**Grayscale Research** | Matthew Beck, CFA | June 2018

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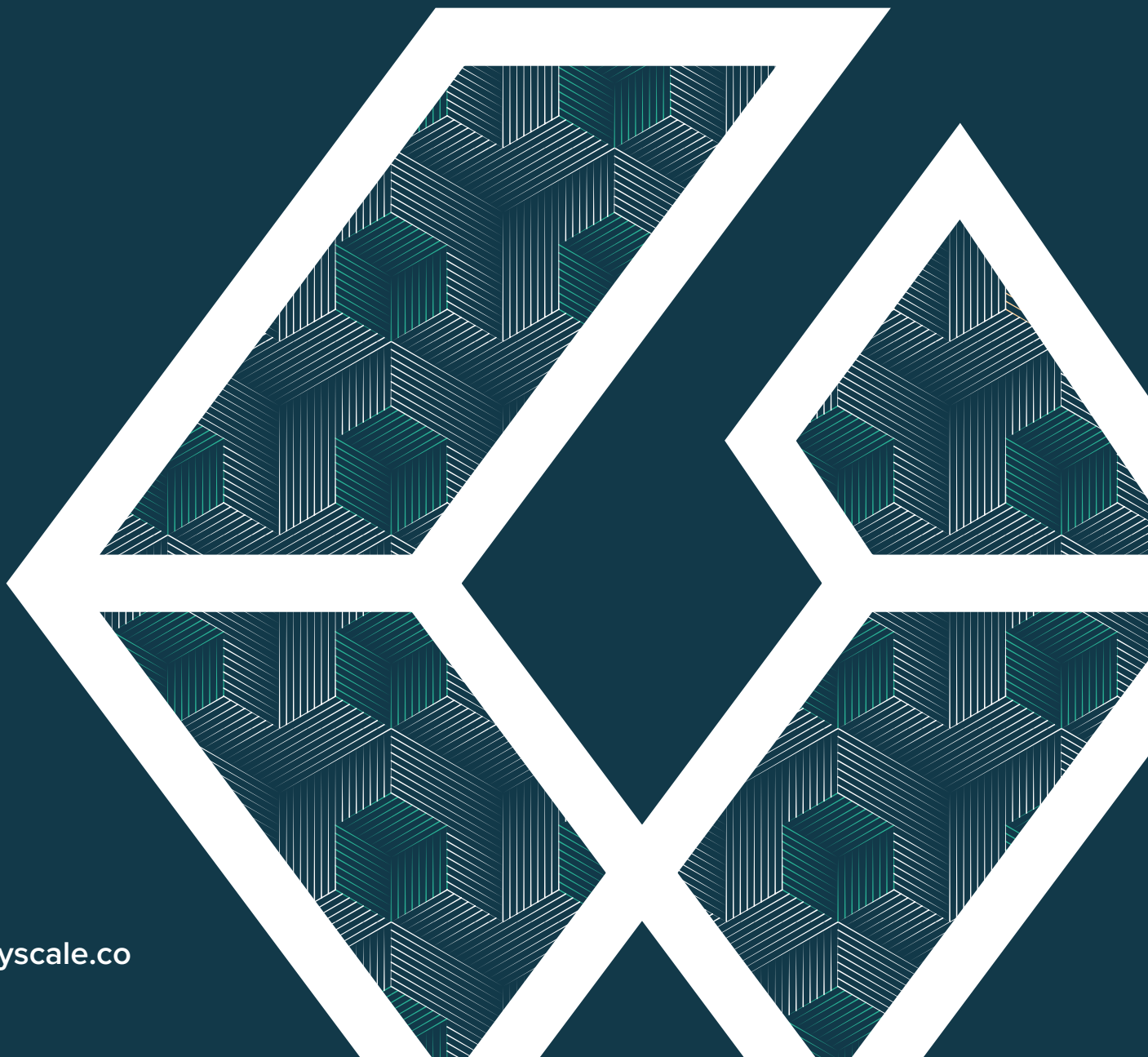
# Into the Ether with Ethereum Classic

*The Store of Value Commodity to Power the Internet of Things*



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# Into the Ether with Ethereum Classic

*The Store of Value Commodity to Power the Internet of Things*

In this next wave of the digital revolution, digital currencies have emerged as what many believe to be the greatest innovation since the advent of the internet. For the first time in history, value can be sent anywhere in the world at the same speed as information in a secure and trustless way. However, digital currencies are more than just payment facilitators. They offer an alternative to the economic, political, and social systems run by a handful of large institutions. Powered by millions of peers within globally distributed networks, digital currencies are democratizing information and value in incredible new ways. We believe in a future of multiple digital currencies, each with unique comparative advantages that enable them to play distinct roles in driving economic growth and in diversifying investment portfolios.

In light of this view, our team has been increasingly focused on the investment potential of Ethereum Classic and its associated digital token, ETC. Ethereum Classic is a next generation blockchain platform for a new internet infrastructure – one that can dramatically enhance the ways that information and value are shared in the digital economy, unlocking billions of dollars in untapped economic surplus in the process.[2] Featuring a flexible and intuitive smart contract programming platform that is powered by ETC, we believe Ethereum Classic may one day be the substrate for a global, secure, and decentralized Internet of Things (IoT).

1. Originally published March 8, 2017. Updated as of May 31, 2018.
2. Source: McKinsey Global Institute: The Internet of Things: Mapping the Value Beyond the Hype, June 2015.

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In this paper, we explore:

- The origins of Ethereum & Ethereum Classic
- The investment opportunity that ETC presents as a store of value commodity that can power the IoT
- How a strategic allocation to ETC can improve the efficiency of investor portfolios

Throughout this paper, we will evaluate the investment opportunity presented by ETC using a similar framework to the one used for bitcoin in our previous study, Bitcoin & the Rise of Digital Gold.

## The Origins of Ethereum & Ethereum Classic

In late 2013, programmer and co-founder of Bitcoin Magazine, Vitalik Buterin, published a white paper detailing an innovative digital currency-powered technology platform known as Ethereum. As an early adopter of bitcoin, Vitalik developed the view that a digital token and its associated blockchain could facilitate much more than just peer-to-peer electronic value transfer. In pursuit of this grander vision, he set out to create a computationally complete virtual ecosystem, featuring a global blockchain and "smart contract" programming platform. Both would be powered by a native digital asset, known as ether (ETH).

By integrating programming capabilities directly into the Ethereum protocol, developers all over the world would be able to design a new class of decentralized applications hosted on a public blockchain. Through the use of smart contracts, applications built on Ethereum could automate the transmission of information and value between one another under dynamic conditions, enabling tailored business models for the IoT and Machine-Payable Web.[3] In many ways, Ethereum was designed to be the next iteration of operating systems like Apple iOS or Microsoft Windows, embedded with the enhanced capabilities of blockchain technology.

Ethereum was built on the same fundamental principles as Bitcoin: that a blockchain protocol should be *decentralized* and its transaction ledger, *immutable*. To this day, many in the digital currency community strongly believe that these principles are critical for the organic growth and economical sustainability of distributed blockchain systems.

