for the benefit of others who do not share in the costs. They would only do so if they have something else to gain, such as data or control that they can monetise, which then undermines the decentralised nature of the protocol.

In addition, protocols that are not decentralised (such as proof-of-authority) carry the additional risk that the parties controlling the protocol may introduce a change that alters the economics of the token. This would be akin to buying a bond where the issuer has the right to change the coupon if they so wish.

Tokenomic models

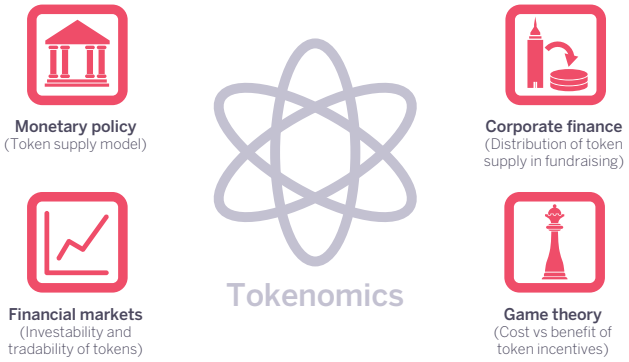
After estimating the fair market capitalisation of a cryptocurrency, the token supply model is used to translate it into an estimated fair value for the token.

Although the supply models of cryptocurrencies are transparent, they can be complex in some cases.

Their transparency is valuable relative to fiat currencies where the money supply can be altered at a whim and is often influenced by political considerations.

The complexities involve the formula that determines the amount of new supply created vs the supply to be destroyed (if such a mechanism exists for the token) and the distribution of the new supply. Cryptocurrencies are still experimenting with the ideal monetary policy.

THE COMPONENTS OF TOKENOMICS



It is also important to keep in mind that the self-custody in crypto led to a portion of tokens being permanently lost, and they need to be excluded from the supply for valuation purposes. This portion is particularly significant for Bitcoin due to its longevity and the relative carelessness of holders in the early days when the token had very little value.

The translation to fair value per token is the easiest for protocols with a supply cap or a fixed supply. For cryptocurrencies that base the minting and/or burning of tokens on the level of activity on the network, the supply also needs to be forecast.

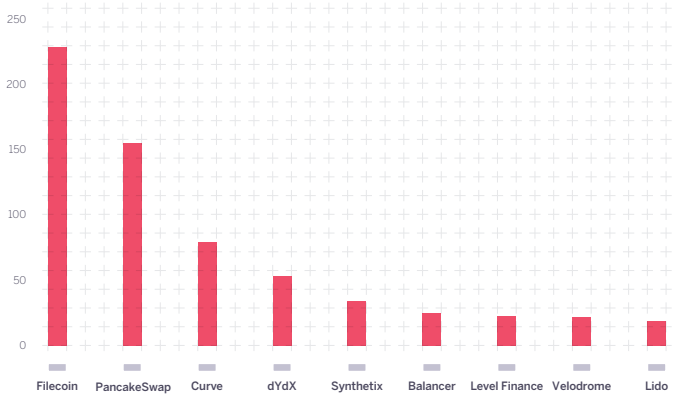
There are also cryptocurrencies that are designed to be permanently inflationary. The purpose of such models is to incentivise participation in the network, with the inflation used to effectively reallocate value from those who participate in validation at the expense of other tokenholders. The rational investor would choose to participate in the network, and the token should be valued from the perspective of the rational tokenholder.

Finally, there is an additional risk that the supply model of a token may be changed. In the case of decentralised Proof-of-Stake protocols, this is an upside risk, as only changes that benefit the value of the token will be approved. But when the protocol is not sufficiently decentralised or when the decision-making power lies with other parties (such as miners), it is possible that the interests driving the decision will not fully align with the interest of tokenholders. In the case of miners, there is still significant – although not perfect – alignment. But in the case of centralisation, the economic interests can diverge significantly.

Incentives

Token incentives are widely used in crypto as a means of growing the user bases of early-stage projects. This makes good sense due to the powerful network effects. They are also used as temporary competitive measures.

TOKEN INCENTIVES OF SELECTED DECENTRALISED APPLICATIONS (USD MILLIONS AS OF 18/4/23)



Source: Token Terminal

Their impact on value is twofold. On the one hand, they divert economic value away from tokenholders to another group (for example, liquidity providers to a DeFi protocol or new users of a game). Strictly speaking, rewarding miners with newly issued tokens as is the case with Proof-of-Work protocols is also an example of rewarding a group at the expense of tokenholders to incentivise them to secure the network until the transaction fees reach a level where they provide sufficient reward on their own.

Although incentives detract from the value in the first instance, they are used with the purpose of generating more value for the protocol than the value they divert. In the case of blockchain protocols (such as Bitcoin), this has typically been the case. In general, network effects create more economic value than the cost of the incentives since the latter are linear while the former are exponential.

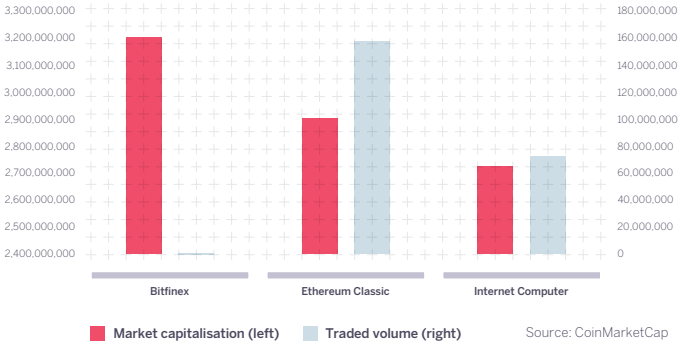
However, this only works if the incentivised user growth is sticky. In many cases, incentives have failed to achieve sustainable growth, as due to low switching costs, mercenary users have moved on to whichever project offered the most generous incentives at any given time.

Whether the incentives offered by a protocol are expected to be net-value accretive depends on how strong the project's value proposition is and how easy it is to switch to alternatives. In forecasting future revenues to the protocol, the questions to answer are whether customers are likely to remain once the incentives wind down and whether there is a 'moat' around the project that will ensure that the newly acquired business volume stays.

