CoinShares

ASSET HIGHLIGHT: ETHER

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CORE SECTIONS

1. Overview of the Ethereum Platform and Ether
2. Drivers of Utility Value of the Ethereum Network
3. Trends in Speculative Drivers & Market Dynamics
4. Asset Performance Relative to Other Common Assets
5. Risks: Both Common and Unique to this New Asset

ABSTRACT

The Ethereum platform is already proving to be a robust tool for paradigm shifting innovation in a number of industries, a fact which has at least partly driven a substantial increase in price, market-cap and transaction volume of the platform's core token, ether.

In addition to its potential as a platform, Ethereum has also emerged as a potentially investable crypto-asset. To properly assess the investment potential of this emerging asset, we need context. In the following document we provide said context via: a quick overview of the platform and its component parts; a discussion about current and future growth drivers; an examination of price, volume and transaction trends; a look at ether as a portfolio tool; and finally a brief overview of some of the largest risks to the platform.

None of the commentary or analysis contained herein is meant to constitute financial advice. This document is meant to be used as a foundational guide to Ethereum and its potential. All analysis is meant to provide emerging trends and observations that may offer value in developing your own investment thesis, though past performance is not indicative of future performance. Please consider all risks carefully prior to making any investment, especially in an evolving asset like ether.

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ETHEREUM BACKGROUND

Origin

The origins of Ethereum are inextricably linked to its creator, Russian-Canadian programmer Vitalik Buterin. As an early adopter of Bitcoin, Buterin was involved in many aspects of the post-Nakamoto crypto-revolution, from code contribution to co-founding the later influential Bitcoin Magazine. In many ways, the events leading to the creation of Ethereum can actually be seen as a direct result of his initial involvement in Bitcoin development and his rejected attempts to add a full scripting language to the Bitcoin protocol. Not content to see his vision left unexplored, Buterin began contemplating the design of a completely new protocol incorporating the full spectrum of his ideas.

Vision

Ethereum made its formal entry in 2013 with the publishing of the foundational whitepaper *A Next-Generation Smart Contract and Decentralized Application Platform* [1]. In this seminal work, Buterin laid out a vision to expand on what he saw as raw potentials of decentralized blockchain protocols that remained untapped by crypto-incumbents like Bitcoin. In his view, blockchains could be utilized in vastly larger numbers of applications than simply peer-to-peer value transfer. Buterin took it upon himself to design a system capable of unleashing the full potential of global, decentralized computing networks.

Team

To facilitate the creation of his vision Buterin teamed up with Anthony Di Iorio, Charles Hoskinson and Mihai Alisie. Formal work on the new platform began in early 2014 under the umbrella of the Swiss company Ethereum Switzerland GmbH (EthSuisse). Shortly thereafter, the Ethereum Foundation (Stiftung Ethereum) was set up as a Swiss non-profit. Funding for the protocol development was secured in July-August of 2014 by means of an online crowd-sale with participants buying pre-mined Ethereum value tokens (ether) with crypto-reserve-currency bitcoin (BTC). This was one of the first, and at the time the largest, ICO ever executed.

After launching several prototypes of the Ethereum platform as part of their Proof-of-Concept series, the initial experimental *Frontier* version went public on July 30th 2015. The protocol has seen several upgrades since that release, and was formally superseded by the current version, Homestead, on March 14th 2016.

Governance

The Ethereum protocol is open-source and therefore accessible to any interested party. As such, improvements to the protocol can be authored and proposed by anyone with the appropriate motivation and ability. Contribution by the public is encouraged and programmers can access documentation covering all aspects of the development process from the Ethereum GitHub repository [2].

The Ethereum Foundation acts as an underpinning body of support to the development of the protocol and its members are considered to be extremely influential in the decision processes determining which changes are made to the codebase. The presence of an experienced and coherent development team has enabled the Ethereum protocol to respond with extraordinary agility relative to other contenders in the crypto space, when confronted with issues relating to the protocol code.

Technology & Technical Definitions

As suggested by the title of the whitepaper, the intent of Ethereum is to act as a protocol allowing developers to build and run decentralized applications and smart contracts. These applications are hosted on a public blockchain and allow for the distribution of computational tasks across a network in exchange for market driven fees.

Unlike Bitcoin, the Ethereum protocol comes with a Turing-Complete programming language. In short, this means the protocol can be used to perform any calculation possible by any other programmable computer, allowing for the execution of arbitrarily complex computations over its decentralized network. A subset of these computations, referred to as smart contracts, enable atomized automation of value transfer between applications built on Ethereum, a functionality that could prove immensely useful for in the development and practical implementation of the Internet of Things.

[1] V. Buterin, "A Next-Generation Smart Contract and Decentralized Application Platform," 2013. [Online]. Available: https://github.com/ethereum/wiki/wiki/White-Paper.

[2] "GitHub Ethereum Repository," GitHub, Inc., 2017. [Online]. Available: https://github.com/ethereum/solidity/blob/develop/docs/contributing.rst. [Accessed 4 August 2017].

ETHEREUM BACKGROUND (CONT.)