On July 30, 2015, less than two years after the original white paper was published, Vitalik and a non-profit foundation launched Ethereum.

3. The Machine-Payable Web is a component of the Internet of Things and a concept made possible through the technological innovations of digital-currency powered blockchains. In the Machine-Payable Web, machines can operate autonomously as economic agents, paying other machines for goods and services automatically based on computer code.

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**The DAO and the Death of Principles**

With the promise of a more secure and scalable internet infrastructure came excitement around the novel applications and business models planned to be built on Ethereum. The one garnering the most attention was the now defunct decentralized autonomous organization, known as "The DAO."

In April 2016, a blockchain and IoT solutions company known as Slock.it announced the launch of The DAO on Ethereum. The DAO was designed as a decentralized crowdfunding model, in which anyone could contribute ETH tokens to become a voting member and equity stakeholder in the organization. Members of The DAO could then make proposals about different projects to pursue and put them to a vote. By committing to profitable projects, members would be rewarded based on the terms of a smart contract and their proportional interest in The DAO.[4]

On June 17, 2016, an anonymous hacker used an exploit in The DAO smart contract code to syphon approximately $60 million worth of tokens into a segregated account.[5] Upon the news of the breach, the price of ETH was quickly cut in half, as investors liquidated their holdings and members of the Ethereum community scrambled to determine a solution.

In the days that followed, several attempts were made to retrieve the stolen funds and secure the Ethereum network. However, it soon became apparent that direct interference with the protocol (i.e. a "hard fork") might be necessary, sparking a heated debate within the Ethereum community. The argument for the hard fork was that it would create an entirely new version of the Ethereum blockchain, erasing any record of the theft, and restoring the stolen funds to their original owners. The counterargument was that it would be antithetical to the core principle of immutability, thus compromising a key driver of value for the entire system.

As the debate raged on, the decision over whether or not to fork the network was put to a vote and on July 15, 2016, a hard fork specification was implemented by the Ethereum Foundation. On July 20, 2016, the Ethereum network completed the hard fork, and a new version of the blockchain, without recognition of the theft, was born.

Many believed that the original version of the Ethereum blockchain would dissipate entirely following the hard fork. However, it quickly became clear some market participants were committed to supporting its continuation for philosophical and economic reasons. On July 20, 2016, the original Ethereum protocol was rebranded as Ethereum Classic, and its native token as ETC, preserving the untampered transaction history (including The DAO theft) and the foundational principles of decentralization and immutability.

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4. Source: Slock.it, Decentralized Autonomous Organization to Automate Governance, Christoph Jentzsch.
5. Source: CoinDesk: The DAO Attacked: Code Issue Leads, to $60 Million Ether Theft, June 2017, Michael del Castillo. http://www.coindesk.com/dao-attacked-code-issue-leads-60-million-ether-theft/.

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Today, there remain two versions of Ethereum, each with nearly identical potential real-world applications, but critical differences in their governance, economic, and development structures.

**Protocol Governance**

There is a growing base of quantitative and qualitative research evidencing a positive relationship between good governance and the long-term performance of traditional assets.[6] We believe this concept extends to digital currencies and is perhaps even more important in determining their investability.

In the world of digital currencies, the quality of a governance system can be assessed on its principles and design. Principles are important because they establish the collective values of participants and design is important because it is ensures a structure that supports and protects those values.

As we've already mentioned, Ethereum Classic seeks to preserve the foundational principles of decentralization and immutability. These principles are believed to be key factors driving the organic success and sustainability of a decentralized digital currency network.

From a design perspective, the distributed consensus mechanisms employed to validate transactions on each version of Ethereum will differ substantially going forward. The Ethereum Classic community is sticking to a proven proof-of-work security model until it is decisively demonstrated that a better model is effective. With a proof-of-work model, transactions are confirmed using cryptographic algorithms that ensure tokens have not been double-spent. This is the same security model that underlies Bitcoin, the most successful global blockchain protocol.

On the contrary, the Ethereum Foundation intends to migrate Ethereum from proof-of-work to proof-of-stake in the foreseeable future. With a proof-of-stake model, select token holders are chosen and relied upon to verify transactions accurately. It is presupposed that they will do so because they have a "stake" in the system and would suffer the consequences of falsifying transactions.

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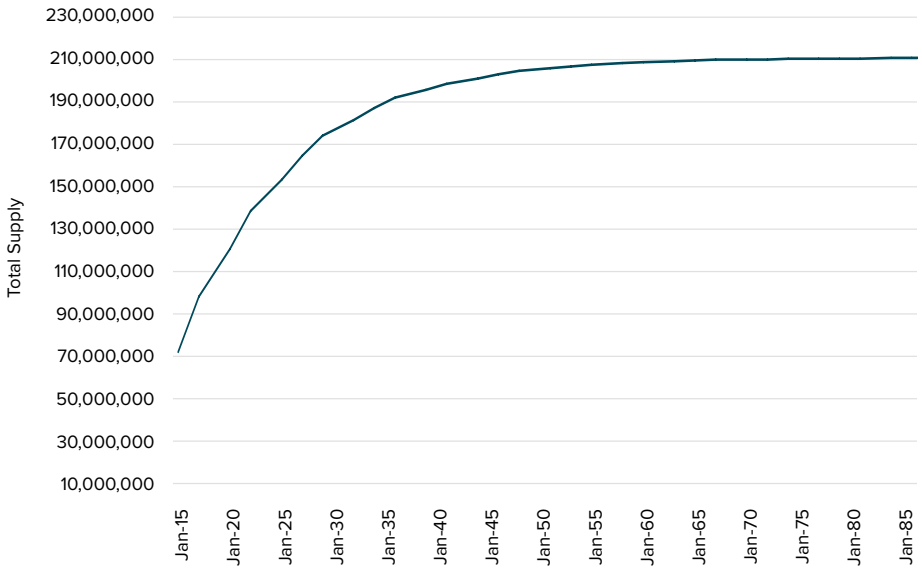
6. Source: MSCI: Can ESG Add Alpha? An Analysis of ESG Tilt and Momentum Strategies, June 2015, Zoltan Nagy et al.
Source: Grant & Eisenhofer P.A: Does Corporate Governance Matter to Investment Returns? 2010, Jay Eisenhofer.

## Protocol Economics

Recognizing the need for a robust economic framework that balances the long-term interests of investors, developers, and business operators alike, key stakeholders in the Ethereum Classic community announced their commitment to implement a new monetary model on March 1, 2017.[7]

Similar to Bitcoin, the new policy was built on the fundamental economic principle that the value of an asset is a function of its utility and its scarcity. As such, it established a hard cap on the total ETC issuance. The miner reward of 5 ETC per block was reduced by 20% at block number 5,000,000 in December 2017, and will be reduced by 20% every 5,000,000 blocks thereafter.

FIGURE 1: **ETC ESTIMATED TOTAL SUPPLY[8]**




A block of transactions is confirmed on Ethereum Classic about every 15 seconds. Due to slight variations in the block reward rate, it is anticipated that the total supply of ETC will reach ~210 million and will never exceed 230 million.[9] As of May 31, 2018, approximately 5.9 million blocks have been mined, setting the total ETC outstanding at 101.95 million, and the overall market capitalization at roughly $1.57 billion.