Liquidity discount

As with all investments, illiquidity detracts from the asset's value, as it increases the risk that the fair value cannot be realised due to significant slippage when trying to sell the token.

MARKET CAPITALISATION VS TRADED VOLUME OF SELECT TOKENS (USD AS OF 18/4/23)



Source: CoinMarketCap

This is an additional risk factor to consider in valuations. For an individual investor, the magnitude of the liquidity discount depends on the investment size relative to the traded volume for the token, but this consideration also drives the market price by dictating whether larger pools of capital will demand a discount.

Beyond traded volumes, the other consideration with regard to liquidity is whether there are large holders of the token who control a significant portion of the supply and may need to or choose to floor the market at some point. It is especially relevant to consider vesting and lockup schedules as an additional risk factor for the token price over the investment horizon.

Regulation

Regulatory risk remains a significant factor in several key jurisdictions – not least in the US – where regulators have so far failed to clarify the rules that apply to decentralised projects, and have brought enforcement actions retrospectively.

This can affect the whole market in the case of blanket regulations or bans or it might affect individual tokens. Regulatory risk necessitates either a higher discount factor in valuation models or modelling various regulatory scenarios.

Due to the decentralised and distributed nature of crypto, it cannot be banned or destroyed, but very hostile regulation can limit the growth opportunity.

A further point is that cryptocurrencies sometimes trade at a premium in certain markets (this has mostly happened in developing economies) when local demand rises steeply. These premiums can prevail for long periods when there are currency restrictions in place that prevent arbitrage, such as in the Nigerian example below.

THE PRICE OF BITCOIN IN NAIRA ON 23/4/2023

Putting it together

The fair market capitalisation of a cryptocurrency is the sum of its estimated value as a currency, as a store of value and as a smart contract platform.

Some tokens also provide access to external revenue streams. For example, the BNB token, which is the native currency of the BNB Chain, gains additional value from the revenues of the Binance exchange, a portion of which Binance uses to buy and destroy (burn) BNB tokens.

In addition to the growth estimates, the discount factor needs to be estimated to account for the risks. These risks include uncertainty around the growth estimates, execution risk, technology-related risks (security, bugs), regulatory risk and liquidity risk.

The estimated fair market capitalisation is translated into a fair value for the token by accounting for the supply dynamics. Future token issuance is dilutive while destroying (burning) tokens is value accretive. Neither affects the fair market capitalisation, but they affect the fair value per token.

For older projects, there is a certain amount of supply that has been permanently lost as early users did not always safeguard these assets that were not that valuable at the time. The estimates for irrecoverably lost supply also need to be considered.

Supply that is tied up at project foundations, early investors and founders or as collateral held in applications affects the token value by reducing the velocity of the token. In the valuation model, these should be included in the supply figure.

Below we provide a couple of examples of valuing cryptocurrencies. The objective is not to provide a forecast or express a view on the value of these tokens but to demonstrate the approach and the methodology. Therefore, the estimates are wide and are based on high-level data.

Case study: Bitcoin

We calculate the fair value for Bitcoin by estimating its value as a currency and as a store-of-value asset.

The value of Bitcoin as a platform for other use cases and applications is rolled into its value as a currency because for so-called Proof-of-Work protocols like Bitcoin, the transaction fees earned by the protocol are paid to the miners and the value does not directly accrue to tokenholders. However, a certain amount of 'money supply' is required to support payments in the transaction-fee economy. By including this in the estimate of the total money supply required to support Bitcoin's function as a payment mechanism, Bitcoin's use as a platform contributes to its fair value.

Bitcoin's value as a payment mechanism is estimated by forecasting its market share in global payments as well as its use within the crypto market as a payment currency, including in its own transaction-fee economy.

To forecast how much market share Bitcoin might take in global payments, we include a range of scenarios. Bitcoin's use in payments has been hindered by scalability issues, and growth is enabled by the Bitcoin layer-two scalability protocol, the Lightning Network, which offers not just increased transaction throughput but also lower fees.

Our low-end estimate forecasts Bitcoin's market share in consumer payments growing to 0.5 percent in ten years. This figure can be far greater in a period of monetary instability, which is a reasonable scenario over the next few years. The growth in Bitcoin's use as a store-of-value asset also creates demand as holders of Bitcoin find it convenient to be able use it for payments as well.

The scenarios we use for valuation are 0.5-percent, 1-percent and 2.5-percent market shares in consumer payments. We include a 5-percent 'extreme' scenario as a possibility under certain macroeconomic circumstances, but we do not include this scenario in the fair value calculations.

The FIS 2023 Global Payments Report references USD 48tr in global payments transaction volume which they forecast to grow at 5-6 percent a year over the next four years. Instead we used the OECD's 3-percent per annum forecast for long term global economic growth.

In business-to-business transactions and global trade, the role of Bitcoin is negligible at this stage. But there have been suggestions by certain national governments to allow its use in international trade, and it can be expected that a certain portion of domestic and international transactions will settle in Bitcoin. We use scenarios with market shares of 0.05 percent, 0.1 percent and 0.2 percent and include a 0.5 percent market share scenario as an 'aggressive' case although we do not include this in the fair value calculations.

The global B2B payments needs are estimated as the global GDP times the average length of supply chains of four to six intermediary steps between raw material and consumer (assuming on average one step between materials supplier and final manufacturing – although there can be more steps in between, and one wholesaler before distribution to retailers).

Bitcoin payments within the crypto ecosystem are estimated at USD 3tr currently, subtracting flows relating to investments and real-world payments already accounted for above from the current annualised transaction volume of approximately USD 4tr. In bull markets, the total onchain transaction volume has been significantly higher than this but we stick with the current figure as the baseline. Crypto payments include P2P transfers, transaction-fee payments, investment flows denominated in Bitcoin and paying for other crypto assets such as NFTs. We used a conservative ten-percent annual growth rate, which combines the crypto ecosystem's development and Bitcoin's price appreciation.

Due to network effects, this rate is likely to accelerate over time, but we use a flat ten-percent rate here. The ten-percent figure is quite conservative as Bitcoin's use as a platform may experience significant growth with the recent introduction of Bitcoin NFTs (Ordinals), the BRC-20 token standard for issuing assets on the protocol, and work on using zero-knowledge proof technology on the Bitcoin network.

