Blockchain, Cryptocurrency and ICO 101
Cutting through the hype

AMTD Research

October 2017

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1. What is blockchain?

Why you must understand blockchain technology

❖ The current internet market is dominated by giant companies. Three disruptive changes blockchain could bring to the society:

❖ 1) Change the way how people <u>trust</u> each other: from an intermediary model from a decentralized model – a low cost trust mechanism based on machine rules/consensus in stead of a central party.

❖ 2) The internet of information shift to the <u>internet of Value</u>. Value/money will be sent as easily as information. Internet users will obtain full control of their own data

❖ 3) <u>Smart contract</u>: Automated contract execution at low cost.

❖ Almost all tech giants have dedicated blockchain project teams to keep them at forefront of this technology.

The ABCD of financial technology (FinTech)

| **A** Artificial Intelligence	**B** Blockchain
AI enables financial institutions to remove the human factor in order to accelerate process, improve efficiency and eliminating human errors.	Blockchain enables faster, cheaper and safer transfer of assets and transform the business world to a distributed model with less intermediaries.
C Cloud Computing	**D** Big Data
Cloud computing services provided by technology companies enables businesses to fast process large volume of data and transactions.	By introducing new data source, big data technology enables financial institutions to conduct target marketing, better manage risk and price risk.

![AMTD 尚乘 logo]

Source: World Economic Forum, Tencent Blockchain White Paper, AMTD Research

Passion, hype and speculation

❖ World Economic Forum white paper: "Block chain signals the beginning of a new era of the internet that will be defined by value rather than information."

❖ The interest in blockchain technology grew along with the price gains in cryptocurrencies. But blockchain is much more than just bitcoin.

❖ **Problems blockchain aims to solve**: Fragility introduced by centralization, high transaction cost due to existence of intermediary, inefficient transaction, lack of trust in transactions, data integrity.

**Blockchain google search interest reached all-time high**
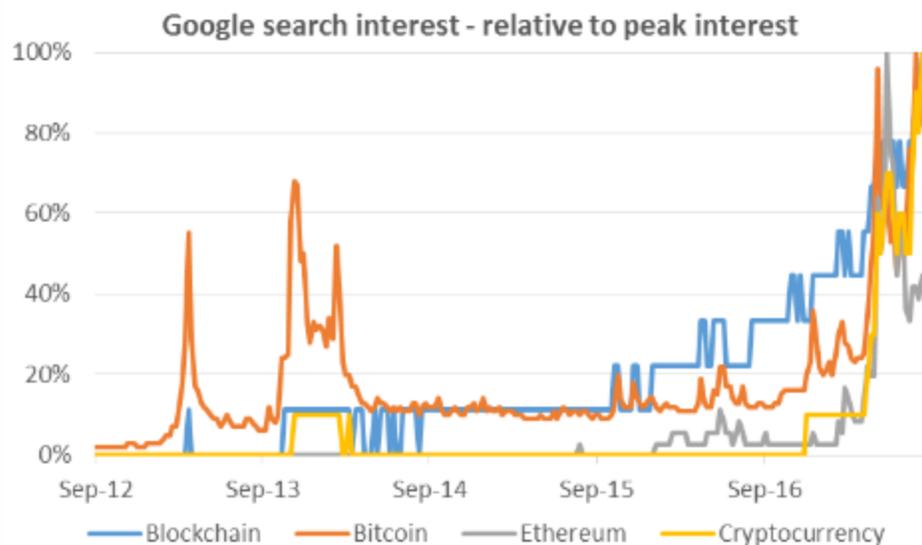
Search interest grew along with coin price surge

Source: World Economic Forum, Google, blockgeeks.com
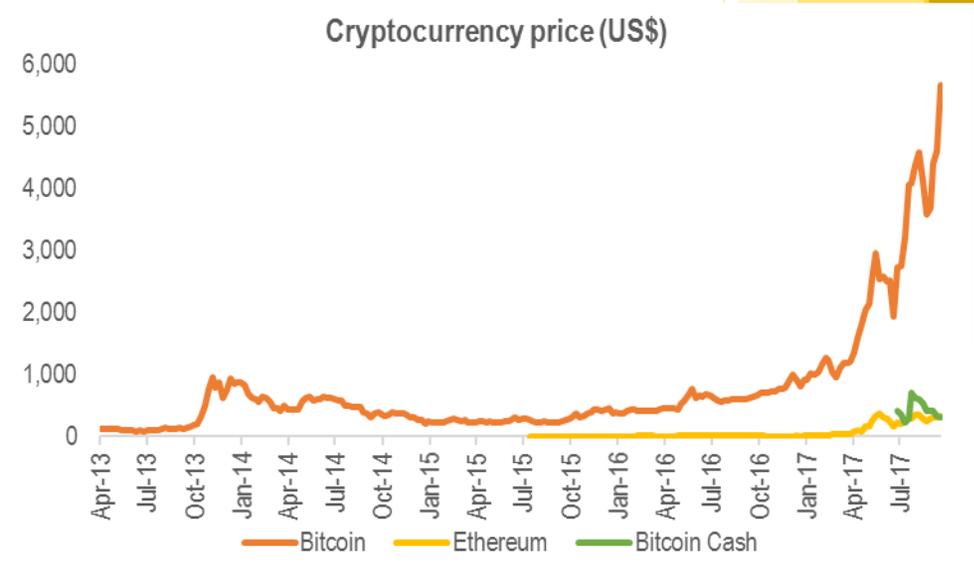
Blockchain is not same as bitcoin

❖ Blockchain is the technology behind bitcoin and all other cryptocurrencies.

❖ A blockchain is a distributed ledger, continuously growing list of records, called blocks, which are linked and secured using cryptography. A network of so-called computing "nodes" make up the blockchain. The nodes jointly manage the database that records all the transactions. No intermediary or central party is involved. The new block contains all transactions previously recorded and are synchronized on the network; by storing data across its network, the blockchain eliminates the risks that come with data being held centrally.

❖ Currently, finance offers the strongest use cases for blockchain technology.

❖ Advantage of blockchain technology: Immutable, high efficiency, low transaction cost, low vulnerability to attack; Limitations: Capacity

Simplified bitcoin Blockchain transaction history
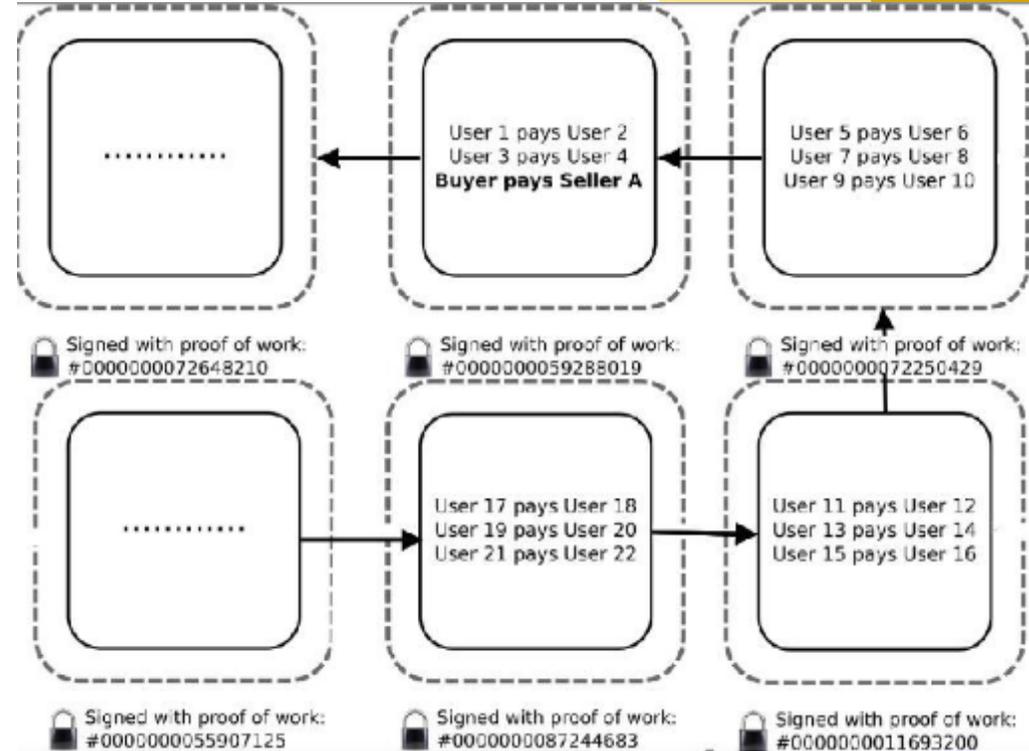
Blockchain network is decentralized; a network of "nodes" make up the blockchain

Source: blockgeeks.com
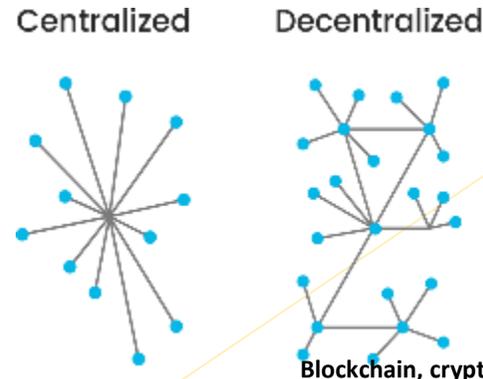
Three essential technologies on a blockchain network

The blockchain database isn't stored in any single location, it is stored on all the nodes on the chain. No centralized version of this information exists for a hacker to corrupt. Hosted by millions of computers simultaneously, its data is accessible to anyone on the internet.

A distributed database

The basis for this is that the so-called public and private "keys". A "public key" (a long, randomly-generated string of numbers) is a user's address on the blockchain. Bitcoins sent across the network get recorded as belonging to that address. The "private key" is like a password that gives its owner access to their Bitcoin or other digital assets. Store your data on the blockchain and it is incorruptible.

Encryption technology

Consensus protocol

Since any entity, individual, or party can submit information to the blockchain, we cannot be sure of the author's trustworthiness. Therefore, it is vital that all new information must be reviewed and confirmed before being accepted. There are four main methods of finding consensus in a blockchain: the practical byzantine fault tolerance algorithm (PBFT), the proof-of-work algorithm(PoW) ,the proof-of-stake algorithm (PoS), and the delegated proof-of-stake algorithm (DPoS).

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Source: blockgeeks.com

Public blockchain vs private blockchain

Public blockchain

Example: Bitcoin, Ethereum

Public blockchain allows everyone to access and contribute to its database. Since there is no central owner/operator of the ledger, everybody on the chain is responsible for the integrity of the database.

Advantage: Immutable, high security, individual anonymity

Disadvantage: Relatively slow transaction speed, scalability constraint

Use case: Cryptocurrency

Private blockchain

Example: Ripple

A private blockchain has a company writing and verifying each transaction. This allows for much greater efficiency and transactions on a private blockchain will be completed significantly faster.

Advantage: High transaction speed, privacy

Disadvantage: Low decentralized security

Use case: Enabling traditional business

Consortium blockchain

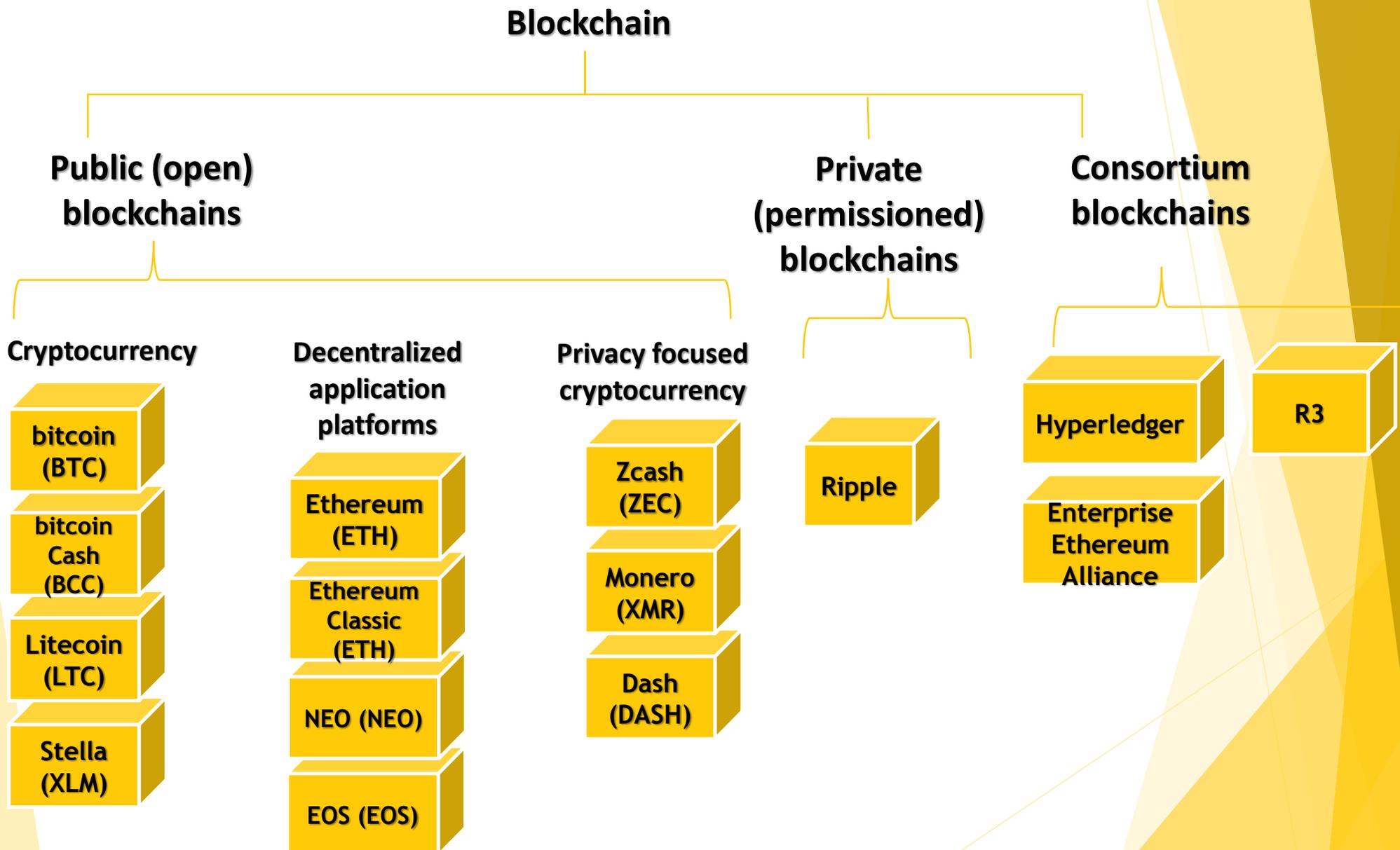**Example:** R3, Hyperleder, Enterprise Ethereum Alliance

Consortium blockchain is partly private, allowing a few selected nodes to write and verify transactions.

