The Rise Of A Digital Currency Era: Bitcoin

Theory & Applications

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Abstract

This paper is intended to introduce some basic ideas behind the rising popularity of a digital currency called Bitcoin. The key concern of major business worldwide is the continuous trend towards higher technology awareness and adaptation of innovative digital products. This trend has a significant impact on the business models of a vast majority of industries, which start to put in serious effort to remain leaders in the market. Financial institutions are no exception and particularly with respect to the rise of FinTech[1], we are more concerned about virtual payment methods, such as through Bitcoins, than ever before.

[1] Financial Technology

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Theory

1. Introduction

Before discussing the applications of Bitcoin, a retrospective overview of its history and characteristics could help us better understand the underlying concepts.

The founder of Bitcoin, Satoshi Nakamoto started to develop his idea in Japan in 2007. Interestingly no one really knows who Satoshi Nakamoto is and speculators argue that the pseudonymous name can be associated with one person or even a group of people. Nevertheless, in 2008 a paper on Bitcoin under the name Satoshi Nakamoto was released online (reference to the paper: https://bitcoin.org/bitcoin.pdf), together with the official website published anonymously. A rationale behind the voluntary anonymous position the founder wants to take, might be on the one side privacy and staying out of the spotlight from media and governments. On the other side, security could play another factor for the choice taken, as Bitcoin is a digital currency and identity could lead to becoming a target of online criminal action, which would cause harmful effects on sensitive data.

Bitcoin is probably the closest Keynes could get in our modern world, to his idea of a supranational currency, namely the Bancor. The digital currency saw its first official transaction in 2009 with an initial exchange rate of 1 USD = 1309,03 BTC. The official currency abbreviation for bitcoin transformed from BTC to XBT and the exchange rate changed incredibly over the years. Its quotations are given daily on multiple exchanges. Bitcoin exchanges are an integral part of the virtual currency world and its ecosystem in particular, and

in just six years' time, the number of transaction on these exchanges changed from zero to almost 260,000 a day in 2016, with an overall market capitalization of 6.5 billion USD.

Figure 1: Exchange Rate USD/XBT. Source: bitcoinaverage.com (data as of 6th April 2016): USD average price history

2. Key Features of Bitcoin

- A global digital currency operating through the internet
    - Every person has a unique digital fingerprint, which allows the individual to buy/sell/trade Bitcoins for goods and services (just as with a physical fiat currency)
    - It is a complex product using technical algorithms
    - Limited scope of usage and lack of acceptance by many institutions and organisations
- No central authority such as a central bank
    - Lack of monetary policy
    - Decentralised system, operating through a network of computers worldwide
    - People themselves create Bitcoins through a complex process called mining
    - Total number of Bitcoins that will be issued is limited to 21 million

- Digital transactions (online exchanges)
    - Special exchange places with little regulation for bitcoins (e.g. BTC China, CampBX in the US or Bitcoin.de in Germany)
    - Made without 3rd party intervention (e.g. banks or clearinghouses)
    - Programming made it impossible to spend the same Bitcoin twice
    - Transactions are irreversible
    - Reduced transaction costs
    - Faster/easier payments
    - Easy conversion from Bitcoin to Cash and vice versa through an exchange or broker
- Bitcoin account (the online Bitcoin Wallet)
    - *Wallets* stores the information necessary to transact bitcoins. There are three main types: software, online and physical wallets.
    - No insurance on bitcoin balances and still lack of significant security
    - If digital keys to access your bitcoins are lost, there is no way for you to retrieve it back and you lose the bitcoins (unlike with a credit card, where theft can be reported)
- Satoshis
    - A Satoshi is the smallest fraction of a Bitcoin that can currently be sent: 0.00000001 BTC, that is, a hundredth of a millionth BTC.
    - If a Satoshi was equivalent to one penny, one BTC would be equivalent to 1,000,000 dollars.

