

## Bitcoin and Blockchain: A Threat or Opportunity for the Financial System

Gonca Atici

Assoc. Prof. Istanbul University / School of Business, Business Administration

### Abstract

As world economy evolved over years, barter which is a primitive transaction system left its place to money system. Commodity and bimetallic systems of money resolved the problems, especially the requirement of double coincidence of wants and eased the trade within parties. Chronologically, paper system of money followed the commodity system and implemented via two methods. In the first method, convertible paper money is converted into gold and silver by the authority that issued paper money. In the second method that is still valid today, fiat money is accepted by parties because of its being a legal tender. Money supply definitions keep changing as new liquid assets emerge day by day. Especially after the post global financial crisis, central banks have a more critical function for the world economies. Keeping all these developments aside, surrounded by fintech trends, financial system has confronted with a new instrument bitcoin that is first introduced in 2009. Though there are still too many consideration about this new financial instrument, number of bitcoins has growing since 2009 and has reached almost 17 million as of September 2018. Some economists consider bitcoin and other cryptocurrencies as a threat especially for central banks' emission power. In this study we try to shed light to bitcoin, other cryptocurrencies and blockchain technology with regard to their evolvement and whether they pose a threat or provide an opportunity to the financial system.

**Keywords:** Bitcoin, cryptocurrency, blockchain, central banks, regulation, financial system

### 1. Introduction

Money is an asset that is generally accepted as payment, for goods and services or repayment of debt (Cecchetti and Schoenholtz, 2011). Though definition of money supply keeps changing, as new liquid assets emerge day by day, money preserves its place at the core of the payment system. In the evolution of the payment system, commodity moneys takes the first place. Commodity moneys are things with intrinsic value. From ancient times until several hundred years ago, they functioned as medium of exchange. Second period has launched with paper currency that is also convertible into coins and precious metals. Over years, it evolved into today's fiat money. Decried by government as a legal tender, fiat money lost its feature of convertibility into precious metals. To overcome problems special to money, such as the risk of theft and transferring fees of huge amounts, a new step was taken towards modern banking instruments like checks, electronic payment and, e-money. First form of e-money was the debit card. A more advanced e-money is the stored-value card. A more sophisticated version is called a smart card. Another form of e-money is referred to as e-cash that is used in internet transactions. Though all these progress bring the idea of a cashless society, it seems the world is far from this alternative, at least for the near future. But another question arises as what will be the money of future? (Mishkin, 2016).

Following global financial turmoil of 2008, central banks of especially emerged economies have taken a leading role in terms of finding a panacea to the sub-prime mortgage backed problems. They have pursued several unconventional monetary policies such as quantitative easing, forward guidance, and negative interest rates in a rush to ease the unfavourable developments in global economic conjuncture. Under the scope of these effects, central banks of emerged economies have injected abundant liquidity to the financial markets in order to stimulate their economies (Atici, 2017). As a result of the monetary easing policies, balance sheet of the FED (Federal Reserve System) reached to \$4.4 trillion as of

the end of 2016 from the \$1 trillion in 2007. For the same period, balance sheet of ECB (European Central Bank) increased to \$3.5 trillion from \$2.1 trillion and balance sheet of BOJ (Bank of Japan) reached to \$4.1 trillion from \$1 trillion. When People's Bank of China included to the picture, whose balance sheet increased to \$5 trillion from \$2.2 trillion, total balance sheet figure of the four biggest central banks rocketed from \$5 trillion in 2007 to \$17.3 trillion as of the end of 2016 which represents a dramatic increase of 246% (Yardeni, 2017). Besides their other functions, central banks have come to the fore with their authority on money or money supply.