Advantage: High transaction speed, privacy

Disadvantage: Low decentralized security

Use case: Cross platform cooperation

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Different types of blockchains

Blockchain

Public (open) blockchains

Private (permissioned) blockchains

Consortium blockchains

Cryptocurrency
- bitcoin (BTC)
- bitcoin Cash (BCC)
- Litecoin (LTC)
- Stella (XLM)

Decentralized application platforms
- Ethereum (ETH)
- Ethereum Classic (ETH)
- NEO (NEO)
- EOS (EOS)

Privacy focused cryptocurrency
- Zcash (ZEC)
- Monero (XMR)
- Dash (DASH)

- Ripple

- Hyperledger
- R3
- Enterprise Ethereum Alliance

Source: coindesk.com

Application of blockchain technology

Data sharing, blockchain infrastructure development

Enterprise alliance

IoT

Distributed cloud service, car rental

Payment, insurance, capital market

Finance

Supply chain

Supply chain finance, supply chain tracing system

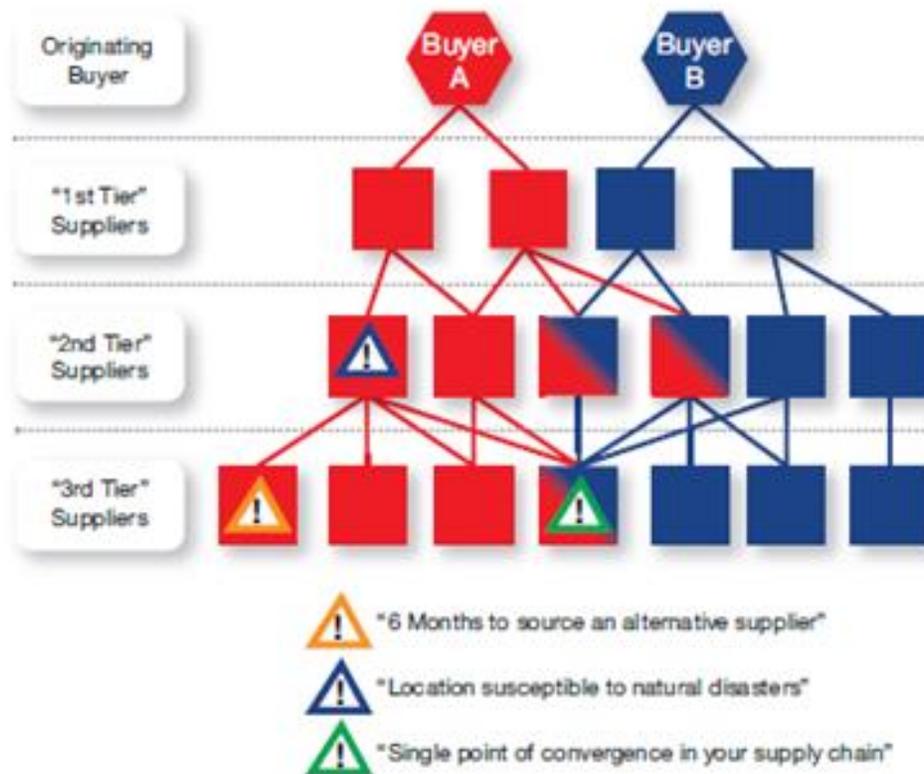Identity management, KYC, anti-money laundry, property registration

Public service

Charity

Blockchain based donation system

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Source: coindesk.com

Case study: Dianrong and Foxconn's supply chain finance

❖ **Rebuild Foxconn's supply chain based on blockchain technology; every transaction will be booked and synchronized on the chain; can be replicated on other companies' supply chain**

❖ **Provide financing to lower tier suppliers based on immutable transaction data on the blockchain; traditionally only the 1st tier suppliers get receivable financing from banks (factoring)**

❖ **Provide Foxconn real-time supply chain management and supplier concentration analysis**

Originating Buyer

"1st Tier" Suppliers

"2nd Tier" Suppliers

"3rd Tier" Suppliers

⚠ "6 Months to source an alternative supplier"

⚠ "Location susceptible to natural disasters"

⚠ "Single point of convergence in your supply chain"

In the light of ever diminishing profit margins, over-whelming demand for shortest possible time delivery and minimum inventory holding, presence of a responsive and resilient supply chain is a necessity.

In March 2011, Japan was hit by earthquake and tsunami which caused huge loss of lives and also affected the production facilities of major automotive companies namely Toyota, Nissan and Honda. The effect was of such magnitude that it took Toyota over six months to restore production to pre-calamity levels, resulted in a production loss of 140,000 cars and 30% decrease in company profits. This demonstrated the importance of real time analysis of concentration of suppliers.

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VC and Equity investment trends

❖ According to CB Insights, traditional equity investment in the blockchain sector seems to be maturing, with seed/equity deals decreasing to 50% of the total in YTD 2017, down from 57% in 2016 and 72% in 2015.

❖ Blockchain sector's consolidation may be tight, with blockchain companies failing at a higher rate than other tech startups. Of 103 blockchain companies that received initial seed or angel funding in 2013-2014, only 28% managed to raise additional funding, and just one company made it to Series D: Japan based cryptocurrency exchange, bitFlyer.

❖ Corporate investors have also been active, including SBI Holdings from Japan, Google, Overstock, Citigroup and Goldman Sachs.

❖ Investment in blockchain by category:

1. Cryptocurrencies and ICOs

2. Companies directly correlated with bitcoin speculations such as exchanges, trading platforms and mining companies

3. Companies with bitcoin as a currency for P2P payments and remittance

4. Blockchain use cases in media, e-commerce, identification

5. Private blockchain firms building enterprise-facing blockchain software

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Source: CB Insights

Most well-funded blockchain startups

Most well-funded venture-backed blockchain companies
Equity funding (excluding initial coin offerings and consortia). 2012 - 2017 YTD (10/08/2017)

Company	Disclosed Funding ($M)	Most Recent Funding	Country	Select Investors
coinbase	$217M	Series D $100M August 2017	USA	Andreessen Horowitz, DFJ Growth Fund, Union Square Ventures, Greylock Partners, Battery Ventures
CIRCLE	$136M	Series D $60M June 2016	USA	Accel Partners, Baidu, Goldman Sachs, General Catalyst, IDG Capital Partners, Pantera Capital
21 Inc.	$116M	Series C $111M March 2015	USA	Cisco Investments, Khosla Ventures, Qualcomm Ventures, RRE Ventures, Andreessen Horowitz
ripple	$94M	Series B $55M September 2016	USA	Accenture, Google Ventures, Lightspeed Venture Partners, Santander InnoVentures, SBI Group
BitFury	$90M	Series C $30M January 2017	Netherlands	Binary Capital, QueensBridge Venture Partners, China Credit Limited Holdings, Blockchain Capital
Blockstream	$76M	Series A $55M February 2016	USA	AXA Strategic Ventures, Blockchain Capital, Digital Currency Group, Khosla Ventures
BLOCKCHAIN	$71M	Series B $40M June 2017	UK	Digital Currency Group, Lightspeed Venture Partners, Google Ventures, Mosaic Venture Partners, Virgin Group
Digital Asset	$67M	Series A - II $7M June 2016	USA	Citigroup, JP Morgan Chase, PNC Financial Services, DTCC, Australian Securities Exchange
BITMAIN	$50M	Unattributed $50M September 2017	China	IDG Capital, Sequoia Capital China
Canaan	$48M	Series A $43M May 2017	China	Baopu Asset Management, Tunlan Investment, Jin Jiang International

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Source: CB Insights

Global blockchain startups

BITCOIN & BLOCKCHAIN STARTUPS MARKET MAP

Source: CBInsights

2. What is cryptocurrency?

Market cap of cryptocurrencies reached all-time high

❖ A cryptocurrency (or crypto currency) is a decentralized, math-based digital asset whose transaction is performed cryptographically, without the existence of a central power. Cryptography is used to secure the transactions and to control the creation of new coins. All cryptocurrencies are based on blockchain technology.

❖ Bitcoin was conceptualized in 2008 and implemented in 2009. It was the first time **blockchain technology** was introduced. Since then, numerous cryptocurrencies have been created. By Oct-2017, there are over 1000 different cryptocurrencies.

❖ The total market capitalization of cryptocurrencies reached all-time high of US$180bn in Aug-2017. Current market cap stands at US$174bn.

Total market cap reached all-time high in Aug-2017

Market cap market share – concentration significantly decreased in 2017


Source: coinmarketcap.com
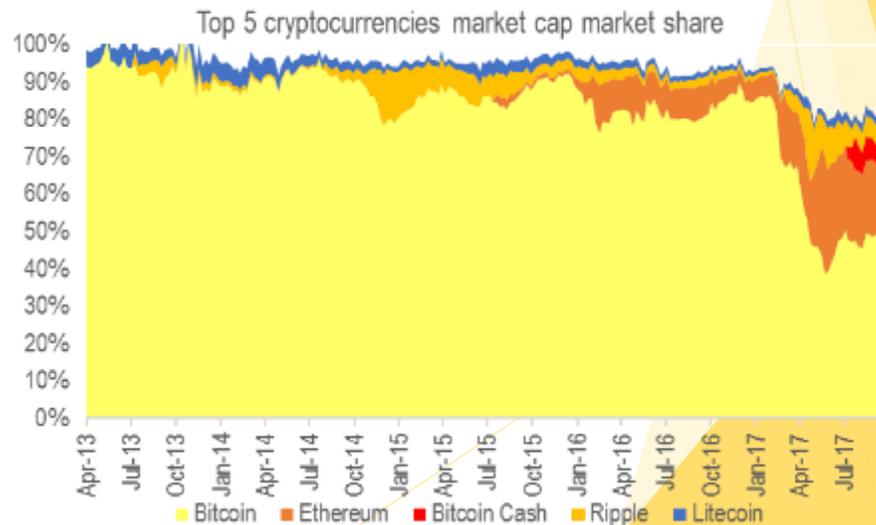
Top 10 cryptocurrencies

❖ The top cryptocurrencies enjoy early mover advantages and dominate the cryptocurrency market.

❖ The top 10 cryptocurrencies account for 89% of the total market cap and 84% of daily trading turnover.