- Are also used as alternative units millibitcoin (mBTC), which equals to 0.001 bitcoin, and microbitcoin (μBTC), 0.000001 bitcoin.
- In the future, however, the protocol may be updated to allow further subdivisions, should they be needed.

Bitcoin Spot Prices

To gain a deeper insight in this crypotcurrency we can see in the table the exchange rate of bitcoin with some of the major currencies. This exchange rate, as any other, are subject to daily adjustments and are often much more volatile than "usual" currencies.

Bitcoin currency markets

currency	volume %	volume ฿	last price	cross price
USD	63.29	38,612.06	424.81 USD	424.81 USD
EUR	20.77	12,669.83	373.40 EUR	424.13 USD
HKD	2.87	1,748.64	3251.24 HKD	419.15 USD
CNY	2.47	1,506.54	2737.06 CNY	422.53 USD
JPY	1.83	1,115.01	46867.70 JPY	424.37 USD
GBP	1.78	1,083.73	309.65 GBP	437.70 USD

Table 1: Bitcoin Spot Prices. Source: bitcoinaverage.com (data as of 6th April 2016)

However, Bitcoin spot prices have shown lower than expected volatility in the last month. As we can see from Figure 2, the price ranged between 405 USD to a peak of 425 USD, and it is currently trading at 424,81 USD. In the same way the price for the Euro ranged from 366EUR at the beginning of the month and increased up to 373EUR (last closing price).

Some analysts nonetheless are expecting a reversal of this trend, with a significant bearish drop due to macroeconomic warning signs.

Figure 2: Bitcoin Spot Prices. Source: bitcoinaverage.com (data as of 6th April 2016): USD average price history

3. The Deflationary and Volatile Nature of Bitcoin

This digital currency is designed to be deflationary. As a certain amount of bitcoins are produced through the process of Bitcoin mining, the amount of bitcoins that are rewarded to the miners per block is decreased. Simultaneously, as more and more bitcoins are mined, the difficulty of the hashing algorithm increases, which then requires more computing power to solve. As a result, Bitcoin mining becomes more expensive, and miners get less coins as Bitcoin mining progresses. If you add to this the fact that once digital keys are lost, there is no way to retrieve them, we can see the deflationary spiral to which Bitcoins are doomed.

Together with its deflationary nature, Bitcoins have shown to be highly volatile as well. The history of this cryptocurrency is dotted with periods of extreme appreciations in value and, even more extreme fall. After reaching its high of around $1,100 in 2013, Bitcoins experienced a long fall until it arrived at the lowest in August, $200. Only to repeat it all over again between October and November 2015. Bitcoin volatility has been seven times greater than gold, eight times greater than the S&P 500, and eighteen times greater than the U.S. dollar. However, Bitcoin evangelists say it will stabilize as more people start using it to buy goods and services, rather than just holding on to it, trying to speculate on its appreciation. Gil Luria, a stock analyst covering financial technology at Wedbush Securities, projects bitcoin will be used in 1 percent or 2 percent of online transactions within five years, about 80 times more than today.

