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Investment Management Division

# An Overview of the Current State of Cryptocurrencies and Blockchain Technology

November 15, 2017

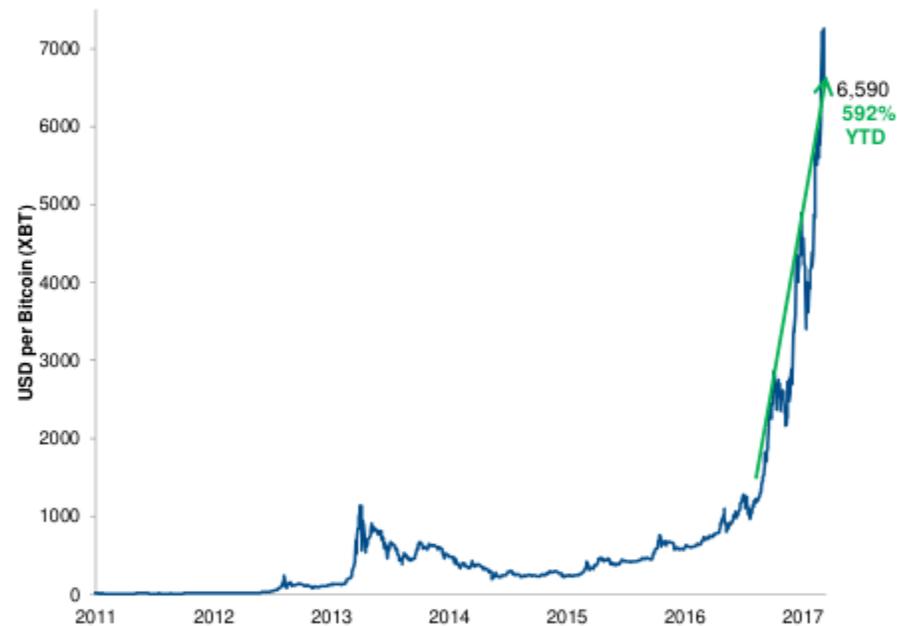
Investment Strategy Group

# Today's Discussion

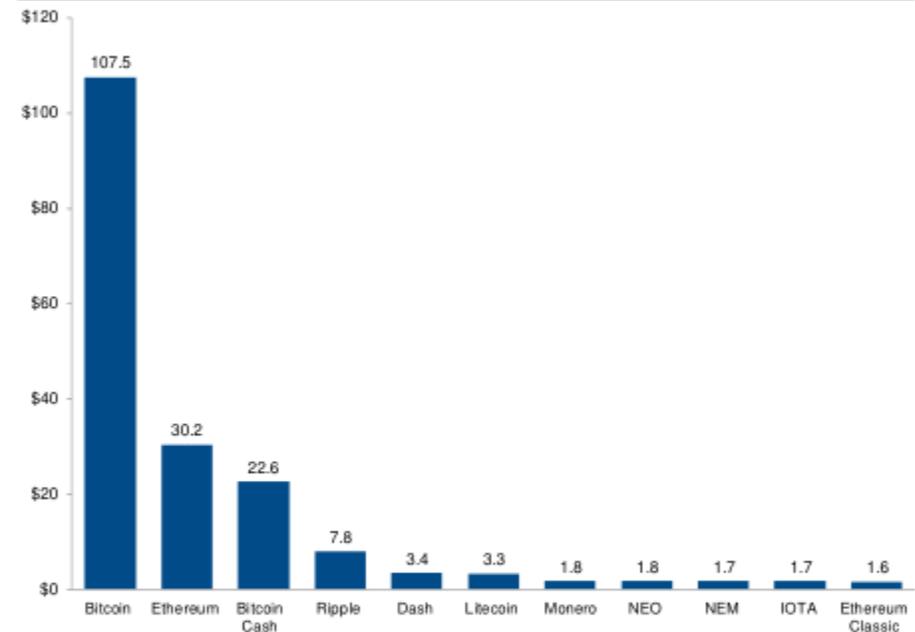
- I. The Cryptocurrency Marketplace
- II. Blockchain Technology and Potential Uses
- III. How Cryptocurrencies Work
- IV. Is Bitcoin a Viable Currency?
- V. Is Bitcoin a Viable Asset?
- VI. Cryptocurrency Risks
- VII. Key Takeaways

# Cryptocurrencies Have Received Enormous Attention

## 1. Bitcoin Currency Value – Through November 14, 2017



## 2. Cryptocurrencies with Market Capitalization over US\$1 Billion

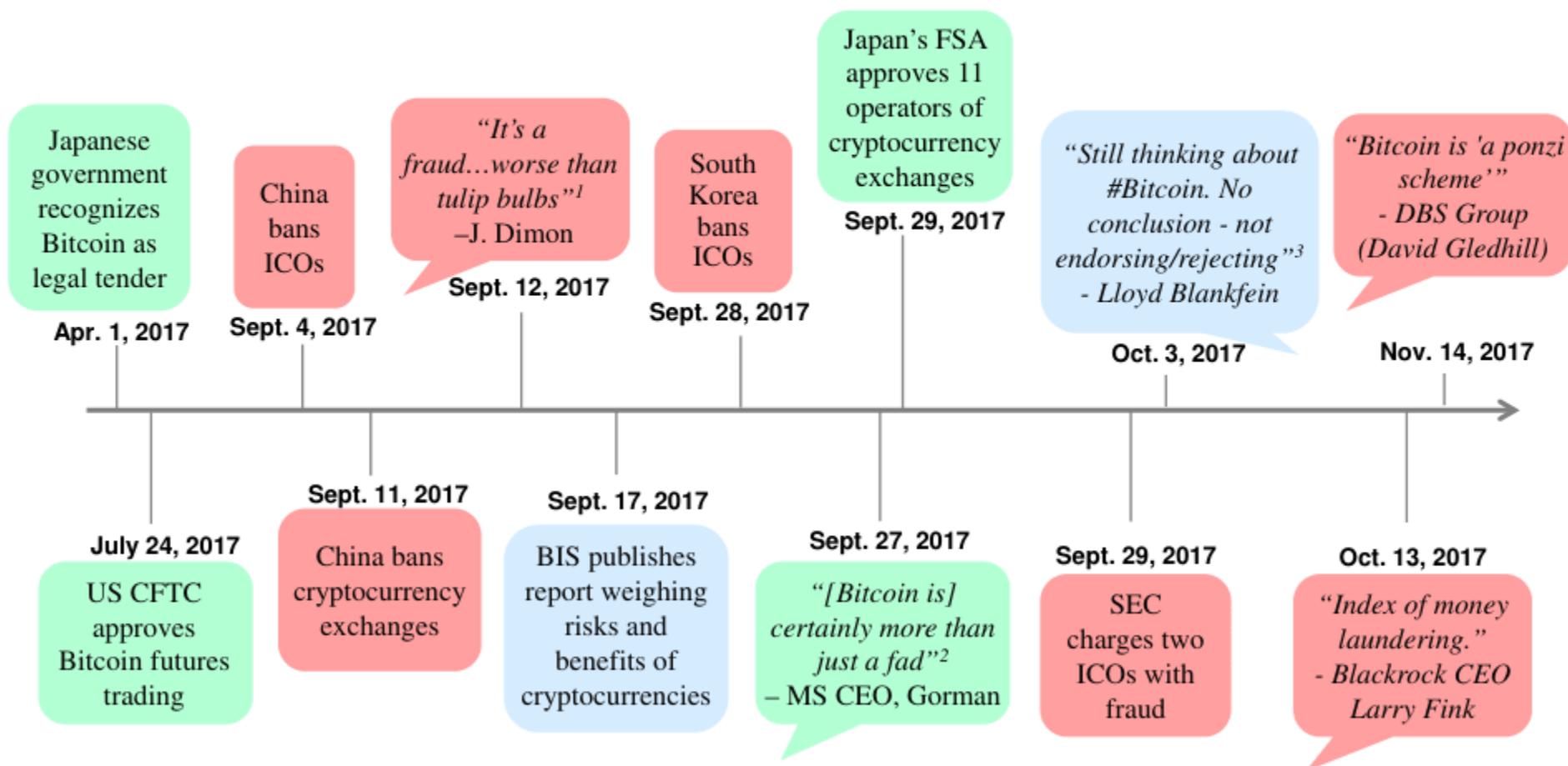


- Bitcoin was conceived in 2008 by an anonymous inventor who is known by the pseudonym, Satoshi Nakamoto.
- Since then, an estimated 2,000+ cryptocurrencies have come into existence, with a combined market cap of over \$200bn.<sup>1</sup>
- There are an estimated 129 focused hedge funds<sup>2</sup> and 121 cryptocurrency exchanges globally.<sup>3</sup>

(1) [REDACTED], (2) [REDACTED], (3) <https://cryptocoincharts.info/markets/info>

# Cryptocurrencies have Garnered Diverging Views

## Timeline of Statements and Measures over Recent Months



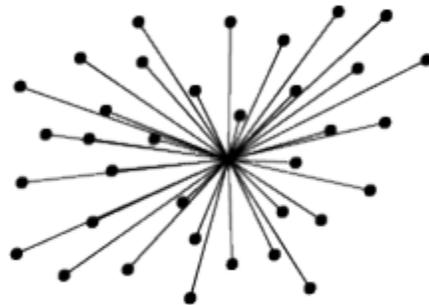
(1) Barclays Investor Conference, September 12, 2017. (2) Wall Street Journal Event, September 27, 2017. (3) Twitter, October 3, 2017. (4) CNBC, November 14, 2017.