#	Name	Symbol	Market Cap
1	Bitcoin	BTC	$95,248,067,306
2	Ethereum	ETH	$31,962,341,454
3	Ripple	XRP	$9,937,173,558
4	Bitcoin Cash	BCH	$5,311,751,870
5	Litecoin	LTC	$3,549,415,165
6	Dash	DASH	$2,343,743,812
7	NEM	XEM	$1,857,629,470
8	Monero	XMR	$1,493,206,407
9	BitConnect	BCC	$1,407,750,470
10	NEO	NEO	$1,378,758,067

Market cap market share
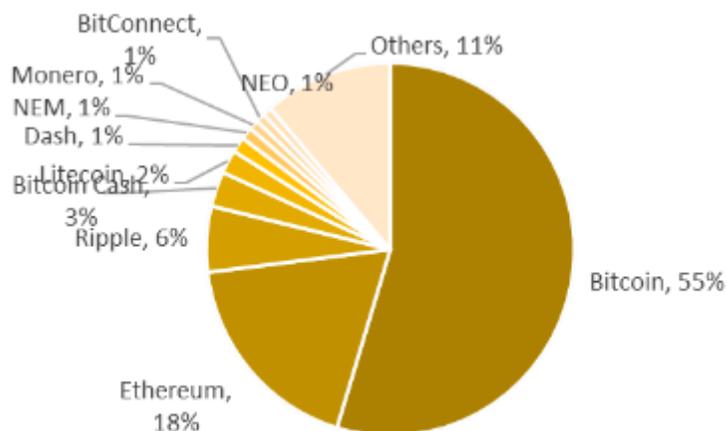
30day trading volume market share

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Priced as of 18 Oct 2017; Source: coinmarketcap.com
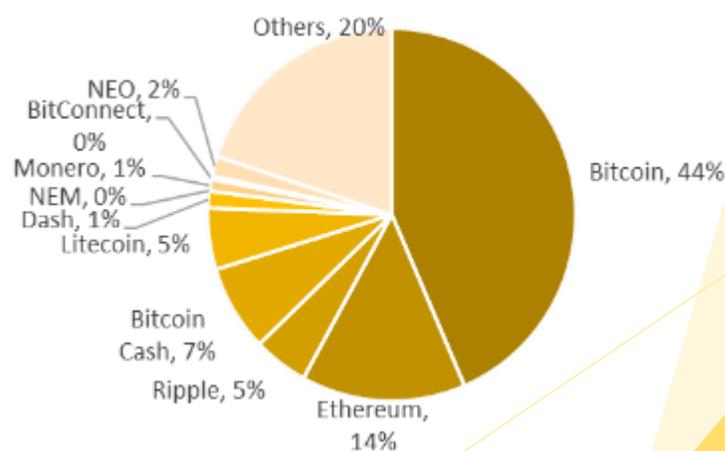
The supply of cryptocurrency

❖ A cryptocurrency's supply is predetermined before its creation.

❖ bitcoin will reach a limit of 21 million around the year of 2140 then stop to grow. The speed of bitcoin growth is fixed. Currently ~80% of bitcoins have been mined.

❖ In contrast, Ether's supply will grow infinitively as of now, subject to future changes.

❖ All Ripple was distributed upon its creation. No additional Ripple will be created or mined.

❖ Note: The cloned coins born in a fork in a way create competing supply (bitcoin cash as an example)
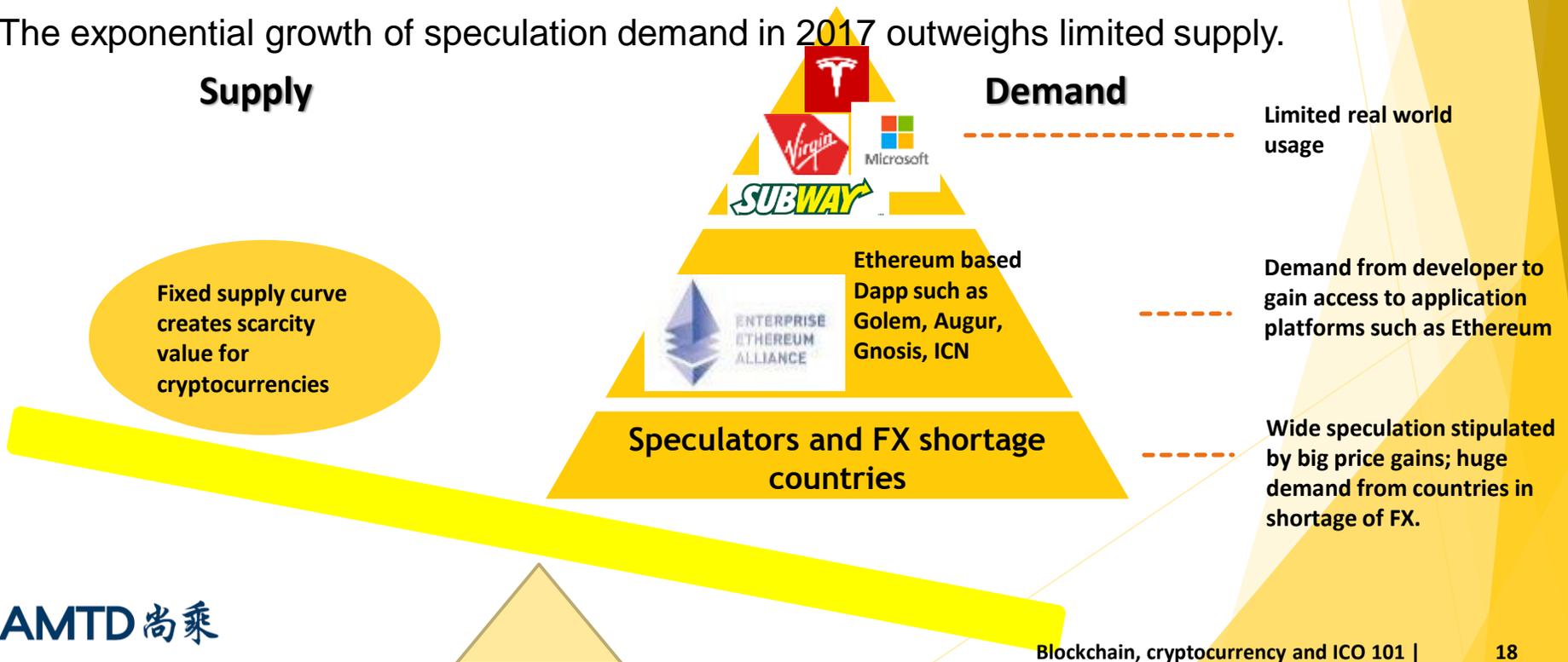
bitcoin supply and inflation forecast
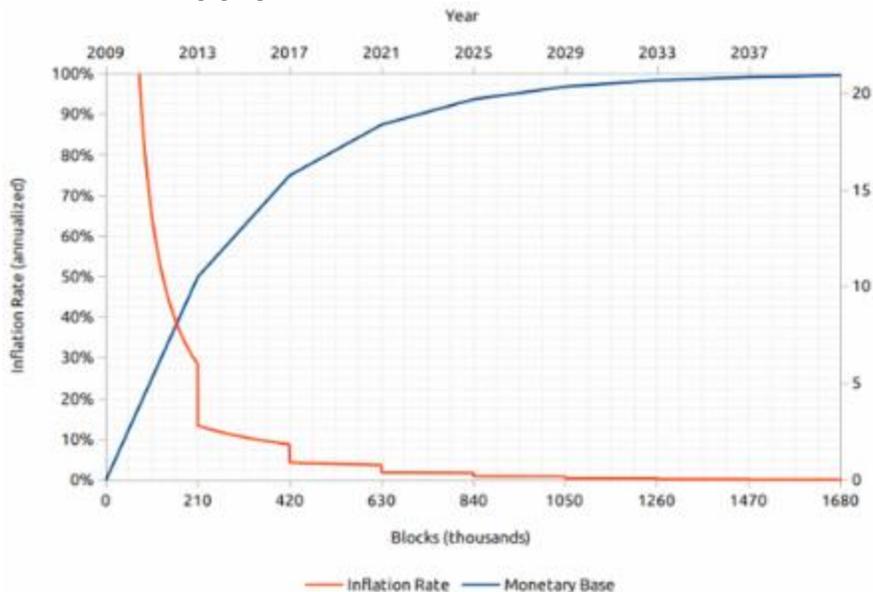
bitcoin mining difficulty has dramatically increased due to intensified competition

![AMTD 尚乘]

Source: blockchain.info, bitcoinwiki
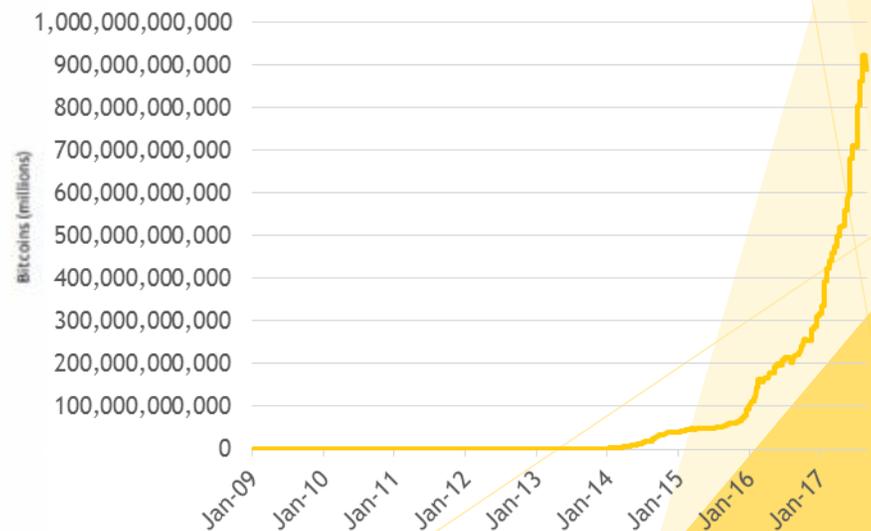
The demand for cryptocurrency

❖ Overall cryptocurrencies have very limited real world usage. Majority of demand for cryptocurrencies have come from speculators.

❖ Bitcoin has the best real world acceptance compared to other cryptocurrencies due to its early mover advantage and network effect. People in countries that suffer from international sanction, shortage of FX, or vicious inflation or have disbelief in USD switched to bitcoin, including Venezuela, Zimbabwe, Iran, North Korea etc.

❖ The demand for Ether, on the other hand, has been driven largely by ICO investors and developers who want to access Ethereum's platform. The emerge of Ethereum backed ICOs also contributes to the surge in demand.

❖ The exponential growth of speculation demand in 2017 outweighs limited supply.

Supply

Demand

Fixed supply curve creates scarcity value for cryptocurrencies

Ethereum based Dapp such as Golem, Augur, Gnosis, ICN

Speculators and FX shortage countries

Limited real world usage

Demand from developer to gain access to application platforms such as Ethereum

Wide speculation stipulated by big price gains; huge demand from countries in shortage of FX.

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Source: blockchain.info, bitcoinwiki

Leading cryptocurrencies in comparison

	Bitcoin	Ethereum	Bitcoin Cash	Ripple	Litecoin
Supply	Limited. By 2140, Bitcoin will reach its limit of 21 million and stop growing	Unlimited as of now. Issuance of ether is capped at 18 million ether per year (this number equals 25% of the initial supply)	Limited - same as Bitcoin	Ripple XRP was created by allocating 100 billion XRP to Ripple Labs (80%) and the 3 founders (20% total). ≈38 billion XRP has been sold and distributed to the public since. No additional XRP will ever be mined or created.	Limited. Max supply is capped at 84 million
Mining	Bigger pools have better chance in finding a block.	Ethereum discourages centralised pool mining through its Ghost protocol rewarding stale blocks	Same as Bitcoin	Not minable	Much lower mining difficulty than Bitcoin and Ethereum
Block time	~10 minutes	14-15 seconds	~10 minutes	~3.5 seconds	~2.5minutes
Transactions per second	~7	~20	not available	~1000	~56
Purpose	To create a secure, immutable electronic peer-to-peer payment system without the need of a trusted third party in order to fully avoid double spending and reduce transaction costs	Ethereum is an open software platform based on blockchain technology for coding and processing smart contracts. Ether is an incentive and a form of payment made by the clients of the platform for the computing power.	Bitcoin Cash is "forked" from Bitcoin on 1 Aug 2017. Bitcoin Cash is try to solve Bitcoin's scalability problem by increasing block size cap to 8MB from Bitcoin's 1MB.	Ripple network is a decentralized currency system designed to allow the seamless transfer of any form of currency. Ripple has been increasingly adopted by banks and payment networks as settlement infrastructure technology	To improve upon Bitcoin
Scalability	Low	Median	Median	High	Median

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Key features of bitcoin

How bitcoin was invented

❖ Satoshi Nakamoto (his/her/their real identity remains unknown) published a paper in 2008 titled bitcoin: A Peer-to-Peer Electronic Cash System, which outlined the conceptual and technical details of a bitcoin payment system.

❖ The core concept is to create a secure, immutable electronic peer-to-peer payment system without the need of a trusted third party in order to fully avoid double spending and reduce transaction costs.

Key features

❖ Decentralized leger system: bitcoin network is sharing a public ledger called the "blockchain". This ledger contains every transaction ever processed, allowing a user's computer to verify the validity of each transaction.

❖ A controlled supply: If the mining power had remained constant since the first bitcoin was mined, the last bitcoin would have been mined around 2140.

❖ Partial anonymity: bitcoin is designed to allow its users to send and receive payments with an acceptable level of privacy. However, bitcoin is not anonymous and cannot offer the same level of privacy as cash.

❖ Divisibility: A bitcoin is divisible to the eight decimal. The smallest portion of bitcoin has its own name: satoshi, whereas 1 BTC = 10^8 satoshis = 100,000,000 satoshis.

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Key features of Ethereum

How Ethereum was invented:

❖ Ethereum is the name of a platform; Ether is the cryptocurrency. Bitcoin was designed for a particular task – payment while Ethereum was designed as a foundational layer for any kind apps to be built on top. Ethereum seeks to enable the creation of similar Internet services while restoring the control of personal data and funds to users

❖ Vitalik Buterin, a developer from Toronto, released a white paper in 2013 describing an alternative platform designed for any type of decentralized application developers.

