SAC Knowledge Hub

Date: 18th September 2017

Cryptocurrency

Cryptocurrency as an alternative asset class has been gaining traction in recent years. Their low correlation to other asset classes and superior performance has seen strong investor interest in the asset. Whilst there are hundreds of alternative coins in existence, Bitcoin and Ethereum have generated the greatest interest amongst investors, with year-to-date returns of 354% and 3,800% respectively. In this paper, we explore how Cryptocurrencies work, the applications and regulations surrounding the currency.

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What are Cryptocurrencies?

Cryptocurrencies are a digital currency utilising cryptography to secure transactions and to create new cryptocurrency. Similar to traditional currencies, it is intended to function as a medium of exchange. However, unlike traditional currencies which are controlled by a central authority, cryptocurrencies use decentralised control and therefore are insusceptible to a central authority's influence. In 2009, the first decentralized cryptocurrency - Bitcoin was created. Subsequently, many Bitcoin alternatives (called altcoins) such as Ethereum, Litecoin, Namecoin and PPCoin have also been created.

What are the most common Cryptocurrencies?

1. Bitcoin: With a market capitalisation of around US$45 billion as of July 2017, Bitcoin was the first decentralised cryptocurrency. It was created by a mysterious person known by the pseudonym Satoshi Nakamoto in 2009, and has remained as the most actively traded and valuable cryptocurrency thus far. However, on 01 August 2017, the Bitcoin blockchain was split in two separate digital assets – Bitcoin and Bitcoin Cash due to a failure to reach a consensus for its scaling issue by the Bitcoin community.

2. Ethereum: Ethereum, which was created in 2015, is a decentralised software platform that incorporates smart contract functionality. A smart contract is a self-executing and self – enforcing contract, stored on the blockchain as lines of code containing contractual terms. Following Bitcoin, it is the second most actively traded and valuable cryptocurrency with a market capitalisation of around US$18 billion as of July 2017. Nonetheless, Ethereum has had a rather upheaval course. In the wake of the Decentralised Autonomous Organsation ("**DAO**") Ethereum hack in 2016, it split into two currencies – Ethereum and Ethereum Classic.

3. Ripple: Ripple is a real time global settlement network developed in 2012, with a market capitalisation of around US$6.3 billion as of July 2017. As it allows for transparent international payments, it is increasingly taken up by banks such as Santander and UBS.

4. Litecoin: While similar to Bitcoin in many ways, Litecoin presents itself as an improved version of Bitcoin via new innovations such as faster transaction confirmation to enable additional transactions. It has a total value of around US$2.1 billion as of July 2017.

How do Cryptocurrencies work?

Cryptocurrencies allow users to make secure transactions pseudonymously via a distributed public ledger (called blockchain) as shown in Figure 1, which stores all transactions ever been conducted across the peer-to-peer network. Put

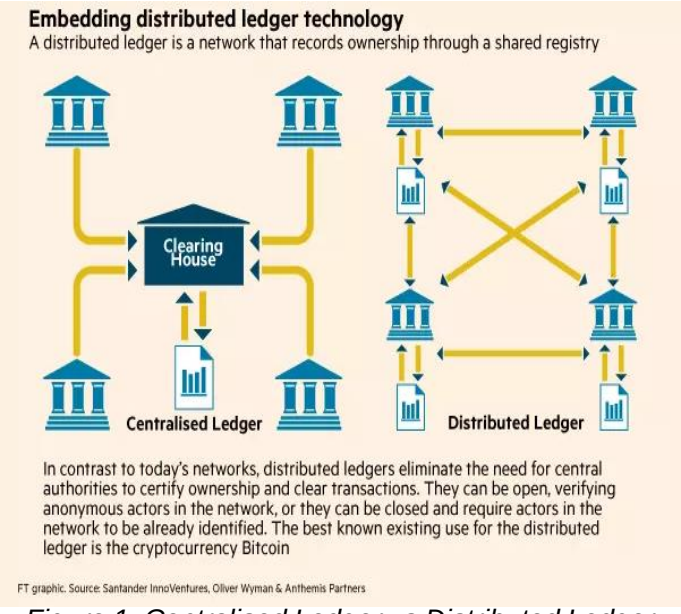


Figure 1. Centralised Ledger vs Distributed Ledger

simply, the blockchain operates by putting each ocurred transaction into a "block", before connecting these "blocks" of transactions to the blockchain in a linear, sequential order.