We believe that the successful implementation of the monetary policy solidified a sound economic framework that supports long-term investment in ETC.

7. Source: https://iohk.io/blog/ethereum-classic/a-joint-statement-on-ethereum-classics-monetary-policy/.
8. Source: Overview of ETC Monetary Policy Proposal, December 13, 2016, London, Matthew Mazur, Architect of ECIP1017.
9. Source: See previous footnote

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**Protocol Development**

There is a growing group of developers, business operators, non-profits, and active community members driving development, education, and adoption of Ethereum Classic. Below we've provided a brief description of the most active groups that are contributing to Ethereum Classic today:[10]

- ETC Labs Core is a geographically dispersed, interdisciplinary team of soft-ware engineers, cryptographers, and blockchain professionals. They work full-time on many core Ethereum Classic projects including Classic Geth, Emerald SDK/Platform, SputnikVM, and sidechains. They're at the forefront of blockchain development and research.

- The IOHK Grothendieck Team is a global group of math and sci-ence-driven engineers and developers. At the front line of the team's development is Mantis, a node client built from scratch using Scala, a functional programming language. Mantis easily connects to the IOHK Daedalus Wallet user interface, allowing users to easily manage their ETC holdings. The team's focus is to securely and methodically establish strong ETC ecosystem infrastructure, with a solid foundation of immutability at its core.

- The ETC Cooperative (the "ECC") was created to financially support the growth and development of Ethereum Classic by funding three key aspects of the ETC ecosystem: development, marketing, and community. To that end, the ECC serves as a liaison between various developer teams, maintains community-based software, hosts the annual ETC Summit, and seeks to foster greater collaboration with other Ethere-um-based communities.

- Ethereum Classic Labs provides funding, industry connections, and other resources to burgeoning ETC projects and business looking to build on top of the Ethereum Classic blockchain. With office space in San Francisco and Singapore, Ethereum Classic Labs' long-term goal is to accelerate the development of the Ethereum Classic community & ecosystem.

- Ethereum Commonwealth works on multiple blockchain projects includ-ing Ethereum Classic and currently maintains Classic Ether Wallet.

It's important to highlight that these teams have demonstrated a capacity to operate both independently and collaboratively, creating a decentralized eco-system that makes Ethereum Classic even more robust and resilient than other blockchain networks. You can learn more about the individuals and entities supporting Ethereum Classic development at: https://ethereumclassic.org/.

10. Source: https://ethereumclassic.org/

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# The Investment Opportunity for ETC

We've identified two possible drivers of alpha for Ethereum Classic and ETC. First, ETC possesses store of value properties similar to precious metals and bitcoin, giving it credence as an inflation hedge over long-term investment horizons. Second, as the digital token that runs Ethereum Classic smart contracts, ETC can become the scarce commodity that powers a universally-scalable IoT. Throughout this section, we'll outline the rationale supporting each of these fundamental drivers and evaluate the market opportunity across both dimensions.

## A Digital Store of Value

There are certain core properties that are essential to the investability of an asset as a store of value, be it physical or digital. Gold, silver, platinum, bitcoin and now ETC share the following characteristics that we believe are key to the success and sustainability of store of value assets:

- **Scarcity**: ETC is a scarce asset. It is estimated that the supply will level off near 210 million tokens by the year 2070 with a capped maximum of 230 million tokens that can ever enter circulation. This is an explicit design element of the Ethereum Classic protocol.[11] As of May 31, 2018, there were approximately 101.95 million ETC floating in the market.[12]

- **Divisibility**: Digital currencies represent some of the most divisible forms of payment available in the world. The smallest possible unit of ETC, a "wei," represents 0.000000000000000001 of a single token. ETC can be displayed out to eighteen decimal places, creating one quintillion units within each.

- **Portability**: ETC can be sent across borders electronically and clears much faster than legacy payment networks, making it an alternative to bitcoin and far more portable than precious metals or fiat currency.

- **Fungibility**: One unit of ETC represents the same exact value as anoth-er unit of equal size.

- **Verifiability**: ETC are unique cryptographic tokens that are directly verifiable on the Ethereum Classic blockchain, in real-time, from anywhere in the world.

- **Recognizability**: ETC is gaining broader recognition as a transactional token with perceived utility. Tens of thousands of active wallet addresses and network transactions can be observed on a daily basis.[13]

11. See previous footnote.
12. Source: CoinMarketCap.com. May 31, 2018.
13. Source: Bitinfocharts.com. May 31, 2018.

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Furthermore, the protocol underlying a digital currency must also possess additional properties to qualify its token as a store of value:

- **Decentralization**: Ethereum Classic operates as a decentralized network. In principle, decentralized networks are more secure and stable than centralized or concentrated-control networks, since there is no single point of failure. Internet protocols like email and http are examples of widely-used decentralized networks.

- **Immutability**: Ethereum Classic maintains an immutable global blockchain, preventing any possibility of fraud, censorship, or unjust interference by any actor.

- **Adaptability**: The open-source nature of the Ethereum Classic protocol allows for continuous adaptation and improvement. Adaptability is essential to the future viability of any technology.

### The Store of Value Market Opportunity for ETC

While many investors already view bitcoin as digital gold, we view ETC as digital silver or platinum. Our rationale for this is twofold. First, in the same way that silver and platinum have store of value properties and general industrial application in the physical economy, we see ETC as an asset with store-of-value properties and broad industrial application in the digital economy. Second, just as investing in silver and platinum, in addition to gold, can diversify a precious metals allocation, we believe that investing in a select mix of digital currencies, including ETC, can produce similar benefits and increase risk-adjusted returns.

As a result, we assess the investment opportunity for ETC as a store of value asset through a market share framework, based on observations of the precious metals market. According to BlackRock, as of April 30, 2018 there was approximately $99 billion invested in physically-backed gold exchange-traded products (ETPs), $10 billion invested in silver ETPs, and $3 billion invested in other precious metal ETPs, a category largely comprised of platinum.[14] By extrapolating from the share that various precious metals maintain in the physical store of value market, we imagine that ETC can capture a comparable portion of the digital store of value market as a diversifier. In the following chart, we look at how the price of ETC could change if its market capitalization relative to bitcoin were to grow to the same size as silver and platinum relative to gold.