❖ Buterin and the other founders launched a crowdfunding campaign in July 2014 where participants purchased **ether**, or the **ethereum tokens** that function as shares in the project, raising more than $18m. Ether is used as an incentive and a form of payment made by the clients of the platform for the computing power.

❖ **The Ethereum platform is being used to create applications across a broad range of services and industries. Here are a few examples:** For other projects that are developed on Ethereum please visit https://dapps.ethercasts.com/

Source: blockgeeks.com, coindesk.com
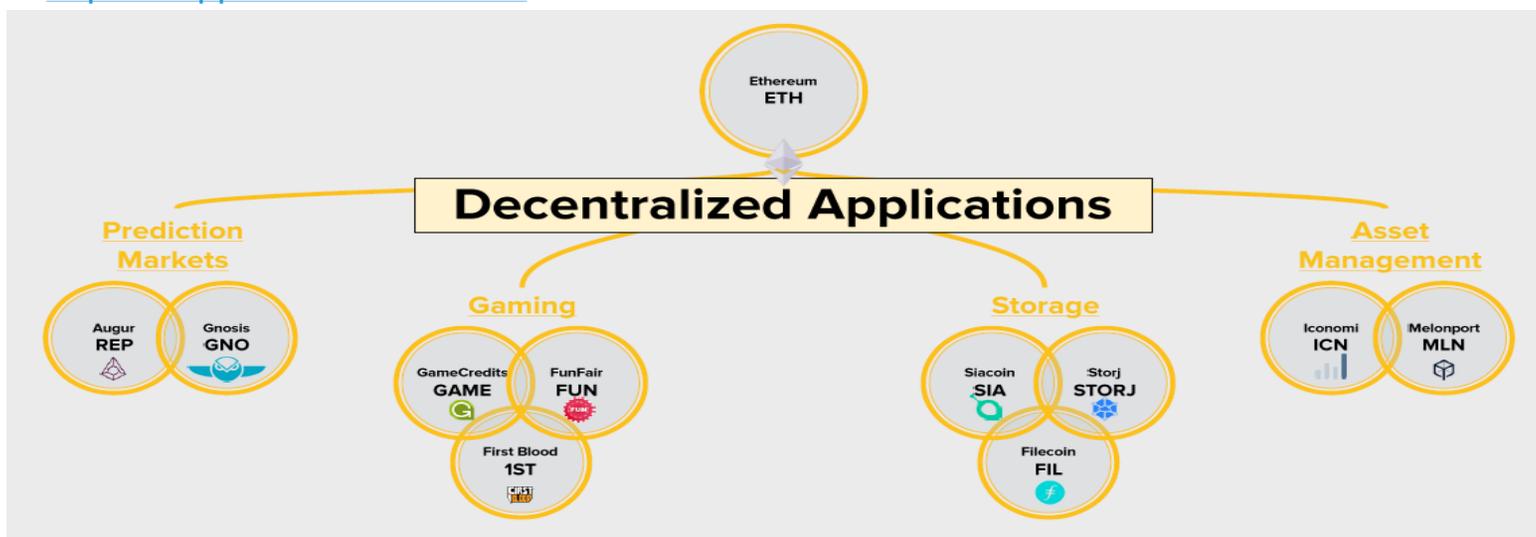
Smart contract and Ethereum Virtual Machine (EVM)

❖ At the center of Ethereum lies the EVM or "Ethereum Virtual Machine", a decentralized computer that can execute "smart contracts". Ethereum is a platform that's built specifically for creating smart contracts.

❖ While a standard contract outlines the terms of a relationship (usually one enforceable by law), a smart contract enforces a relationship with cryptographic code and will be automatically enforced by predetermined conditions. Smart contract may reduce the importance of contract enforcement agent such as lawyers.

❖ Bitcoin is limited to the currency use case; ethereum replaces bitcoin's more restrictive language (a scripting language of a hundred or so scripts) and replaces it with a language that allows developers to write their own programs. Running each contract requires ether transaction fees, which depend on the amount of computational power required.

❖ Smart contracts can:

- Function as 'multi-signature' accounts, so that funds are spent only when a required percentage of people agree

- Manage agreements between users, say, if one buys insurance from the other

- Provide utility to other contracts (similar to how a software library works)

- Store information about an application, such as domain registration information or membership records.

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Source: coindesk.com

Cryptocurrency and ICO governance

❖ Cryptocurrencies are usually loosely governed by a centralized non-profit foundation (usually in Switerland). ICOs could have very complex governance structure.

❖ With the exit of Satoshi Nakamoto, Bitcoin was left without any leading figure or institution that could speak on its behalf. This is what justified the creation, in September 2012, of the Bitcoin Foundation – an American lobbying group focused on standardizing, protecting and promoting Bitcoin.

❖ Decisions like modifying Bitcoin's code currently involve interactions; 95% of mining nodes must approve and run the new code. In practice, the blockchain database may "fork," meaning it branches into two blockchains, one with the change and one without.

❖ Ethereum, the largest of the altcoins, has the nonprofit Ethereum Foundation at its center. The foundation does not have the power to unilaterally change code or reverse transactions, but does carry a large amount of influence in the Ethereum community.

❖ When Vitalik Buterin, Ethereum's creator proposed the "hard fork" to reverse a fraudulent transaction (The DAO), the intention was for all Ethereum miners to go along with the decision. While 85 percent of Ethereum's miners agreed, the remaining 15 percent did not support the action, resulting in a full split. Ethereum Classic was born.

❖ In Tezos's case (the largest ICO in history), the company had set up a complex governance structure where the inventors of the protocol, a couple named Arthur and Kathleen Breitman, owned a company developing and owning the code. But instead of the $232 million raised in the ICO going to the company, an independent Swiss foundation was created to handle the money. The Breitmans are now in a dispute with the head of the foundation, Johann Grevers.

Source: coindesk.com

The scalability challenge and debates

❖ The biggest challenge for all cryptocurrency currently is scalability.

❖ Predetermined block size and block time are limiting the number of transactions the network could process in a given time. For example, the block size is set at 2MB (recently upgraded from 1MB through the Segwit2x upgrade) for bitcoin currently.

❖ Currently bitcoin is processing around 14 transactions per second, Ethereum is doing 20. However, visa does 1667 per second and Paypal manages 193 per second.

❖ However, the upgrade in block size also runs the risk of leading to more concentration of mining pools, as larger pools with big volume of computing power have a higher chance of mining blocks. Concentration would lead to the network more vulnerable to a 51% attack. This is against the original ideal of decentralization.

❖ There are ongoing debates around the solution for scalability.

❖ Bitcoin as an example, just experienced its Segwit2x upgrade. The Lightning Network solution could help to increase capacity by allowing transactions to be made without being broadcast to the entire network. Ethereum's version of similar protocol is called Raiden.

❖ Another long-term solution or development plan the Ethereum Foundation is looking into is the possibility of switching the consensus protocol of Ethereum from Proof of Work (PoW) to Proof of Stake (PoS).

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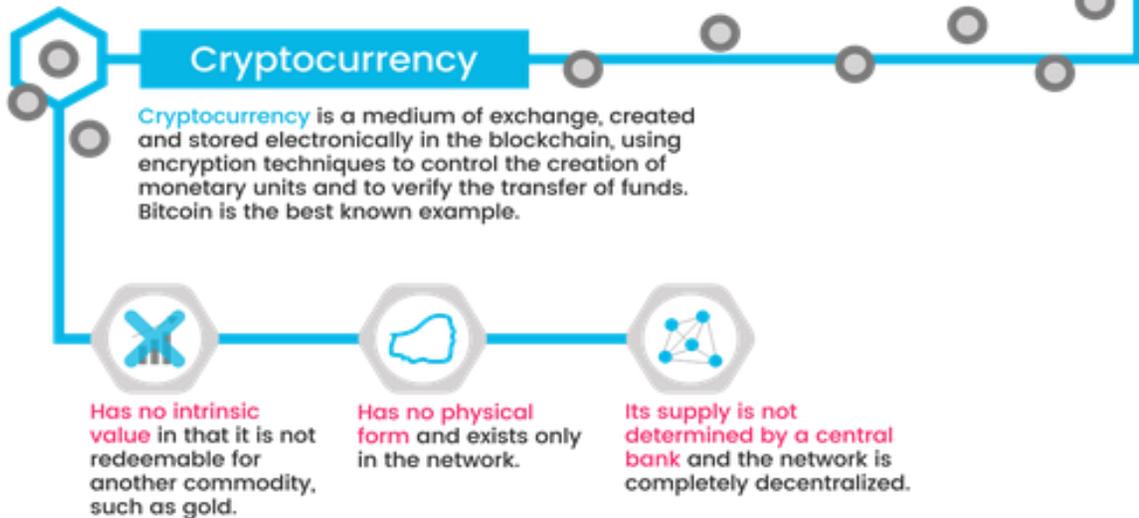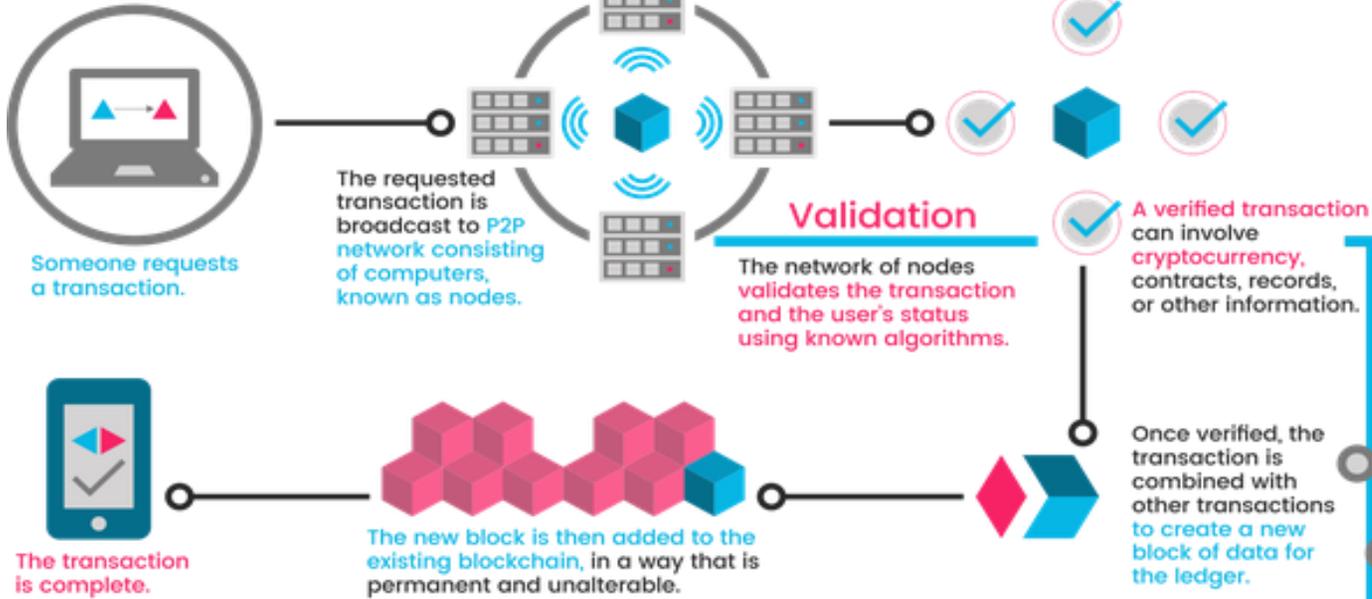
What is a cryptocurrency fork?