A detailed illustration of how a blockchain operates can be demonstrated using Bitcoin as an example as shown in Figure 2: If users want to make a transaction, the transaction will be broadcast across the Bitcoin network as a "block". Processing power is then exerted by the network to authenticate the transaction (i.e ensures that the Bitcoin hasn't been used before and belongs to the user) and add it to the "chain" or public ledger through the solving of complex mathematical problems. This process is called mining. Mining can be done by anybody since it is an open source. However, only the first "miner" who helped make the "block" of transactions possible will be rewarded newly created Bitcoin and transaction fees. Apart from mining, Bitcoin can also be bought from an Exchange, ATM machine or traded with a Bitcoin owner.

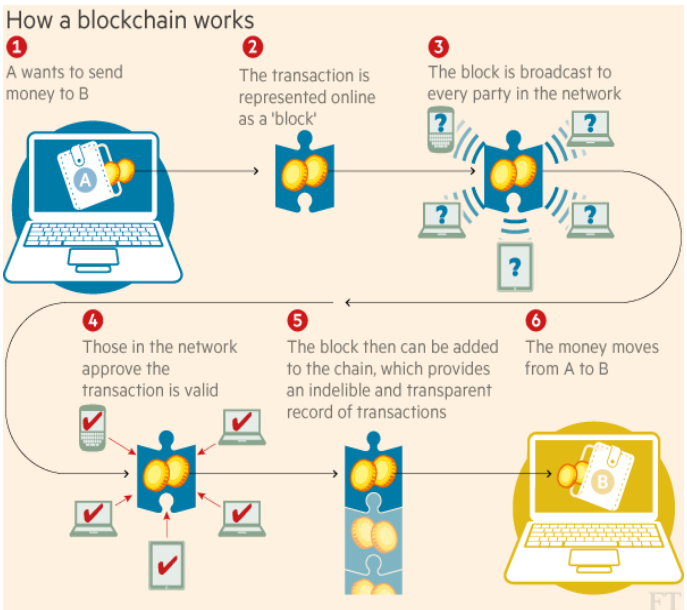


Figure 2. How a blockchain works in Bitcoin

Through this technology, users (i.e. buyers and sellers) can make transactions directly with one another without the need for third party verification. Also, the transaction is pseudonymous as individual information is encrypted and not shared despite the presence of a transaction record.

How do you use Cryptocurrencies?

A cryptocurrency wallet is required to start using cryptocurrency. It is a software program where users store, send and receive cryptocurrency, akin to a bank account. Nonetheless, to be technically accurate, a cryptocurrency wallet does not actually store cryptocurrency; rather, it stores the private key (known only to the user) and public key (known to the user and anyone else) which grant users' cryptocurrency ownership. A cryptocurrency wallet can be opened by users via a wallet service or a cryptocurrency exchange.

However, to trade cryptocurrency, both the cryptocurrency wallet and access to the cryptocurrency exchange will be required. And this is similar to stock trading where users are required to have a bank account and stock exchange access to trade. In this case, users can engage the services of CoinHako, Coinbase, Luno and ItBit which are Wallet and exchange services in Singapore to trade.

Why would you use Cryptocurrencies?