Several years after its creation as a new type of e-money, Bitcoin has boosted questions that if it can take the place of money in future. To answer this question a good starting point is to ask whether Bitcoin can fit the three classical functions of money, namely the medium of exchange, unit of account and store of value. Further questions will follow like, what are the other cryptocurrencies? What is the function of blockchain? We should also ask if bitcoin would turn to be a threat against the authority or emission power of central banks or an opportunity for the financial system. This study tries to shed light to these questions by analyzing the evolvement of bitcoin, other cryptocurrencies, and blockchain and whether these instruments pose a threat or provide an opportunity to the financial system. Section 2 presents the historical background. Section 3 discusses Bitcoin, Blockchain and monetary system. Section 4 concludes the paper.

## 2. Historical Background

Bitcoin is a private and decentralized digital currency. It has first developed by a person or a group operating under the name Satoshi Nakamoto in 2008 and has become operational by the early 2009 (Nakamoto, 2008). Unlike traditional fiat currencies, Bitcoin is not backed by a government decree. There is no authority that is in charge of its supply. It is not indexed to any other currency but its value with respect to other currencies is determined by supply and demand. Since it is a digital currency, it can be broken into very small numerical values. Bitcoin is a network that consists of computers covering the entire system. As a section of data in a massive database, it is just like a computer file that is assigned to a certain owner's digital address. It operates using peer-to-peer networking that eliminates the intermediary so that the exchange can be realized directly between parties. Users have digital wallets so they can trade between each other. The owner of a bitcoin can swap its ownership by sending bitcoin to a different personal wallet so by this way possession of a bitcoin can change. System employs cryptography to maintain the anonymity of its users to secure the transactions and to control the creation of additional units of currency, namely the "cryptocurrency" (ElBahrawy et al. 2017). At the core of the bitcoin system there is block chain. Block chain records every transaction that have ever taken place in bitcoin. So we can call it as a public ledger that details the history of every bitcoin. Block chain is sustained by participating computers which verify transactions in chunks called "blocks" and relay them across the network (Pagliery, 2014). Validation process relies on data being encrypted using algorithmic hashing. Encrypted value is a series of numbers and letters that does not share similarity with the original data, and is called a hash. Cryptocurrency mining involves working with this hash. Proof-of-work is the system that Bitcoin's blockchain network uses to create and hash blocks together. When the computer in a network must use proof-of-work for mining, it needs to solve a complicated mathematical problem. If a computer which is also named as node successfully solves the problem, it must then be verified by the other nodes in the network. If it does, the transaction is verified and completed, and the miner whose node solved it, is rewarded with Bitcoins.

There are hundreds of cryptocurrencies with market values and the common feature of these different cryptocurrency systems is the blockchain. Although all cryptocurrencies share an underlying blockchain technology and reward mechanism, they stand on isolated transaction networks. The majority of cryptocurrencies are almost the clones of bitcoin and referred to as 'altcoins'. On the other side, there are a number of cryptocurrencies that share common features of bitcoin but also have innovative features that provide substantial differences (Hileman & Rauchs, 2017).

Though year 2008 has taken as the milestone of Bitcoin, we can trace the roots of it in the Austrian theory of the business cycle. Ludwig von Mises revealed the hints to the problem of business cycles in his monument, *Theory of Money and Credit* (1933). He developed the cycle theory in 1920s and published his book *Monetary Theory and the Trade Cycle* (1933) and *Prices and Production* (1931) by the contribution of Friedrich von Hayek. This theory has become known as the "Austrian" theory of the business cycle.

According to the "Austrian" theory, without an expansion in bank credit, supply and demand tend to reach an equilibrium in a free price system. However, when government leads to a credit expansion through central bank, this increases the cash reserves of commercial banks which in turn increases bank credit supply and an increased supply of money or inflation. Another effect of an expansion in bank credit is the excessively funnelled new funds to real sector which leads to decreased interest rates that are artificially positioned below the level of free market rates. When interest rates fall artificially, investors prefer to invest more in capital goods since the previously unprofitable projects seem profitable by the lowered interest

rates. The credit flow boosts economic activities on one side but gives way to increasing costs of factors of production, on the other. If investments made do not match with consumer preferences than the gap between these two leads to a slow down and even a depression. The result reveals the fact that inadequate savings are not enough to buy the excessively produced capital goods. So firms re-adapt their production to match consumer's intertemporal preferences (Rothbard, 2009).