A central underpinning concept of the Ethereum blockchain is the value token called 'ether' (ETH). Ether is used as the denomination of all value-transfer functions on the network and is the currency in which the 'gas function' is valued. Gas is, not unlike combustion engines, what makes applications run on the Ethereum network. It acts as remuneration for offering computational power to the network for use by decentralized applications (dApps) and is claimed by computation suppliers as a fee in the mining process.

Computations are executed on the Ethereum Virtual Machine (EVM) in return for gas (valued in ether). Every Ethereum node runs an implementation of the EVM and executes the same exact instructions. This includes all smart contracts, dApps and distributed autonomous organizations.

Supporters

Ethereum has seen widespread support and adoption among participants of the legacy financial system. Standalone parties testing the protocol of enterprise software include Deloitte, IBM, Innovate UK, JPMorgan Chase, Microsoft and R3. Furthermore, the Enterprise Ethereum Alliance, a group of Fortune 500 companies, research groups and blockchain start-ups, was created in March 2017 and as of July 2017 counts more than 150 members including Accenture, Banco Santander, BNY Mellon, Cisco Systems, ConsenSys, Cornell University, Deloitte, DTCC, ING, Intel, JPMorgan, MasterCard, Microsoft, National Bank of Canada, Samsung SDS, Scotiabank and Toyota Research Institute [3].

Among their stated purposes is the desire to coordinate the creation of open-source reference standard and private versions of the Ethereum blockchain, as well as facilitate collaboration on anchoring of private blockchains to the public Ethereum blockchain. While this effort will not necessarily result in the consumption of ether directly (their private chain gas, would be privately issued) it is foreseeable that Ether could act as the reserve token for transfer between private blockchains and for purchase of gas used to power private chains. This is a phenomenon already observable in both BTC (with respect to other alt coins) and ETH markets on exchanges.

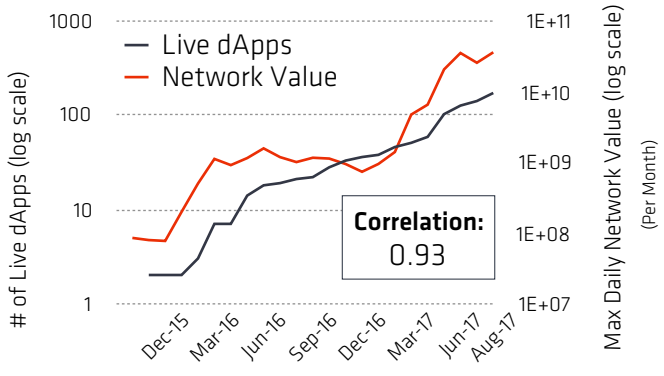
[3] "Enterprise Ethereum Alliance," 2017. [Online]. Available: https://entethalliance.org. [Accessed 4 August 2017].

GROWTH OPPORTUNITIES

In this section we will describe a series of potential drivers, which likely hold the highest promise for supporting mid-term appreciation of the Ethereum network value. We believe that currently, the value of the Ethereum protocol, and by extension the price of the Ether currency unit, is mainly fueled by expectations of future utility value, which in turn drives market hype and speculation. The future utility value of the Ethereum protocol derives significantly from its use as a platform for running programs of arbitrary complexity on the decentralized Ethereum Virtual Machine. It is envisioned that a global computational network will form, allowing entities in need of computational work to access calculation power without any hardware investment required. All that's needed is software and Ether.

By analogy, one can compare the Ethereum protocol and what it aims to achieve in the digital realm to the technology of internal combustion and its achievements in the physical realm; the EVM combined with dApps and smart contracts resemble combustion engines performing useful work; ether is the fuel, similar to digital oil. Not unlike the proliferation of engines, the more dApps there are, the more transactions will be executed and thus the more gas will be consumed. Much like the oil market, when more 'gas' is in demand, the total market value of all ETH goes up. In the chart below, we show a strong correlation between the number of live dApps and the total value of all ETH (Network Value).

Live dApps vs. Network Value



Source: State of dAPPs Etherscan

Among the most promising areas of applications for dApps and smart contracts are those that lie within the realm of the Internet of Things (IoT). The IoT concept envisions a future of increased device-to-device interconnectivity whereby automated programs communicate, collaborate,

GROWTH OPPORTUNITIES (CONT.)

compete and transfer value between each other on a continuous basis with little to no human intervention required. In short, the IoT promises to deliver efficiency improvements across a wide range of services by unlocking time-effort and cost savings using algorithmically driven process optimization and automation. One can for example imagine a smart refrigerator monitoring stocking levels and food expiration, such that when its contents are consumed or spoiled, it responds by ordering replacements, in close coordination with other household smart appliances and service provision dApps.

In their 2015 report *The Internet of Things: Mapping the Value Beyond the Hype*, McKinsey estimates that the Internet of Things could unlock between $4 and $11 trillion of untapped efficiency gains by 2025 [4]. But many critics have voiced concern over the lack of standardized solutions offering sufficient privacy, data security and network interoperability. The Ethereum protocol aims to solve many, if not all of these issues.