Source: coindesk.com
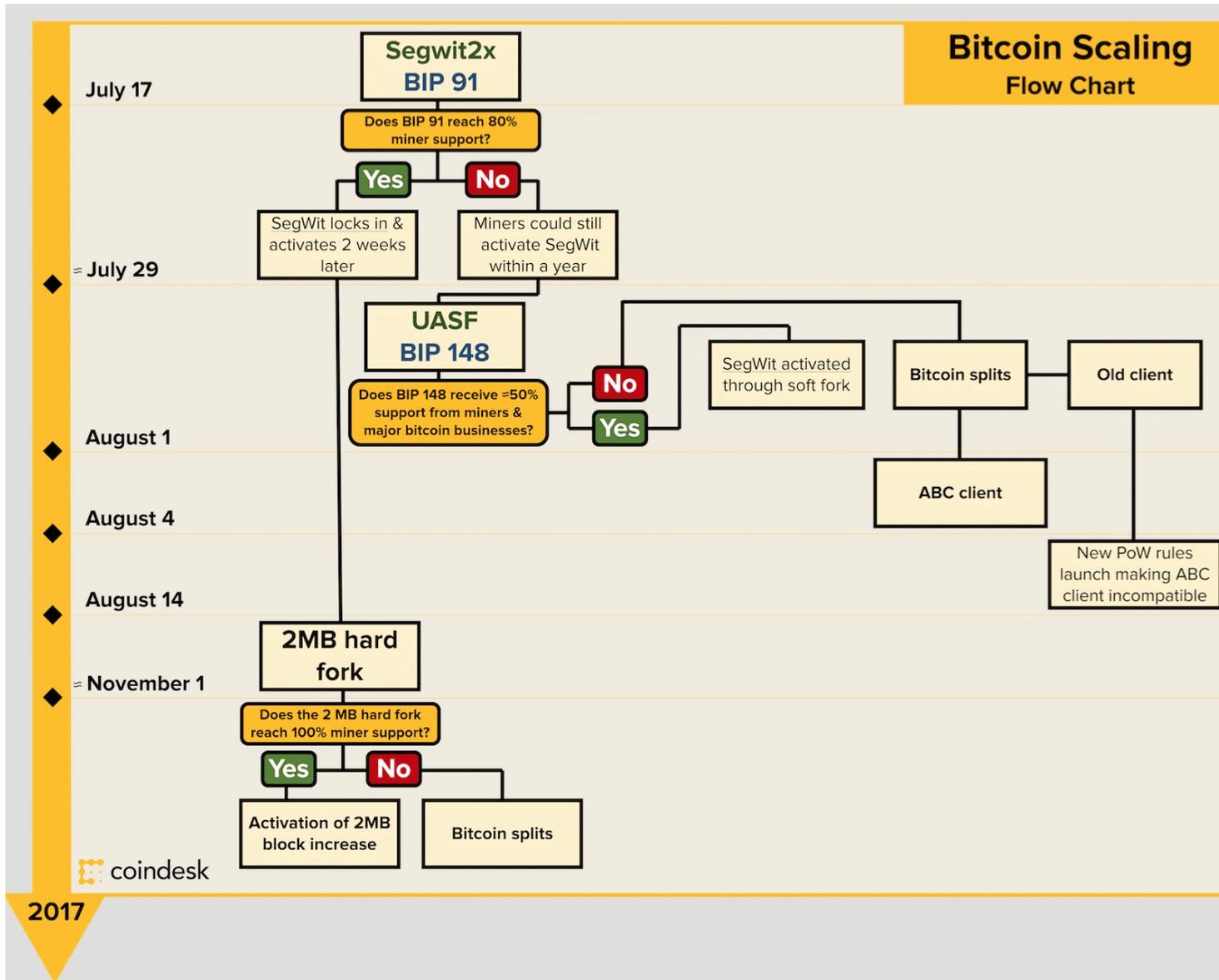
Soft fork vs Hard fork

❖ Every fork was trying to solve a major problems such as scalability (Bitcoin Cash's case), or the return of the stolen coins (Ethereum Classic's case).

❖ A soft fork is a temporary divergence in the block chain caused by non-upgraded nodes not following new consensus rules; a hard fork is a permanent divergence in the block chain. New rules that actually breed compatibility must be implemented with a hard fork. These would include things such as methods to prevent serious network abuse and increase of the block size on the blockchain, or seeking to redistribute funds due to broken code or theft to a centralized method.

❖ If a hard fork doesn't obtain majority support, it could trip the split of one cryptocurrency into two, both of which would still inherit the same historical transactions on the chain right before the fork, but will be run on different rules after the fork. Underlying the fork is in fact the split of the community (developers and miners) into two.

❖ On 1 Aug 2017, Bitcoin was forked into Bitcoin (BTC) and Bitcoin Cash (BCH). Bitcoin is said to have been backed by the largest mining pool Bitmain from China; Bitcoin is likely to see another hard fork which will create a competing coin names Bitcoin Gold (BTG) which aims to make Bitcoin more decentralized again.

❖ On 20 Jul 2016, Ethereum was forked into Ethereum (ETH) and Ethereum Classic (ETC); the old one changed its name to Ethereum Classic (ETC) and the new one with majority community support inherited the name Ethereum (ETH); On 16 Oct 2017, Ethereum successfully executed a new fork – the Byzantine hard fork, without creating any competing coins.

❖ The creation of a "double blockchain" is a problematic situation that Bitcoin has been trying to prevent for a long time. Not only it creates confusion amongst investors and casual users, but it also opens possibilities for replay attacks on both blockchains. There have always been fears before the forks due to uncertainty and instability it could bring about, thus brought volatility in the underlying coins. A smooth fork should reflect positively on coin price.

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Source: coindesk.com

How coin mining works? An illustration

How it works:

Someone requests a transaction.

The transaction is complete.

The requested transaction is broadcast to P2P network consisting of computers, known as nodes.

Validation

The network of nodes validates the transaction and the user's status using known algorithms.

A verified transaction can involve cryptocurrency, contracts, records, or other information.

Once verified, the transaction is combined with other transactions to create a new block of data for the ledger.

The new block is then added to the existing blockchain, in a way that is permanent and unalterable.

Cryptocurrency

Cryptocurrency is a medium of exchange, created and stored electronically in the blockchain, using encryption techniques to control the creation of monetary units and to verify the transfer of funds. Bitcoin is the best known example.

Has no intrinsic value in that it is not redeemable for another commodity, such as gold.

Has no physical form and exists only in the network.

Its supply is not determined by a central bank and the network is completely decentralized.

Blockgeeks

❖ **Proof-of-work (PoW)**: It's difficult for miners to cheat at this game. There's no way to fake this work and come away with the correct puzzle answer. That's why the puzzle-solving method is called 'proof-of-work'.

❖ **Proof-of-stake (PoS):** Ethereum might not need miners forever, though. Developers plan to ditch proof-of-work, the algorithm that the network currently uses to determine which transactions are valid and protect it from tampering, in favor of proof of stake, where the network is secured by the owners of tokens.
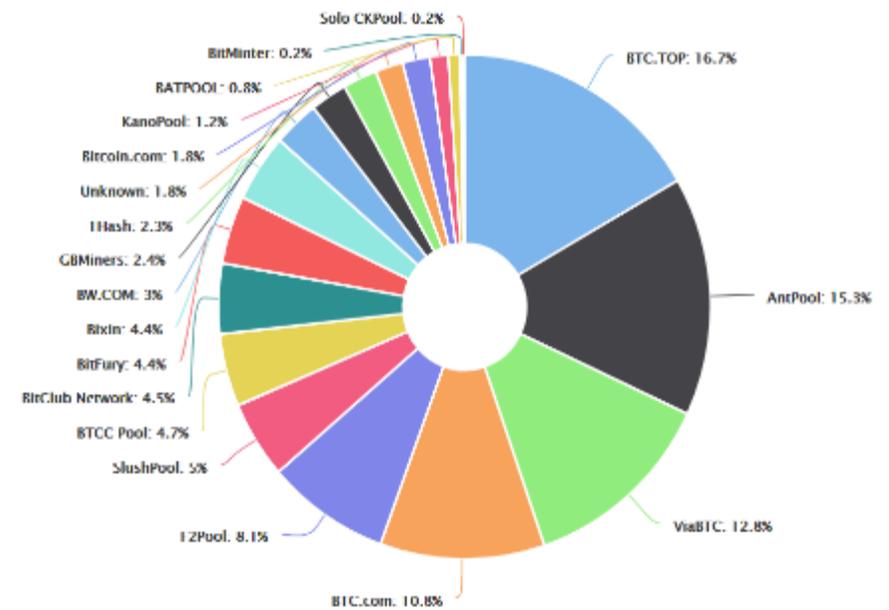
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Source: blockgeeks.com

How coin mining works? bitcoin as an example

❖ bitcoin's record-keeping is decentralized into a "blockchain", an ever-expanding ledger that holds the transaction history.

❖ The reward system of bitcoin gives miners an incentive to participate in the system and validate transactions.

❖ Every ten minutes or so mining computers collect a set of pending bitcoin transactions (a "block") and turn them into a mathematical puzzle.

❖ The first miner to find the solution announces it to others on the network to claim their prize.

❖ The other miners then check whether the sender of the funds has the right to spend the money, and whether the solution to the puzzle is correct. If enough of them grant their approval, the block is cryptographically added to the ledger and the miners move on to the next set of transactions. => PoW consensus protocol

❖ The prize currently is set at 12.5 bitcoins per block. The prize will halve after every 210,000 blocks are found (around 4 years).

❖ Miners are essentially competing on their computing powers (hash rate). The more computing power they own compared to others, the higher chance they find a block.

❖ Most mining power today is provided by "pools", big groups of miners who combine their computing power to increase the chance of winning a reward.

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Source: blockchain.info, bitcoinwiki

80% of the network computing power comes from China

❖ Mining pools are groups of cooperating miners who agree to share block rewards in proportion to their contributed mining hash power.

❖ Most mining pools for bitcoins are in China. Buybitcoinworldwide.com estimates that 81% of the network hash rate (computing power) is controlled by Chinese pools.

❖ Miners economics decide if they have incentive to mine. Coin's price, mining costs including computer hardware, electricity bills are key determinants.

bitcoin harsh rate distribution of major pools

Solo CKPool: 0.2%
BitMinter: 0.2%
BATPOOL: 0.8%
KanoPool: 1.2%
Bitcoin.com: 1.8%
Unknown: 1.8%
1Hash: 2.3%
GBMiners: 2.4%
BW.COM: 3%
Bixin: 4.4%
BitFury: 4.4%
BitClub Network: 4.5%
BTCC Pool: 4.7%
SlushPool: 5%
F2Pool: 8.1%
BTC.com: 10.8%
ViaBTC: 12.8%
AntPool: 15.3%
BTC.TOP: 16.7%

A bitcoin mine in China

China dominates the computing power

- China – 81%
- Iceland – 5%
- Japan – 3%
- Czech Republic – 3%
- Georgia – 2%
- India – 2%

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Source: blockchain.info
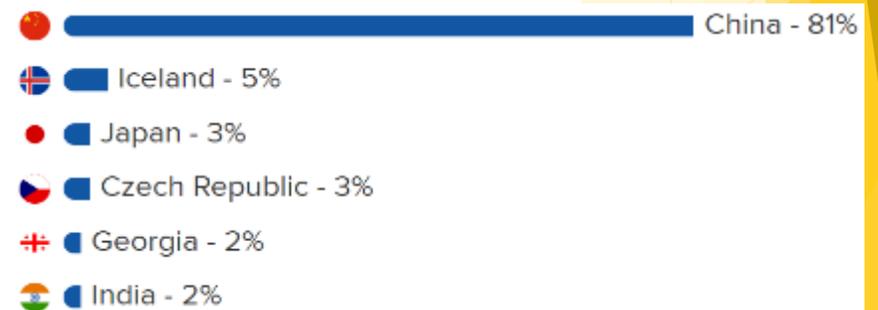
How to calculate mining profit – bitcoin as an example

+ Revenue   = Number of coins mined x coin price

- Operating cost = Power consumed x power price

- Cash profit = Revenue – operating cost

Payback period = Capex / Cash profit

Breakeven price = Operating cost / Reward per day

	Global	Per mining machine (翼比特 E9矿机)
Hash rate/second (TH/S)	6,605,000	6.3
Reward per hour (BTC)	75	0.00007
Reward per day (BTC)	1,800	0.00171688
BTC price (USD)	6,000	6,000
BTC price (Rmb)	40,200	40,200
Income per day (USD)	10,800,000	10.301
Income per day (Rmb)	72,360,000	69.019
Watt/TH/S (墙上功耗)	140	140
Watt	924,700,000	882
Power consumption per hour (kwh)	924,700	0.88
Power consumption per day (kwh)	22,192,800	21.17
Power cost (Rmb per kwh)	0.3	0.3
Cash cost per day (Rmb)	6,657,840	6
Cash profit per day (Rmb)	**65,702,160**	**63**
Cash profit ratio	**91%**	**91%**
Mining machine cost (Rmb)		4,900
Payback period (days)		78
Breakeven price (Rmb)	**3,699**	**3,699**
Breakeven price (USD)	**569**	**569**
Note: Ignore cooling facility investment and labor cost		

Source: AMTD Research

Where can you buy cryptocurrencies?

- Find other owners through apps such as Bitcoin meetups

- Show the ATM your bitcoin address and insert bank note. This process is anonymous

In person

Bitcoin ATM

Crypto exchanges

Earn bitcoin

- One of the cheapest options. Go to exchanges such as coinbase or Bitfinex

- Buy mining machine or computing power;
- Accept bitcoins as payment for your business

Source: blockchain.info, bitcoinwiki

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3. What is ICO?