Friedrich Hayek, in "Denationalisation of Money" (1974) refers to the abolition of central banks. He figures that abolition of the government monopoly of the issuing money covers also the disappearance of central banks. He suggests private banks can issue non-interest bearing certificates or notes, with a district registered names. By this way, currencies that can provide a stable purchasing power would eliminate other less stable currencies from the market. These ideas describe a private currency created by private enterprises to end the monopoly power of central banks in the issuance of money (ECB, 2012).

We can trace roots of Bitcoin in the ideas of tech enthusiasts, as well. Chaum (1998), introduced a new kind of cryptography which enables an automated payment system that third parties could not see details on the payment made by the individual. Dwork and Naor (1992), suggested a moderately hard technique that would be computed by a user to gain access to a resource by preventing unnecessary use of that resource. British cryptographer Back (2002) proposed a function similar to the one submitted by Dwork and Naor (1992). He used the iteration, hashcash. Hashcash was proposed as a mechanism to suppress systematic abuse of internet resources such as email, and anonymous remailers. Dai (1998), in his paper, proposed an alternative money creation subprotocol, in which, account keepers decide and agree on the amount of b-money to be created each period, with the cost of creating that money determined by an auction. In a most recent paper, Szabo (1998) developed a proposal similar to b-money which is named bit gold and suggested those bits could be created online with minimal dependence on third parties, and securely stored and transferred.

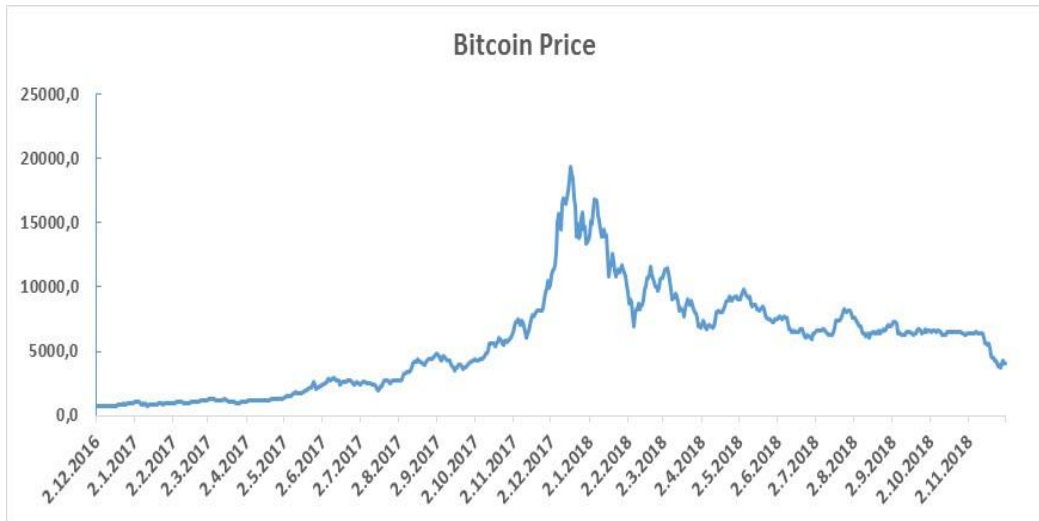
Some of the today's economists have basically two criticism concerning Bitcoin. First one is that, Bitcoin does not have any intrinsic value like gold and silver; it is just a bit stored in a computer. Another concern is, it becomes accepted not because of a government decree but because it has its roots in a commodity expressing a certain purchasing power (ECB, 2012). But besides these basic concerns there are some other concerns such as the regulatory environment which is an indispensable part of financial transactions, volatility of bitcoin's value, limitation of its supply, a possible bubble in its value and also environmental issues with regard to its mining.