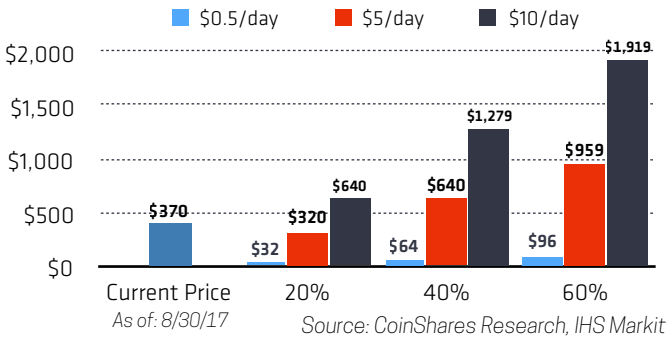
'IoT' As A Lens for Commodity Valuation

As one methodology for approximating future valuation ranges based on growth and usage projections we can use a working capital model of value transfer dApps. We assume each device connected to the IoT on average runs one program tasked with value transfer, each program receiving working capital replenishments once per day. Research provider IHS Markit estimates that IoT may contain 75.4 billion devices by 2025 [5]. If we assume the total value of all ether to be at least the same as the total daily working capital requirement - the amount of ether required to operate all dApps on a daily basis - we can model a 'minimum lower bound' of cumulative future ether value based on IoT alone. To do this, we model a range of penetration levels (percent of IoT devices running on Ethereum), using a pre-determined average daily spend (value-transfer) per dApp. Simply put, each device needs an ether reserve to guarantee proper functioning; and the more devices paying for services, the higher necessary volume (and likely, value) of the money supply. Crucially, this is only one component of a future ether valuation.

Elaborating on the 'average daily spend per value-transfer' of dApps, we offer the following examples of potential use cases and varying degrees of spending which may coexist by 2025:

Apple TV Accessing Netflix	Router Accessing Internet	Refrigerator Re-Ordering Groceries	Smart Building Paying Daily Electricity	Smart Ship Refueling (Avg. Daily)
$0.33	$2	$5	$100	$5000

2025: IoT Working Capital Requirement Model



As of: 8/30/17

Source: CoinShares Research, IHS Markit

Private, Secure Data Rights Management

The decentralized nature of the network, coupled with its cryptographic security and Turing-Complete programming language makes it a prime candidate to be the future standard platform for dApps and smart contracts. Within a cryptographically secure network, enterprises can safely and easily manage, verify, disseminate and ultimately monetize, a vast array of digital content. These capabilities could allow for a much more efficient and secure handling of everything from public data such as deeds and medical records, to intellectual property such as music, video or writing.

Documented, Interoperable Protocol

Ethereum facilitates seamless communication between devices by providing a common language in which their software can be written. An excellent example of the benefits offered by common digital standards are ERC20 tokens. These tokens all share six common, documented functions such that within the same systems, developers can expect the same exact behavior patterns from all tokens that are ERC20 compliant, enabling excellent opportunities for software standardization. The potential benefits from interoperability are certainly partly responsible for nearly all contemporary Initial Coin Offerings (ICOs) issuing ERC20 compliant tokens.

ICOs & Capital Formation

Over the past year, the Ethereum protocol and its ERC20 tokens has become the de facto standard for hosting Initial Coin Offerings. Many of these ICOs have been extremely successful, with multiple oversubscribed

[4] McKinsey Global Institute, "A Next-Generation Smart Contract and Decentralized Application Platform," 2015. [Online]. Available: http://www.mckinsey.com.

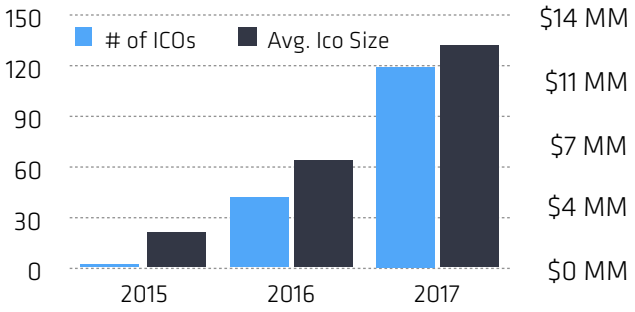
[5] IHS Technology, "IoT Platforms: Enabling the Internet of Things," 2016. [Online]. Available: https://cdn.ihs.com/www/pdf/enabling-IOT.pdf

GROWTH OPPORTUNITIES (CONT.)

offerings reaching quotas in a matter of hours. Since September 2016, more than 130 ICOs have concluded, raising more than $1.5bn at current ether values.

Whenever ICOs are brought to market, demand is generated for its underlying currency. Prospective ICO participants not already holding ether will need to acquire some, and participants already holding ether may want to replenish their invested amounts. The resulting increase in demand puts upwards pressure on the price of ether. ICOs can also act as a timed lock on the amount of raised ether, removing it from the immediate market and slow-dripping it back as the projects burn through development costs. Startups commonly time their development funds to last over a pre-planned development period, steadily releasing money to cover costs. Assuming the Ether is not immediately sold, the reduction in Ether supply also places an on upward pressure on the price.