The average of these estimates is calculated (ignoring the high-end estimates) and this is divided by the recent M2 money velocity of approximately 1.2 times as we assume that consumers' payment behaviour would not be affected by the currency they use. We do not use Bitcoin's velocity as that amalgamates multiple use cases for Bitcoin, not just consumer payments.

The long run global GDP growth was higher (around 5 percent) prior to the accelerating monetary and economic shifts since early 2020, and M2 velocity was also higher, around 1.8x. We base our assumptions on the prevailing macroeconomic environment.

Estimating Bitcoin's value as a safe-haven asset includes various scenarios along two vectors. One vector is the global demand for safe-haven assets and the other is Bitcoin's market share relative to other safe-haven assets, such as gold.

With the prevailing instability, many forecast the demand for gold to increase substantially, by 100 percent or more. We include three scenarios: a ten-percent, a 50-percent and a 100-percent increase in the global demand for store-of-value assets.

With Bitcoin's greater acceptance and its advantages (e.g. portability, divisibility and storability) over precious metals, its market share of approximately four percent is likely to increase. Our scenarios are a ten-percent, a 25-percent and a 50-percent market share. Our expectation is less that Bitcoin will cannibalise gold, it is more that a greater portion of the additional demand for safe-haven assets will flow towards Bitcoin, not least because it diversifies the safe-haven asset holdings to account for uncertainty over macro scenarios.

As with payments, we do not include the high-end estimates (doubling of the market for safe-haven assets and a 50-percent market share for Bitcoin) in our fair value calculations, but we include them for illustrative purposes as these scenarios are also plausible, even if not likely.

Once we have summed the above averages, we apply a 70-percent discount to account for the risks around the estimates as well as technological and regulatory risk.

Although we looked ten years ahead to describe reasonable scenarios, adoption can happen much faster under certain circumstances and can accelerate exponentially due to network effects. We are not forecasting cashflows here, but rather market size and market shares. The seventy-percent discount also accounts for the uncertainty over timeframes.

As our base case, we use all tokens in issue and apply the 6.6-percent future dilution as a further discount to fair value.

It is more accurate to subtract the lost and destroyed tokens from the supply. In the case of Bitcoin, this is estimated at four million tokens, including 'Satoshi Nakamoto's' one million Bitcoin that has never been touched or moved (other than ten Bitcoin moved in 2009).

However, as the lost tokens are an estimate, we ignored them in this model.

Below is a summary of the scenarios and estimates. The assumptions can be debated, and our purpose is primarily to illustrate the process.

BITCOIN VALUATION EXAMPLE

Payments	**Market size ($tr)**	**Market size in ten years ($tr)**	**Market share scenario**			
Consumer	48	65	0.5%	1%	2.5%	5%
			0.3	0.6	1.6	3.2
B2B	450	605	0.05%	0.1%	0.2%	0.5%
			0.3	0.6	1.2	3.0
Crypto	3	7.8	7.8	7.8	7.8	7.8
Total			8.4	9.0	10.6	14.0
Velocity	1.2X		7.0	7.5	8.8	11.7
Average of lower end scenarios ($tr)			7.8			

Safe-haven	**Market growth**		
Market size	**10%**	**50%**	**100%**
	14.85	20.25	27
Market share			
10%	1.49	2.03	2.7
25%	3.71	5.06	6.75
50%	7.43	10.13	13.5
Average of lower end scenarios	3.1		

Combined estimates	**Low end**	**Average of lower end scenarios**	**Average of all scenarios**	**High end**
Estimated market capitalisation ($tr)	10.1	10.8	11.8	17.6
Discounted at 70%	3.0	3.3	3.6	5.3

Estimated fair market capitalisation: $3.2tr	Supply metric	Estimated fair token price ($)
All tokens in issue	19.1m	165,386
Future dilution	6.6%	**155,147**
Estimated circulating supply	15.7m	207,522
Future dilution	8.3%	191,653

Case study: Ethereum

Proof-of-Stake protocols such as Ethereum are valued differently because the transaction fees accrue directly to tokenholders. Their valuation as a payment currency and safe-haven asset follows the same mechanics, but additional significant value is derived from their use as a smart contract platform.

Proof-of-Stake protocols are substantially more valuable as platforms because they capture the value of the transaction fees generated, while in Proof-of-Work protocols this is paid to external parties (i.e. the miners).

We estimate Ether's value as a payment currency by assuming it maintains its current market share relative to Bitcoin in consumer payments and captures only a negligible percentage of any business-to-business payments. This ignores the plausible possibility of Ethereum overtaking Bitcoin as the preeminent cryptocurrency based on its better development roadmap, yield and increasingly deflationary supply model.

A possible flip in the ranks of the top cryptocurrencies adds a potential further upside to Ethereum, but we ignore this in the fair value calculations.

Our market share assumptions for Ether in consumer payments are 0.2 percent, 0.3 percent, 0.5 percent and 1 percent, with the latter only illustrative and ignored in the fair value calculations. The assumptions for business-to-business payments are 0.01 percent, 0.02 percent, 0.05 percent and 0.1 percent, with the latter not included in the fair value averages.

Ethereum is widely used as a payment currency within the crypto ecosystem. We estimate the current usage at USD 1.5 tr, subtracting store-of-value investments and real-world payments from the onchain transaction volume. As with Bitcoin, we use the current levels as the baseline for our forecasts, although transaction volumes have been significantly higher in bull markets. We apply a 15-percent growth rate to Ethereum's use as a currency within the crypto ecosystem (including the effect of an increase in the price of Ether), although this rate could be significantly higher and could accelerate with network effects.

Ether's velocity is quite low due to a significant portion of the tokens staked and locked up as collateral. As with Bitcoin, we use the M2 money velocity of 1.2x in our estimates for valuing Ether as a currency.

Ethereum's current market share of under one percent as a safe-haven asset is expected to increase as recent upgrades to the protocol's monetary policy have turned the asset broadly deflationary. We are forecasting scenarios of one percent, five percent and ten percent, using only the former two in our fair value estimate. As with Ether's use in payments, there is a significant upside to its use as a store of value should it flip Bitcoin.