Source: Investment Strategy Group, public news sources.

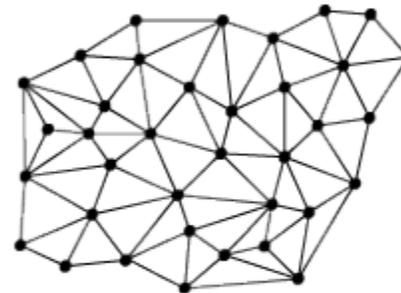
# What is Blockchain Technology?

## Illustrative Schematic: Centralized Network versus Distributed Network

Centralized Network



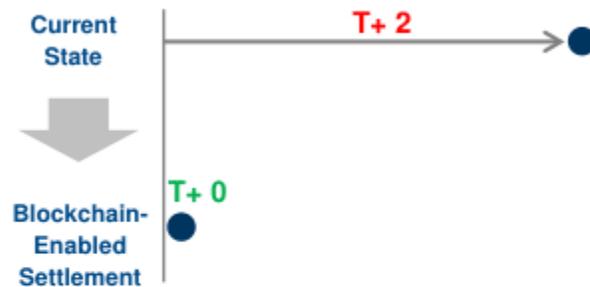
Distributed Network



- Blockchain is the critical and differentiating infrastructure that underlies cryptocurrencies.
- Unlike most networks today, which rely on a centralized hub, a blockchain is a public distributed network whose complete database can be accessed and maintained by each member of the network.
- The blockchain is a shared and continually reconciled database. As new transactions occur, data is quickly disseminated to, verified, and incorporated across all nodes on the network.
- Because it has no single maintainer, the blockchain's history is resistant to editing by a malicious actor.

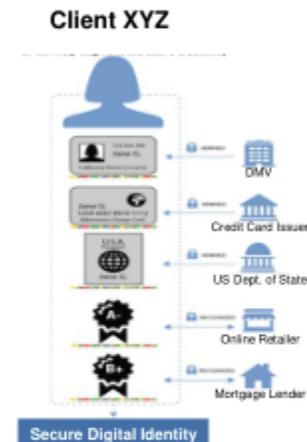
# Blockchain Technology Holds Potential for a Range of Applications

## 1. Financial Market Transactions



- Banks are focused on blockchain technology for post-trade settlement and clearing, with aims to:
  - ✓ Streamline equities settlement from T+2 to T+0.

## 2. Identity Validation and Security



- Potential to securely link identity and payment credentials to a unique individual.
  - ✓ Benefit peer-to-peer businesses reliant on counterparty trust.
  - ✓ Streamline compliance and anti-money laundering surveillance.

- Goldman Sachs Global Investment Research expects limited blockchain adoption over the next 2-5 years, and broader acceptance after 5-10 years.
  - Capital market adoption may take over 10 years, given regulatory oversight and the multitude of participants.

# What is a Cryptocurrency and Why is Blockchain Technology Important?

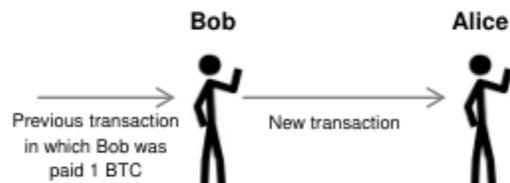
Common Features of Cryptocurrencies	
Common Features of Cryptocurrencies	Attributes
✓ <b>Digital</b>	▪ Coin ownership is represented by entries on a digital ledger, not by a physical token.
✓ <b>Decentralization</b>	▪ No single entity controls the currency.
✓ <b>Open Source</b>	▪ All source code is available freely online.
✓ <b>Distributed Consensus</b>	▪ Each cryptocurrency uses a method for obtaining consensus on ownership without a central arbiter.
✓ <b>Pseudonymity</b>	▪ Coin ownership is not linked to real-world identities within the blockchain.
✓ <b>Cryptography</b> (computerized encoding)	▪ Several cryptographic techniques are used to verify transactions, protect identities, and limit supply.

- A cryptocurrency is a decentralized digital coin. It allows users to make transactions and store money in a secure and pseudonymous manner.
- All cryptocurrency transactions are recorded chronologically on a blockchain, which acts as the critical infrastructure underlying a cryptocurrency.
- The process of verifying transactions and ensuring the validity of the blockchain is called “mining.”
- Mining solves the “double-spending” problem that had plagued previous attempts to implement a digital currency.

# How Do Miners Process Individual Transactions?

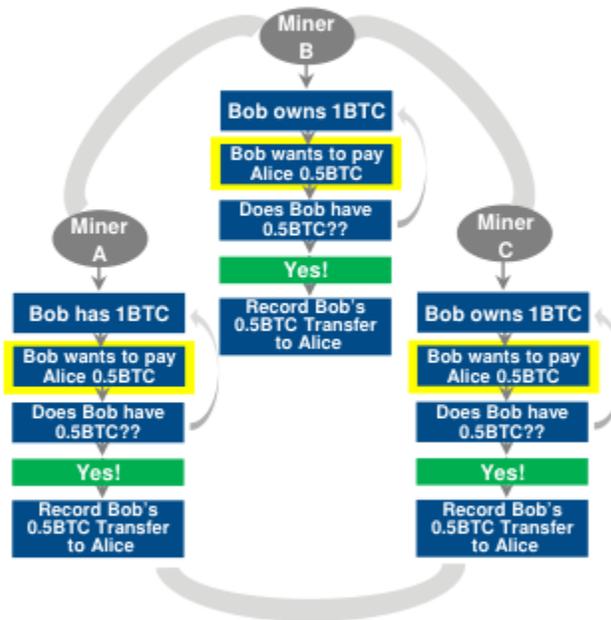
## Illustrative Schematic of a Bitcoin Transaction

### Step 1: Bob wants to pay Alice 0.5 BTC

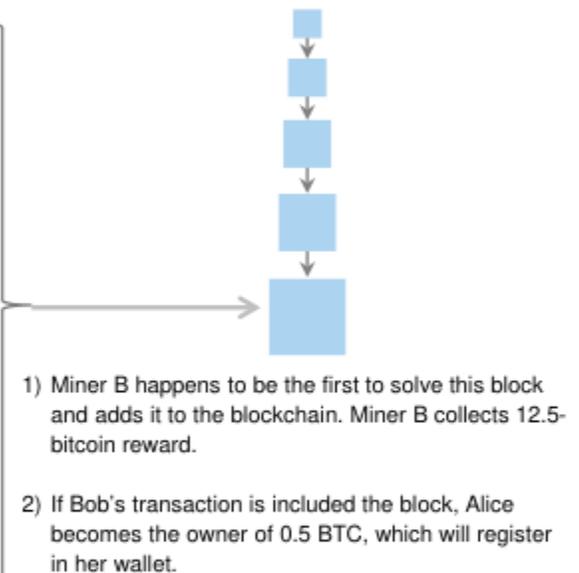


- 1) Before sending any bitcoins, Bob must hold bitcoins in his wallet from a previous transaction (or by solving a block to earn the mining reward).
- 2) Bob creates a new transaction in which he pays 0.5 BTC (of his 1 BTC) to Alice.
- 3) Bob broadcasts this transaction to the network for validation and inclusion in the blockchain.

