The Future of Cryptocurrency

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Abstract

The aim of this paper is to convey an understanding into the basic fundamental and technical workings of cryptocurrencies, outline the notable types of digital currencies and their individual characteristics and finally identify the variables responsible for the future of cryptocurrencies.

Existing as a relatively new concept, with the first currencies finishing development during the year of 2009, little research has been done into the full economic potential of digital currencies and the possible expansion into wider mainstream usage. However, they have seen exponential growth and have been featured in many large financial media publications from Forbes, BBC, Financial Times and The Wall Street Journal.

Digital currencies have remained persistent as a topic of high speculation in trading communities, financial media and wider economic debate. The main question being this: What does the future hold for Cryptocurrencies?

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The Future of Cryptocurrency

1. What is Cryptocurrency?

Cryptocurrency is a digital medium of exchange – a digital currency. Cryptocurrency can be thought of as digital 'points' - These points, often referred to as 'coins' can be traded from person to person (peer to peer) to transact value. For value to be transacted, the digital currency itself must have value.

2. Economic Value

As cryptocurrency exists entirely digitally, merely as numbers - as intangible computer code - it has no intrinsic value. So where does the value come from?

In the same way that there is the use of currency, and the different types of currency (United States Dollars, British Pounds Sterling, Japanese Yen, etc.) – There is also cryptocurrency (crypto for short), and the many different types of cryptocurrencies. By far the most established and widely-known cryptocurrency is Bitcoin[1], and the real value of a digital currency can be considered to be created by the faith in the 'brand' of each currency[2].

Each individual digital currency is entirely unconnected, apart from the defining characteristics that enable the categorisation as a cryptocurrency – and each currency will have unique fundamental and technical characteristics that differentiates it from other digital currencies. The consistency of a digital currency is maintained through a series of predetermined rules put in place to regulate the expansion of the currency, maintain value and protect against inflation.

The market value of digital currencies (often valued against fiat currencies, such as the United States Dollar) is created through the market capitalisation of the currency. The market capital is the total value of all of a given currency in existence added together, and is increased through the inflow of fiat currency into the given digital currency market.

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[1] Bitcoin has consistently held a >50% market share of digital currencies, information provided by crypto-market statistic website: https://coinmarketcap.com/

[2] The defining characteristics that make up the currency being considered to constitute the 'brand'.

3. Origins

The conception of Cryptocurrency took place on the 3rd of January 2009 – with the birth of Bitcoin (BTC) and the rapidly emerging digital currency market that ensued. The revolutionary concept that

Bitcoin was structured around initially captured the interest of small niche crowds, but quickly developed wider interest based on its (previously unseen) characteristics.

Bitcoin was created as a peer-to-peer exchange system. The inceptive event that triggered the rapid expansion of Bitcoin's popularity was the opening of the first Bitcoin Exchanges[3]. These Bitcoin Exchanges accepted fiat currency deposits and facilitated exchanges between two parties, thus removing the peer-to-peer aspect of the trading. This created an inflow and outflow of fiat money (liquidity) into the Bitcoin market. With the inflow of fiat currency into the Bitcoin market, Bitcoin quickly gained value. The outflow into fiat currency meant that holders of Bitcoins could then evolve their stake into fiat money. Bitcoin exchanges made it easy for anyone with a bank account to buy and sell Bitcoins and really brought the availability of the currency to the mainstream market – it just needed the exposure.

Bitcoin first hit the mainstream news when Bitcoin donations began to be accepted by online journalistic organisation WikiLeaks. WikiLeaks utilised the anonymity that came with Bitcoin transactions, as this was important to protect donors given the sensitive nature of the content published by WikiLeaks. This gave insight into the potential of digital currencies in wider mainstream usage, and the accepting of Bitcoins began to be utilised by many online vendors.

However, the anonymous transactions facilitated by digital currency brought the interest of parties involved in illegal activities. This contributed to the growth of cryptocurrencies as well as having detrimental effects on the reputation and perceived legitimacy of digital currencies[4].

With the exponential growth of Bitcoin over the 2009 – 2013 period (See Appendix A), the conception and growth of a number of other, separate digital currencies followed. This added a certain diversity to the bracket of cryptocurrencies, and allowed for a diversity of currency characteristics to suit niche markets, as well as provide demonstrations and testing of additional models for currency success.