We apply the same 70-percent discount to our estimates as we did with Bitcoin to account for the uncertainty around the estimates, the delivery of the technology upgrades and regulation.

The calculated fair market capitalisation is supplemented by the direct value created by Ethereum as a smart contract platform through the transaction fees that accrue to tokenholders. Tokenholders earn the fees either by the protocol destroying a corresponding amount of tokens or by being paid to stakers as reward. Any tokenholder can stake their Ether.

We use two different approaches to approximate Ethereum's value as a smart contract platform: discounted cashflows and comparable multiples.

Ethereum's revenues annualised to close to USD 20bn at the height of the bull market but fell to USD 2bn during the bear market. We use a base-line assumption of USD 10bn and a long-term growth rate of 35 percent, which incorporates both a growth in the volume of business and a translation gain from a rising Ether price as the fees are paid in Ether. We use the prevailing approximate CCC yields of 15 percent to discount the cashflows. The net present value yields USD 330bn.

As future cashflows of early-stage growth projects are notoriously difficult to forecast and the growth can be, and often is, exponential, we sanity check the analysis by using P/E multiples of companies from somewhat comparable sectors. Major tech companies such as Google or Microsoft currently trade at P/E multiples of 20–30x, while major payment providers such as MasterCard, Visa or PayPal trade at 25–35x. As none of these businesses are early stage, it is reasonable to assign a multiple of at least 40x to an early-stage technology with extraordinary growth potential. This would put a value of USD 400bn on Ethereum as a platform.

As crypto's use cases are only just beginning to be explored, the upside in transaction volume growth is potentially far greater than these forecasts.

We used the platform revenues as a basis for our forecasts because the cost of operating the platform is extremely low. Development and maintenance of the protocol is funded by the Ethereum Foundation, which continues to have very significant resources that it was originally allocated at the time of the original token launch.

A final point to consider is whether the drive towards lower transaction fees, and in particular Layer 2 protocols' role in improving scalability and reducing costs, which has allowed them to take significant market share, necessitates reduced revenue forecasts for Ethereum. On balance, we

believe that these scalability improvements are a necessary enabler for the blockchain megatrend and Ethereum will be a net beneficiary of earning a smaller share of a very much bigger pie as a consequence.

The net of Ether issuance and token burn resulted in an annualised 2-3 percent net decline in token supply recently. For our forecast, we use a very conservative assumption of an annual 0.25 percent decline in supply while recognising that an increase in network activity can lead to a far greater deflationary effect, representing further potential upside for the token.

There are also approximately 600–700,000 tokens permanently lost, but as this is a relatively small share of the total supply, we will ignore this.

The chart below summarises of assumptions and forecasts.

ETHER VALUATION EXAMPLE

Payments	Market size ($tr)	Market size in ten years ($tr)	Market share scenario			
Consumer	48	65	0.2%	0.3%	0.5%	1%
			0.13	0.19	0.32	0.65
B2B	450	605	0.01%	0.02%	0.05%	0.1%
			0.06	0.12	0.30	0.60
Crypto	1.5	6.1	6.1	6.1	6.1	6.1
Total			6.3	6.4	6.7	7.3
Velocity	1.2X		5.2	5.3	5.6	6.1
Average of lower end scenarios ($tr)			5.4			

Safe-haven	Market growth		
Market size	10%	50%	100%
	14.85	20.25	27
Market share			
1%	0.15	0.20	0.27
5%	0.74	1.01	1.35
10%	1.49	2.03	2.70
Average of lower end scenarios	0.53		

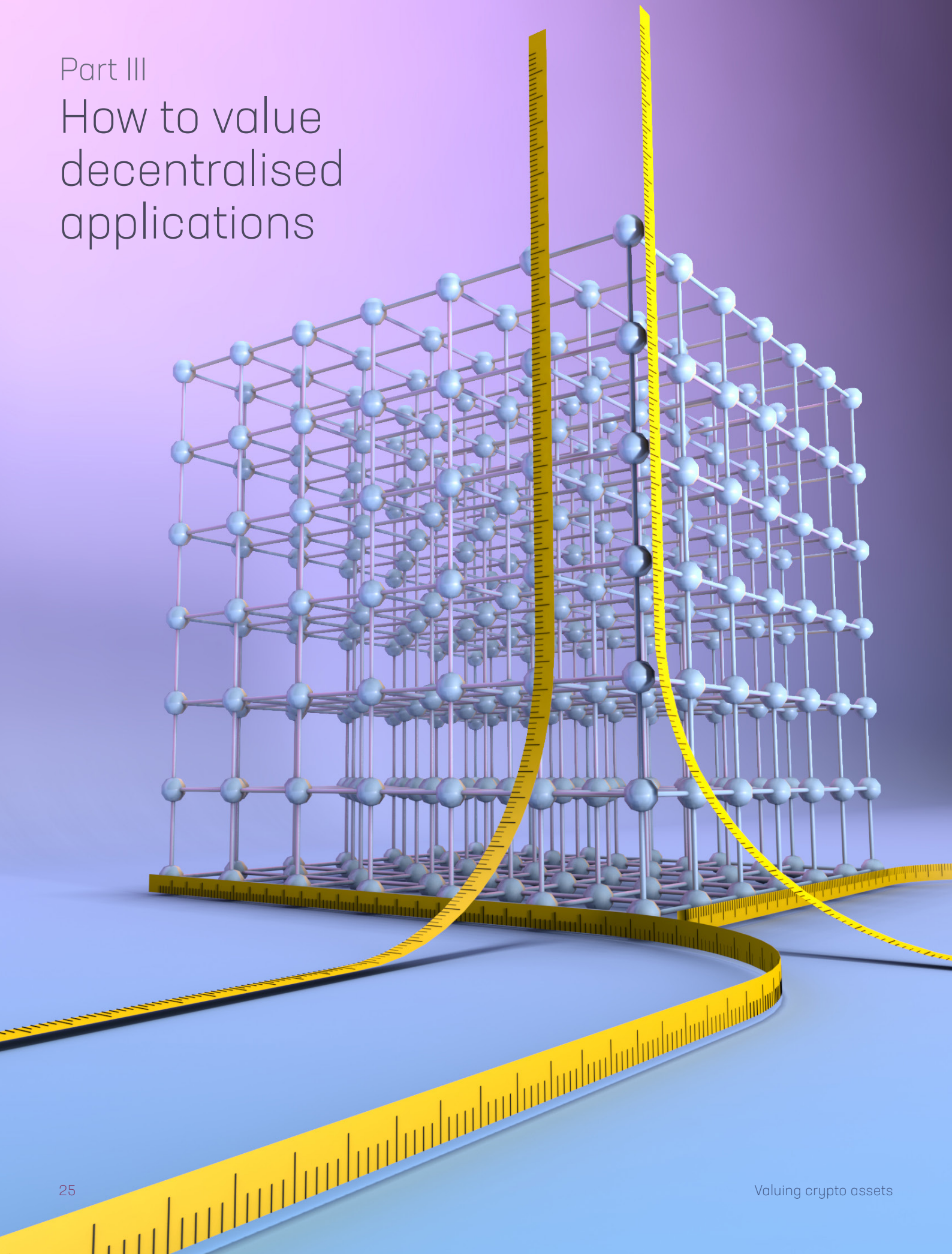
Combined estimates	Low end	Average of lower end scenarios	Average of all scenarios	High end
Estimated market capitalisation ($tr)	5.7	5.9	6.1	7.2
Discounted at 70%	1.72	1.77	1.82	2.16