Pros:

1. The network allows for a secured and pseudonymous form of transaction. In particular, "double-spending" via forgery and counterfeiting is not permitted as each transaction added to the public ledger is authenticated.
2. Transactions occur permanently over the network, without the need for third party verification.
3. It allows for the ease of transferring large amounts of funds via public and private keys usage (security purposes) between parties at a minimum processing fee. This is unlike the large fees charged by banks and financial institutions for wire transfers.
4. Users' access to transactions is no longer dependent on factors such as having a bank account or their credit history, but rather technological access.

Cons:

1. It is misused by hackers and criminals for a multitude of illegal activities such as money laundering and tax evasion due to its pseudonymous nature.
2. In the case of a lack of a backup digital cryptocurrency balance copy, its balance can be erased if a computer crash occurs since it is virtual and has no central repository.

3. Cryptocurrency value fluctuates widely as it is supply and demand based. For instance, while there is still a lack of a generally accepted Bitcoin Volatility Index, it is known that Bitcoin has a short term volatility of about 10 times that of the U.S. dollar.

What are the applications of Cryptocurrencies' technology?

The blockchain technology has the potential to be implemented in innovative ways far beyond cryptocurrencies:

1. Financial Institutions: Blockchain technology enables distributed public ledger to become records of the future as it is shared and resistant to tempering, and so trims down the paper trial in traditional record-keeping and ensures secured and data consistent transactions. As such, the transactions stored on a blockchain could allow for automated reconciliation of accounts, thus improving the transparency and efficiency of financial institutions' cross-border transactions. Also the identity data stored on a blockchain, akin to a digital passport, could help financial institutions improve on their anti-money laundering and "know your customer" checks. Below are some applications of blockchain technology taking place in the financial sector:
   - Barclays had partnered with start-up Wave in September 2016 to execute a global trade transaction using blockchain.
   - Santander had initiated usage of blockchain for international payment processing via a mobile app that can connect to Apply Pay, in June 2016.
   - Global Payments Steering Group which consists of the Bank of America Merill Lynch, Royal Bank of Canada, Santander, UniCredit, Standard Chartered and Westpac Banking Corp, has partnered with Ripple to develop a 'rules-based blockchain payments network.
   - The Monetary Authority of Singapore ("**MAS**") announced plans to launch a pilot project with the Singapore stock exchange and eight local and foreign banks to use blockchain for interbank payments in November 2016.

2. Supply Chain Management: Blockchain technology provides an updated and authenticated shared ledger with network participants in real time, thus allowing for traceability and visibility of activities when required. In other words, it could disclose the location of an asset at any point in time, the person who owns it and the condition it is in. Below are some applications of blockchain technology taking place in supply chain management:
   - Everledger was able to trace diamonds through its supply chain, from producers to cutters to bankers and insurance companies via the use of blockchain. And this helps ensure the authenticity of its diamonds.
   - Walmart will manage its supply chain for pork in China by adopting an IBM developed blockchain platform, so as to improve transparency and tackle food safety issues.

3. Healthcare: Blockchain technology provides a more competent and secured system for the managing and maintaining of medical records, thus offering patients with a complete medical history report. This is unlike the current utilisation of a data centre for the maintaining of medical records, which can be costly and prone to security breach. Also, it could improve clinical trials by boosting patients' and doctors' trust since data transparency dissuades those who selectively report outcomes. Below are some applications of blockchain technology taking place in the healthcare industry:
   - The Estonian eHealth Foundation partnered with data security startup, Guardtime, to develop a blockchain-based system capable of protecting more than 1 million patients' medical records.
   - The US Food and Drug Administration ("**FDA**") announced a research partnership with IBM Watson in January 2017 to research blockchain and seek how data from electronic medical records, clinical trials and wearable devices could be shared and audited more effectively using the blockchain.

4. Government: Blockchain technology can make the recording of transactions and tracking of

asset ownership more efficient and transparent. It can also help establish trusted identities and prevent forgery via the issuance of digitally authenticated birth certificates that are unforgettable, time-stamped and accessible to anyone in the world. Below are some applications of blockchain technology adopted by the government:

- Delaware was the first US state to utilise blockchain to store and encrypt government archives in 2016. This allows the archives to be stored in multiple locations, and helps reduce off-site physical storage cost as well as improve disaster recovery.
- A Global Blockchain Council was created by Dubai to research existing and future blockchain applications. To add on, a strategic plan to store government documents with blockchain by 2020 was announced by the Crown Prince of Dubai on October 2016. And this is estimated to economise 25.1 million hours of economic productivity each year.