[3] Cryptocurrency exchanges operate on a trade-matching basis, acting as a middleman and taking a processing fee.

[4] Further elaborated on in section 7, Threats to Expansion.

4. Initial Ideology

During November 2008, a paper was published on the internet under the pseudonym Satoshi Nakamoto[5] – titled *Bitcoin: A Peer-to-Peer Electronic Cash System*. This paper outlined the technical ecosystem that would structure the world's first Cryptocurrency.

The ideology of Bitcoin was created with a libertarian point of view[6] – and focused on creating a decentralised market that could be a viable alternative to fiat money. Due to the currency existing entirely in digital form, and the nature of digital currency transactions, Bitcoin would largely be detached from government control and pose issues relating to taxation.

Privacy, security and anonymity have long stood as cornerstones of internet culture, and the technical characteristics of Bitcoin set out to adopt and maintain this key theme – providing a means of exchange that could truly work alongside the internet order.

[5] The true identity of Satoshi Nakamoto remains unknown (with constant media speculation) as of March 2014.

[6] A focus on freedom from government control being a central factor during development.

5. Technical concepts

Cryptocurrencies are generated through the use of Cryptography. Cryptography is the coding and decoding of encrypted messages, or the solving of complex algorithms – and is undertaken by a computer in the process of cryptocurrency generation. For an example of a digital currency generation process, Bitcoin will be used. This is because the structure of Bitcoin has been considered fully secure and has been used as a model for development of many other digital currencies.

Bitcoin exists entirely virtually with the generation of Bitcoins facilitated by a process known as 'Mining'. Mining can be undertaken by any computer through the use of Bitcoin mining software, of which is available to download for free from affiliated sites. Mining is used to generate Bitcoins through the mining of 'Blocks', of which are broken down by the computer through algorithmic solution – a process which exists entirely online. With the algorithmic breakdown of these blocks, 25 Bitcoins are 'created' and paid out to (shared between) the miners, of whose efforts can be pooled together through the use of merged mining networks. Blocks are available for mining at a limited rate, with one block created by the Bitcoin network every 10 minutes. The total amount of Bitcoins available is capped at an arbitrary total of 21million individual coins as a hedge against inflation in the long-term. Up until this 21million coin-cap is hit, Bitcoin will be in a stage of growth (in terms of coin amounts) as blocks are mined in a continual pattern, with mining pay-outs decreasing consistent with the increase of Bitcoins in existence.

Bitcoins can be stored in software known as 'wallets', which is also where the Bitcoins are paid out to in the mining process. These wallets have the ability to 'store' and transact Bitcoins, with each wallet having one or multiple 'Bitcoin addresses'. A Bitcoin address is required to indentify an individual holding of Bitcoins, similar to how a bank account will have a name, account number, sort code – a Bitcoin address will consist of a random 27 to 34 character cryptographic code, for example "13h1ULGwrKYTeLwged98oTzjG4SShQjNUh"[7], which will be the identifying address of a Bitcoin wallet. Similar to how an email will be associated with a Paypal or Google wallet account, where the email will be used as the identifying element for sending and receiving payments – a Bitcoin address will be used in the same regard when sending and receiving Bitcoins. This adds a degree of anonymity to individual accounts on the Bitcoin network, as each individual account is disconnected from any personal identifying information such as names, emails and addresses. The transfer of balances, however, is still recorded in a ledger known as the 'Blockchain' which is publicly available for viewing on the Blockchain website[8]. All Bitcoin transactions are recorded by the Blockchain and exemption from the Blockchain is not possible for any Bitcoin address. It must be noted that all Bitcoin transactions (>0.01BTC) carry a small processing fee by the Blockchain. This fee is at the cost of the sender, and is taken in Bitcoins – the value of which is calculated in a complex manor, based on the number of 'bytes' transacted. Although the fee can vary, it is always less than 1% of the transaction value.

Cryptocurrencies focus on the transfer of balances in its very basic form. One 'problem' often considered with online monetary transfer systems such as Paypal, Google Wallet and Skrill is the fact that payments are able to be 'recalled'. This adds additional security for buyers and lessens the negative effects of scams. For sellers however, the possible countermand of payments is seen as a

point of additional risk. This recall of value is not applicable to digital currencies – a characteristic that can be considered both a blessing and a curse[9].