### Step 2: Miners Verify the Transfer Request and add it to the next block



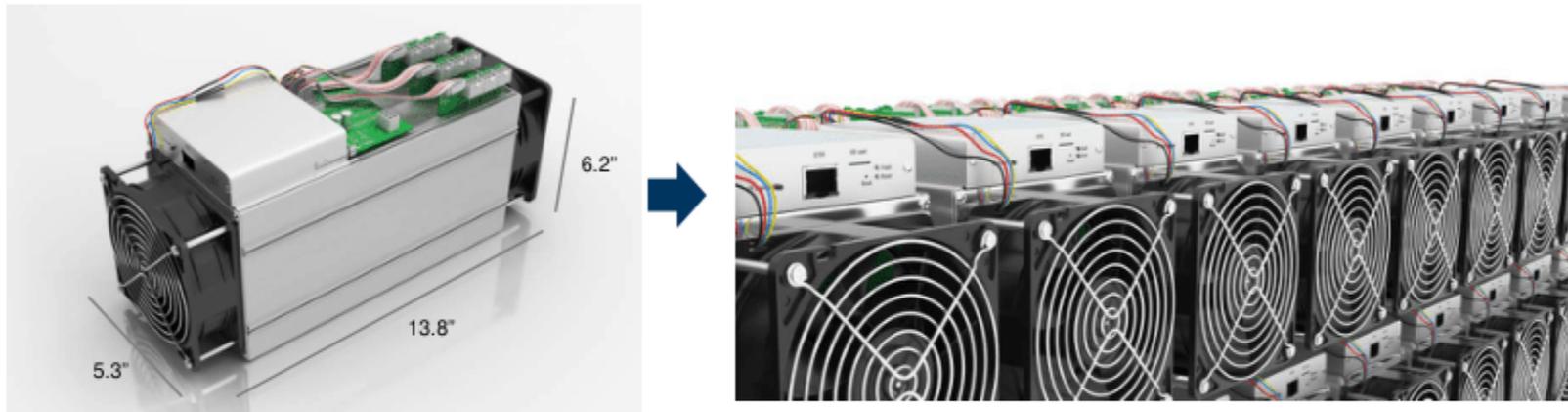
### Step 3: Block Containing Bob and Alice's Transaction is Added to the Blockchain



- Consensus transaction validation creates a book of record for all transactions that have ever occurred.
  - Transactions may only occur if they are supported by evidence from previous transactions.
  - To send bitcoins, an owner's wallet uses its private key to prove ownership of the referenced bitcoins.
- Transaction processing typically take 10-20 minutes, but can take up to 18 hours if the network is congested.

# What is Mining?

ASIC Mining Computer and a Mining Rig

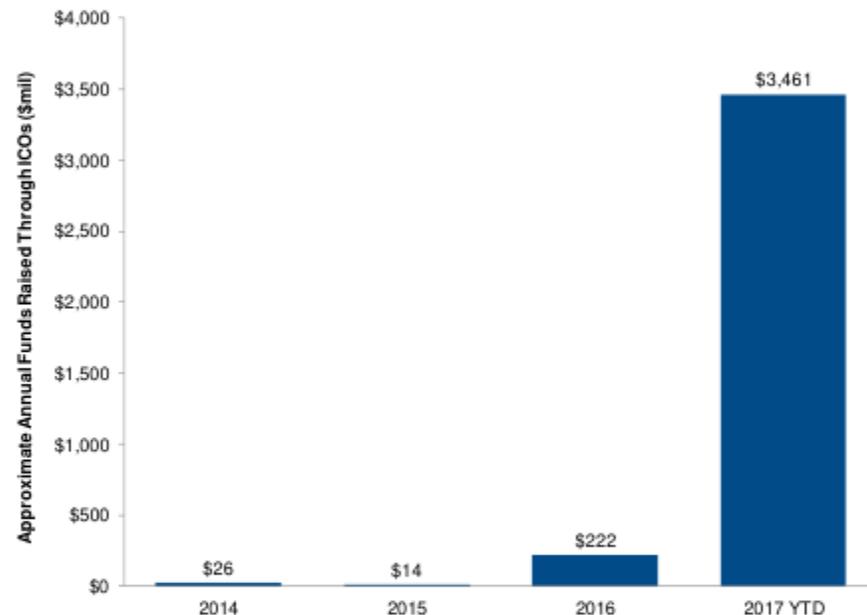


- Miners use highly specialized computers designed to run an algorithm that attempts to solve a cryptographic puzzle in order to add a new block on the blockchain. By design, a bitcoin block is created once every ten minutes.
- The computing power required to solve the cryptographic puzzle is high and expensive; bitcoin mining consumes an estimated \$1.3bn worth of electricity annually<sup>1</sup>—equivalent to Ireland’s annual electricity consumption.
- In order to incentivize mining, the first miner to complete a block is rewarded 12.5 bitcoins. The global supply of bitcoins is capped at 21mil (currently ~16.5m) and follows a predetermined growth rate—the miners’ rewards halve every four years.
- Given ~1-1.5m mining units globally, the likelihood of any one miner solving a block is low. Many miners join “mining pools,” which are cooperatives which share block rewards proportionate to contributed mining power.
  - Mining pools are highly concentrated; the top four pools represent over 50% of total mining power.

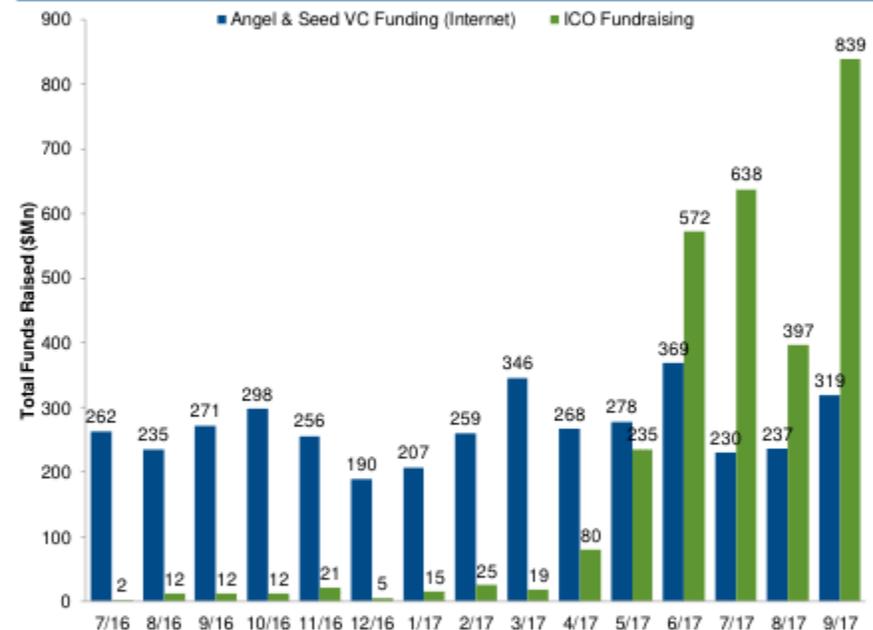
(1) Bitcoin Energy Consumption Index: <https://digiconomist.net/bitcoin-energy-consumption>

# ICOs Fund the Development of New Currencies

1. Approximate Funds Raised by ICOs by Calendar Year (US\$ Millions)



2. Total Funds Raised by Month (US\$ Millions): Angel and Seed Stage Internet VC versus ICO

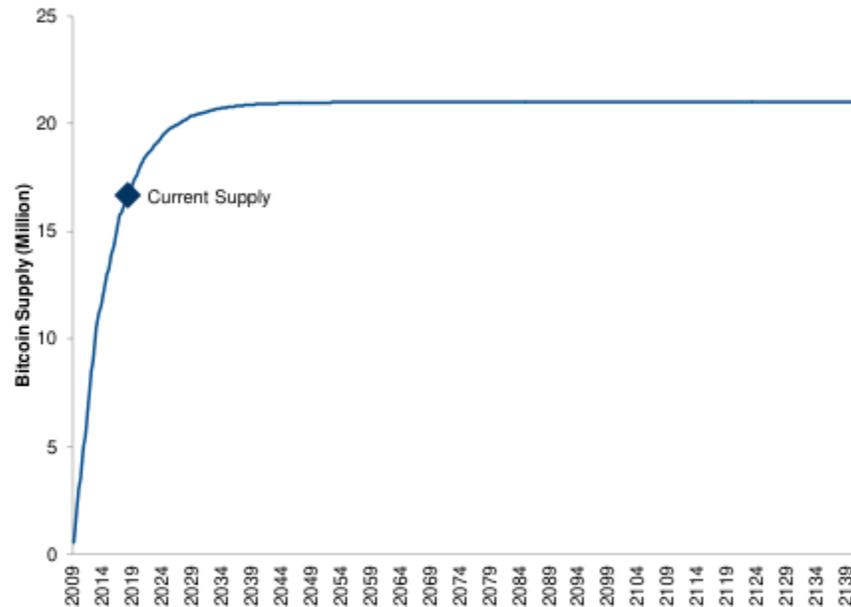


- New blockchain-related projects are funded via an Initial Coin Offering (ICO). This process raises capital through token sales.
- In an ICO, the object offered is either a new digital coin or a yet undeveloped concept in search of funding. ICO investors purchase an ownership percentage of a future money supply or functionality.
- While many ICOs support legitimate use cases, Autonomous Research asserts, “unfortunately, many ICOs are fraudulent.”<sup>1</sup>
- Rather than raising fiat currency, ICOs primarily raise capital in the form of Bitcoin and Ether, driving additional demand for the cryptocurrencies.