### 3. Bitcoin, Blockchain and Monetary System

Milton Friedman, founder of monetarism, argued that central bank should increase the money supply by a constant percentage every year. Through the k-percent money supply rule, Friedman proposed to set the money supply growth at a rate equal to the growth of real gross domestic product each year. Almost twenty years ago, Friedman predicted and drew attention to the rise of cryptocurrencies, as well. He noted web as a major source for the emergence of a reliable electronic currency that can enable an anonymous online transaction between parties which can turn to be one of the major forces that will reduce the role of governments ([www.ntu.org](http://www.ntu.org)). While some views have suggested a connection between bitcoin's growth rate and the monetary growth rate adopted by Milton Friedman, the bitcoin protocol appears to give almost no attention to any optimal rate of monetary growth. The number of Bitcoins produced has reached 17 million as of November 2018 ([news.bitcoin.com](http://news.bitcoin.com)). According to the rule of the system, the number of bitcoins generated per block is set to decrease by 50 percent for every 210,000 blocks. As six blocks are found on average within an hour, this means almost every four years there will be halving to keep the inflation under control. By this declining growth rate, the final number of Bitcoins will be fixed at 21 million units by the year 2140. Though Bitcoin is intended to simulate the rarity of gold, whether the supply will be truly fixed has become a matter of disagreement (Yermack, 2013).

There are also concerns about the price of Bitcoin due to the high swings and volatility of it. As presented in Figure 1, high volatility is experienced in the price of Bitcoin especially in the last quarter of 2017 and first quarter of 2018. On the supply side, Bitcoin is overwhelmingly controlled by adopters and miners. On the demand side, scarcity have an important influence on the prices. Nonetheless, demand and supply determine the price. Other factors that lead to high volatility can be stated as investor (renowned investor) preferences, regulatory issues, speculation and manipulation.

Figure 1: Bitcoin Price



Source: data.bitcoinity.org

Another drawback of Bitcoin is whether it comprises a bubble or not. According to Roubini and Byrne (2018) "coin mania" consists of a risk of a bubble. They compare Bitcoin with the railway stocks in the 1840s at the dawn of the industrial revolution. They argue that as the bubble burst in railway stocks, a similar case can be expected for Bitcoin and other cryptocurrencies, as well. For a recent example it would be enough to recall the dot-com bubble of NASDAQ in year 2000. Similarities among these cases can be a signal of a possible burst in Bitcoin.

Despite the concerns mentioned above, if we turn back to the question of whether Bitcoin satisfies the three functions of money, it can be stated that Bitcoin satisfies being a medium of exchange. Transaction fees which are lower than the traditional payment vehicles and anonymous characteristic that is necessary for the parties that need privacy, makes it attractive for conducting transactions. However, volatility of Bitcoin makes it unfavourable in terms of unit of account and store of value functions. Since it is volatile, no one quotes its price in terms of Bitcoin. The volatility in its value makes Bitcoin unsuccessful as a store of value, as well. (Mishkin, 2016).

Transparency is the most important feature in the financial system. Stiglitz ([www.independent.co.uk](http://www.independent.co.uk)) highlights this fact and criticizes Bitcoin with regard to the anonymity in its nature. Governments concern about the uses of Bitcoin as it is also a convenient tool to conduct illegal operations such as drug trade, tax evasion, ransomware and money laundering. Several monetary authorities around the world warn the users of cryptocurrencies that regulations are around the corner in parallel to the increasing risks of it.

Thefts of Bitcoin and other cryptocurrencies are another issue of criticism towards the electronic currencies. In February 2014, Mt. Gox which is one of the largest Bitcoin exchanges experienced a theft that is almost 500 million USD. This theft led to the bankruptcy of Mt. Gox. Market cap of top ten cryptocurrencies is presented in Figure 2. Price increases in cryptocurrencies may turn them to potential targets of cyber criminals. Almost 1.1 billion USD worth of cryptocurrency was stolen in the first half of 2018 (Carbon Black, 2018). Unlike banks, cryptocurrencies are not typically protected or insured by a third party so this reveals the importance of security and necessity of a regulatory mechanism.