[7] Address randomly generated by a BitcoinQT wallet for the purpose of example.

[8] The Blockchain website can be found at: https://blockchain.info/

[9] Further elaborated on in section 7, Threats to Expansion.

6. Progression

In the early months of the year 2013, the Bitcoin markets saw the first boom. Having previously had a value peaking at $5 USD per Bitcoin – the value rose sharply to upwards of $100 USD. This meant that a $10 USD transaction in Bitcoin (BTC) could be facilitated by the transfer of 0.1BTC.

This is where the first gap in the market for a new coin became apparent. Many Bitcoin users became opposed to accepting fractions of a Bitcoin for their $10 transaction. Even though 0.1BTC now had a value of $10, a cognitive bias in accepting fractions of an item for something considered to have a higher value meant that Bitcoin was not always a viable payment option for sellers of sub-$100 goods. This paved the way for a lower-priced currency to take its position in the digital currency market, which came with Litecoin.

Litecoin (LTC) is often likened as silver to Bitcoin's gold. Litecoin – with a total cap of 84million coins ($400,000,000 USD as of March 2014), a great deal higher than the 21million cap seen with Bitcoin – is based around the Bitcoin framework and is close-to identical in terms of fundamental workings. Litecoin has seen pricing patterns correlating with that of Bitcoin (see Appendix B), although Litecoin has (typically) a 40-times lower market capitalisation. This pricing makes the currency ideal for smaller value transactions on a perceptive level as the trading can be fulfilled with whole coins as opposed to fractions of coin. Litecoin has one of the highest levels of liquidity of digital currencies, with numerous Litecoin exchanges[10] – and contributes to an average of 23% of cryptocurrency trade volume, second only to Bitcoin[11].

With the continued success and growth of digital currencies, a number of new coins have been developed to fill niche aspects of the market. Small digital exchanges such as Cryptsy[12] have catered to small-cap coin markets and have contributed to the liquidity and growth of the small-cap markets. Other cryptocurencies of particular note are Dogecoin and NXT, of which will be further explained in the following two paragraphs.

Dogecoin (DOGE) – again based on the Bitcoin framework and close-to identical in terms of fundamental workings – is an atypical digital currency, in the sense that it was created as a joke. Using the popular 'Doge' internet meme as a mascot, the coin was created to parody Bitcoin and the Bitcoin communities – separating itself from the controversial problems (mentioned in the 'Threats to Expansion' section) that Bitcoin was facing and portraying itself as a more 'fun' and 'relaxed' digital currency. Initially worthless, Dogecoin went on to gain value within its second week of usage – primarily trading on dedicated forums and Reddit market sections on a peer-to-peer basis and priding itself on strong trading community values. Dogecoin is an uncapped currency with an easy mining rate, paying out 10,000 coins per mined block. This means there is an abundance of Dogecoins with 62billion coins in circulation, shared across a 45million dollar market capitalisation as of March 2014. Dogecoin is a perfect example of brand strength, with a 45million dollar market-cap entirely due to its fun self-portrayal and large, notoriously friendly trading community.

NXT, also known as Nextcoin, is a second generation digital currency. NXT was designed with separation from Bitcoin as a primary factor, built entirely separately from the Bitcoin infrastructure. The official NXT website, (http://www.nxtcrypto.org/) states that "*Nxt is not an altcoin* (alternative coin) *such as litecoin, peercoin, and others who have their code based on Bitcoin's source code are. It is brand new from scratch with its own code*." Notable characteristics of Nextcoin include an eco-friendly coin-generation process[13] as well as a refined transaction process – allowing for higher transaction speeds and a much greater potential trade volume, comparable to that of card processing companies such as Visa and Mastercard.

Cryptocurrencies as a whole can be considered to be undergoing continued development, with the full potential in terms of transaction processing, security and ease of use not yet utilised fully (at present). This development could be attained through the further development of current coins (such as Bitcoin) which already have the market exposure and economical structure – or through the creation of new currencies set to improve on or eradicate issues and improve on impeding barriers to expansion.

[10] Litecoin exchanges are available in both a LTC/BTC and LTC/fiat currency basis on exchange: https://btc-e.com/.

[11] Information sourced from volume rankings provided by https://coinmarketcap.com/.

[12] Found at https://www.cryptsy.com.