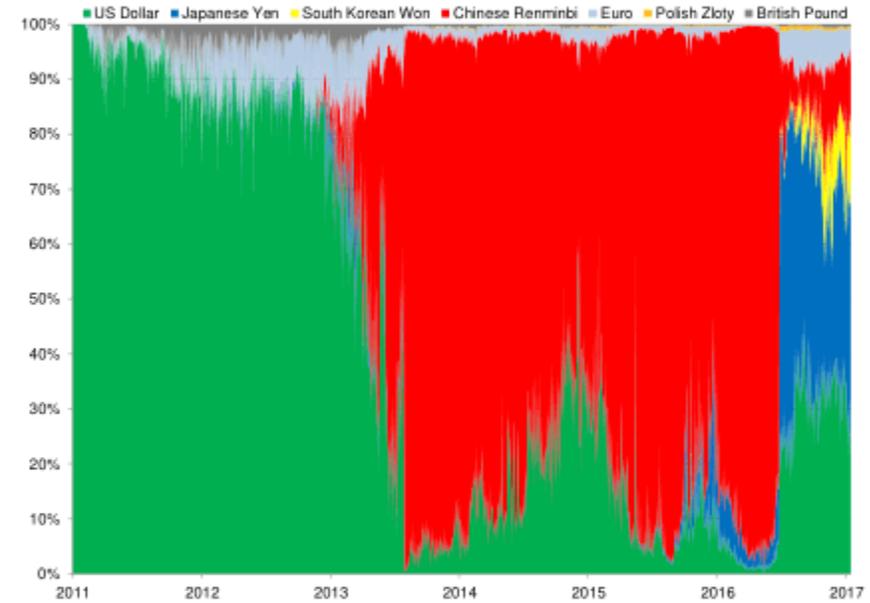
(1) #Token Mania, Autonomous Research, July 2017.

# Why Have Cryptocurrencies Rallied So Much?

## 1. Bitcoin Supply Over Time (Million Tokens)



## 2. Currency Composition of Bitcoin Purchase Volume



- In addition to speculation, which has been the biggest driver of cryptocurrency appreciation, other drivers include:
- **Perceived Scarcity:** Bitcoin’s 21 million token cap is expected to be reached in 2140 (16.5 million today). Many of the over 2,000 other cryptocurrencies, however, do not have a capped supply. Further, while unlikely, bitcoin’s token cap could be raised if a consensus of programmers decided so.
- **Desired Safe-haven:** Increased global participation reflects desire for an asset independent from governments or central banks (“digital gold”). Many governments from which investors have sought diversification, however, have recently banned domestic crypto-exchanges.

# As Bitcoin Ownership is Not Anonymous, Illicit Use has Fallen

## Larry Fink on Bitcoin's Illicit Use

*"Bitcoin just shows you how much demand for money laundering there is in the world. That's all it is. It's an index of money laundering."*

– BlackRock CEO *Larry Fink*, October 13, 2017

- Because bitcoin is pseudonymous, not anonymous, users' real-world identities are ascertainable once the individual converts bitcoin to fiat currency.
- Digital intelligence companies continually scan the blockchain to identify suspicious transaction activity.
- The Blockchain Intelligence Group estimates that illegal transactions in bitcoin fell from ~50% of total volume in 2015 to ~20% in 2016, and represent *"significantly less than that"* today.
- As law enforcement has become better able to track bitcoin ransom, cybercriminals have begun to favor currencies that allow anonymity, such as Monero and Zcash, and even Ether.

## 1) They are used as a medium of exchange.

- To represent a medium of exchange, an instrument must facilitate the transaction of goods or services between parities (*US\$ are used to buy a barrel of oil*).

## 2) They serve as unit of account.

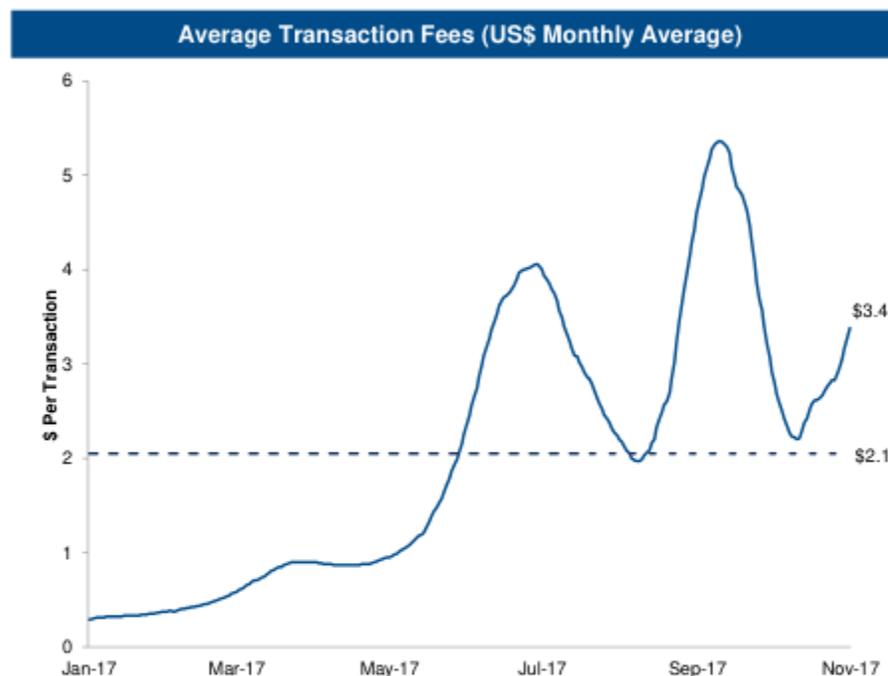
- A unit of account is a measurement which allows value to be accounted and compared (*a barrel of WTI is worth ~\$55*).

## 3) They are a store of value.

- A store of value is an asset that can be saved, stored, and exchanged in the future for a predictable stable value (*with 2% annual inflation, a nominal dollar today will be worth 82¢ in 10 years*).