Regulation of Cryptocurrencies in Singapore

According to MoneySENSE, virtual currencies are sometimes referred to as digital or cryptographic currencies as they are digital currency secured by cryptography. Consequently, in the following paragraph the terms - virtual currencies and cryptocurrencies will have the same meaning.

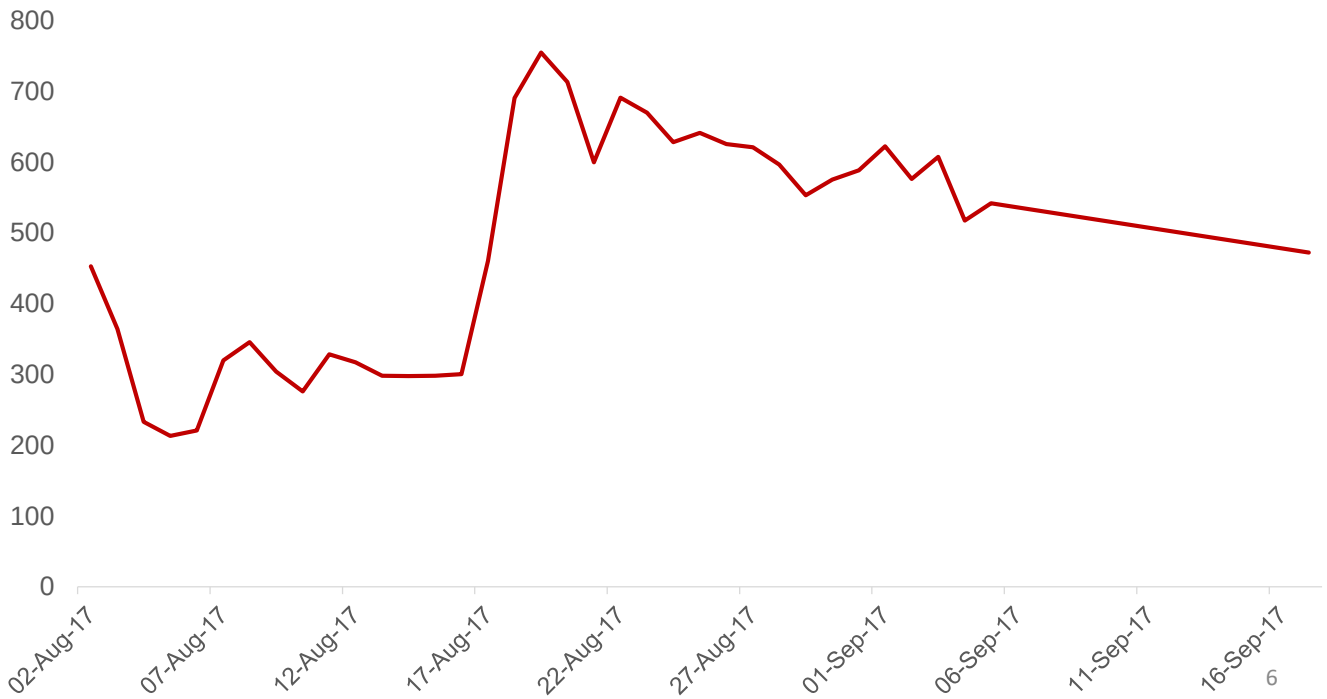
Since virtual currencies are not regarded as securities or legal tender, it is not regulated by the MAS. Nonetheless, MAS will regulate virtual currencies intermediaries, engaged in the transactions of buying, selling and exchanging of virtual currencies, for money laundering and terrorist financing (**"ML/TF"**) risks.