[13] Instead of being 'mined', a process that uses up computer power and therefore electricity, NXT coins are generated on a proof-of-stake interest system, similar to the workings of interest used by banks.

7. Threats to expansion

The complexities of digital currencies can be considered a threat to their successful future simply because a majority of the population do not understand the technicalities, and hence the fundamental workings of cryptocurrency. Even with research into the subject, a certain level of technical insight is required to fully comprehend the complex workings of digital currencies. This acts as a deterrent to mainstream usage of digital currencies, and is a fundamental threat to their future growth.

Bitcoin has suffered from great reputation damage due to the trading of potentially illegal goods through black-market Tor[14] hidden websites, with Bitcoin used as a sole currency. These marketplace websites have been featured in publications by many different news channels, and a large portion of the initial news covering the subject of Cryptocurrencies focused great attention on the exploitation of anonymity provided by Bitcoin for illegal usage. This contributed to early negative associations with digital currencies, which could have motivated potential buyers and users to stay clear of the currency for fear of ties to illegalities.

The issue of taxation often brought governmental opposition to the idea of digital currencies. The lack of governmental control of digital currencies is an issue (although also a primary factor in the success of cryptocurrencies) that is near-impossible to mitigate. Steps have been taken in the UK to recognise cryptocurrencies as tax-liable commodities, however the tax can only be applicable when the digital currencies are 'cashed out' into fiat currency – leaving cryptocurrencies as an untaxable medium of exchange in their basic digital peer-to-peer form.

The illegal Gambling scene has seen a revival fuelled by the anonymity of digital currencies. Online gambling, which is illegal in many countries and US states, now operates with anonymity in mind, utilising the Tor network and anonymity of cryptocurrencies to protect the identities of all parties involved. This adds further governmental opposition to cryptocurrencies, and can have a detrimental effect on the perceived legitimacy of digital currencies.

As mentioned under Technical Concepts in section 5, once a cryptocurrency has been transacted, it is not possible for the amount to be recalled or charged-back. This provides an ideal characteristic for hackers and thieves as the stolen currency cannot be retrieved once the transaction has taken place. The trail of digital currency transactions, although recorded through dedicated online ledgers, can easily be made ambiguous through the use of nominee-holdings of currency[15]. These characteristics, in the same vein, also completely dissipate any scam protection for users of digital currencies. Trades will have to be undertaken at the risk of the initial sender, based completely on trust. The nature of the risk presented by this issue makes digital currencies a prime target for digital-hackers, thieves and scammers. Bitcoin, as the highest-cap cryptocurrency has featured numerous multi-million dollar hacks in its short existence, primarily from exchanges and private holdings. It must be noted however – that these hacks are avoidable and serve as a barrier of separation between secure exchanges and exchanges with insufficient security protection in place.

Price volatility has posed a significant risk to the adoption of digital currencies as a mainstream payment method, and also their use a long-term store of value. The price volatilities seen have discouraged many commercial organisations from accepting Bitcoin as a method of payment due to the uncertainty of future pricing. As the highest cap coin, with a market capital exceeding $7billion USD as of March 2014, Bitcoin has been able to maintain the highest level of price stability, and thus having the greatest commercial adoption as a payment method, see *Table 1*.

Table 1

A table presenting commercial organisations accepting *Bitcoin* as a method of payment.

Organisation	Description
Overstock.com	Online goods retailer
University of Nicosia, Cyprus	Educational organisation
BitPremier	Luxury goods retailer
The Swiss Pharmacy	Pharmaceuticals retailer
Virgin Galactic	Commercial Space Tourism
CheapAir.com	Commercial travel
BitcoinCommodities	Commodities retailer

[14] Tor is free-to-download browser software which focuses on user-anonymity through the usage of encrypted links between multiple proxies. Tor software can be acquired from: https://www.torproject.org/.

[15] The digital currency can be deposited into a pooled nominee-holding from one holding location and withdrew into a different location, thus removing any ledger trail of individual coins.

8. The Future

The future of cryptocurrency largely comes down to the question of whether digital currencies pose a serious alternative to fiat currencies and gold. The high-cap coins, such as those previously mentioned, all conform to the standards of money – showing potential as a store of value, being utilised as a medium of exchange and also used as a unit of account[16].

The emergence of value and liquidity seen in cryptocurrency markets has provided a base for advancement into the ranks of more established mediums of exchange and fiat currencies.