# Do Cryptocurrencies Meet the Criteria for Currencies?

## 1) Bitcoin is an Inefficient Medium of Exchange

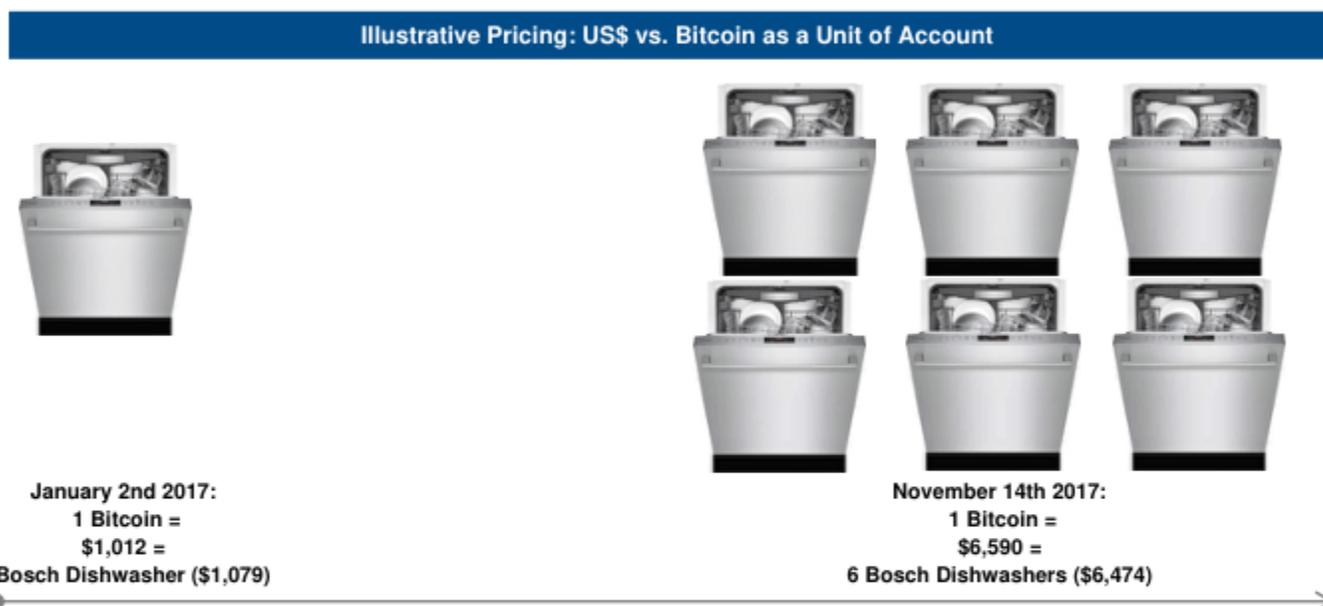


- Processing is expensive. The average transaction cost is ~\$3.40, rendering transfer of small fund balances uneconomical.
- Processing is slow. Transaction processing typically takes a minimum of 10-20 minutes, but can take up to 18 hours if the network is congested (Visa and Mastercard authorize transactions in ~20 milliseconds).
- Bitcoin is not broadly accepted. A mere 9k merchants accept bitcoin, compared to the 37mil that accept Visa and MasterCard, and the billions of merchants and people globally that accept US dollars.<sup>1</sup>
- Further, the IRS considers all cryptocurrency gains a taxable event (including for de minimis purchases).

(1) Do Digital Currencies Pose a Threat to Sovereign Currencies and Central Banks?, Daniel Heller, PIIE.

# Do Cryptocurrencies Meet the Criteria for Currencies?

## 2) Bitcoin is an Unreliable Unit of Account

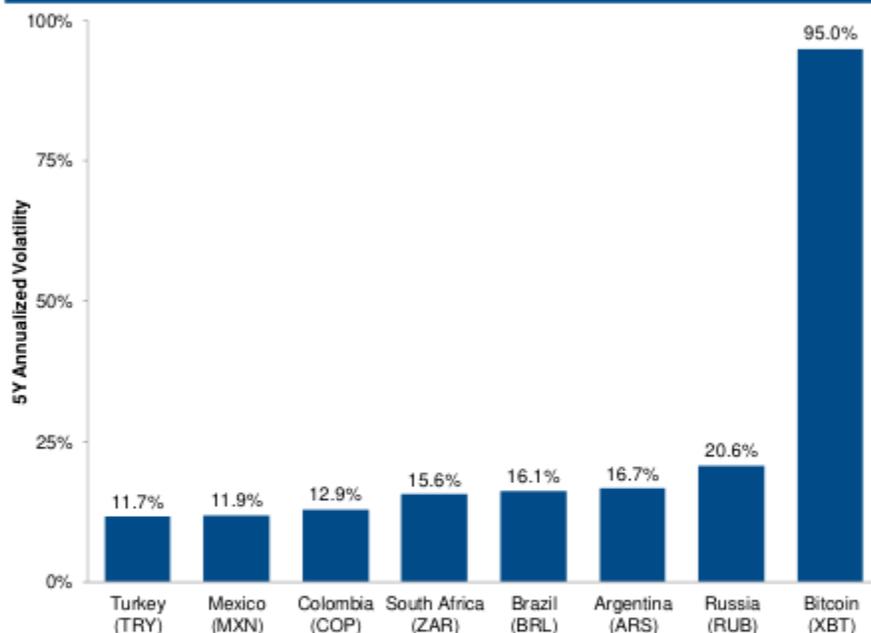


- Bitcoin's rapid appreciation makes it an unsatisfactory candidate as a unit of account.
- In January, one could have purchased a dishwasher for one bitcoin. Today, it would cost 1/6<sup>th</sup> a bitcoin to buy the unit, implying severe deflation over the past several months.
- In deflationary environments, people hoard their money in order to buy goods more cheaply at a later date, which has prompted most people to hoard their bitcoin.

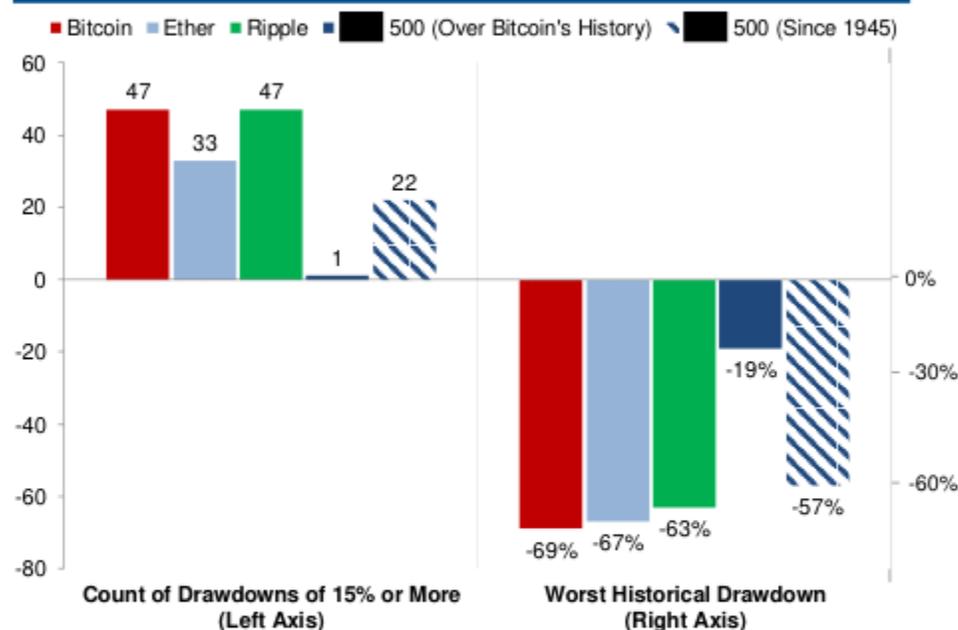
# Do Cryptocurrencies Meet the Criteria for Currencies?

## 3) Bitcoin is an Unstable Store of Value

### 1. Volatility: Bitcoin versus Most Volatile EM Currencies



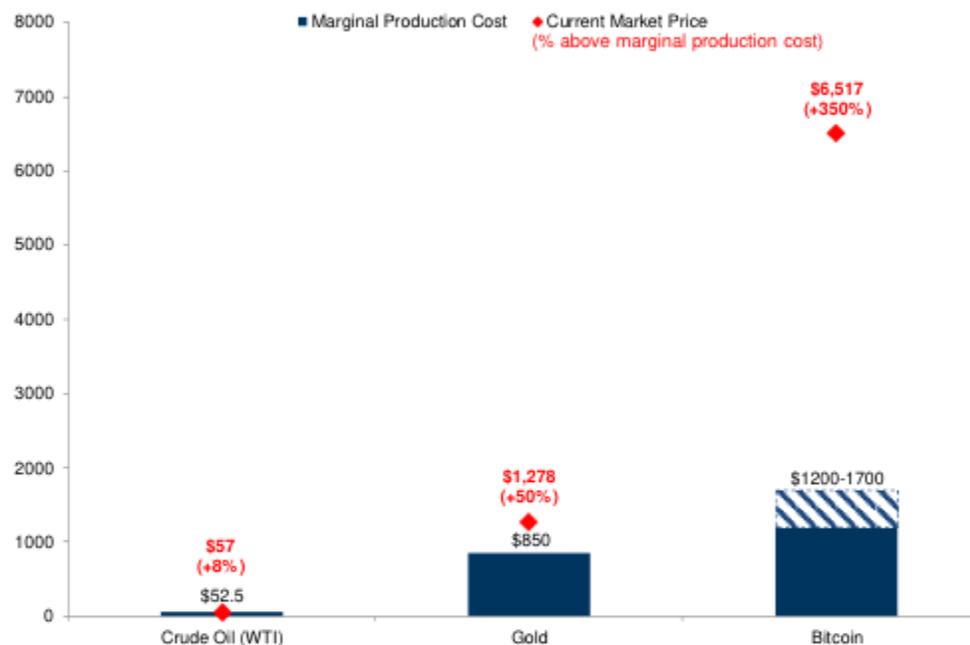
### 2. Bitcoin, Ether and Ripple versus 500 Historical Drawdowns



- Bitcoin's annualized volatility of 95% dwarfs even the most volatile of EM currencies.
- Bitcoin's volatility is 8x the volatility of US equities. In terms of both count and magnitude, Bitcoin, Ether and Ripple have all experienced more severe drawdowns over their short histories than the 500 has since 1945.
- Bitcoin exchanges have thin liquidity, which plays a role in driving enormous price movement—so far to the upside, but which could cause a flash crash upon a large sell order. A ~\$30 million sell order would likely move the market by 5%.
- A store of value should predictably preserve wealth. Bitcoin is unable to do so, as it neither generates income nor grows with earnings.