Smart contract platform valuation	DCF based	Multiple based	Average
Estimated market capitalisation ($tr)	0.33	0.4	0.365
Combined with currency/store of value asset valuation	2.13		

Estimated fair market capitalisation: $3.2tr	Supply metric	Estimated fair token price ($)
All tokens in issue	120.2m	17,784
Deflation per annum	0.25%	**18,229**

Part III

How to value decentralised applications



Part III: How to value decentralised applications

The tokens of decentralised applications building on top of blockchain protocols are more straightforward to value than the underlying protocols (cryptocurrencies).

These projects come close to resembling traditional corporations as far as economic value generation is concerned although they are very different in terms of ownership, governance and alignment of incentives.

As they are projects with cashflows earned from the service they offer (lending, video streaming, gaming, etc.), their fair market capitalisation is the present value of the expected future cashflows that accrue to the token.

The tokens of decentralised applications do not have characteristics that make them good money or store of value because they reside on top of other protocols. Their transactions are processed by the underlying blockchain, which they have no control over.

These tokens derive their value solely from the economic activity of the project. It is, therefore, very important to ascertain how the protocol generates revenue and whether, and how, that revenue is shared with tokenholders.

Protocols that offer a free service may be extremely useful and a common good, but the token of such a protocol has no value. Some protocols offer a free service early on to gain customer adoption or even reward their users rather than earn a revenue. Gaming projects and various spinoffs of the concept such as 'move to earn' are examples. This can be a legitimate customer acquisition strategy at the early stages of the project, however, there needs to be a plan and a roadmap for revenue generation and phasing out incentives. It also increases the risk factor for the value of the token, as users often abandon projects once the incentives stop or a fee model is introduced unless the protocol has successfully demonstrated its value and usefulness to its customers.

Decentralised applications can also earn revenues from external sources (for example, advertising to their users). But this may negatively impact user growth and introduces a degree of centralisation. Many early-stage decentralised protocols are necessarily centralised at least to some extent in the very early stages although their roadmap typically points to becoming largely or entirely decentralised. When the roadmap itself necessitates ongoing centralisation, this introduces further risks as the power of decentralised protocols is that they sustain themselves without execution risk or conflicts of interest.

When a credible plan for sustainable revenue generation is lacking, this devalues the project substantially.

The other important questions are whether protocol revenues exceed the costs of doing business and whether the revenue is shared with tokenholders. For example, if lending protocols need to offer higher yields to lenders than they can earn from borrowers, the token only has value if there is a clear path to reversing this as the protocol becomes established.

The protocol also needs to channel revenues to tokenholders in some way, rather than simply feeding it back into the project treasury or even worse (as far as token value is concerned) to a private corporation that built the protocol in the first place. The mechanisms for sharing revenues can be tricky sometimes due to legal and regulatory issues, but we can assume that these issues will be worked out over the medium to long term.

A mechanism often used is buying tokens in the market with the revenue intended to be paid to tokenholders and burning (destroying) them. Additional mechanisms may be offering discounts and rebates to tokenholders.

When protocols share the economics with tokenholders only if the tokenholders take additional risk, this reduces the value that accrues to the token. For example, a lending protocol may offer a yield if tokens are staked in a module that provides safety reserves in case of a liquidity shortfall. This only adds value to the token if the yield is in excess of what would be expected for taking this risk.

The governance mechanism of the protocol influences the value of the token substantially. If tokenholders have the voting rights to affect the distribution of project economics, we can assume that they will make the most financially rational decisions so that maximum value accrues to the token over time. The optimal decision includes providing sufficient incentives to other parties whose participation is necessary for the protocol's long-term success. For example, token value is maximised for a decentralised exchange protocol if liquidity providers are incentivised to engage with the platform, rather than if all the fees earned are paid to tokenholders.

Where the governance is not decentralised, there is substantial risk that project revenues may be channelled elsewhere and not to tokenholders. Projects necessarily have centralised governance very early on, but with a roadmap to transition to decentralised governance. The lack of such a roadmap reduces the value of the token.

It is also important that the protocol has sustainable funding to support the maintenance of the platform as well as ongoing upgrades and innovation.

Decentralised applications typically create the entire token supply upfront but earmark a portion of the tokens for user incentives and the project treasury, which then funds further development. This dilution should be factored in, as these are de facto future costs that will be borne through dilution.

In terms the risk factors to consider in the valuation, technology risk (smart contract risk) and regulatory risk also apply, in addition to the usual risks of early-stage projects.