The price volatility now closely associated with digital currencies has been considered a serious impediment to their status as a dependable store of value. This ties in with the consideration of cryptocurrencies as a viable, digital alternative to gold. Gold is largely used as a long-term store of value, notably because of its ability to maintain value as well as its detachment to fiat money in times of economic crisis. This detachment from fiat currencies has also been presented in the cryptocurrency market, particularly seen with Bitcoin during the Cyprus banking crisis of 2013 – where a large majority of the populace chose to store their savings in Bitcoin. This is because Bitcoin was considered a safer option to retaining savings with the banks, and the decentralised characteristics of cryptocurrency rendered Bitcoin savings out of government control.

Price volatilities in the cryptocurrency markets, however, have served to attract a large number of traders, of whom hope to profit from the large fluctuations in price. These traders have helped to increase liquidity as well as contribute a large portion of the influx of capital into digital currency markets, thus contributing greatly to the growth and exposure. The volatilities in price have lead some parties to view cryptocurrencies as a passing fad, as evidenced by Newsweek sources[17]. However, market patterns have reflected consistent long-term growth, with Forbes analysts stating "This is a very serious industry and I think it is going to continue to grow. Its potential is limitless."[18]

The usability of cryptocurrency is also a catalytic factor to further growth. The technology is available to create a market for mainstream usage of digital currencies. This particularly involves the evolution of digital currencies for usage in real-world settings.

Quick Response (QR) codes (see *Figure 1*) have seen wide usage in recent years due to their ability to store information in easily-readable barcode form. These barcodes can be read digitally using camera phones (with the correct software) and other forms of barcode-scanners. QR codes have seen common use with cryptogenic currencies, with transactions being made possible in a real-world setting by scanning a QR code that contains a digital currency wallet address, instantly transacting the coins digitally. This enables digital currency payments to be used as quickly and easily as physical money coins and notes – and could contribute to a future expansion into mainstream usage.

There have been many attempts to use physical 'cash'[19] as a method of transacting digital currencies. One example of this would be Casascius coins (see *Figure 2*), built to store a given amount of Bitcoins. These coins have a code embedded within the coin that can be used to 'claim' the given amount of Bitcoins. This code, however, can only be retrieved by causing physical damage to the coin. As the coin is constructed using Bronze, Silver or Gold (depending on the denomination) this method is largely inefficient – and this has proved as an inhibiting factor to the wider usage of digital-currency coins.

Through the growth of internet technology, the development of international business markets and e-commerce has seen exponential growth. To some extent, the variation of fiat currencies has

served as a barrier for international transaction due to the complications of exchange rates. Well established digital currencies, such as Bitcoin, are able to be 'cashed out' into various different fiat currencies, and thus usage of these established digital currencies on the international market could provide a universal unit of account. This would contribute to the breakdown of price-barriers and increase the simplicity of international transactions – of which would be able to be made instantly and at a low cost.

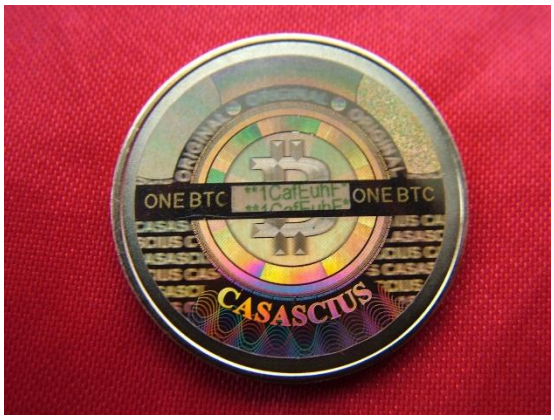
Cryptocurrency, as a whole, is still undergoing a certain development process – and could even be considered to be in stages of infancy. The digital currency market is largely dominated by Bitcoin, and with a $7billion dollar market-cap and each coin being currently worth $600 (as of March 2014) Bitcoin holds a majority portion of the market-share. With such a dominant hold of the market, Bitcoin will pose a strong coin to surpass. However, Bitcoin does have its own problems, such as transaction speeds and an inefficient generation process - problems which have already been solved by other currencies, such as NXT – as well as a slightly tainted history. This could lead a whole new coin to grow and surpass Bitcoin, and possibly propel cryptocurrency into mainstream usage.