Blockchain ICO

ICO funding gained momentum in 2017

❖ High capital gain demonstrated by some early ICOs

❖ Most ROI of ICOs are achieved due to price appreciation of cryptocurrency, not the ICO project itself

❖ ICO demand for Ether and other cryptocurrency in turn stimulates the price of cryptocurrency

ICO capital raising + VC funding vs ether price

Legend: ICO Size ($m) — Blockchain VC funding ($ m) — Ether price ($) - RHS

Source: coindesk.com, icostats.com
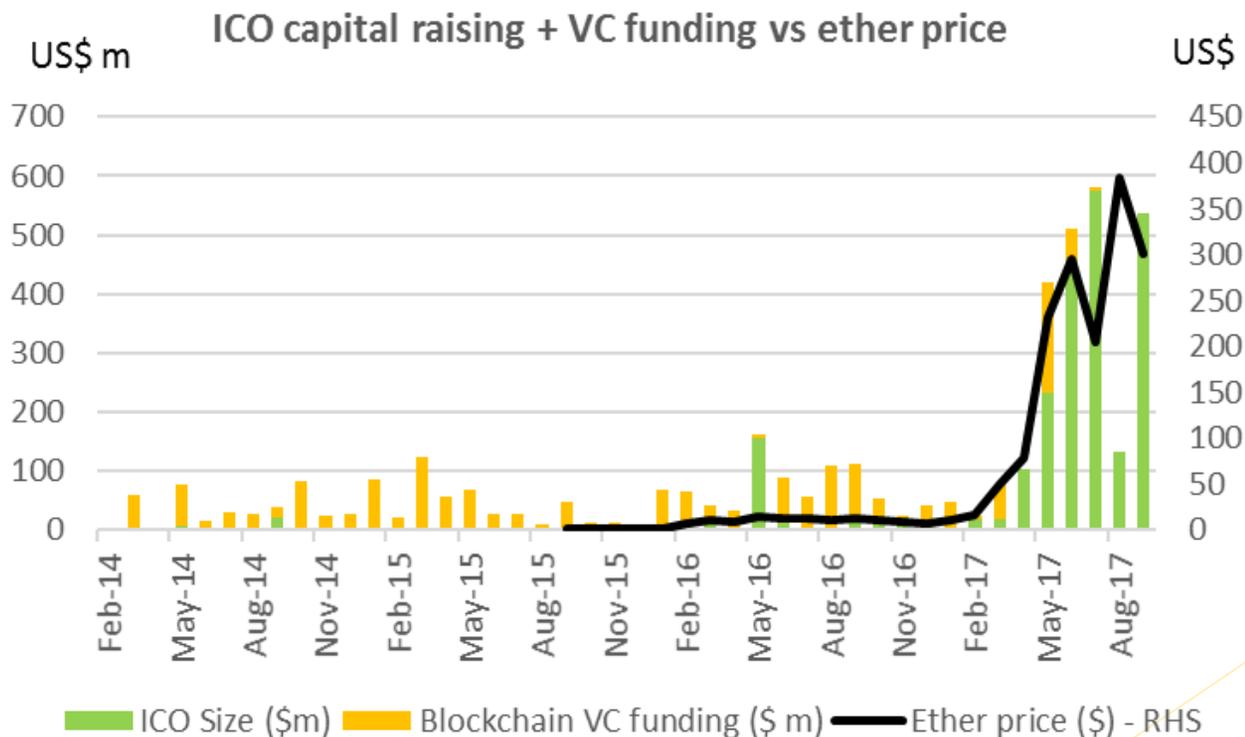
Certain level of over-capitalization

❖ YTD ICOs have raised US$2bn funding, the largest being Tezos which raised US$ 232m; cumulatively 250 blockchain teams have completed ICOs, 55% of which happened after July 2017.

❖ ICOs normally would raise >US$10m, well above the average of US$ 3m for early stage block chain deals.

❖ There could be mismanagement risks of the team receiving such large sums in such a short time.

Tech angel and seed equity funding vs. ICO funding
Q1'16 - Q3'17

	Tech Angel & Seed Equity Funding ($M)	ICO Funding ($M)
Q1'16	$1,186	$12
Q2'16	$1,316	$21
Q3'16	$1,232	$21
Q4'16	$1,197	$39
Q1'17	$1,434	$38
Q2'17	$1,279	$757
Q3'17	$1,406	$1,327

Source: CB Insights
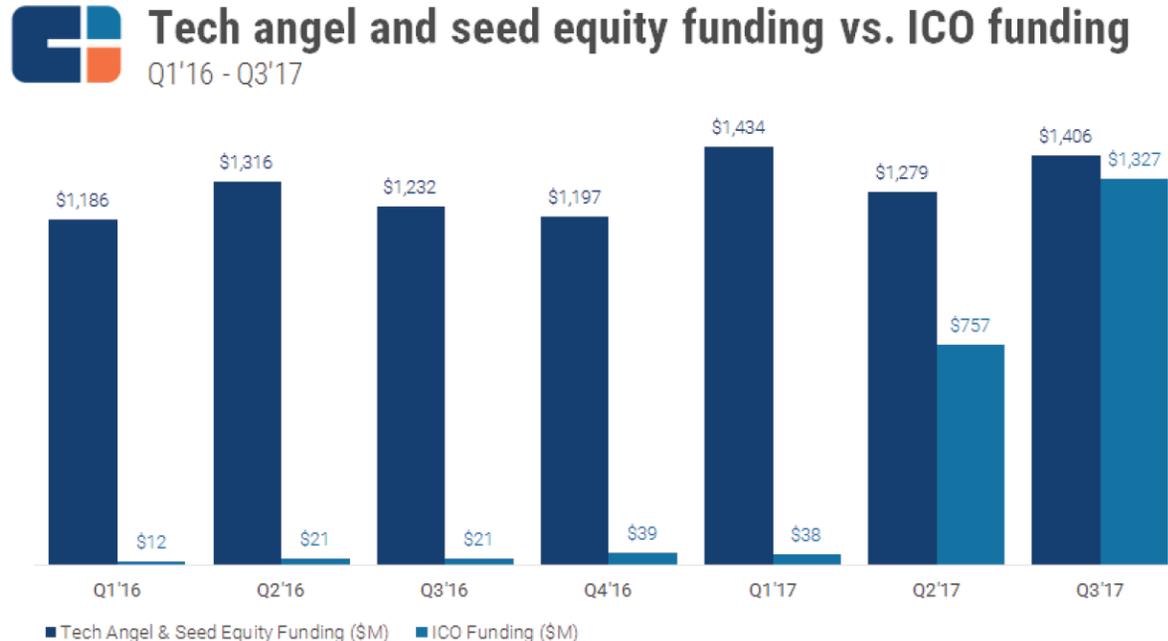
How does ICO work? ICO vs IPO

❖ An ICO is a crowdfunding event in which a new blockchain project sells part of its tokens (priced at certain amount of cryptocurrency). ICOs provide a way for cryptocurrency project creators to raise money for their operations.

❖ Most ICOs raise money in ether, bitcoin or other cryptocurrencies. ICO priced in Ether is the most common form as Ethereum has defined ERC-20 token standard in 2015.

❖ If people want to buy the tokens, they can send a particular amount of ether to the crowd-sale address. When the contract acknowledges that this transaction is done, they receive their corresponding amount of tokens.
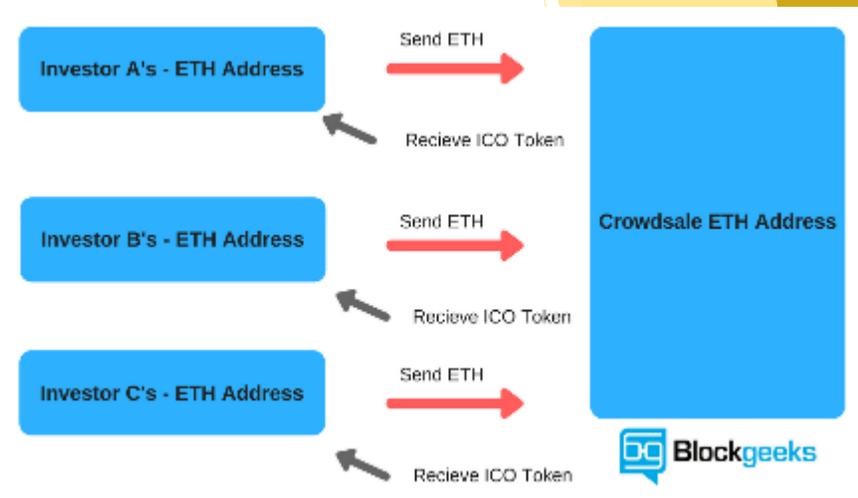
❖ **Developers/entrepreneurs** launch ICO token sale to 1) fund their project: 2) attract users of the underlying Dapp; 3) circumvent securities rules that applied to IPOs.

❖ **Buyers of ICO tokens** can 1) be early adopter of the ICO project; 2) financially benefit from the gain in value of the token due to wider adoption of the ICO project

Source: blockgeeks.com

Token 101

❖ A token is just a smart contract running on top of the ethereum blockchain.

❖ A token is a set of codes (functions) with an associated database. The codes describe the behavior of the token, and the database is basically a table with rows and columns tracking who owns how many tokens.

❖ **ICOs may issue one of three major types of tokens:**

1) Cryptocurrency

2) Utility tokens: The utility tokens are services or units of services that can be purchased.

3) Securitized token: These tokens are representing shares of a business which resembles securities; they are subject to stricter regulatory scrutiny.

❖ ICO tokens are tradable on token exchanges such as Bittrex, Poloniex and Kraken.

❖ Tokens sold to US citizen may be subject to SEC regulation, after SEC's investigation into the DAO accident

Source: blockgeeks.com

Why most ICOs are on Ethereum?

- ❖ Ethereum was designed to make it possible for anyone to code nearly any type of app and deploy that on a blockchain. Many of these decentralized apps (or 'dapps' for short) needed their own token that could be sold and traded easily.

- ❖ ERC-20 token standard was born in 2015 to standardize this process.

- ❖ ERC-20 allows developers of wallets, exchanges and other smart contracts, to know in advance how any new token based on the standard will behave. This way, they can design their apps to work with these tokens out of the box, without having to reinvent the wheel each time a new token system comes along.

- ❖ As a result, almost all of the major tokens on the ethereum blockchain today are ERC-20 compliant.

- ❖ The ERC-20 token standard allows developers to take advantage of the security the Ethereum protocol provides, minus all the additional technical overhead and complexity. Without having to worry as much about security (the initial token contract being secure is still of top priority), developers can keenly focus on the application layer.

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Source: blockgeeks.com

Key criteria to look at when evaluating an ICO project

- **A strong technical reason for a new token and new platform**
- **Management & advisory board experience & execution capability**
- **Target market size & business plan roadmap**
- **Whitepaper only or launched product already**
- **VC backing**

- **Project progress reflected on public dashboards**
- **Regular communication**

- **A transparent ICO process**
- **Token distribution structure**
- **Legal structure**

- **Regulatory risk**
- **Corporate governance**
- **Scam protection; staged release of fund**
- **Inflation risk**

- **Technical advancement and stability; quality of the code**

Startup characteristics

Operational transparency

Crypto-sale resiliency

Risk

Technology

![AMTD 尚乘 logo]

Source: icostats.com, Huobi.com
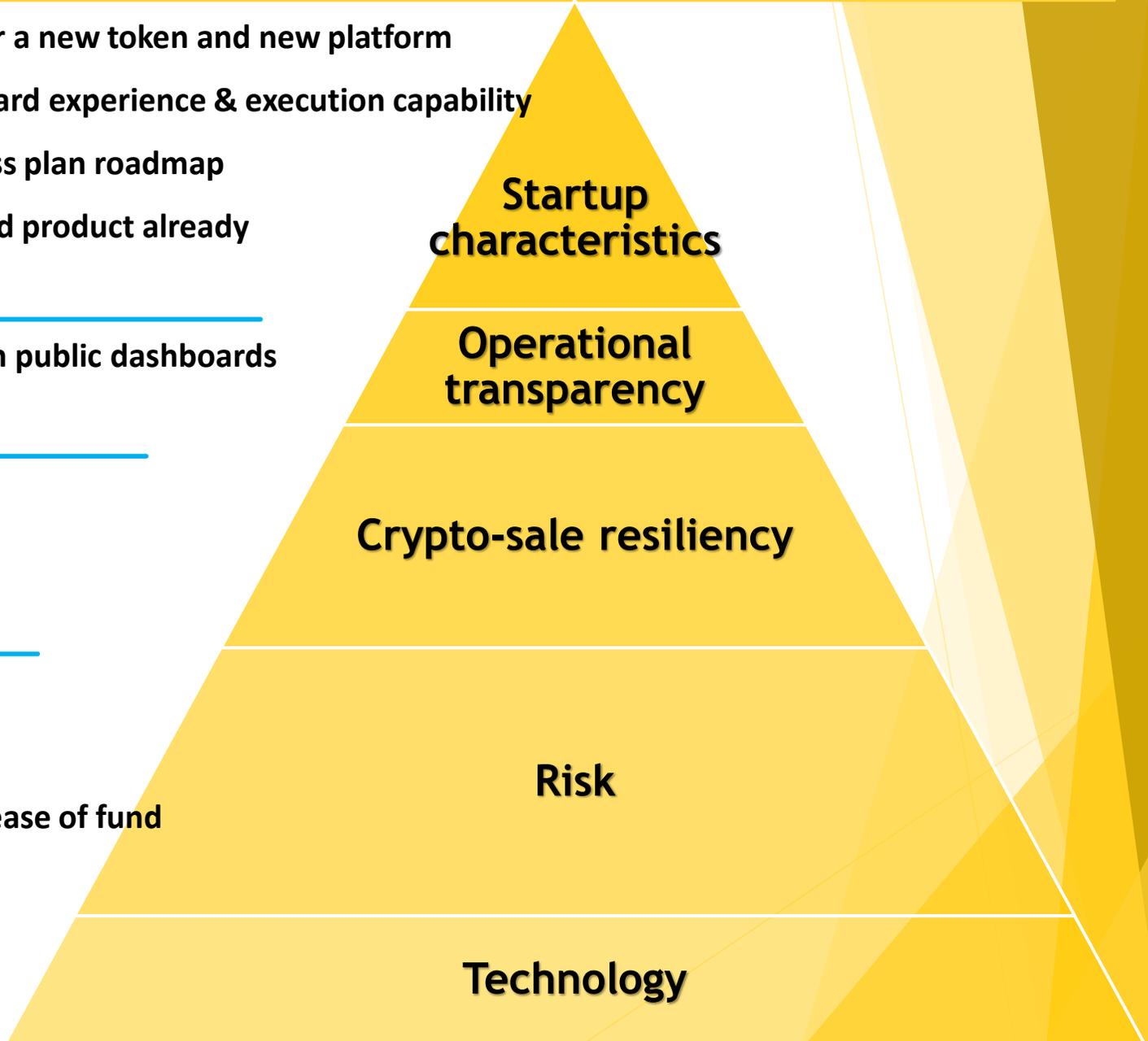
ICO performance

❖ Earliest ICOs were cryptocurrency projects; only a selective survived well including Ethereum and NEO.