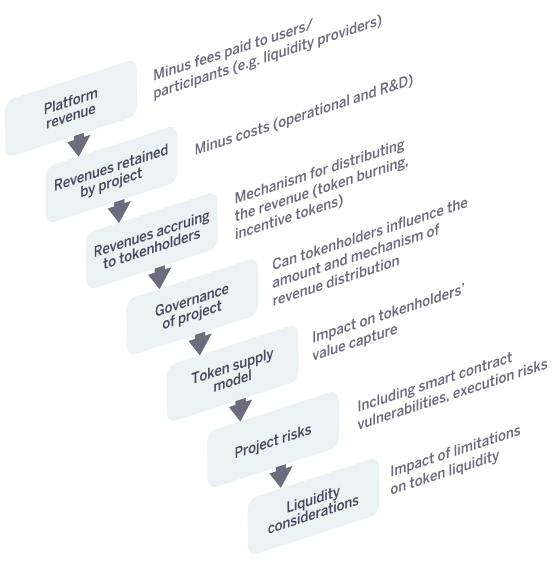
Although the tokens of small early-stage projects may be highly illiquid, necessitating a further haircut to value, they are typically more liquid than early-stage corporations of comparable maturity because of the broader engagement of tokenholders in decentralised platforms.

Schematic model

In summary, when analysing the tokens of decentralised applications, the following factors need to be considered:

- Forecast revenues to the platform (market opportunity, forecast market size and market share, revenue sources, pricing)
- The cost of engaging participants necessary for the sustained operation of the platform (e.g. yields paid to liquidity providers of decentralised lending protocols)
- Operational costs of the project (including the maintenance and development of the technology)
- Revenues shared with tokenholders, including the mechanism (token burning, staking rewards, discounts, etc.)
- Governance of the protocol (most importantly, whether tokenholders decide on the distribution of project economics)
- Token supply model (dilution through using tokens as user incentives or to cover project operational costs and R&D)
- Project risks (smart contract vulnerabilities, execution risk, regulatory risk, etc.)
- Liquidity risk

VALUE ACCRUAL TO TOKENS OF DECENTRALISED APPLICATIONS



Case study: GMX

To demonstrate the valuation of tokens of decentralised applications, we look at the decentralised exchange GMX.

Although GMX is a relatively young platform, having been launched in September 2021, it has grown fast and has a track record of the revenues it has passed on to tokenholders. This makes the valuation less speculative than platforms that have not yet enabled mechanisms to provide economic value to tokenholders or where the amounts to date have been extremely small.

GMX pays 30 percent of the platform revenues to tokenholders who stake their GMX tokens. This is currently running at an annualised rate of USD 65m. The distribution of the reward is skewed towards long term stakers, but ultimately the total amount of fees paid to tokenholders is what determines the fair market capitalisation. Approximately one percent of platform costs are subtracted as are any referral rewards paid out by the protocol.

The growth opportunities for the platform are threefold: market growth, a shift in the market share from centralised platforms to decentralised protocols and GMX gaining market share at the expense of other decentralised exchanges.

GMX's market will expand in line with the growth of the crypto market as well as through increasing their product range. The bulk of crypto derivatives trading continues to take place on centralised exchanges, with Binance as the leader. A shift towards decentralised platforms is likely, especially as centralised providers (not least Binance) have come under regulatory pressure.

GMX's model ensures no slippage, which makes it attractive to traders, but its fees are higher than those of its competitors and significantly higher than its closest comparable, dYdX. It also prioritised sharing the economics with tokenholders vs other DEX protocols that reward liquidity providers to achieve user growth, with only a future prospect of channelling revenues to tokenholders.

While it can be debated whether GMX's positioning will allow it to grow at its competitors' expense – especially with multiple new entrants – its market growth, product range expansion and a tilt from centralised to decentralised exchanges should allow it to grow its revenues strongly from its current – still early stage – base.

With exchanges such as ICE (NYSE parent) or NASDAQ trading at P/E multiples of 20x, a multiple of 30-40x can reasonably be applied to a project in a market with high growth potential. In the DCF model, we assume a 35 percent growth rate and apply a 15 percent discount rate to cashflows (approximately equivalent to CCC yields). As only a small amount of reward tokens remain for distribution to GMX holders, we use the fully diluted supply of 13.25m tokens for valuation purposes.

GMX VALUATION EXAMPLE

	Model		
	30X multiple	DCF	40X multiple
Fair market capitalisation ($bn)	1.80	1.97	2.40
Estimated fair token price ($)	135.8	**148.4**	181.1

Part IV

How to value NFTs

Part IV: How to value NFT's

Non-fungible tokens are unique representations of single assets such as a concert ticket or a piece of digital art. They are in themselves not economically productive.

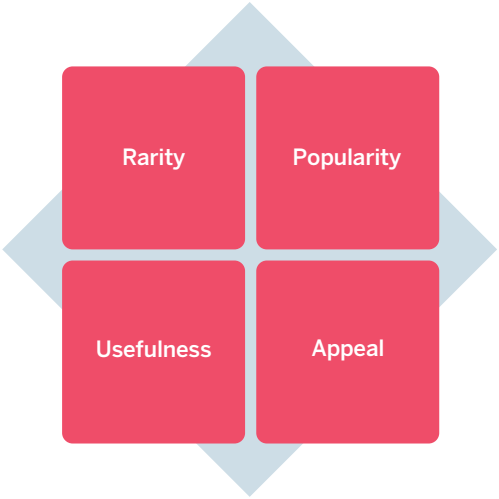
NFTs that represent economic value such as a flight ticket or discount voucher simply inherit that value. NFTs in the art and collectibles class, however, have no intrinsic value.

The value of these tokens is in the eye of the beholder – if there is one other party to whom that piece of art, collectible, avatar, etc. is meaningful, they will determine the value. This is analogous to the value of traditional art and collectibles.

What an investor can assess is the likely value that someone else will place on the NFT. This will depend on the rarity (the number of identical items created and the number of different items from the same artist or studio), the popularity (based on past demand and demand for similar items), the usefulness (e.g. items usable in games or in metaverse application) and an assessment of the likely desirability.

The price of NFTs with comparable features can give a guide to the likely value a potential buyer will place on the NFT.