14. Source: BlackRock: Global ETP Landscape, April 30, 2018.

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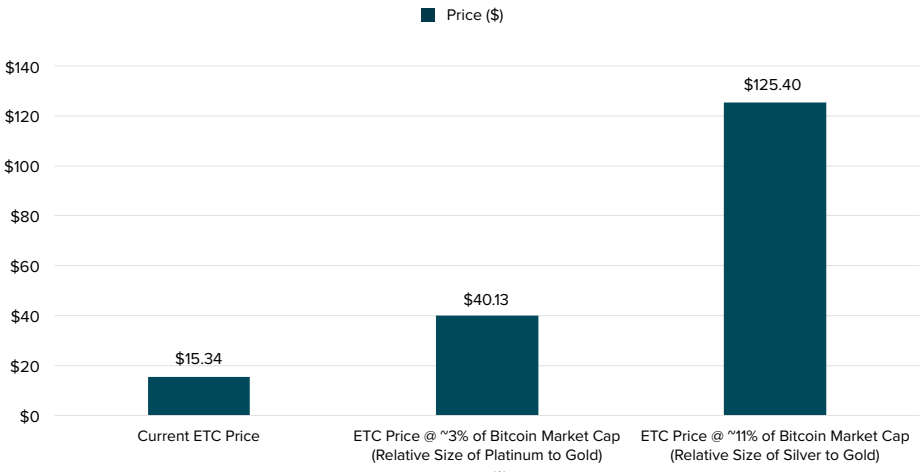
FIGURE 2: **DIGITAL STORE OF VALUE MARKET SHARE**[15]
Hypothetical Value of ETC as a % of Bitcoin Market Capitalization[16]




If the market capitalization of ETC were to grow to the same relative size of silver to gold (10%), a single token could hypothetically be worth more than $125 – more than 8X its May 31, 2018 market price.

**The Commodity that Powers the Internet of Things (IoT)**

The IoT is a concept used to describe an automated and interoperable, physical-digital world, in which every day items can be connected to the internet to share information and value with people and other devices. Simply put, the IoT translates into a more open, systematic, and efficient world, allowing people to use their time more productively.

There is tremendous investment opportunity in the IoT. McKinsey estimates the economic impact of a full-scale IoT to be between $4 trillion and $11 trillion per year by 2025.[17] They identify nine different settings where IoT technologies can be implemented to capture this value:

15. Source: Blockchain.info, TradeBlock. Etherscan.io. Based on a bitcoin market capitalization of $127.85 billion and an ETC supply of 101.95 million as of May 31, 2018.
16. THE FUTURE ETC PRICES SHOWN ARE PURELY HYPOTHETICAL AND SPECIFICALLY ASSUME THAT ETC PRICES WILL INCREASE. The financial projections set forth herein are subject to great uncertainty. There can be no assurance that the projected hypothetical prices will be achieved. Actual future prices will depend on numerous factors, including the future liquidity of ETC, all of which may differ from the assumptions on which the hypothetical prices contained herein are based. NO REPRESENTATION IS BEING MADE THAT ANY RESULTS WILL OR ARE LIKELY TO ACHIEVE PRICES SIMILAR TO THOSE SHOWN.
17. Source: McKinsey Global Institute: The Internet of Things: Mapping the Value Beyond the Hype, June 2015.

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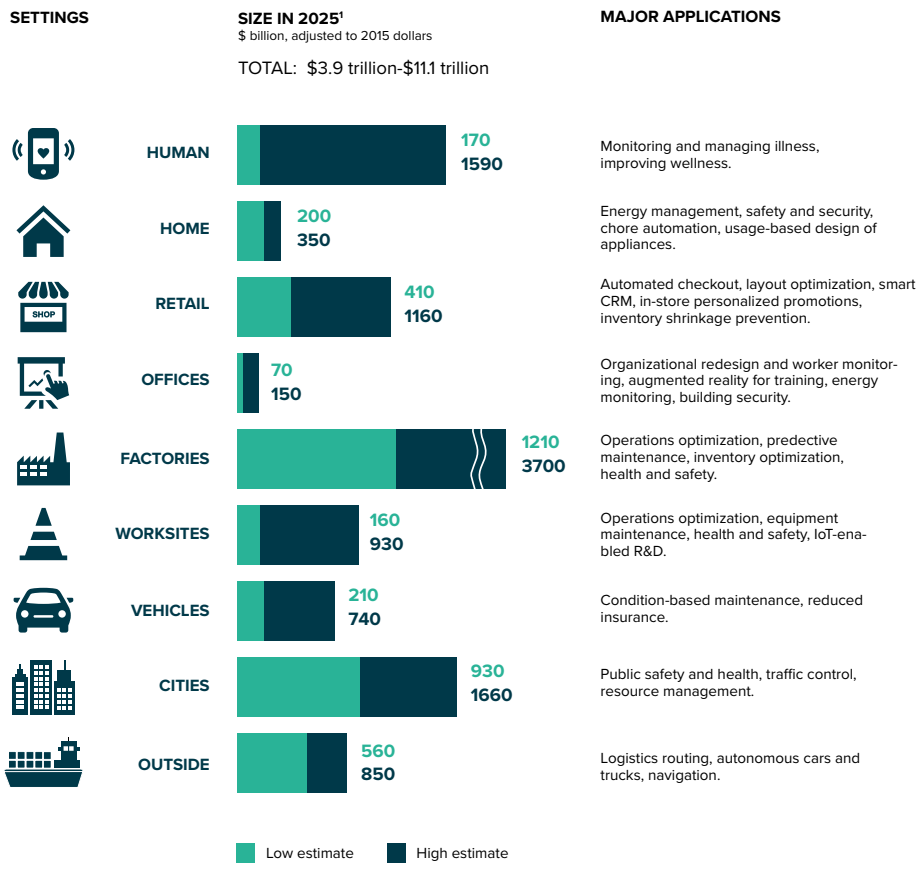
FIGURE 3: **POTENTIAL ECONOMIC IMPACT OF IOT IN 2025, INCLUDING CONSUMER SURPLUS, IS $3.9 TRILLION TO 11.1 TRILLION.**[18]




[1] Includes sized applications only.
NOTE: Numbers may not sum due to rounding

Today, there are numerous IoT technologies in development or in use. Companies including Amazon, IBM, AT&T, Bosch, Cisco, Dell, GE, and Google are all researching, investing in, and building their own IoT hardware and software solutions. While applications that streamline the transmission and synthesis of data are beginning to emerge, there are considerable concerns about data security and privacy, network interoperability, and the lack of incentives driving adoption of these solutions. According to Cisco, approximately 99% of physical objects with IoT potential are still unconnected.[19] We broadly attribute this to the absence of a common platform that resolves these issues.

We believe Ethereum Classic provides the greatest opportunity to achieve a global IoT, as a scalable technology platform with superior features along each of these dimensions:

18. See previous footnote.
19. Source: Cisco: Embracing the Internet of Everything to Capture Your Share of $14.4 Trillion, 2013, Bradley, Barbier, & Handler.

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### Data Security & Privacy

As a decentralized protocol with smart contracts, Ethereum Classic gives individuals and enterprises the ability to control, track, and monetize the distribution of proprietary data, intellectual property, and other digital content in a cryptographically secure environment. Furthermore, with an immutable global blockchain, Ethereum Classic is not subject to censorship, fraud, tampering, or unjustified interference by a central authority. Envision a world in which applications built on Ethereum Classic allow users to upload original music, photographs, writing or even personal medical records to an online portal. Using an intuitive smart contract interface, users could specify who can consume their content, how much it will cost, and how it can be redistributed, among other desirable parameters. This gives users an incredible new way to protect their digital content in the Internet Era.