All Funding via Initial Coin Offerings



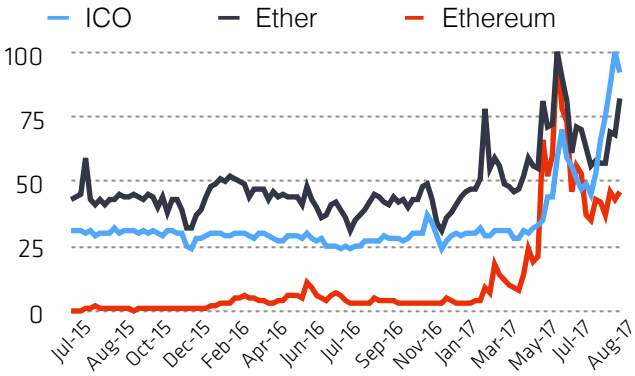
Source: CoinDesk ICO Tracker

MM $USD	2015	2016	2017
# of ICOs	3	43	120
Avg. ICO $	$2.04	$5.96	$12.39
Total ICO $	$6.11	$256.41	$1,486.74

Successful ICOs also provide the network and protocol with valuable media exposure. Owing to its relatively recent entry into the crypto-space, Ethereum is still establishing brand penetration levels comparable to incumbents such as crypto-reserve currency bitcoin. With each successful ICO story, the combined media attention further distributes knowledge of the Ethereum network among the global population, increasing not only the investor base, but also that of potential developers, business leaders and general market participants. For further evidence, when comparing the trends in search volume, the relationship of ICOs (searches) contributing to general ether and Ethereum awareness is obvious.

Each trend line is an index of relative popularity specific to each term's lifetime popularity. For instance, Ethereum has seen a dramatic spike in popularity while ether has seen a spike, though less dramatic. Thus for this chart, ether's 'baseline' is higher and indexed growth is less dramatic than Ethereum. Ethereum, overall, is a more popular search term with respect to volume.

Search Trends for ICO, Ether & Ethereum

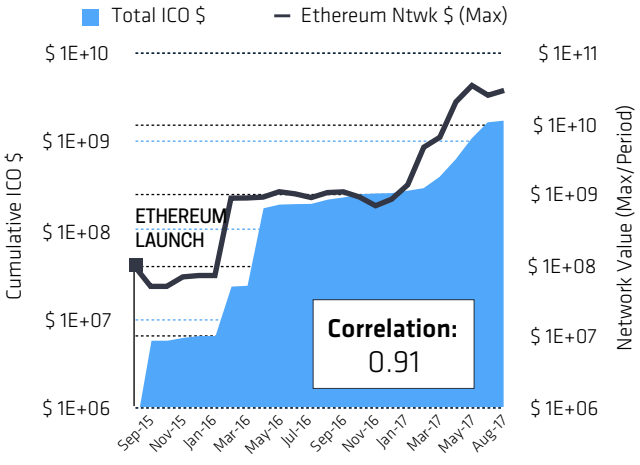


Source: Google Search Trends

It is important to note that the Ethereum network is not the only platform used for ICOs, however, since public launch in July 2015, a vast majority of ICOs have taken place using Ethereum's ERC20 token standard.

Examining the relationship between the Ethereum network value and the cumulative funding raised via ICOs, we observe it does appear that there is a relatively strong historical correlation between network value of the ethereum network and the cumulative funding raised via ICOs. This relationship, may be an important trend to watch as ICOs become a more mainstream tool as it appears that growth in ICO funding may raise the baseline of the overall network value imparted to ETH.

Cumulative ICO Funding v. Network Value



Source: CoinDesk ICO Tracker, ETHERSCAN

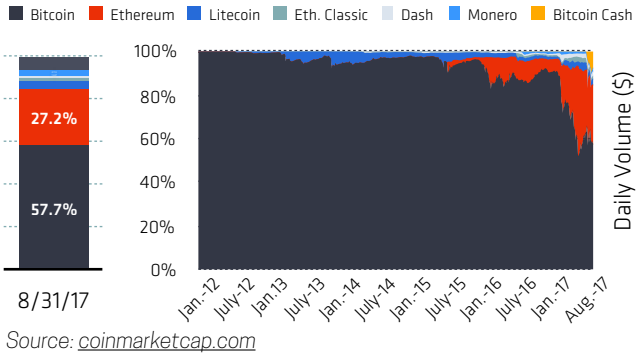
SPECULATIVE VALUE

SPECULATIVE VALUE & DOMINANCE AMONG DECENTRALIZED TOKENS

In this section we have mapped some possible drivers of growth in the utility value of the underlying Ethereum network. These are nonetheless single components in the aggregate token price and thus affects network value in a non-exhaustive manner. In addition to these components, speculation undoubtedly plays a role in driving the ether price and said speculation does not exist in a vacuum. There are other decentralized tokens with which ether competes on both technical and speculative fronts. One trend to watch when evaluating relative performance is the overall dominance (share of the decentralized token market's outstanding value) of ether among its 5 closest competitors.

Dominance among decentralized currencies is often measured by percentage of cumulative network value (often modeled on conventional market capitalization). Since its ICO Ether has seen its unit value go from less than $1 to a peak of more than $400. This has translated into a rapidly rising dominance, currently placing it second only to bitcoin, and solidifying ether's status of top-contender among its competitors. But more than merely measuring each currency's relative valuation/standing, the long terms dynamics of the dominance curve can illuminate trends in funding patterns between competing protocol technologies. As protocols develop, each addition or reduction of value to the codebase should elicit organic responses in the volume and momentum of flows funding flows between coins as investors re-weight their holdings based on their belief in the viability of the technologies.