FACTORS INFLUENCING THE PERCEIVED VALUE OF NFTS



Part V

How to value other token types

Part V: How to value other token types

How to assess stablecoins

Stablecoins are designed to represent the value of an underlying asset, usually a fiat currency.

Their value is primarily determined by the value of the underlying asset, barring a deviation due to various risks and flaws with the mechanism used to ensure the stable value.

They may trade at a discount to their peg if there is a risk that the mechanism cannot maintain the stablecoin's value. The nature of the risk depends on the mechanism.

In the case of stablecoins backed by fiat reserves, the risk is whether the reserves verifiably exist and are safely stored and invested in liquid instruments without additional credit or market risk. Until recently, fiat-backed stablecoins holding their reserves at banks in strong jurisdictions were considered the safest. But since the start of the global banking crisis, the risk is considered greater than previously thought.

Stablecoins that are backed by other types of reserves (such as cryptocurrencies) carry a market risk, as the reserves may not be sufficient if the price of the reserve assets falls. This is usually addressed by overcollateralisation. For example, the recently issued Djed stablecoin on the Cardano network holds collateral equal to four to eight times the dollar value of the stablecoins outstanding.

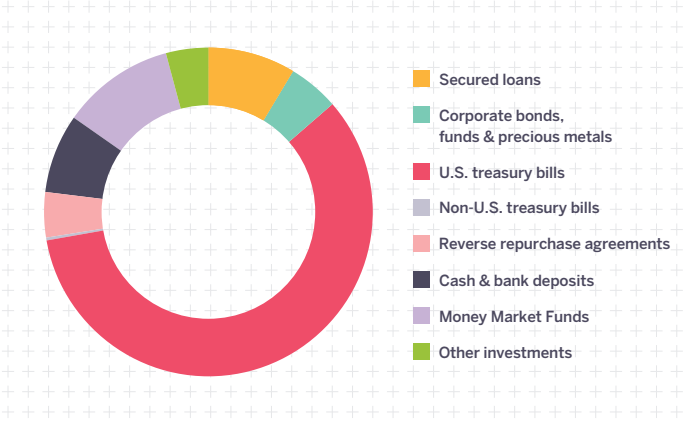
The crypto market has long experimented with algorithms to maintain the peg of stablecoins, but these algorithms often broke down in the face of adverse market conditions and significant one-way flows.

Some stablecoins experiment with a combination of the various mechanisms.

Possible hacks to the platform issuing the stablecoin pose a further risk.

As stablecoins guarantee the exchange of the token for one unit of the underlying fiat currency, an arbitrage opportunity exists if the tokens trade at a discount to their peg – unless the backing mechanism fails and the protocol is unable to perform the conversions. Stablecoins trading at a premium are straightforward to arbitrage, as there is no risk to the protocol's ability to mint new stablecoins at their peg value. Transaction costs, however, create a band around the peg within which the arbitrage is not profitable, and in this very narrow range, supply and demand determine the price.

TETHER RESERVES (31/12/2022)



Source: Tether

How to value tokenised assets

When assets are tokenised, the platform or entity performing the tokenisation holds the underlying asset in secure custody or is in possession of a legally binding title to the asset. Any asset can be tokenised, including art, real estate, stocks, bonds, commodities, funds or crypto assets (including NFTs). The purpose of tokenising an asset is to make it available on a different platform, thereby increasing its tradability or to fractionalise high-value assets and increase their liquidity.

The value of the tokenised asset should equal that of the underlying asset, barring any concerns about the veracity of the underlying asset and its accessibility to the token issuer or any risks related to the platform.

The risks related to access to the underlying asset include legal and regulatory risk on the contract, potentially affecting its enforceability, and risks to the continued presence of the collateral unless transparent proofs are provided. In the case of certain assets, for example income-bearing collaterals such as bonds, there may be an additional cost due to double taxation. These risks and costs would necessitate a discount to the underlying asset's fair value as would any risks to the platform on which the tokenised assets are issued. Projects such as Accumulate aim to provide decentralised access to verified audits confirming the veracity of the underlying asset.

EXAMPLE OF DECENTRALISED AUDIT CHAINS

Auditors:	PWC	Deloitte	EY	Asset verification data
Asset 1	Audit chain (1,P)	Audit chain (1,D)	Audit chain (1,E)	Metadata (1,P-D-E)
Asset 2	Audit chain (2,P)	Audit chain (2,D)	Audit chain (2,E)	Metadata (2,P-D-E)
Asset 3	Audit chain (3,P)	Audit chain (3,D)	Audit chain (3,E)	Metadata (3,P-D-E)
Asset 4	Audit chain (4,P)	Audit chain (4,D)	Audit chain (4,E)	Metadata (4,P-D-E)

When free conversion between the token and the underlying asset is not offered or is not feasible, the tokenised asset may trade at a premium or a discount, without the possibility of arbitrage. Such a premium or discount may be 'fair' where the differential liquidity offers value (such as in the case of tokenising and fractionalising highly illiquid assets) or where the lack of easy redeemability necessitates a liquidity discount.

How to value tokens issued by private corporations

When private corporations issue a token, they are raising funds for their business. It is the issuers' choice to determine what value they provide in return.

This is very different from the value of tokens representing decentralised protocols, as here it is entirely in the private company's gift to share the value generated by their business, and without legal contracts, the issuer may choose to make changes to how much value they share with the tokenholders.

As legal frameworks develop around crypto assets, there is likely to be more protection for tokenholders in this regard.

It is important not to confuse the value of a token issued by a company with the success of that company as it may be that tokenholders will not share in the company's success.

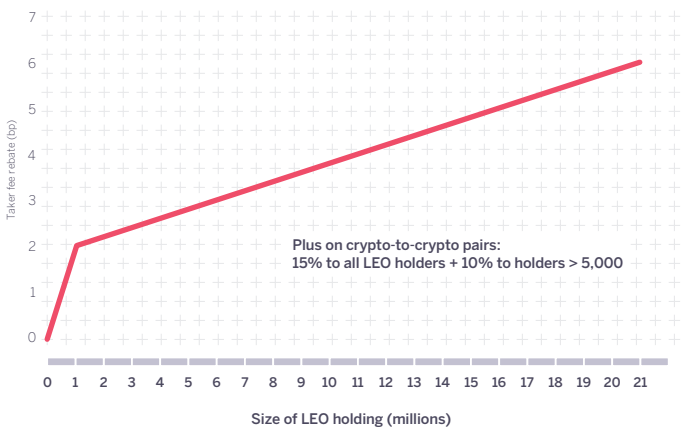
The only thing that gives value to these tokens is what the company has committed to sharing with tokenholders – and even then there is a risk that they might decide otherwise in future. The latter is less likely when there is an alignment of incentives – a company that services crypto customers would not want to harm the value of their token.