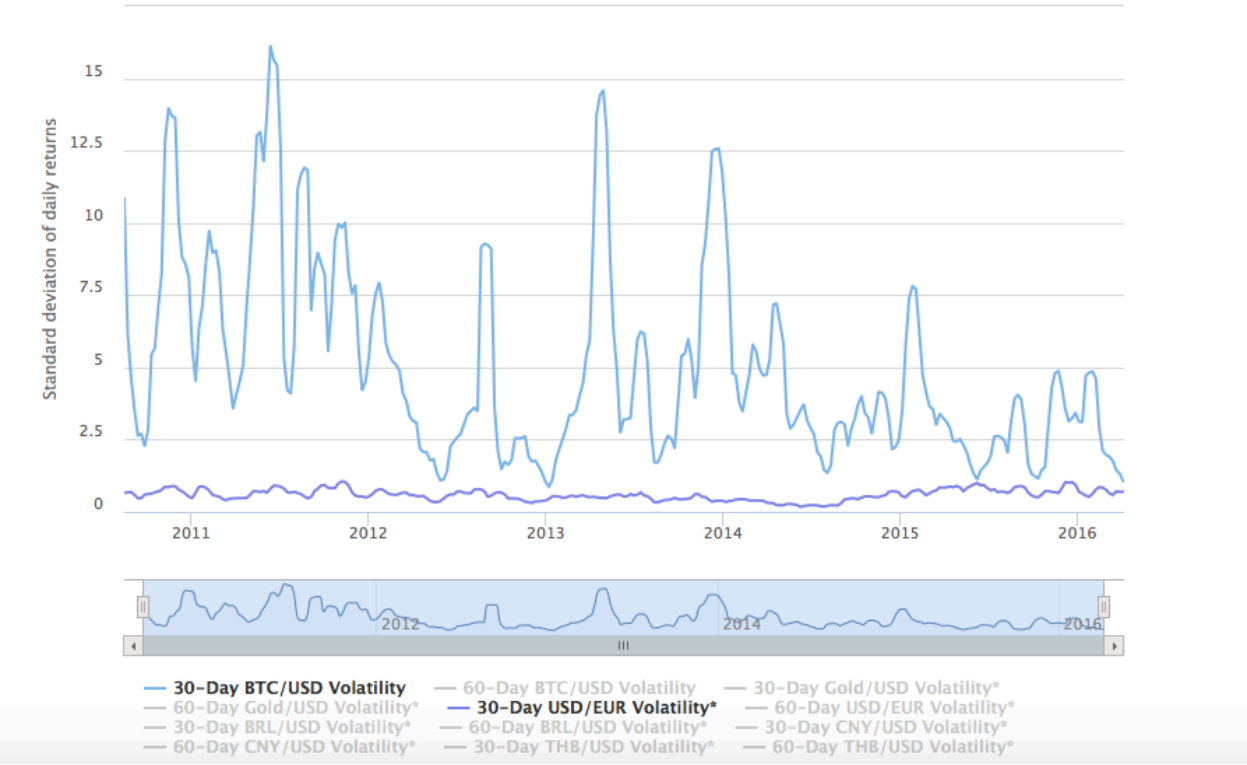

Figure 3: Bitcoin Volatility. Source:btcvol.info

Their assertations rely on factual basis, from the graph we can see a clear decreasing trend in the BTC/USD volatility, with the latest estimate indicating a 1.04% volatility. This figure when compared with the USD/EUR volatility 0.70% is even more indicative.

However, Bitcoin underwent some significant improvements in the recent years and gained in popularity. Yet, online security and global acceptance of Bitcoins remain major issues to be tackled in the future. Overall the digital supranational currency has potential and there is enough room to expand this idea to fully incorporate it in our modern financial markets.

Applications

An interesting application of Bitcoins is the case of capital controls in an economy.

4. The Case of Argentina

Argentina, one of the most significant and largest economies of the emerging South American continent, went through severe periods of depression in the last decades. One of the peaking points of the misfortune occurred during 2001 – 2002, where the government announced that the foreign debt reached its limits and could not be paid back. Argentina's default in 2001 amounted to nearly $100 billion in sovereign debt.

Striking macroeconomic metrics of Argentina's period of great depression 1998-2002:

- Real GDP fell by 28%
- Almost hyperinflationary peak in 2002 with about 41% inflation
- Unemployment rose to 23.6%
- Poverty reached an extreme level of 57.5%
- Real wages fell by 23.7%

After chaos and panic hit the nation in 2002, the Argentinian government decided to extremely strengthen its intervention in the economy and ultimately imposed austerity measurements as well as so called capital controls to better regulate the flow of capital. Until today, Argentina's prolonged economic problems of exacerbating stagnation and high inflation hurt the citizens and especially domestic businesses.

Capital flows in and out the country became a nightmare and people started to turn their heads to alternative options to tackle the issue of capital controls.