# Compared to Commodities, Bitcoin's Market Price is Dislocated Relative to its Marginal Production Cost

Oil, Gold and Bitcoin: Marginal Production Cost versus Current Market Price



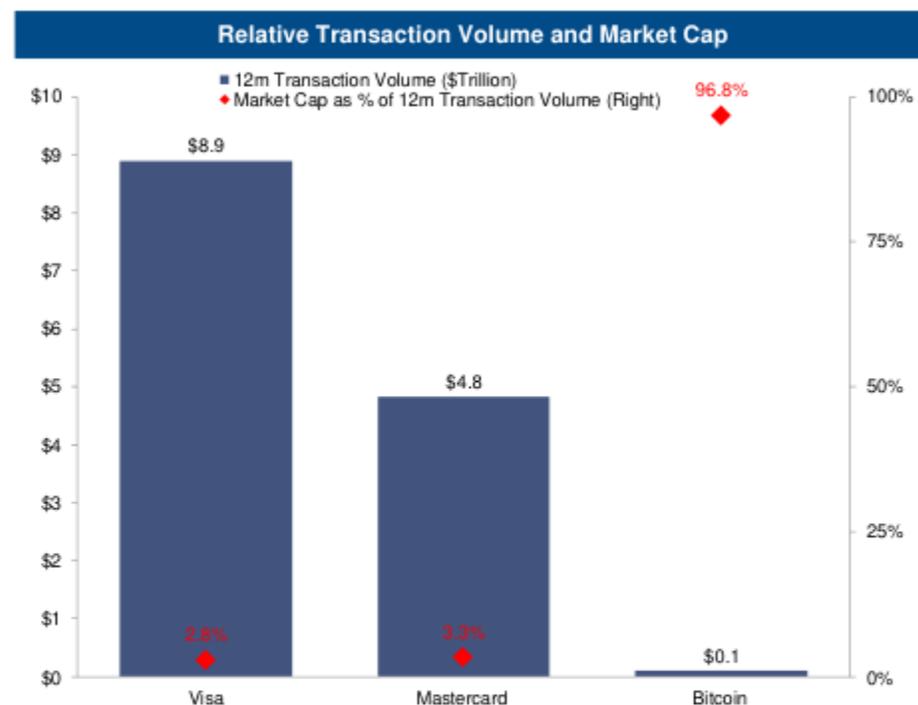
- Bitcoin tokens possesses no physicality, a criteria for traditional commodities.
- Compared to other commodities, Bitcoin's market price stands far above its marginal production cost.
  - Gold miners' and oil drillers' revenues stand 50% and 8% above their marginal production costs, respectively.
  - Bitcoin miners' revenue per bitcoin stands approximately 350% above their electricity expenditures.

(1) Peter C.B. Phillips, Shu-Ping Shi and Jun Yu, "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500," International Economic Review, Oct 28, 2015.

Source: Investment Strategy Group, Bloomberg.

# Bitcoin's Market Cap is Dislocated Relative to that of Payment Processors

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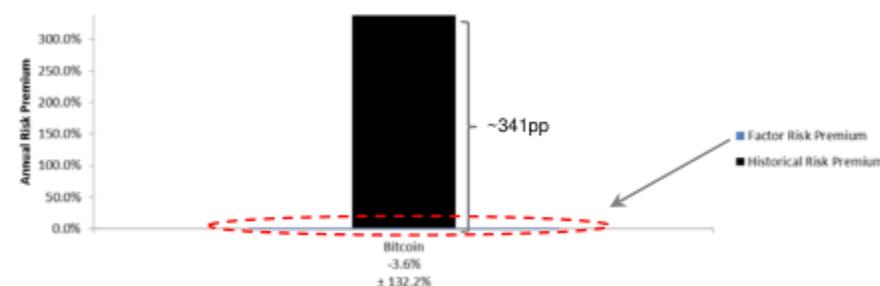
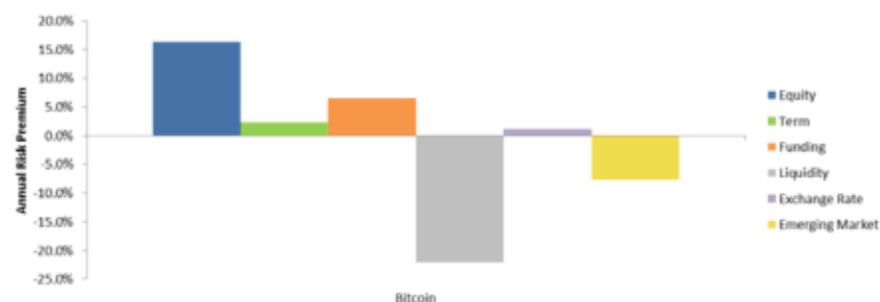
- Traditional payment processors, Visa and Mastercard, each processed several trillion worth of transaction volumes in 2016. Bitcoin has processed \$111 billion of transactions over the last 12 months.
  - Bitcoin's slow transaction time precipitated its recent "hard fork" in attempt to enhance processing capacity.
- Whereas traditional payment processors' market cap represents ~3% of their transaction volume, Bitcoin's represents 97%, suggesting its valuation is dislocated from its fundamental value and that speculation has driven its price.

(1) "Future of Finance Payment Ecosystems," Goldman Sachs Global Investment Research, August 3, 2017.

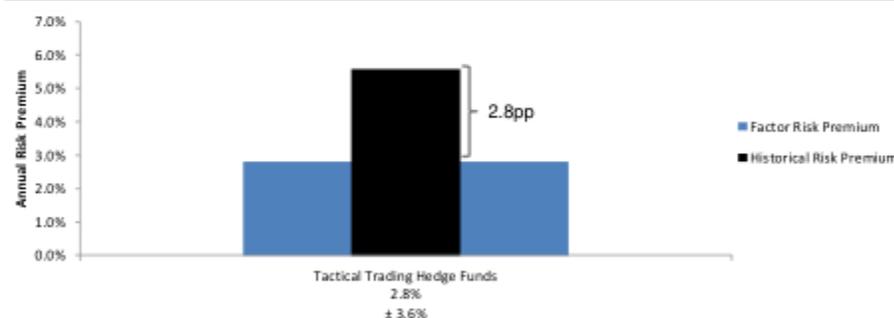
Source: Investment Strategy Group, Bloomberg, Corporate Annual Reports, [REDACTED]

# Bitcoin's Historical Risk Premium is Unexplainable

## 1. Bitcoin Factor Exposures and Unexplained Premium



## 2. Tactical Hedge Funds' Factor Exposures and Unexplained Premium

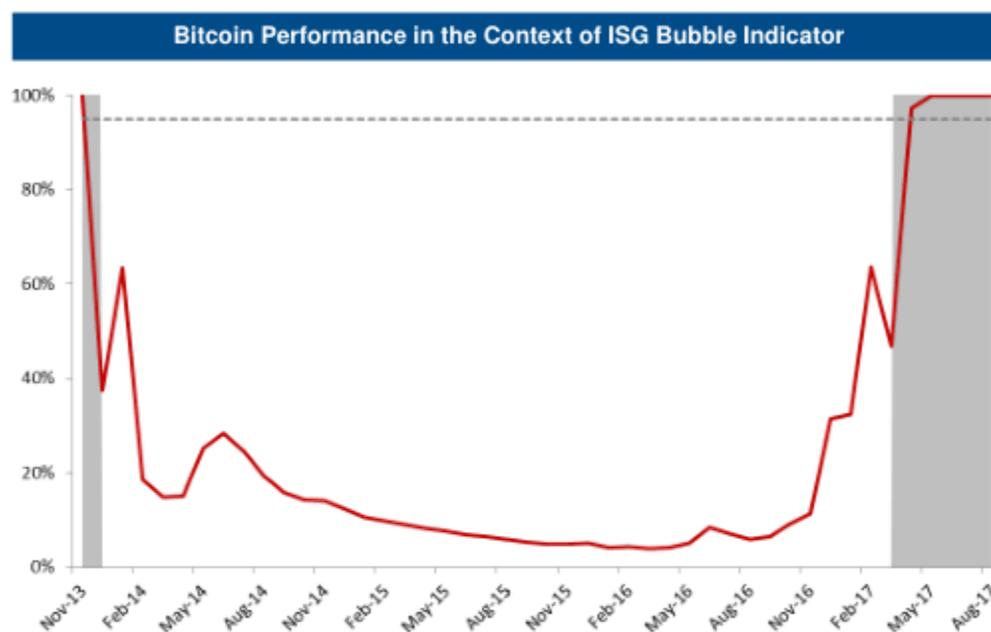


- Bitcoin's 300%+ historical annual risk premium is idiosyncratic and cannot be explained by ISG's multi-factor model.
- An inability to understand sources of risk and return makes one incapable of predicting when performance will reverse.
- For tactical hedge funds, half of the historical risk premium is explained by the factor model.