ETH v. Next 6 Largest Decentralized Tokens

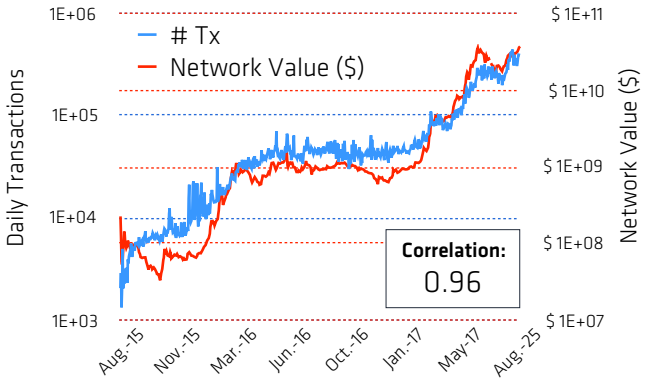


Source: coinmarketcap.com

TRANSACTION VOLUME AS AN INDICATOR

As aforementioned, speculative value in ether is driven by future expectation of utility, weighted (or inflated) by current level of hype in the space. One key indicator which many digital asset speculators watch as a relational indicator of both price and network value is the development of daily on-chain transaction volume. We observe a strong correlation between daily transaction volume and network value with long-term parallel movement and a marked, recurring tendency of the curves to close their spread after phases apart.

Daily Transaction Volume vs Network Value

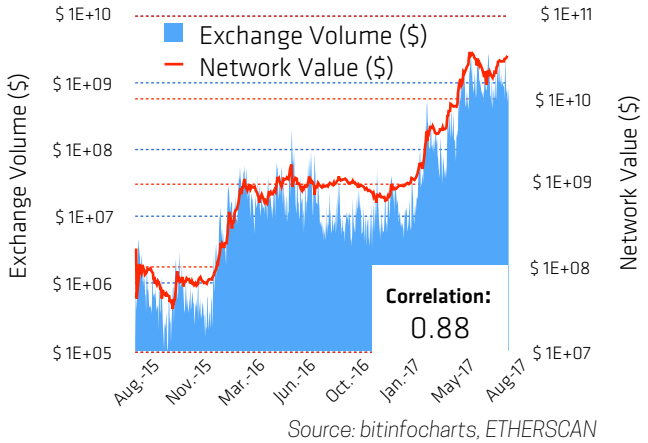


Source: bitinfocharts, ETHERSCAN

EXCHANGE VOLUME AS AN INDICATOR

We also observe a moderate correlation between exchange traded volume (USD) and ethereum network value. Strong growth in ether price partially explains this as exchange volumes are denominated in USD.

Daily Exchange Volume vs Network Value



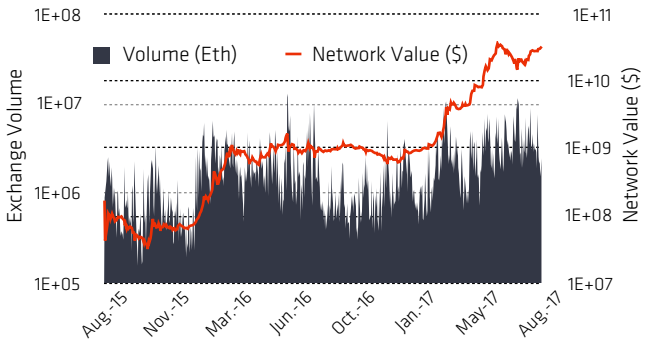
Source: bitinfocharts, ETHERSCAN

SPECULATIVE VALUE

To elaborate further on the potential trend between daily exchange volume and network value, a deeper analysis is necessary to determine the directionality of any causal relationships. Moreover, since exchange volume ($) and network value ($) both contain the ether price as components of their calculation, it may create an inflated sense of covariance between the two.

To standardize the relationship, one can look at ether-denominated trade volumes. These have grown since inception, a particularly impressive statistic given the meteoric rise of the ether price as one would expect the volume in ETH terms to decrease as overall value of ETH token increased higher. Despite this, there is a low correlation between exchange volume denominated in ether terms and overall network value.

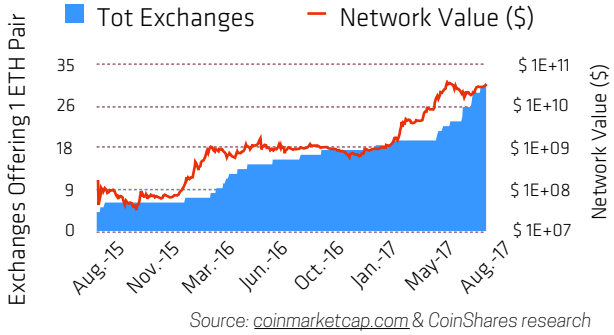
Daily Exchange Volume vs Network Value



Source: coinmarketcap.com

There has been strong growth in the number of exchanges offering at least one tradable ether pair (e.g. ETH/USD or ETH/BTC). From less than five at inception, exchange offerings have grown steadily at an average rate of a ~3 additions per month, with notable surges following price rises in winter/spring '16 and spring/summer '17.