### Interoperability

Ethereum Classic offers universal interoperability for applications and business models built on its network via the integration of smart contracts. Smart contracts can autonomously transmit information and value from machine-to-person (M2P) and machine-to-machine (M2M) without the need for human intervention, connecting seemingly independent devices. Cisco estimates that the Machine-Payable Web will account for roughly two-thirds of the value associated with IoT.[20] With this level of interoperability, we can imagine how Ethereum Classic could be used to optimize global supply chain logistics. Suppliers, manufacturers, wholesalers, and retailers could build fully interoperable M2M and M2P applications that streamline inventory management, transportation, distribution, accounting, and payment processes.

### Economic Incentives

Ethereum Classic possesses a borderless digital token with store-of-value properties that can incentivize participation to organically grow the IoT. A virtuous cycle can function as follows:

1. Speculative demand by investors over the economic potential that Ethereum Classic possesses can drive appreciation of ETC.
2. Miners validate transactions and support the speed and security of the network, in order to earn freshly minted ETC.
3. As the network becomes more secure, developers can build real-world applications on Ethereum Classic, attracted by a novel internet infrastructure that offers access to untapped revenue streams.
4. As new applications are developed on Ethereum Classic, consumer adoption can be driven by implicit incentives, via the realization of productivity gains, or explicit incentives, perhaps in the form of ETC rebates.

20. See previous footnote.

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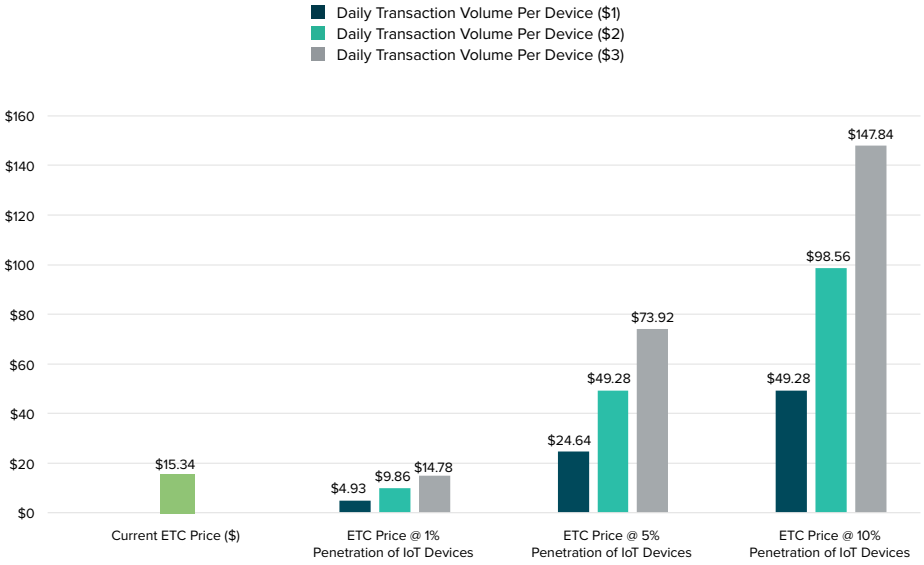
By completing this cycle, ETC can transition from a digital currency whose value is driven by speculative demand to one whose value is driven by utility.

### The IoT Market Opportunity for ETC

We evaluate the investment opportunity for ETC, as a digital commodity powering IoT applications, using a working capital framework. According to research firm IHS Markit, approximately 75.4 billion devices may be connected to the IoT by 2025.[21] Assuming that some percentage of these devices run Machine-Payable Web operations using Ethereum Classic and that a certain amount of value, denominated in ETC, will need to be in the 'pipes' as both the 'fuel' and money facilitating these transactions, we can begin to assess the asymmetric return potential of ETC.

FIGURE 4: **FUEL FOR THE INTERNET OF THINGS**
Hypothetical Value of ETC as IoT Working Capital in 2025[22]




21. Source: IHS Technology. IoT platforms: enabling the Internet of Things, March 2016, Sam Lucero.
22. Source: TradeBlock. McKinsey Global Institute: The Internet of Things: Mapping the Value Beyond the Hype, June 2015. Overview of ETC Monetary Policy Proposal, December 13, 2016, London, Matthew Mazur, Architect of ECIP1017. Current ETC price is based on the TradeBlock ECX Index value as of May 31, 2018. Simulated price estimates are based on an estimated ETC supply of 153 million as of January 2025. THE FUTURE ETC PRICES SHOWN ARE PURELY HYPOTHETICAL AND SPECIFICALLY ASSUME THAT ETC PRICES WILL INCREASE. The financial projections set forth herein are subject to great uncertainty. There can be no assurance that the projected hypothetical prices will be achieved. Actual future prices will depend on numerous factors, including the future liquidity of ETC, all of which may differ from the assumptions on which the hypothetical prices contained herein are based. NO REPRESENTATION IS BEING MADE THAT ANY RESULTS WILL OR ARE LIKELY TO ACHIEVE PRICES SIMILAR TO THOSE SHOWN.

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For example in 2025, if 5% of IoT devices were to run on Ethereum Classic, each with an average daily transaction volume of $1, approximately $3.77 billion worth of ETC could be needed as working capital on a daily basis. Conservatively, assuming that the market capitalization of ETC would need to be at least equivalent to the daily working capital requirement, the price of a single token of ETC could be worth more than $24. Moreover, if 10% of IoT devices were to run on Ethereum Classic, each with an average daily transaction volume of $3, approximately $22.62 billion worth of ETC could be needed as working capital. In this scenario, the price of a single ETC token could approach $150.[23]

By giving the IoT a common language to communicate in, a common currency to transact with, and an immutable global blockchain to store, track, and manage the flow of information and value, quickly, accurately, securely, and without the need for trusted intermediaries, Ethereum Classic can capture synergies across every industry setting and payment segment.

## ETC in Portfolio Construction

As Ethereum Classic promotes economic growth in innovative ways, ETC gives investors an opportunity to build more efficient portfolios.

Slow global growth, secular high debt burdens, deteriorating effectiveness of monetary policies, and low yielding assets are all contributing to a sav-ings crisis that threatens the economic welfare of future generations. We are entering a low return environment with significant downside risk, where it will be difficult for many investors to achieve their target returns. There are two options available to investors:

1. Increase exposure to risky assets already held in their portfolios in hopes of generating higher returns. However, this will mean holding more concentrated, less diversified portfolios, with higher risk of ruin.

2. Identify uncorrelated assets with positive expected returns and use them to build more balanced portfolios.

As a distinct, uncorrelated asset, ETC can broaden a digital currency allocation and further diversify investor portfolios to help them achieve their investment goals. Between July 23, 2016 and May 31, 2018, ETC had an average cross-sectional correlation of 0.1 with the following major asset classes and currencies.