5. Bitcoins for Capital Controls

Capital controls effectively means that a government or another authority such as a central bank imposes strict measures to limit the flow of foreign capital that goes in and outside the economy. When capital is less available but still needed, you start looking at alternative options. That is exactly where Bitcoin comes into play and might be a potential solution for many Argentinian businesses, which have suffered from capital controls for many years now.

Argentina is a good example for analysing the implications of Bitcoin usage in a world where capital controls and the domestic currency issues play an important role. According to an article by the Financial Times, many small Argentinian businesses start to increasingly turn to Bitcoins and are positively surprised by the benefits it brings to them. First of all we should note that until today, many people do not even know what Bitcoin is and most of us are still concerned about the possible security issues it might bring. Yet, the ones that have used Bitcoins praise the additional return they have received through the unofficial currency market instead of the chaotic overvalued official exchange rate, which primarily suffers from restricted access to foreign currency.

The Latin American Bitcoin exchange saw an impressive surge in growth of the Argentinian market in light of their long lasting capital control issues and sees an increased demand coming ahead.

Also in China we have seen a broad adoption of bitcoins to circumvent capital controls. During much of the past year investment money has been flowing out of China's markets at a record pace, creating great instability. The largely state-controlled economy saw new measures to stem the tide, and massive capital controls were on the horizon, creating a great opportunity for

Bitcoins. Their unique ability to move money globally in seconds created a natural fit for any financial market in this situation. The transaction volume in the Asian country in bitcoins went from 540,324 in September to 1,152,889 in October.

Bitcoin has proved to be a ground-breaking innovation, which could potentially alter our currency market and might even be the perfect solution for capital controls.

6. The Future of Bitcoin

As already stated, Bitcoins are created each time a miner discovers a new block. The number of bitcoins generated per block is set to decrease geometrically, the result is that the number of bitcoins in existence is not expected to exceed 21 million. Some theorist thought to obviate to this problem through the creation of a new cryptocurrency that will be pegged against the original Bitcoin. This system will be based on the same idea of the gold standard, and will substantially solve one the major issues of Bitcoins, their deflationary nature.

Or as the very eclectic view of bitcoin expressed by Vice President of St. Louis Federal Reserve Bank, David Andolfatto, that, despite its limitations, states in its blog article titled, Is Bitcoin a Safe Asset; that "Bitcoin could be the world's next great safe asset". According to him this cryptocurrency certainly seems to have all the properties that are desired in a safe asset. Simplicity in the sense that it's a pure fiat object and a very simple monetary policy.

Nevertheless, the real disruptive innovation is not the Bitcoin itself, which is merely a crypto-currency, but is the blockchain technology behind it, that as Goldman Sachs says "has the potential to redefine transactions" and can change "everything."

In its purest form, a blockchain is a distributed database that maintains a continuously growing list of data that each refer to previous items in the chain.

In this way a full copy of the chain contains every "transaction" ever executed. This renders impossible the manipulation of the chain, since each node (computer connected to the network) has at least a partial copy of the chain, providing insight about facts like how much value belonged a particular address at any point in the past. At the same the same time this enables to avoids the need to have a centralized database.

The first Blockchain, a decentralized digital ledger, to be successfully put into use is the Bitcoin one. The Bitcoin network, as it is known, is accessible to anyone who wants to join and be part of. In other words, you do not need permission from anyone in order to run the Bitcoin core software. Thus, the Bitcoin Blockchain is a *permissionless* one (i.e. public blockchain).
On the other hand, several mainstream financial institutions and technology companies have embarked on building blockchains that are not free for anyone to be part of. For these latter versions of the blockchain, you need permission from some form of authority in order for you to join them (i.e. permissioned).

This would allow to apply same technology behind the Bitcoin could be applied to many other uses, revolutionizing our world.

Some possible fields could include:

- Smart Contracts: digital documents and proof of ownership for transfers
- Stock Exchanges: digital trading platform
- Smart Property: digitally recorded assets
- Health Records: decentralised patient records management

- Music Distribution: proof of ownership of digital content
- Secure Digital Voting: fraud proof anonymous digital voting solution

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