Exchanges Listing 1 or More Ether Pairs



Source: coinmarketcap.com & CoinShares research

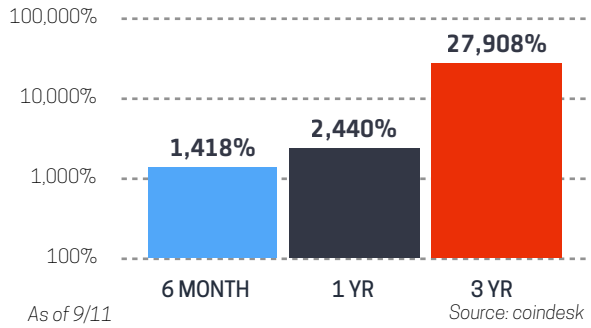
As of end of August 2017, there are more than 30 exchanges with ether pair trading volumes that individually exceed more than $1,000,000 per day. Total daily ETH trade volumes have regularly exceeded $1bn in Q3 2017.

Although trade volumes are valuable data points when analyzing ether price trends, there are some attributes of various crypto-exchanges that should be noted with caution when looking at available data. There has been, and to a certain degree remains, a tendency for upstart exchanges to offer zero-fee trading in order to attract traders. While this is the complete prerogative of each individual exchange, one consequence of zero-fee trading is that volumes may appear stronger that what could be reasonably expected at more established exchanges where fees are levied.

ASSET PERFORMANCE & CORRELATIONS

Ether has provided some of the most dramatic returns of any of the 5 most dominant cryptocurrencies.

ETH Returns: 6 Mo. 1 Yr & 3 Yr To Date



As of 9/11 *Source: coindesk*

Bitcoin, since its first exchange rate in 2010 ($0.07 on Mt. Gox), has delivered +70K% returns; though the majority of investors did not discover bitcoin until much later in its growth. Ether however is currently less than half the age of bitcoin.

While these returns look 'absurd' when compared with other investable assets, they are not unheard of, especially considering the early low price at which the public gained access (via exchanges) to ether as a unit of speculative investment.

ASSET PERFORMANCE & CORRELATIONS

RETURNS COMPARED TO COMMON ASSETS

One of the most exciting attributes of the cryptocurrency space is highlighted in this table: whereas assets with similar returns (and risks) have largely been unavailable to anyone outside the venture capital industry, the open nature of crypto-markets has made high-risk/ high-return assets accessible to a much wider public. The 3-month returns in the table to the right makes the risk/reward relationship of the crypto-space compared with more 'traditional' assets abundantly clear.

3 Month Returns						
	Ether	Bitcoin	S&P 500	Nasdaq	Gold	Brent
Q4 15	35.3%	81.0%	6.2%	8.2%	-5.3%	-22.9%
Q1 16	1102.5%	-4.4%	0.8%	-2.7%	16.7%	0.4%
Q2 16	6.9%	61.3%	1.3%	-1.5%	8.8%	31.9%
Q3 16	8.4%	-10.1%	3.1%	9.2%	-1.3%	1.2%
Q4 16	-39.5%	57.7%	3.3%	1.3%	-13.4%	13.9%
Q1 17	512.5%	8.2%	5.5%	9.8%	8.6%	-5.0%
Q2 17	489.4%	131.5%	2.6%	3.9%	-0.2%	-9.8%

3-month returns are calculated from the daily closing prices of the underlying assets and indexes, between the first and last month of the quarter.

Souce: *St. Louis Fed, coindesk and coinmarketcap*

CORRELATION OF RETURNS BY ASSET

Extending the discussion on comparative returns, this correlation table shows the relationship between the daily returns of ether (since listing) of the same set of assets as above (S&P 500, the Nasdaq Composite, Gold, Brent Crude, bitcoin and ether) using Pearson's Correlation Coefficient.

The inclusion of uncorrelated assets into a diversified asset portfolio generally serves to lover its overall volatility. This way, large movements in single assets only affects the overall portfolio value in a dampened manner as the probability of all assets moving together is low. Conversely, if all portfolio components move in unison there is an increased propensity of the entire portfolio value to follow the movement of single assets and diversification benefits are greatly diminished.

	Ether	Bitcoin	S&P 500	Nasdaq	Gold	Brent
Ether		0.207	0.013	0.010	0.068	-0.025
Bitcoin	0.207		-0.012	0.003	0.061	-0.006
S&P 500	0.013	-0.012		0.946	-0.178	0.303
Nasdaq	0.010	0.003	0.946		-0.170	0.220
Gold	0.068	0.061	-0.178	-0.170		-0.041
Brent	-0.025	-0.006	0.303	0.220	-0.041	

Souce: *St. Louis Fed, coindesk and coinmarketcap*

A note on how to read the table: *a correlation value of 1 indicates that the assets are entirely covariant, moving in exact lock step with each other and a -1 one means that they are entirely covariant but in opposite directions. A value of 0 means that there is no covariance whatsoever between the assets and that they move entirely independently of each other.*

RISKS

It's been less than five years since the release of the Ethereum whitepaper, authored by then 18 year old Vitalik Buterin. Decentralized virtual computation technology is in its very infancy and in the words of one of Ethereum's lead developers, Vlad Zamfir: "Ethereum isn't safe or scalable. It is immature experimental tech. Don't rely on it for mission critical apps unless absolutely necessary!"