23. See previous footnote.

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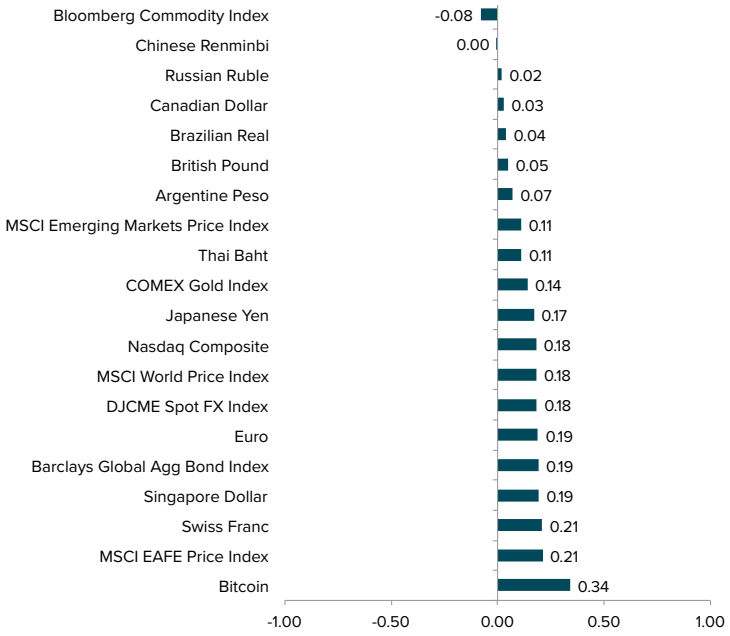
FIGURE 5: **CORRELATION OF ETC TO ASSET CLASSES & CURRENCIES**[24]
Based on Rolling 10-Day Returns




To gain a deeper understanding of the diversification benefits that ETC can offer, we ran a series of simulations on both digital currency and traditional investment portfolios.

In the first example, we looked at how a digital currency portfolio consisting of 90% bitcoin and 10% ETC would have performed versus a portfolio solely comprised of bitcoin. We ran this simulation for the following reasons:

- ETC shares common properties with investable digital currencies like bitcoin that fundamentally support its role as a store-of-value asset and inflation hedge over long-term investment horizons.

- While both ETC and bitcoin are digital assets with store-of-value properties, each have unique, diversifying characteristics. For example, ETC could become the dominant digital currency for the Machine-Payable Web, while bitcoin will likely continue to be the dominant peer-to-peer digital currency.

- It can provide insight as to whether a diversified investment in a basket of select digital currencies might deliver better risk-adjusted returns than a standalone investment in bitcoin.

24. Source: Bloomberg, CoinMarketCap.com. PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS. As the period during which ETC has been available for trading is limited, the correlations may not be meaningful when considering longer periods. Correlations are based on 10-day rolling returns from July 23, 2016 through May 31, 2018. Performance of bitcoin is based on the daily values of the Bloomberg Bitcoin/US Dollar Spot Price. Performance of ETC is based on the daily values provided by CoinMarketCap.com.

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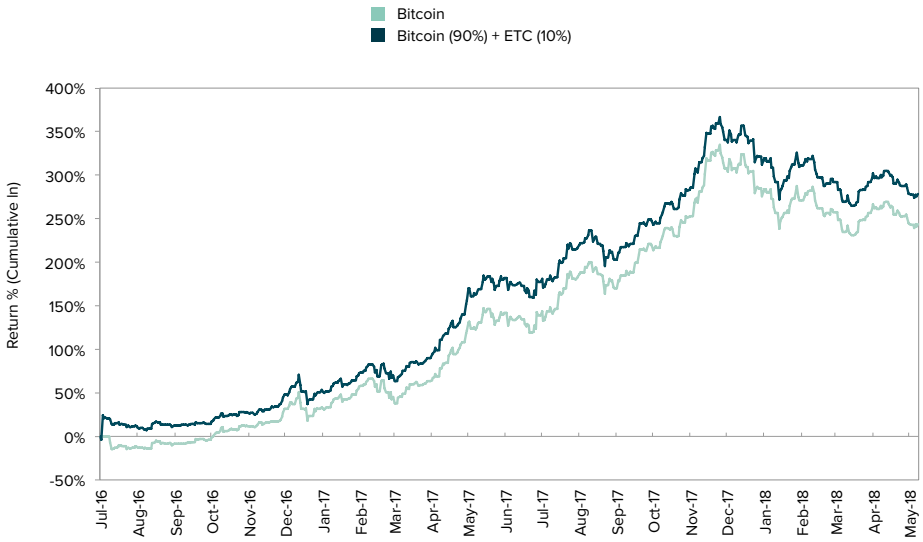
FIGURE 6: **HYPOTHETICAL SIMULATED PORTFOLIO PERFORMANCE**[25]
July 23, 2016 through May 31, 2018.

| PORTFOLIO | Bitcoin | Bitcoin (90%) + ETC (10%)[26] |
|---|---|---|
| Cumulative Total Return | 1046.2% | 1519.4% |
| Annualized Total Return | 270.7% | 346.3% |
| Annualized Std Dev | 79.5% | 81.4% |
| Sharpe Ratio | 3.39 | 4.23 |
| **Change in Annualized Return** | -- | **75.6%** |
| **Change in Annualized Risk** | -- | **1.9%** |
| **Ratio Improvement** | -- | **25%** |

FIGURE 7: **HYPOTHETICAL SIMULATED PORTFOLIO PERFORMANCE**
Cumulative (ln)




As the above figures show, the blended portfolio, containing bitcoin and ETC, produced a hypothetical simulated cumulative return that was roughly 473% higher than that of a pure bitcoin portfolio, at approximately the same level of volatility.[27]

25. HYPOTHETICAL SIMULATED PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. There is no guarantee that the market conditions during the past period will be present in the future. Rather, it is most likely that the future market conditions will differ significantly from those of this past period, which could have a materially adverse impact on future returns. Unlike an actual performance record, simulated results do not represent actual trading or the costs of managing the portfolio. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. PAST PERFORMANCE IS NOT NECESSARILY INDICATIVE OF FUTURE RESULTS. SEE "NOTE ON HYPOTHETICAL SIMULATED PERFORMANCE RESULTS" IN IMPORTANT DISCLOSURES FOR ADDITIONAL DISCLOSURES.
26. Source: Bloomberg, CoinMarketCap.com. Performance is shown from July 23, 2016 through May 31, 2018. Annualized figures are based on 252 trading days. Performance of bitcoin is based on the daily values of the Bloomberg Bitcoin/US Dollar Spot Price. Performance of ETC is based on the daily values provided by CoinMarketCap.com. THE BITCOIN (90%) + ETC (10%) RESULTS ARE HYPOTHETICAL AND ARE NOT BASED ON ACTUAL RETURNS OR HISTORICAL PERFORMANCE. Component asset weights are held constant over the period. The Sharpe Ratio is calculated as the annualized excess return of the portfolio over the 3-month US T-Bill divided by the standard deviation of excess returns.
27. See previous footnote.