Figure 1

An example of a Quick Response (QR) code.

Source: http://upload.wikimedia.org/wikipedia/commons/thumb/9/9b/Wikipedia_mobile_en.svg/220px-Wikipedia_mobile_en.svg.png

Figure 2



An image showing a Casascius coin worth 1BTC.

Source: http://coin.me.uk/wp-content/uploads/2012/04/casascius-1-bitcoin-obv.jpg

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[16] Providing a common base for prices.

[17] Source found at http://mag.newsweek.com/2014/03/28/bitcoin.html

[18] Quote sourced from http://www.forbes.com/sites/kitconews/2013/12/10/2013-year-of-the-bitcoin/

[19] As in items that mimic the physical characteristics and usability of cash.

9. Conclusion

The future of cryptocurrency is dependent on the wider adoption as a use as a means of payment, particularly from large commercial organisations. This adoption will be made possible through the further strengthened reputation of digital currencies as a means of exchange, as well as the continued liquidity, security and retention of value throughout the long-term. The predictive future continues to come with a level of uncertainty, although the channels for growth are present for expansion into mainstream usage. Governmental stances on digital currencies do pose a large threat, particularly because of potential bans due to the difficulties of regulation.

Cryptocurrencies conform to the standards of money – showing potential as a store of value, being utilised as a medium of exchange and also used as a unit of account. The possibilities of future success are purely determined by mainstream adoption. The future market could be spearheaded by the further development of current coins (such as Bitcoin) which already have the market exposure and economical structure – or through the creation of new currencies set to improve on or eradicate issues and improve on impeding barriers to expansion.

Cryptocurrency will, through the self-sufficient ecosystem, continue to exist for niche online uses regardless of circumstances. However, the expansion of digital currencies into mainstream usage remains open to speculation and will provide an interesting point of topic for future economic debate.

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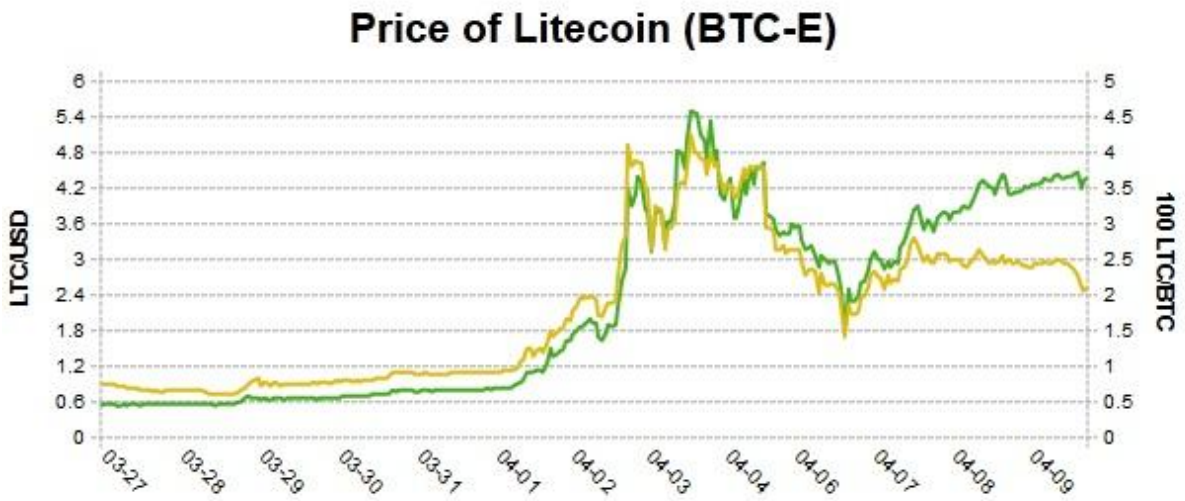
Appendix A

Bitcoin/USD over time graph courtesy of Bitstamp Ltd.

Source: https://www.bitstamp.net/

Appendix B

A graph showing the comparison of LTC/USD and LTC/BTC price trends over time.



Source: http://3.bp.blogspot.com/-hiS0EjPuZqA/UWRDYcBFNTI/AAAAAAAAG9o/P2bNtpAqAsE/s1600/Litecoin%20Bitcoin%20USD.jpg

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