There were many instances during the ICO boom era of 2016–17 of private companies issuing tokens that provided no economic value whatsoever to tokenholders.

The market has become more discriminating since then, and it is important to recognise that if the company does not explicitly share economic benefits with tokenholders, the token has no value.

These tokens are valued based on the cashflow forecasts that are meant to accrue to tokenholders. These often take the form of the company allocating a share of their revenues or profits and then using the corresponding amount to purchase tokens in the market and destroy them. Examples are tokens issued by Bitfinex or Binance. Companies may also offer rebates and discounts or free services to tokenholders. Once the expected cashflows have been determined, they can be valued using traditional methods.

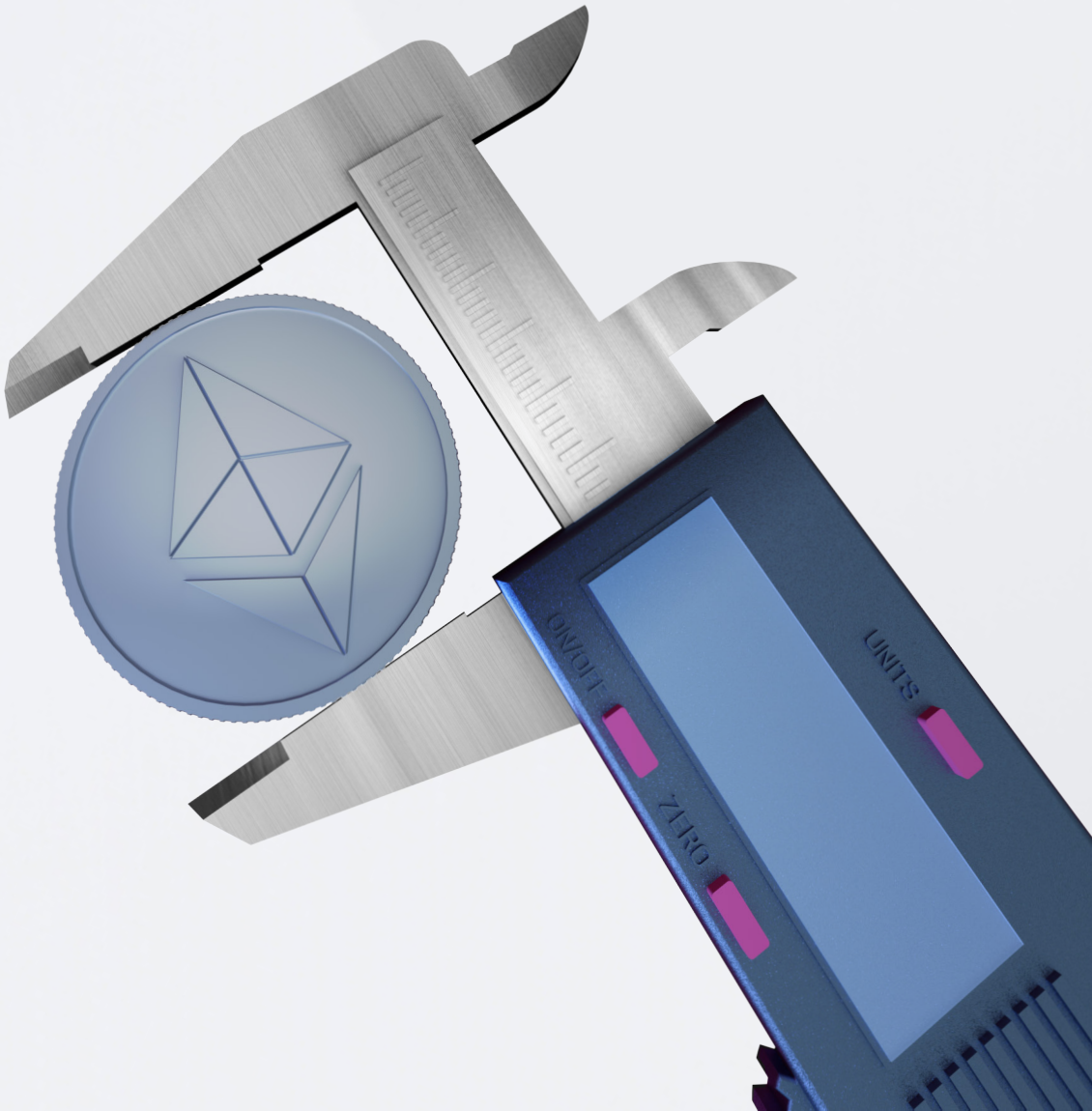
TAKER FEE DISCOUNTS ON BITFINEX TO HOLDERS OF LEO TOKENS



Summary

While not all crypto assets have intrinsic value, the native tokens of blockchain protocols such as Bitcoin and Ethereum most certainly do, as do most of the tokens of decentralised applications.

Valuing crypto assets is complex, as the market is made up of different asset types, and the cryptocurrencies at the core of the market derive their value from multiple sources. This is further complicated by the early-stage nature of the market where valuation requires making forecasts about growth that is still far in the future but is likely to be exponential.



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CoinMetrics

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Messari

CCC yields:
St. Louis Fed

P/E for Google, Microsoft, PayPal, MasterCard, Visa:
NASDAQ

Ethereum tokens lost:
The Block

Ethereum burn rate:
Ultra Sound Money

Data used in GMX forecasts:

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Token Terminal

GMX costs:
GitBook

GMX referral rewards:
GitBook

GMX vs dYdX fees:
Blockworks

P/E for ICE, NASDAQ:
NASDAQ

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