In light of the recent increase in the number of initial coin (or token) offerings (**"ICO"**) in Singapore as a medium to raise funds, the MAS will also regulate the issue of digital tokens if they constitute products under the Securities and Futures Act (Cap. 289). According to MoneySENSE, a digital token is a cryptographically-secured representation of a token-holder's rights to receive a benefit or perform specified functions. One particular type of digital token is virtual currency, which typically functions as a medium of exchange. With the vulnerability of ICOs to be used for ML/TF due to the pseudonymous nature of the transactions, coupled with the ease of raising significant capital within a short period, MAS is currently assessing how to regulate ML/TF risks associated with digitals tokens that function beyond a virtual currency. At this time, the MAS requires those issuers of such tokens to lodge and register a prospectus with MAS prior to their ICO, unless exempted. Issuers or intermediaries of such tokens are also subject to licensing requirements. Additionally, platforms facilitating secondary trading of such tokens require approval or recognition from the MAS as an approved exchange or recognised market operator.

Price Charts

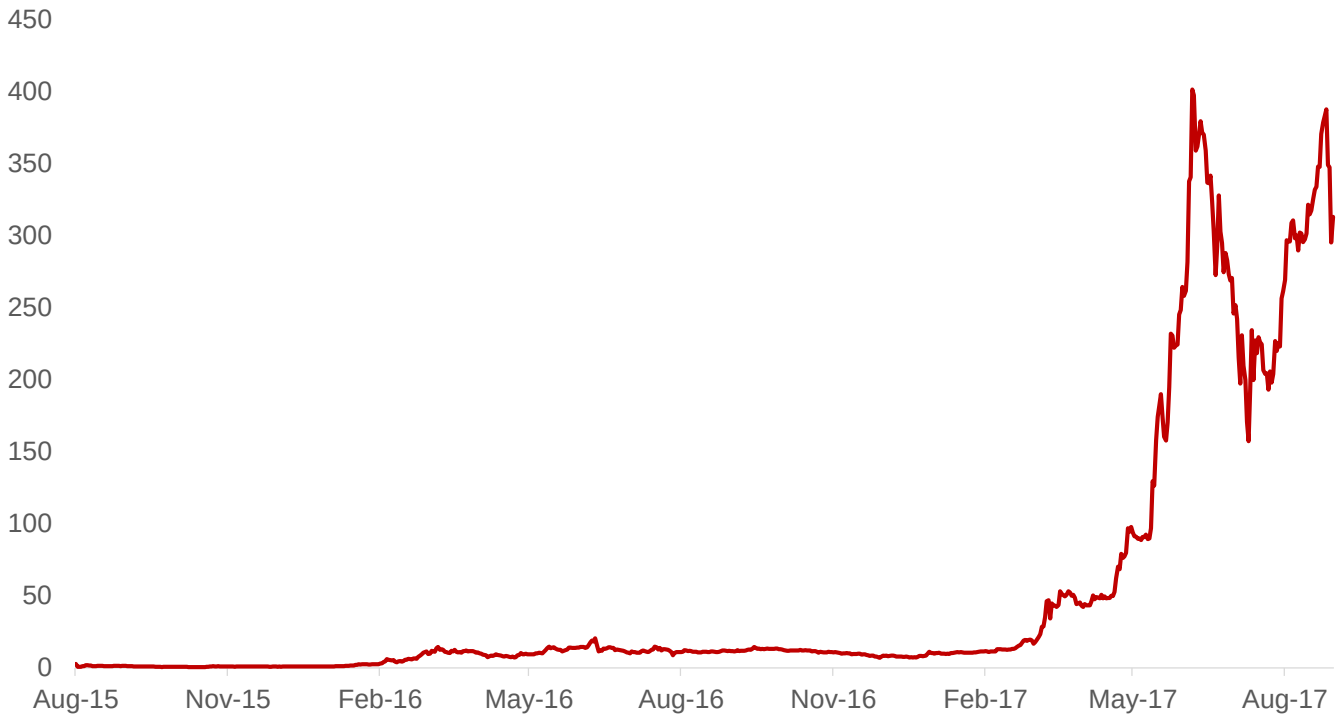
Bitcoin (BTC)
Price: US$3,673.91 (as at 17 Sep 2017)