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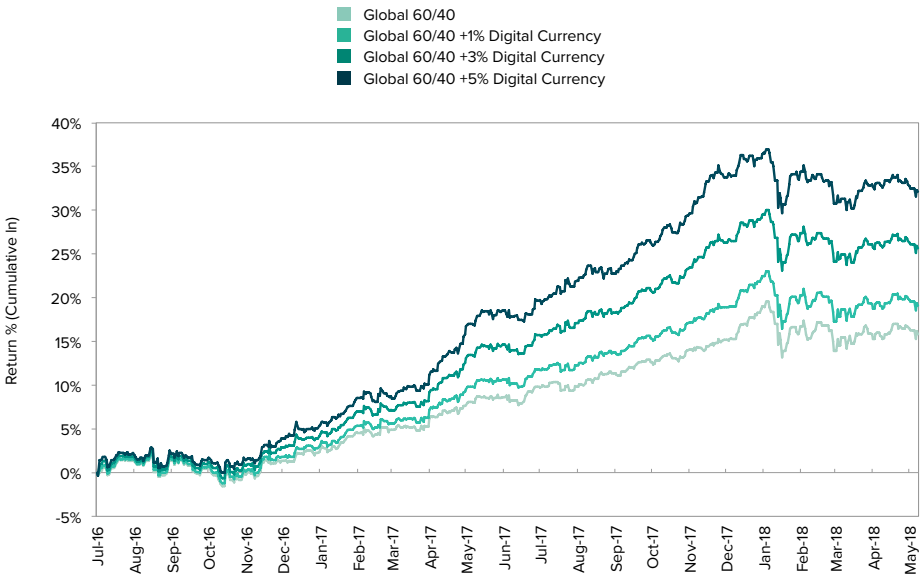
In the second example, we looked at the incremental effects of adding a broader digital currency allocation (1-5%), comprised of bitcoin (90%) and ETC (10%), to a portfolio of global equities and bonds (the "Global 60/40"). Since digital currencies provide exposure to market opportunities not captured by traditional asset classes, we were excited to quantify the potential benefits that they can offer.

FIGURE 8: **HYPOTHETICAL SIMULATED PORTFOLIO PERFORMANCE**[28]
July 23, 2016 through May 31, 2018.

| PORTFOLIO | Global 60/40 | Global 60/40 +1% Digital Currency[29] | Global 60/40 +3% Digital Currency[29] | Global 60/40 +5% Digital Currency[29] |
|---|---|---|---|---|
| Cumulative Total Return | 17.1% | 21.0% | 29.2% | 37.8% |
| Annualized Total Return | 8.9% | 10.9% | 14.8% | 18.9% |
| Annualized Std Dev | 6.2% | 6.3% | 6.7% | 7.5% |
| Sharpe Ratio | 1.31 | 1.61 | 2.09 | 2.43 |
| **Change in Annualized Return** | -- | **1.9%** | **5.9%** | **10.0%** |
| **Change in Annualized Risk** | -- | **0.1%** | **0.5%** | **1.3%** |
| **Ratio Improvement** | -- | **22%** | **59%** | **85%** |

FIGURE 9: **HYPOTHETICAL SIMULATED PORTFOLIO PERFORMANCE**
Cumulative (ln)




28. HYPOTHETICAL SIMULATED PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. SEE FOOTNOTE 25 AND "NOTE ON HYPOTHETICAL SIMULATED PERFORMANCE RESULTS" IN IMPORTANT DISCLOSURES FOR ADDITIONAL DISCLOSURES.
29. Source: Bloomberg, CoinMarketCap.com. Performance is shown from July 23, 2016 through May 31, 2018. Annualized figures are based on 252 trading days. Global 60/40 consists of a 60% allocation to the iShares MSCI ACWI and a 40% allocation to the Vanguard Total International Bond ETF. Performance of bitcoin is based on the daily values of the Bloomberg Bitcoin/US Dollar Spot Price. Performance of ETC is based on the daily values provided by CoinMarketCap.com. "Digital Currency" consists of a 90% allocation to bitcoin and 10% allocation to ETC. THE GLOBAL 60/40 + 1%/3%/5% DIGITAL CURRENCY RESULTS ARE HYPOTHETICAL AND ARE NOT BASED ON ACTUAL RETURNS OR HISTORICAL PERFORMANCE. Component asset weights are held constant over the period. The Sharpe Ratio is calculated as the annualized excess return of the portfolio over the 3-month US T-Bill divided by the standard deviation of excess returns.

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Our analysis revealed that even small allocations to digital currency can significantly enhance the returns of traditional portfolios, without materially increasing volatility. For example:

- Adding a 1% digital currency allocation to the Global 60/40 increased the hypothetical simulated cumulative return by 391 bps, without materially increasing volatility to improve risk-adjusted returns by 22%.[30]
- Adding a 3% digital currency allocation to the Global 60/40 increased the hypothetical simulated cumulative return by 1,207 bps, without materially increasing volatility to improve risk-adjusted returns by 59%.[31]
- Adding a 5% digital currency allocation to the Global 60/40 increased the hypothetical simulated cumulative return by 2,071 bps, without materially increasing volatility to improve risk-adjusted returns by 85%.[32]

It is important to highlight that adding a small allocation to ETC within the digital currency sleeve further enhanced the risk-adjusted returns of the Global 60/40 versus simulations only including bitcoin. We emphasize this point because the hypothetical simulated performance data supports our thesis that there are benefits that investors can realize by incorporating multiple investable digital currencies into the construction of their portfolios. It also reinforces that digital currency has grown to become a new asset class that encompasses more than just bitcoin. Even though our hypothetical simulated analysis is limited by the short timeframe over which Ethereum Classic and ETC have existed, our findings are consistent with the mathematical principle that uncorrelated assets with positive returns can improve the efficiency of investor portfolios.

## Conclusion

We believe in a future of multiple digital currencies, in which unique comparative advantages allow each to play a distinct role in driving economic growth and in diversifying modern investment portfolios. Yet as new tokens enter the fold, it becomes more and more difficult to sift through the noise to identify truly revolutionary assets. Recognizing that this can be challenging for many investors, we have developed a framework to qualify digital currencies with long-term investability. Through this lens, we have come to believe that ETC marks the next generation in a class of investable digital assets, complementing bitcoin, and broadening a dynamic new asset class. With its store-of-value properties, abundant real-world applications, asymmetric return potential, and diversifying characteristics, ETC stands to radically improve many aspects of our lives while also providing investors with a new tool to build efficient portfolios. We look forward to learning more from our experience with this exciting new asset and will continue to deliver investment insights on the broader digital currency ecosystem.

30. See footnote 25.
31. See footnote 25.
31. See footnote 25.

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## About Grayscale Investments, LLC

Grayscale Investments is the world's largest digital currency asset manager. With a proven track record and unrivaled experience, we give investors the tools to make informed investing decisions in a burgeoning asset class. As part of Digital Currency Group, Grayscale accesses the world's biggest network of industry intelligence to build better investment products. We have removed the barrier to entry so that institutions and individual investors can benefit from exposure to digital currencies. Now, forward-thinking investors can embrace a digital future within an institutional grade investment.

Grayscale is headquartered in New York City. For more information on Grayscale, please visit www.grayscale.co or follow us on Twitter @GrayscaleInvest.

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## Note On Hypothetical Simulated Performance Results

HYPOTHETICAL SIMULATED PERFORMANCE RESULTS HAVE CERTAIN INHERENT LIMITATIONS. There is no guarantee that the market conditions during the past period will be present in the future. Rather, it is most likely that the future market conditions will differ significantly from those of this past period, which could have a materially adverse impact on future returns. Unlike an actual performance record, simulated results do not represent actual trading or the costs of managing the portfolio. Also, since the trades have not actually been executed, the results may have under or over compensated for the impact, if any, of certain market factors, such as lack of liquidity. Simulated trading programs in general are also subject to the fact that they are designed with the benefit of hindsight. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. PAST PERFORMANCE IS NOT INDICATIVE OF FUTURE RESULTS.