Statements like this should give investors pause to reflect on the current state of the market and the probability that any fundamentals currently grounding ether price signals may be completely drowned out by the unpredictable noise of speculation. On the other hand the willingness by developers such as Mr. Zamfir to lay bare the experimental reality of the protocol reveals a refreshing honesty on the part of the development team.

Like much of the tech industry, the Ethereum development process operates under the mantra of 'move fast and break things.' This strategic preference for development speed and raw innovation over codebase conservatism is a substantial risk, as software changes must sometimes be implemented before sufficient research can be conducted on all potential effects. We address 7 additional key risks (in no particular order) in the following section:

Key Personnel Risk

The biggest single risk, by far, borne by the Ethereum network is the wellbeing, continued motivation and productivity of its founder and leader, Vitalik Buterin. Unlike Bitcoin, whose anonymous founder Satoshi Nakamoto disappeared from the cryptocurrency community in 2012, leaving the development process completely in the hands of volunteers (and with it, creating the current environment of pure and often 'glacial' democracy), the Ethereum is still very much under the intellectual influence of its founder. If any detrimental event or series of developments should befall Mr. Buterin, there are significant risks of disruption to both the development team and the Ethereum Foundation.

Such disruption can range from power vacuums and infighting as current stakeholders vie for power over the future of the protocol to simple disagreements on protocol changes going unresolved for extended periods of time.

Attack 'Surface Area'

It is easy to envision that the more moving parts in a mechanical device, the higher the overall chance that somewhere in the mechanism, there will be a malfunction. The same exact relationship exists between the general size of software source code and its probability of suffering from bugs and other unintended software behavior.

In a similar fashion, computer programs with a larger codebase will, generally speaking, have a larger surface area on which attackers may operate.

When recalling how the Ethereum protocol's Turing Complete programming language can run benevolent programs of arbitrary complexity, it is then also important to realize that similarly, such capabilities exposes the protocol to malevolent programs of equally arbitrary complexity.

The continuous increase in Ethereum complexity can therefore be viewed as an ever-increasing risk of either detrimental malfunction within the protocol or of the possibility of a successful external or internal attack.

Inflation

The ether inflation rate is basically dependent on four variables, block frequency, block reward, Uncles and Uncle reward. And although these metrics are semi-

predictable, it is not possible to forecast the inflation rate with a high degree of accuracy. Initially, in the Frontier implementation, each block had a block frequency of approximately 17 seconds and carried a block reward of 5 ether (the block reward still remains the same). This frequency was self-adjusting, lending some statistical predictability to the base inflation rate. Because the block reward is static (see announced changes to this metric in next section), the base inflation rate was nominally flat, but exponentially decreasing on a percentage basis as the total coins in circulation increased, but the nominal issuance amount (in ether) remained more or less the same.

With the release of the Homestead upgrade, block frequency was lowered to approximately 14 seconds, increasing the nominal ether inflation rate by a little more than 13%. But underneath both block issuance rates there exists a mechanism called the Difficulty Bomb, which is meant to make mining progressively and irreversibly more demanding, eventually grinding the proof-of-work system to a complete halt. This scheme or disincentive scheme is a part of the long-term plan to migrate the Ethereum consensus mechanism from 'proof-of-work' to 'proof-of-stake.' The difficulty increase is exponential with a slow onset, meaning that the decrease in block frequency has only recently started to become noticeable. Since May, average block generation times have increased from a little more than 14 seconds, to more than 20 seconds, leading to a drop in nominal inflation of more than 30%.

While block frequency is both a fairly easy concept to grasp and a somewhat predictable metric, even when the Difficulty Bomb is accounted for, Uncles are slightly trickier to understand. Whenever a miner is working on top of what they believe to be the most current block, s/he is running the risk that another block has already been mined on top of the current block and transmitted to the rest of the network before s/he could get the message. If the miner then discovers a block and attempts to propagate it through the network, it will be rejected since the rest of the network is already one block ahead. Such a block is referred to as orphaned or stale, and the incidence of stale blocks increases with block frequency as there is less time for blocks to be propagated across the network before the next one is found. This means that a blockchain with short block intervals, like Ethereum (~20 seconds), will have a higher incidence of orphaned blocks than slower confirming blockchains like Bitcoin (~10 minutes). Uncles are stale blocks with shared parentage that goes a maximum of six blocks back from the present block.

Unlike other protocols like Bitcoin in which stale blocks represent wasted energy on the part of the miner, Ethereum rewards Uncles with seven eights of the normal block reward, or 4.375 ether, with a maximum of two Uncles per block. The reward exists in order to lower overall block propagation times and strengthen the security of the network, but comes at the expense of introducing an additional and variable quantity of inflation.

Due to the variable nature of its inflation drivers, and the lack of clarity on its future issuance model, fundamentally, there is no reliable way of knowing the future inflation rate of ether.

This is one of the core differences between dynamic development networks like Ethereum where the protocol undergoes frequent changes in the face of its fluctuating environment, and more conservative protocols like Bitcoin where parameters such as coin issuance and inflation rates are fixed for the lifetime of the network. There is an essential tradeoff between predictability and flexibility.