❖ Most ICOs will fail without a solid foundation of : 1) Cryptoeconomics; 2) Utility; 3) Security

	NAME	▼ CHANGE (%)	ICO DATE	ICO PRICE ❓	CURR. PRICE
	NXT Buy Instantly	+402063%	09/28/13	$ 0.000	$ 0.068
	Ethereum Buy Instantly	+105103%	07/22/14	$ 0.311	$ 327.622
	IOTA	+102374%	11/25/15	$ 0.000	$ 0.445
	Neo	+88547%	10/01/15	$ 0.032	$ 28.190
	Spectrecoin	+43719%	11/20/16	$ 0.001	$ 0.356
	Stratis Buy Instantly	+39383%	06/20/16	$ 0.007	$ 2.872
	Ark	+27409%	11/07/16	$ 0.010	$ 2.738
	Lisk Buy Instantly	+6427%	02/22/16	$ 0.076	$ 4.992
	Etheroll	+5408%	02/13/17	$ 0.069	$ 3.807

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Source: icostats.com

The best performing ICOs

The best performing ICOs are projects with high execution capability, real world use case, a strong community and quality developers.

	NAME	ROI SINCE ICO	ETH ROI SINCE ICO	ABS | REL ▼ ROI VS ETH	ICO DATE	ICO PRICE ❓	CURR. PRICE
POPULOUS	Populous	+1032%	+13%	+7972%	06/24/17	$ 0.278	$ 3.146
	Neo	+88547%	+2594%	+3313%	10/01/15	$ 0.032	$ 28.190
go	OmiseGO Buy Instantly	+3081%	+111%	+2673%	07/15/17	$ 0.244	$ 7.765
0x	0x Buy Instantly	+307%	+14%	+2048%	08/15/17	$ 0.048	$ 0.195
	Stratis Buy Instantly	+39383%	+2259%	+1644%	06/20/16	$ 0.007	$ 2.872
	Spectrecoin	+43719%	+3288%	+1230%	11/20/16	$ 0.001	$ 0.356
	Quantum Resistant Ledger	+711%	+59%	+1098%	05/01/17	$ 0.077	$ 0.624
	adToken	+292%	+25%	+1075%	06/26/17	$ 0.009	$ 0.034
	TenX Buy Instantly	+136%	+13%	+962%	06/24/17	$ 0.794	$ 1.873
	Ark	+27409%	+2889%	+849%	11/07/16	$ 0.010	$ 2.738

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Source: icostats.com

The worst performing ICOs

The worst performing ICOs as measured by relative performance vs ether are projects with low execution capability, or liquidity was constraint due to regulations. Such as EOS in China.

	NAME	ROI SINCE ICO	ETH ROI SINCE ICO	ABS | REL ▲ ROI VS ETH	ICO DATE	ICO PRICE ❓	CURR. PRICE
	Nimiq	-28%	+8%	-464%	06/28/17	$ 1.027	$ 0.736
	EOS Buy Instantly	-40%	+25%	-259%	06/26/17	$ 0.925	$ 0.560
	Cofound.it	-26%	+24%	-209%	06/07/17	$ 0.120	$ 0.089
	Wagerr	-16%	+20%	-180%	07/01/17	$ 0.065	$ 0.054
	Mysterium	-38%	+59%	-164%	05/30/17	$ 0.928	$ 0.576
	Bancor Buy Instantly	-41%	-16%	-156%	06/12/17	$ 3.864	$ 2.283
	Status Buy Instantly	-22%	-10%	-118%	06/20/17	$ 0.036	$ 0.028
	Virtual Accelerator	-93%	+2610%	-104%	10/20/16	$ 0.040	$ 0.003
	BlockPay	-48%	+2948%	-102%	08/20/16	$ 0.124	$ 0.065
	Blockchain Capital	-6%	+647%	-101%	04/10/17	$ 1.000	$ 0.936

Source: icostats.com

How to participate in an ICO

Step 1: Buy ether or bitcoin at cryptocurr-ency exchange

Step 2: Move your ether or bitcoin to a wallet you control

Step 3: Send your ether/bitcoin to ICO wallet address

Step 4: Sore the token securely

Anonymity may not be possible as a strict KYC and identity verification process is required when you deposit money in the exchange

You don't have the private key to your ether/bitcoin address. You can use site like My Ether Wallet or Blockchain.info to create a new key address and transfer your ether to that address. With any wallet, if you lose your key, you lose your money.

You can also create a smart contract that will be automatically executed to make your bid.

You can use an online wallet such as your Ethereum wallet or an offline hardware wallet such as Trezor and Ledger.

You can also buy tokens from secondary market such as Bittrex, Poloniex or Kraken.

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Source: coindesk.com

Case study: Tezos may mark the turning point of ICO

❖ **The problems with Tezos highlights the need for structural changes to the ICO process and may introduce more regulatory scrutiny/clampdown on ICOs**

❖ In July 2017, Tezos raised in total US$232 million through its ICO, the largest in history, partly due to renowned angel investor Tim Draper's participation which was his first investment in ICOs

❖ Tezos was intended to deliver a self-amending crypto ledger technology and improve on the Ethereum and Bitcoin networks, boosting security and trust.

❖ **What happened after the ICO revealed many red flags of the project**

▪ It was not disclosed the Tim Draper was offered a discount price and might have exited his investment around the ICO

▪ The token sale was uncapped

▪ The vesting period is merely programmed into a smart contract that releases 1/48th of their holding monthly over four years without regard for how well the founders do their job.

▪ Bad governance: Since the end of the ICO there has been a diversion of funds to various corporate structures and foundations. The most significant structural change is that Tezos' IP is transferring to a Foundation structure but the founders will hold 10% of all tokens generated at ICO without any token lockup period.

Source: coindesk.com

4. Trading strategies: Outright buying, cross-market arbitrage and derivatives

Cryptocurrency trading platforms

❖ Cryptocurrencies can be transitioned and recorded on their own network.

❖ Investors can also trade cryptocurrencies in specialized exchanges such as BITFINEX and Coinbase. However, only when you deposit into or withdraw coins from your exchange, the transactions are recorded on the cryptocurrency's blockchain. Other trading on the exchange is only reflected as a change in the balance of your virtual wallet on the exchange, thus not recorded on the blockchain.

❖ In theory, without a proper custody policy, if investors do not withdraw the cryptocurrency or money from the exchange, the exchanges may wrongfully move/use customer's coins and funding.

Major BTC<>USD exchanges market share in 2Q17
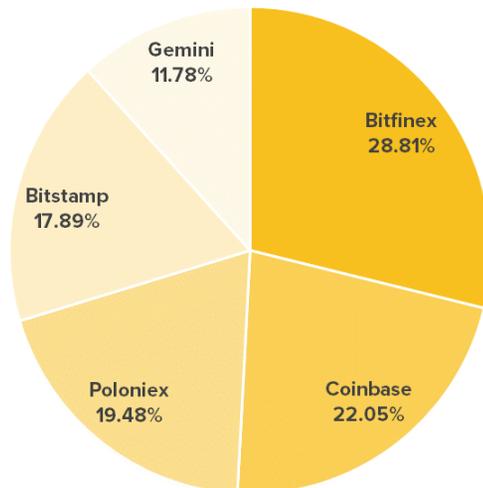
Ether exchange trading quickly gained momentum in 2017

Source: cryptocompare.com, coindesk.com
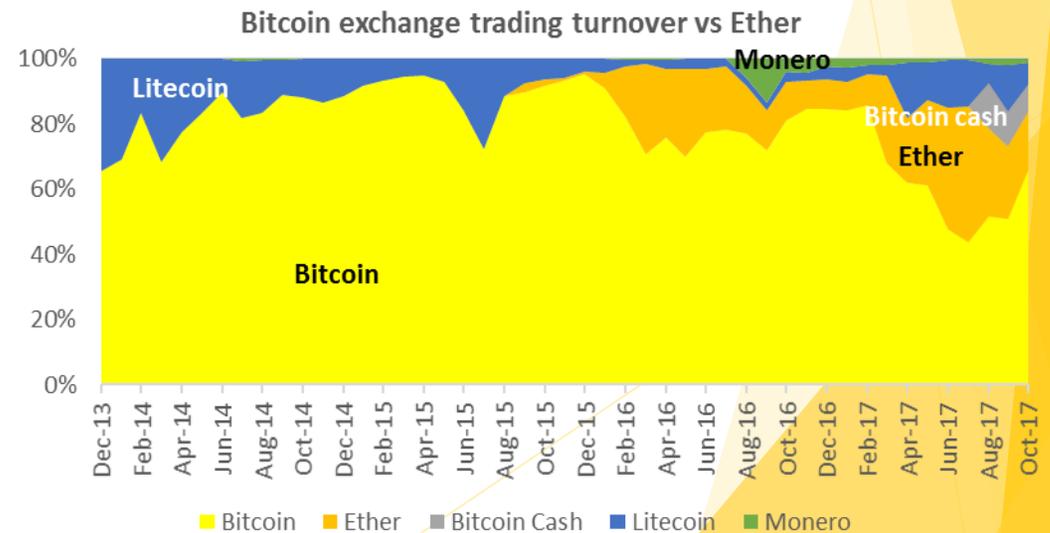
Is bitcoin trading diluted by other cryptocurrencies?

❖ Since there is limited real world use of cryptocurrencies; when you buy them, what essentially do you invest in? – The prospect of more use case and more acceptance by investors.

❖ All cryptocurrencies serve different purposes. They don't have an intrinsic value; i.e. not readily redeemable for other commodities.

❖ Bitcoin/Litecoin/Monero investment prospect: Limited supply vs potential wider acceptance for payment in real world.

❖ Ether investment prospect: Limited supply vs potential explosion in distributed apps and ICO fund raising based on Ethereum platform.

❖ Bitcoin is still the favorite cryptocurrency among speculators. Bitcoin exchange turnover overshadows that of other cryptos. Even in 2017 with the proliferation of ICOs and Ethereum, bitcoin is still the most traded cryptocurrencies.

❖ Bitcoin's use is limited for payment while Ethereum's smart contract can be used for a wider range of applications.

Cryptocurrency exchange trading

❖ On the exchanges, you can also cross trade between two different cryptocurrencies or exchange between a cryptocurrency and a fiat currency such as USD, JPY

❖ Bitcoin exchange trading quickly shifted to USD and JPY from CNY in 2017, even before the clampdown on Chinese exchanges by Chinese regulators

❖ KRW rose to become the second largest currency in Ether exchange trading

❖ Litecoin exchange trading is still dominated by CNY

BTC exchange trading market share – JPY and USD now dominate; CNY gave up market share to USD & JPY
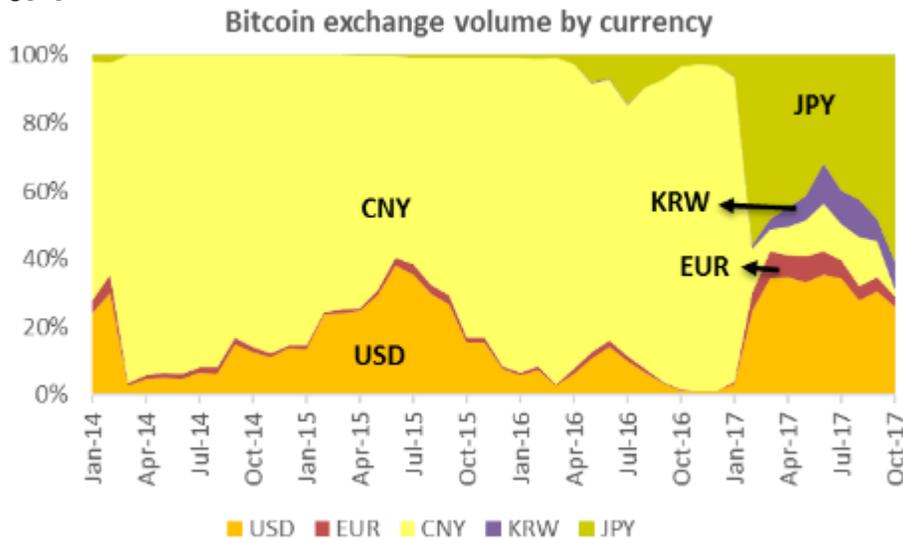
Ether exchange trading market share – USD recently took back the lead from KRW