The hypothetical simulated performance results are based on a model that used inputs that are based on assumptions about a variety of conditions and events and provides hypothetical not actual results. As with all mathematical models, results may vary significantly depending upon the value of the inputs given, so that a relatively minor modification of any assumption may have a significant impact on the result. Among other things, the hypothetical simulated performance calculations do not take into account all aspects of the applicable asset's characteristics under certain conditions, including characteristics that can have a significant impact on the results. Further, in evaluating the hypothetical simulated performance results herein, each prospective investor should understand that not all of the hypothetical assumptions used in the model are described herein, and conditions and events that are not accounted for by the model may have a significant adverse effect on the performance of the assets described herein. Prospective investors should consider whether the behavior of these assets should be tested based on different and/or additional assumptions from those included in the information herein.

IN ADDITION TO OTHER DIFFERENCES, PROSPECTIVE INVESTORS IN A PRODUCT SHOULD NOTE THE FOLLOWING POTENTIALLY SIGNIFICANT DIFFERENCES BETWEEN THE ASSUMPTIONS MADE IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS INCLUDED HEREIN AND THE CONDITIONS UNDER WHICH A PRODUCT WILL PERFORM, WHICH COULD CAUSE THE ACTUAL RETURN OF SUCH PRODUCT TO DIFFER CONSIDERABLY FROM RETURNS SET FORTH BY THE HYPOTHETICAL SIMULATED PERFORMANCE, TO BE MATERIALLY LOWER THAN THE RETURNS AND TO RESULT IN LOSSES OF SOME OR ALL OF THE INVESTMENT BY PROSPECTIVE INVESTORS:

FOR EXAMPLE, EACH TRUST WILL HOLD ONLY ONE DIGITAL ASSET, WHEREAS THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS ARE INTENDED TO SHOW HYPOTHETICAL PERFORMANCE OF AN INVESTMENT MULTIPLE DIGITAL ASSETS. IN ADDITION, THE GENERAL MARKET DATA USED IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS DO NOT REFLECT ACTUAL TRADING ACTIVITY AND COULD NOT BE REPLICATED BY A PRODUCT IN ITS ACTUAL TRANSACTIONS. If actual trading activity was executed at levels that differed significantly from the general market data used in the hypothetical simulated performance, the actual returns achieved would have varied considerably from the results of the hypothetical simulated performances and could have been substantially lower and could result in significant losses.

IN ADDITION, THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS DO NOT ASSUME ANY GAINS OR LOSSES FROM TRADING AND THEREFORE DO NOT REFLECT THE POTENTIAL LOSSES, COSTS AND RISKS POSED BY TRADING AND HOLDING ACTUAL ASSETS.

The hypothetical simulated performance results do not reflect the impact the market conditions may have had upon a Product were it in existence during the historical period selected. The hypothetical simulated performance results do not reflect any fees incurred by a Product. If such amounts had been included in the hypothetical simulated performance, the results would have been lowered.

AS A RESULT OF THESE AND OTHER DIFFERENCES, THE ACTUAL RETURNS OF A PRODUCT MAY BE HIGHER OR LOWER THAN THE RETURNS SET FORTH IN THE HYPOTHETICAL SIMULATED PERFORMANCE RESULTS, WHICH ARE HYPOTHETICAL AND MAY NEVER BE ACHIEVED. Reasons for a deviation may also include, but are by no means limited to, changes in regulatory and/or tax law, generally unfavorable market conditions and the Risk Factors set forth below.

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## Certain Risk Factors

Each Product is a private, unregistered investment vehicle and not subject to the same regulatory requirements as exchange traded funds or mutual funds, including the requirement to provide certain periodic and standardized pricing and valuation information to investors. There are substantial risks in investing in a Product or in digital assets directly, including but not limited to:

- **PRICE VOLATILITY**
  Digital assets have historically experienced significant intraday and long-term price swings. In addition, none of the Products currently operates a redemption program and may halt creations from time to time or, in the case of Grayscale Bitcoin Trust (BTC), periodically. There can be no assurance that the value of the common units of fractional undivided beneficial interest ("Shares") of any Product will approximate the value of the digital assets held by such Product and such Shares may trade at a substantial premium over or discount to the value of the digital assets held by such Product. At this time, none of the Products is operating a redemption program and therefore Shares are not redeemable by any Product. Subject to receipt of regulatory approval from the SEC and approval by Grayscale, in its sole discretion, any Product may in the future operate a redemption program. Because none of the Products believes that the SEC would, at this time, entertain an application for the waiver of rules needed in order to operate an ongoing redemption program, none of the Products currently has any intention of seeking regulatory approval from the SEC to operate an ongoing redemption program.

- **MARKET ADOPTION**
  It is possible that digital assets generally or any digital asset in particular will never be broadly adopted by either the retail or commercial marketplace, in which case, one or more digital assets may lose most, if not all, of its value.

- **GOVERNMENT REGULATION**
  The regulatory framework of digital assets remains unclear and application of existing regulations and/or future restrictions by federal and state authorities may have a significant impact on the value of digital assets.

- **SECURITY**
  While each Product has implemented security measures for the safe storage of its digital assets, there have been significant incidents of digital asset theft and digital assets remains a potential target for hackers. Digital assets that are lost or stolen cannot be replaced, as transactions are irrevocable.

- **TAX TREATMENT OF VIRTUAL CURRENCY**
  For For U.S. federal income tax purposes, Digital Large Cap Fund will be a passive foreign investment company (a "PFIC") and, in certain circumstances, may be a controlled foreign corporation (a "CFC"). Digital Large Cap Fund will make available a PFIC Annual Information Statement that will include information required to permit each eligible shareholder to make a "qualified electing fund" election (a "QEF Election") with respect to Digital Large Cap Fund. Each of the other Products intends to take the position that it is a grantor trust for U.S. federal income tax purposes. Assuming that a Product is properly treated as a grantor trust, Shareholders of that Product generally will be treated as if they directly owned their respective pro rata shares of the underlying assets held in the Product, directly received their respective pro rata shares of the Product's income and directly incurred their respective pro rata shares of the Product 's expenses. Most state and local tax authorities follow U.S. income tax rules in this regard. Prospective investors should discuss the tax consequences of an investment in a Product with their tax advisors.

- **NO SHAREHOLDER CONTROL**
  Grayscale, as sponsor of each Trust and the manager of the Fund, has total authority over the Trusts and the Fund and shareholders' rights are extremely limited.

- **LACK OF LIQUIDITY AND TRANSFER RESTRICTIONS**
  An investment in a Product will be illiquid and there will be significant restrictions on transferring interests in such Product. The Products are not registered with the SEC, any state securities laws, or the U.S. Investment Company Act of 1940, as amended, and the Shares of each Product are being offered in a private placement pursuant to Rule 506(c)

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- **FEES AND EXPENSES**
  Each Product's fees and expenses (which may be substantial regardless of any returns on investment) will offset each Product's trading profits.

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