Proof-of-Stake Implementation

The next major upgrade to the Ethereum protocol, Metropolis, is widely anticipated to include the introduction of proof-of-stake as an alternative consensus mechanism to the current Ethash proof of work system. Dubbed 'Casper,' this new implementation attempts to solve a range of perceived problems with the current protocol including variable inflation rates and decreasing block frequency rates (although it is largely self-afflicted through the Difficulty Bomb). But most importantly, implementing proof-of-stake is meant to

RISKS

eliminate the enormous need for energy expenditure as required by systems secured by proof-of-work. Previous attempts at securing protocols using proof-of-stake by other cryptocurrencies have been generally functional, but no system with a market value or adoption level anywhere near that of Ethereum has ever attempted such a radical change in consensus mechanism via hard-fork on an already operating network worth dozens of billions of dollars.

Metropolis is also expected to alter the issuance and inflation models of the ether, and the current stated intention (as of mid-September 2017) is to reduce the block reward from 5 ether to 3

Mutability

Blockchain immutability is a hotly debated topic in the cryptocurrency space. Many protocols, the most famous being Bitcoin, posit blockchain immutability as a key value proposition and an enabler and safeguard of their store-of-value properties.

The argument is that the public record, being fully transparent and verifiable, should be permanent and unalterable once consensus is reached (in practice this immutability is statistical, but the probability of being able to alter a block in a proof-of-work chain exponentially decays towards zero with each successive confirmation after the block one wishes to alter). In other words, no one should have the power to alter deposits, add money supply at will or edit valid transactional history.

On the other side of the table the opposing view is held that ledgers cannot be immutable, because that removes all possibility of ever correcting mistakes entered into the public record. On its website, the Ethereum Foundation advertises its capability of enabling developers to "write unstoppable code", and the de facto motto of the now defunct Distributed Autonomous Organization (DAO) was "code is law". In fact, the DAO code explicitly stated that its contents were to be the only rules governing its entire existence.

Shortly after going live with more than $150m of ether invested into its contract structure, an unknown coder or group of coders (the attacker) took advantage of properties in the open source DAO code, which were unforeseen by its developers, and drained it of more than a third of its funds.

Although the actions of the attacker were entirely allowed by the contract code, and the code was available for all investors to conduct due diligence, the Ethereum Foundation nevertheless chose to publicly endorse and execute a hardfork of the blockchain, resetting it to an earlier state, and effectively rewriting the ledger history from a point before the creation of the DAO. This was effectively a bailout of DAO investors and the only one of its kind ever executed at a remotely similar scale in the cryptocurrency space. But more importantly, it was a complete violation of both the mantras of "unstoppable code" and "code is law", and potential investors need to be aware of any past discrepancies between stated intent and actions taken.

Opinions of the event still dramatically differ within the cryptocurrency community. Detractors cite it as a broken promise on the part of the Ethereum Foundation, and an invitation to moral hazard on the part of developers. Supporters on the other hand tout it as a great success of justice over what were clearly malicious actions on the part of the attacker.

Proximity to Regulatory Risks

Since the Ethereum platform is not only part of the emerging asset class that is crypto-assets, but also a likely platform to replace many regulatory/financial/identity management rights; it may face extra scrutiny and/or hurdles to adoption as it matures. For instance, we have already seen multiple governments provide statements which have essentially functioned to “chill,” ICOs. It is not unlikely to expect to see additional examples of use cases of the Ethereum platform bump into more regulatory issues as it moves into being leveraged at scale to secure titles, health records, provide escrow services and more.

Additional Risks

This discussion simply presents the 7 largest risks to the future utility of the network as we currently see them. It is not meant to be exhaustive, and should not be considered as such With any investment opportunity it is important to perform proper diligence and know the risks of the market you are investing in, prior to investment.

SUMMARY/CONCLUSION

In the two short years since its public launch, the Ethereum Protocol has enjoyed spectacular growth and initial success. The Solidity programming language has achieved full initial operational capability, a healthy mining industry has developed and a multitude of businesses ranging from startups to international blue chip companies have taken an interest in the platform and its capabilities.

Around the core development team at the Ethereum Foundation, a vibrant and productive ecosystem has emerged from grassroots communities, building all manners of distributed applications on the Ethereum platform.

The creation of the ERC20 token standard has been instrumental in fueling the current boom in ICO activity, funneling more than $1.5bn of crowdsourced venture capital into the Ethereum economy. Live dApps, network transaction volume and Google search trends have likewise seen explosive growth adding further momentum to the overall strengthening network effect.

Alongside the exciting progress of the Ethereum ecosystem we have witnessed nothing less than an astronomical development in the price of Ethereum "fuel" access token: the ether. Since its listing in July 2015, the price of ether has risen from less than $1 to an all-time-high of more than $400 in the summer of 2017.

If the full vision of the Ethereum developers is realized, the ether will become the fuel of the Internet of Things, the new oil to drive the digital economy of the future, and the Ethereum Protocol will the platform on which the economy operates. Everyone interested in the development of digital ecosystems would be wise to keep an eye on this space.

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