Bitcoin exchange volume by currency

Ether exchange volume market share %

Source: cryptocompare.com, coindesk.com
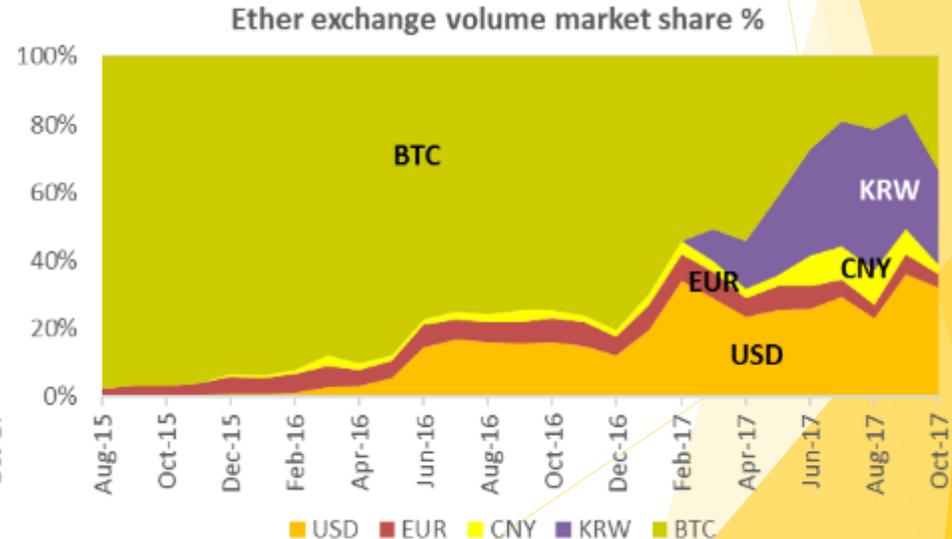
Cross market arbitrage

❖ Due to limited liquidity in individual markets and the inability (from time to time) to withdraw coins/cash, different local regulatory stance may create bit arbitrage opportunities across markets

❖ When Chinese regulators officially banned the exchange between Rmb and cryptocurrencies in China in Sep-2017, Bitcoins price at one point on Chinese exchanges such as Okcoin and Huobi was US$ 600 lower than in the US.

❖ There are cross-exchange arbitrage opportunities among different.

Regulatory clamp down tend to create short-term dump of cryptocurrencies on Chinese exchanges

JPY currently dominates bitcoin exchange volume globally given Japanese regulator's open stance

China vs US premium/(discount)

Japan vs US premium/(discount)

Source: cryptocompare.com, coindesk.com
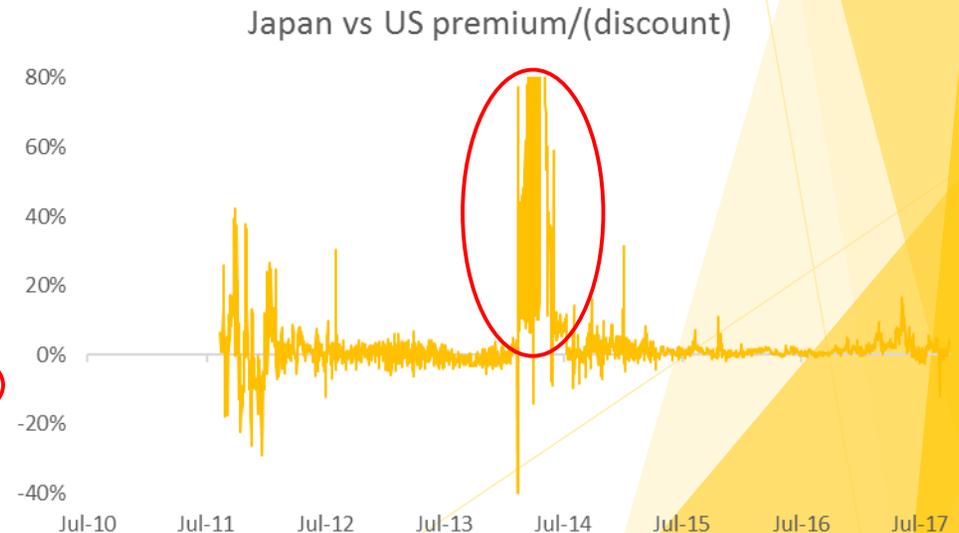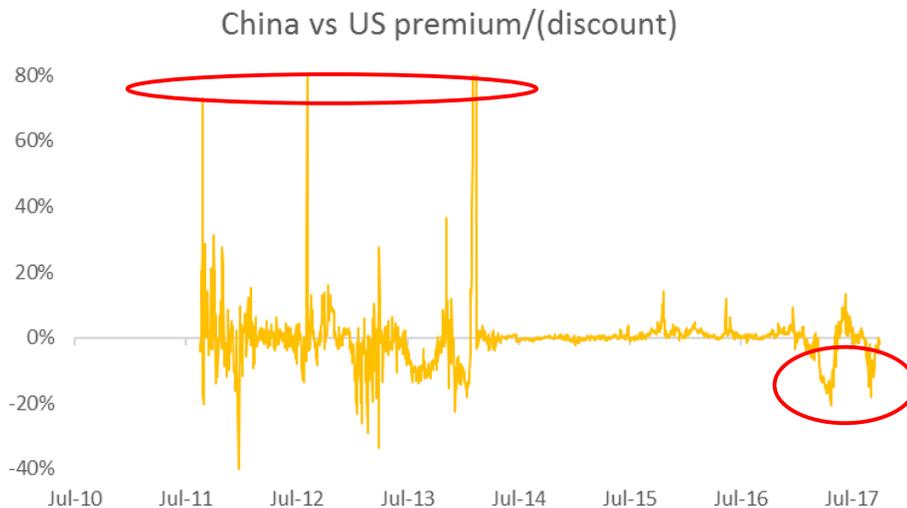
Hedging and the use of derivatives

❖ There are limited hedging tools but exchanges that offer derivatives are emerging

❖ Investors can borrow margin and shortsell, buy/sell option/swaps on bitcoin exchanges.

❖ LedgerX is the first federally regulated exchange and clearing house to list and clear fully-collateralized, physically-settled bitcoin swaps and options for the institutional market. LedgerX is licensed as both a swap execution facility (SEF) and a derivatives clearing organization (DCO).

❖ BitMEX is an exchange based in Hong Kong which offers 100x leverage on it XBTUSD Swap contract. Traders who want to profit from an increase in the Bitcoin / USD price, will buy the XBTUSD swap contract. Conversely, if they believe the price will go down they will sell the swap contract as a margin lender.

XBTUSD Trade Example

A trader goes long 100 XBT of XBTUSD at a price of 600 USD. He is long 100 XBT * 600 USD = 60,000 contracts. A few days later the price of the swap increases to 700 USD.

The trader's profit will be: **60,000 * 1 * (1/600 - 1/700) = 14.286 XBT**

If the price had in fact dropped to 500 USD, the trader's loss would have been: **60,000 * 1 * (1/600 - 1/500) = -20 XBT**. *The loss is greater because of the inverse and non-linear nature of the contract. Conversely, if the trader was short then the trader's profit would be greater if the price moved down than the loss if it moved up.*

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Source: bitmex.com, LedgerX.com

5. Global regulatory trends

Increasing scrutiny on ICOs

❖ ICOs are receiving increasing scrutiny by global regulators.

❖ Many ICO projects were introduced without a valid value proposition of their tokens - they are funding raising activities to bypass securities laws (security tokens). Several ICO projects incurred investor losses due to hack (The DAO), bad governance (Tezos) and other incidents.

❖ Several countries banned ICOs, including China and South Korea.

❖ In the US, if an ICO falls into the definition of "securities" as defined by the Howey Test then it needs to comply with US securities laws.

❖ Russian President Vladimir Putin has mandated new regulations around cryptocurrencies, including registration requirements for miners and the application of securities laws to initial coin offerings.

❖ Swiss Financial Markets Supervisory Authority (FINMA) is investigating ICOs. The Crypto Valley Association recently came out in favor of a code of conduct as a means to encourage the community to foster best practices and weed out scammers. Switzerland still offers the best environment for ICO project as it allows the foundation structure to receive proceeds from ICOs.

Regulators do not encourage speculations on cryptocurrency

❖ Overall Switzerland and Singapore are considered two most advanced countries in creating a welcoming environment for fintech and cryptocurrency. Majority of countries do not publish any legislations that defines the status of cryptocurrency as a currency.

❖ Due to increasing speculations on cryptocurrencies, and their use in money laundry and other illegal transactions, China has banned the exchange between cryptocurrencies and fiat currency in centralized exchanges (OTC trading is still allowed).

❖ Australia announced their plan to better regulate cryptocurrency exchanges in order to strengthen the Anti-Money Laundering and Counter-Terrorism Financing Act.

❖ Japan is the most crypto-friendly country and takes a different approach by issuing operating licenses to bitcoin exchanges. In April 2017, Japan officially recognized bitcoin as a legal payment method.

❖ South Korea regulators also plan to better regulate the exchanges in view of a surge in cryptocurrency exchange trading volumes.

❖ The US regulators have been relatively quiet on cryptocurrencies.

❖ Russia government plans to develop a system for cryptocurrency miners to register and pay taxes on their income.

Global governments welcome blockchain technology

❖ Zug in Switzerland, known in blockchain circles as "Crypto Valley," is currently the perceived leader with the biggest crypto community. A handful of other cities are engaged in serious jurisdictional competition to become the prime innovation hub for blockchain-based technologies.

❖ Central banks are developing their own digital fiat currency backed by the blockchain technology.

❖ Many countries put a lot emphasis on the development of blockchain technology locally. China in particular, has been active in developing its own digital currency, along with its effort in promoting the internationalization of RMB. It seems clear that Chinese authorities see blockchain technology as a potentially useful, disintermediating tool for advancing its regional interests, especially in trade.

❖ City of Tokyo recently announced its plan to set up of a Blockchain-focused startup accelerator in an attempt to attract startups outside of Japan.

❖ Hong Kong and Singapore jointly announced a Trade Finance Platform based on distributed ledger technology (DLT). The project is designed to digitize trade documents and reduce risk and fraud in the industry.

6. Key risks in investing in ICOs and cryptocurrencies

Key risks in investing in cryptocurrencies

❖ Security: Your coins could be stolen by hackers if you store your key online.

❖ Regulatory clampdowns could create liquidity issue and lead to market swings. Withdraw of coins or money from exchanges could take long time in times of panic.

❖ Risk of depositing your coins and money with crypto exchanges: most of them are not regulated with no custodian requirement or capital requirement, and with no FDIC insurance.

❖ Early cryptocurrencies enjoy early mover advantage and are dominating the trading volume. Newer coins could drain in liquidity.

❖ Speculation dominates demand currently. Price movement is determined by underlying use case and speculation demand at the same time.

❖ Large mining pools are taking increasing ownership which may lead to more market manipulation which is against the original idea of decentralization; especially true for cloned coins whose birth is supported by large mining pools such as bitcoin cash.

❖ Major cryptocurrencies such as Bitcoin and Ether may continue experiencing hard forks and create competing coins which in theory could may the supply unlimited.

❖ Concentration risk: Most people only own bitcoins but there are many other coins competing with bitcoins. In terms of technology or functionality, bitcoin may actually fall behind later peers. A certain level of diversification is needed.

❖ Hedging tools are limited.

Key risks in investing in ICOs

❖ No valid reason for raising funds through ICOs or the token sales, just a way to raise money from unsophisticated investors.

❖ Hacking: Funds were stolen by hackers in the ICO process (The DAO being an example).

❖ Bad governance risks: The case of Tezos raised more concerns on this. How the ICO is conducted, how the ICO fund would be used, is there any vesting period for funders' coin allocation, is there any lockup period for VC investors – none of these are standardized.

❖ Execution risk: Most ICO project only has a whitepaper without code or product. The funders may lack the experience required to run a company.

❖ Secondary market liquidity: You may not be able to trade

❖ Regulatory risks: There is increasing scrutiny on ICOs which may lead to fall in secondary market liquidity.

❖ Transparency risk: The project team may not communicate project progress with token holders frequently and equally.

IMPORTANT DISCLOSURES

Analyst Certification

I, Michelle Li, hereby certify that (i) all of the views expressed in this research report reflect accurately our personal views about the subject country or countries, company or companies therein and its or their securities; and (ii) no part of our compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed by us in this research report, nor is it tied to any specific investment banking transactions performed by AMTD Asset Management Limited.

RISKS RELATED TO ICO INVESTMENTS

As the terms and features of ICOs may differ in each case, parties engaging in ICO activities are reminded to seek legal or other professional advice if they are in doubt about the applicable legal and regulatory requirements.

Investors should also be mindful of the potential risks involved in ICOs and investment arrangements involving digital tokens. As these arrangements and the parties involved operate online and may not be regulated, investors may be exposed to heightened risks of fraud. Digital tokens traded on a secondary market may give rise to risks of insufficient liquidity or volatile and opaque pricing. Investors should fully understand the features of any products or business projects they intend to invest in, and carefully weigh the risks against the return before making an investment.

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