(1) Peter C.B. Phillips, Shu-Ping Shi and Jun Yu, "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500," International Economic Review, Oct 28, 2015.

Source: Investment Strategy Group, Bloomberg.

# Bitcoin's Recent Performance is Suggestive of Bubble Territory



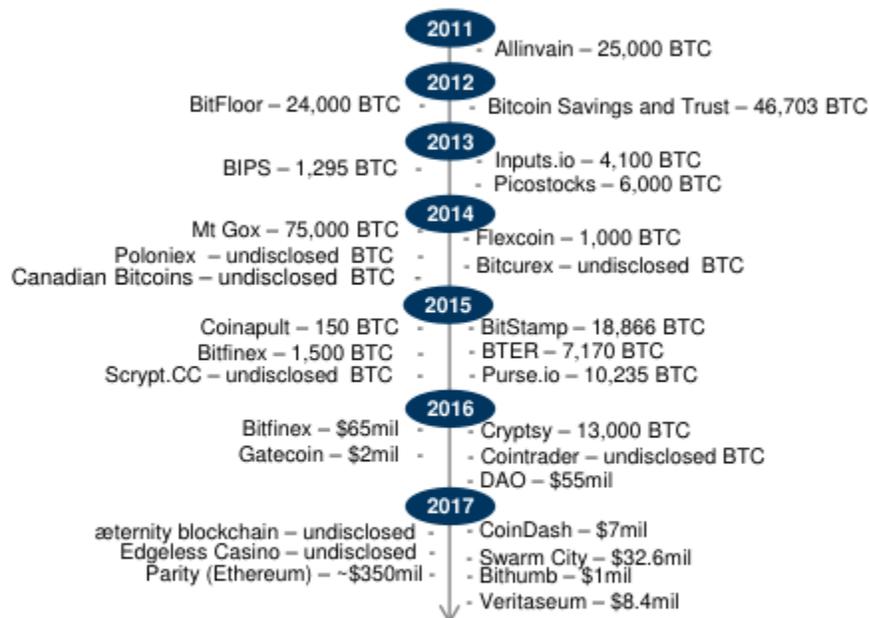
- A bubble-detection test that measures explosive price behavior based on the S&P 500's price-to-dividend ratio<sup>1</sup> suggests only a 16% probability that the US stock market is currently in a bubble.
- Bitcoin's price performance, on the other hand, suggests the asset has been in bubble territory since early this year.

(1) Peter C.B. Phillips, Shu-Ping Shi and Jun Yu, "Testing for Multiple Bubbles: Historical Episodes of Exuberance and Collapse in the S&P 500," International Economic Review, Oct 28, 2015.

- In addition to their extreme volatility, cryptocurrencies are vulnerable to:
  - Hacking of Exchanges
  - Unintentional Coding Error
  - Government Regulation
  - Central Bank Disruption
  - Developments in Quantum Computing (which would increase success of private key hacking)

# The Cryptocurrency Infrastructure is Young and Susceptible to Hacking

## Timeline of Major Cryptocurrency Hacks and Amount Stolen



- Although cryptocurrencies cannot be spent without control of the corresponding private keys, care must be taken to protect those private keys. Many bitcoin owners allow exchanges to custody their private keys, which leaves them vulnerable:
  - If hackers are able to access owners' private keys, they can deplete owners' digital wallets.
  - As of August 2016, Reuters reported that a third of bitcoin exchanges had been hacked.<sup>1</sup>
  - Ethereum's recent Parity hack is the first time a coding error has resulted in a loss of funds.
- Estimates vary but suggest that hackers have stolen at least several hundred million dollars of cryptocurrencies.

(1) [REDACTED]  
Source: Investment Strategy Group, public news sources. See appendix for list of articles.

# Cryptocurrencies' Legal and Regulatory Status Remains Uncertain

Country	Illustrative Acceptance of Cryptocurrencies <sup>1</sup>	Cryptocurrencies' Status	Key Regulator
Switzerland		Assets, not Securities	<ul style="list-style-type: none"> <li>▪ FINMA</li> </ul>
Singapore		Assets, not Securities	<ul style="list-style-type: none"> <li>▪ Monetary Authority of Singapore</li> </ul>
Japan		Recognized as legal tender (Bitcoin only)	<ul style="list-style-type: none"> <li>▪ Financial Services Agency</li> </ul>
United Kingdom		Private Currency	<ul style="list-style-type: none"> <li>▪ Financial Conduct Authority</li> </ul>
United States		<ul style="list-style-type: none"> <li>- Commodities, potentially securities (SEC has not yet made determination)</li> <li>- IRS treats as property for tax purposes (Exchanges, however, are not required to create 1099s).</li> </ul>	<ul style="list-style-type: none"> <li>▪ SEC</li> <li>▪ CFTC</li> <li>▪ OCC</li> <li>▪ 50 States</li> </ul>
Russia		Financial instruments, not currency	<ul style="list-style-type: none"> <li>▪ Central Bank of Russia</li> <li>▪ Russian Finance Ministry</li> </ul>
China		Non-monetary digital asset	<ul style="list-style-type: none"> <li>▪ People's Bank of China</li> </ul>

- The cryptocurrency world operates across geographic and jurisdictional borders, creating ambiguity as to its legal status.
- Individual countries have taken differing views on cryptocurrencies.

(1) Data according to Autonomous NEXT #Token Mania (July 2017)

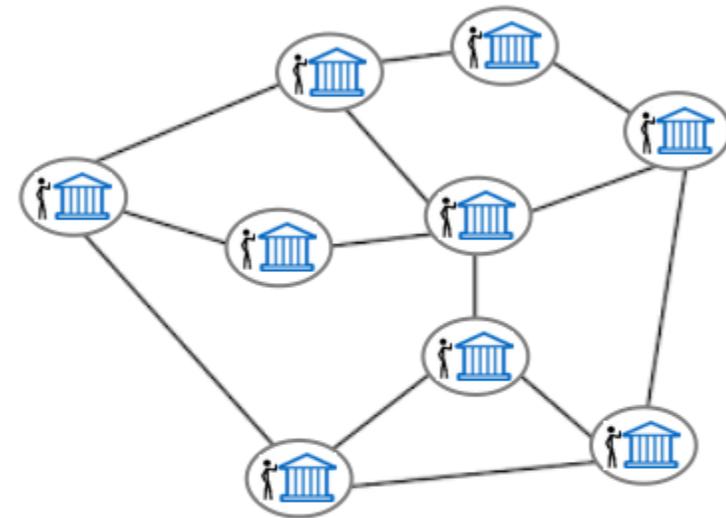
Source: Investment Strategy Group, [REDACTED]

# Central Banks Have Begun Exploring Cryptocurrency Options

## 1. Central Bank Current State



## 2. Illustrative Potential State: Central Bank Cryptocurrencies



- Sovereign central banks have begun exploring cryptocurrency options.
- A retail central bank cryptocurrency would effectively give the public access to accounts at the central bank with the ability to transfer payments peer-to-peer.
- Cryptocurrency proposals are being considered by several central banks, including Singapore's MAS, China's PBOC, Russia's Central Bank, Sweden's Riksbank and Ecuador's Banco Central.
- A successful central bank cryptocurrency could substantially reduce fraud and tax evasion.