Bitcoin Cash (BCH)
Price: US$471.88 (as at 17 Sep 2017)



Price Charts

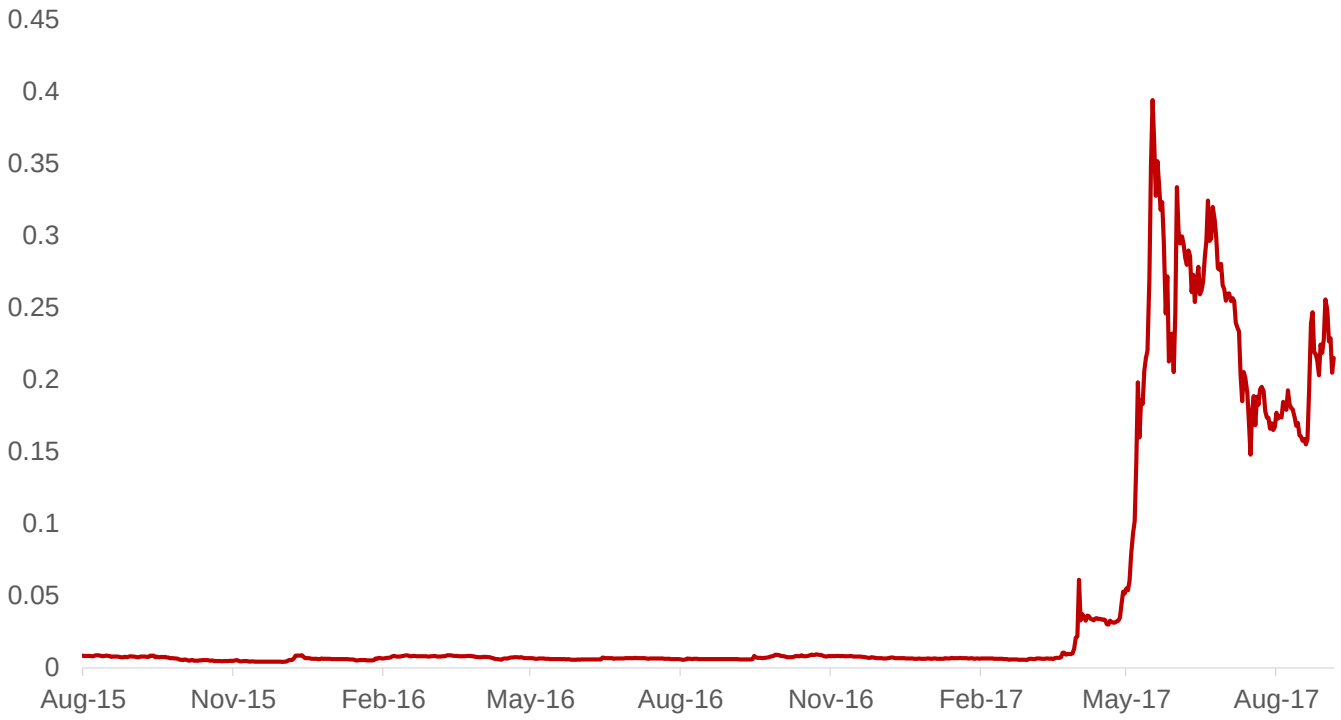
Ethereum (ETH)
Price: US$257.91 (as at 17 Sep 2017)



Ethereum Classic (ETC)
Price: US$10.97 (as at 17 Sep 2017)

Price Charts

Ripple (XRP)
Price: US$0.18 (as at 17 Sep 2017)



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