## Central Bank Cryptocurrencies Could Substantially Reduce Fraud

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Sachs

“Say there’s a grant to Nigeria for health stuff—if it’s digital money, they can track that it was paid to a certain person and when it was paid out. Then you can audit later and say, ‘Did that really happen?’ You don’t want to tell donors that three percent went astray. Now that there’s digital traceability in a place like Nigeria, where corruption is a huge problem, we can bring that down. A lot of the optimism we have at the foundation about disease, education and financial services is because we’re sitting on top of a digital miracle.”

– Bill Gates, September 25, 2017

- Blockchain technology, which underlies cryptocurrencies, is revolutionary, and likely to have many applications.
- Cryptocurrencies are currently too volatile to be a medium of exchange, unit of account, or store of value, and have many vulnerabilities.
- The cryptocurrency ecosystem will evolve substantially over time.
- The current incarnation of cryptocurrencies is unlikely to persist, but we expect central bank digital currencies to prevail.



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Investment Management Division

Economic and Market Monitors

US Labor Market Data	Period	Actual	Survey	Prior	Revised
<b>JOLTS Job Openings (k)</b>	Sep	6,093	6,075	6,082	6,090
<b>Initial Jobless Claims (k)</b>	4-Nov	239	232	229	--
<b>Continuing Claims (k)</b>	28-Oct	1,901	1,885	1,884	--

US Consumer Sentiment	Period	Actual	Survey	Prior	Revised
<b>U. of Mich. Sentiment</b>	Nov P	97.8	100.8	100.7	--
<b>U. of Mich. 5-10 Yr Inflation</b>	Nov P	2.5%	--	2.5%	--

China Activity Data	Period	Actual	Survey	Prior	Revised
<b>Foreign Reserves</b>	Oct	3,109	3,110	3,109	--
<b>Exports YoY</b>	Oct	6.9%	7.1%	8.1%	8.0%
<b>Imports YoY</b>	Oct	17.2%	17.0%	18.7%	18.6%
<b>CPI YoY</b>	Oct	1.9%	1.8%	1.6%	--

European PMI Data	Period	Actual	Survey	Prior	Revised
<b>Markit Eurozone Composite PMI</b>	Oct F	56.0	55.9	55.9	--
<b>Markit/BME Germany Composite PMI</b>	Oct F	56.6	56.9	56.9	--
<b>Markit France Composite PMI</b>	Oct F	57.4	57.5	57.5	--
<b>Markit/ADACI Italy Composite PMI</b>	Oct	53.9	54.3	54.3	--
<b>Markit Spain Composite PMI</b>	Oct	55.1	54.6	56.4	--

European Activity Data	Period	Actual	Survey	Prior	Revised
<b>Eurozone Retail Sales YoY</b>	Sep	3.7%	2.8%	1.2%	2.3%
<b>Italy Retail Sales YoY</b>	Sep	3.4%	0.5%	-0.5%	-0.1%
<b>Germany Industrial Prod. WDA YoY</b>	Sep	3.6%	4.5%	4.7%	4.6%
<b>France Industrial Production YoY</b>	Sep	3.2%	3.1%	1.1%	1.0%
<b>Italy Industrial Production WDA YoY</b>	Sep	2.4%	4.8%	5.7%	5.8%
<b>Spain Industrial Output SA YoY</b>	Sep	3.4%	3.1%	1.8%	1.9%

- The US labor market continues to tighten; the small miss in claims is largely explained by Puerto Rico.
- Chinese trade growth moderated; deals announced during President Trump's visit are unlikely to reduce trade deficit.
- Eurozone data came in mixed relative to consensus expectations, but still points to above-trend growth in the region.

# Markets Monitor

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	1Y Price Range	11/14/2017	WTD	Last Week <sup>1</sup>	YTD
<b>500</b>		<b>2,579</b>	<b>-0.1%</b>	<b>-0.2%</b>	<b>15.2%</b>
Cons Disc		738	0.4%	0.7%	13.9%
Cons Staples		564	0.9%	2.1%	6.0%
Energy		503	-2.1%	1.1%	-9.3%
Financials		433	0.1%	-2.7%	12.0%
Health Care		936	-0.3%	-0.5%	17.4%
Industrials		596	-0.9%	-1.1%	10.7%
Info Tech		1,106	-0.2%	0.0%	36.9%
Materials		362	-0.6%	-1.2%	15.9%
Real Estate		209	0.1%	3.2%	9.8%
Telecom		142	-1.7%	-1.3%	-19.8%
Utilities		288	2.4%	0.4%	16.6%
<b>NASDAQ</b>		<b>6,738</b>	<b>-0.2%</b>	<b>-0.2%</b>	<b>25.2%</b>
<b>VIX</b>		<b>11.59</b>	<b>0.30</b>	<b>2.15</b>	<b>(2.45)</b>
2yr Yield		1.69%	0.03%	0.04%	0.50%
10yr Yield		2.37%	-0.03%	0.07%	-0.07%
30yr Yield		2.83%	-0.05%	0.07%	-0.24%
30yr AA Yield		3.83%	-0.05%	0.14%	-0.33%
HY Spread (bps)		360	0	21	-49
LIBOR		1.42%	0.00%	0.02%	0.42%

	1Y Price Range	11/14/2017	WTD	Last Week <sup>1</sup>	YTD
<b>MSCI AC World</b>		<b>573</b>	<b>-0.4%</b>	<b>-0.4%</b>	<b>14.6%</b>
<b>MSCI EAFE</b>		<b>1,148</b>	<b>-0.8%</b>	<b>-1.1%</b>	<b>10.7%</b>
TOPIX		1,779	-1.2%	0.4%	17.1%
FTSE 100		7,414	-0.2%	-1.7%	3.8%
DAX		13,033	-0.7%	-2.6%	13.5%
IBEX 35		9,990	-1.0%	-2.6%	6.8%
Euro Stoxx 50		3,556	-1.0%	-2.6%	8.1%
<b>MSCI EM</b>		<b>60,154</b>	<b>-0.7%</b>	<b>0.2%</b>	<b>26.2%</b>
MSCI China		88	-0.7%	2.4%	50.7%
MSCI India		1,214	-1.3%	-1.6%	23.5%
MSCI Brazil		240,688	-1.9%	-2.3%	15.4%
MSCI Russia		969	-0.3%	5.4%	-3.0%
USD Trade Weighted		81.16	-0.3%	-0.5%	-7.0%
EUR		1.1798	1.1%	0.5%	12.2%
JPY		113.46	0.1%	0.5%	3.1%
GBP		1.3165	-0.2%	0.9%	6.7%
EM Currencies <sup>2</sup>			-0.2%	0.0%	7.6%
CNH		6.6357	0.4%	-0.4%	5.1%
WTI Crude Oil		55.70	-1.8%	2.0%	3.7%
Gold Spot Price		1,280	0.4%	0.5%	11.1%



- Equities were softer as concerns around tax reform outweighed a mostly positive Q3 earnings season. Bond yields rose globally and the dollar weakened, while oil continued to rally on geopolitical concerns.

<sup>1</sup> Based on the MSCI EM Currency index.

Source: Investment Strategy Group, Bloomberg.



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Investment Management Division

Appendix & Disclosures

- Allinvain - [REDACTED]
- BitFloor - [REDACTED]
- Bitcoin Savings and Trust - [REDACTED]
- BIPS - [REDACTED]
- Inputs.io - [REDACTED]
- PicoStocks - [https://bitcointalk.org/index.php?topic=576337#post\\_toc\\_58](https://bitcointalk.org/index.php?topic=576337#post_toc_58)
- Mt. Gox - [REDACTED]
- Poloniex - [REDACTED]
- Canadian Bitcoins - [REDACTED]
- Flexcoin - [REDACTED]
- Bitcurex - [REDACTED]
- Coinapult - [REDACTED]
- Bitfinex - [REDACTED]
- Script.CC - [REDACTED]
- BitStamp - [REDACTED]
- BTER - [REDACTED]
- Purse.io - [REDACTED]
- Bitfinex - [REDACTED]
- Gatecoin - [REDACTED]
- Cryptsy - [REDACTED]
- Cointrader - [REDACTED]
- DAO - [REDACTED]
- Aeternity blockchain - [REDACTED]
- Edgeless Casino - [REDACTED]
- Parity (Ethereum) - [REDACTED]
- CoinDash - [REDACTED]
- Swarm City - [REDACTED]
- Bithumb - [REDACTED]
- Veritaseum - [REDACTED]

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