Figure 2: Market Cap (Billion USD) as of 02.12.2018



Source: [coinmarketcap.com](http://coinmarketcap.com)

Another dimension of cryptocurrency issue is the absence of a lender of last resort that will manage the economy. Modern central banks of today have more or less the same dominant function in economies, in terms of maintaining stable prices, supporting employment, ensuring the safety and soundness of banking and financial system, stabilizing the financial system during crisis and monitoring the payment system. During the Global financial crisis, the U.S. Federal Reserve has managed to stabilize the financial system by using all its monetary tools. In order to perform their duties, central banks can pursue an expansionary or contractionary monetary policy. They can implement open market operations for contracting or expanding the monetary base. They can change interest rates in order to control inflation. Their actions affect both actors of real economy and households. Advocates of the Austrian School of Economics support the implementation of peer-to-peer networking that eliminates central banks and their complex schemes to democratize the financial system. Even so, cryptocurrencies are far from satisfying immediate liquidity demand when necessary or stabilizing the economy in downswings. Furthermore, thousands of individual cryptocurrencies can not provide the required connection and communication with the fiscal side by their current form (Fatas and Mauro, 2018).

Despite all its drawbacks, cryptocurrencies promise efficient and low cost transactions with their underlying technologies. In order to take advantage of this asset, some central banks have started to consider whether they can issue digital currency of their own. Bank for International Settlements define this potential digital currency as Central Bank Digital Currency (CBDC) as a digital form of central bank money that is different from balances in traditional reserve or settlement balances held by commercial banks at central bank. By introducing CBDC, central banks could satisfy policy goals with respect to financial inclusion, consumer protection, privacy and fraud prevention. However, introducing CBDC could result in a wider presence of central banks in the financial system which could cause greater political interference, as well. CBDC could affect the overall value of money issuing function as it reduces the high fixed infrastructure costs and operational costs such as printing, storage, transportation and settlement. If it could manage to be an attractive asset it could also serve as a substitute for other non-deposit financial assets. If it would highly accepted by the users, the increase in its circulation might contract the overall seigniorage. A significant reduction in seigniorage could lead to financial losses in the absence of alternative sources of income and moreover could risk monetary policy and financial stability goals through negative or low capital (BIS, 2018).

While the excitement about Bitcoin seemed to be settled, blockchain technology is attracting growing interest. It makes it hard to cheat the transactions, saves cost, speeds clearing and settlements, reduces operational risks and keeps transaction details confidential other than supervisors. Moreover, it improves the bargaining power of buyers and sellers due to the absence of third parties. All these improvements undermine the intermediary function of traditional financial institutions but provides opportunities for central banks. Blockchain-based transactions denominated even in domestic currency might provide swiftness to the operations of central banks by the time saved from complex clearing operations.

So all clearing mechanism could shift to new decentralized networks (Niepelt, 2016). This technology may require redefining of the procedures of financial system and roles of its actors over again.

#### 4. Conclusion

Although Bitcoin and other cryptocurrencies are created as a reaction to central banks and to their complex schemes to democratize the financial system, they seem to be accepted by a limited audience for several reasons. Nevertheless, cryptocurrencies inspire the actors of the financial system and fintech companies with their underlying technologies to develop productive facilities.

Cryptocurrencies have many inadequacies in their current forms in terms of legal infrastructure, insurance, transparency, sustainability and regulation but they also have some other features such as fast transaction, low transaction fees and anonymity which attract considerable attention. Some countries strictly ban virtual currencies while some others try to find ways to control it. Considering the potential of it, some central banks seem to work on digital currencies in order to issue their own digital currency in the near future. By this way they can satisfy policy goals with respect to financial inclusion, consumer protection, privacy and fraud prevention. However, on the other side this may lead to a wider presence of central banks in the financial system. Moreover, digital currencies may also affect the seigniorage shares of central banks and result in financial losses in the absence of alternative sources of income.

Above all, blockchain technology promises cost and time saving transactions. If central banks could interiorise this technology, current procedures of the financial system and roles of its actors may change, as well. Bitcoin, alt coins and their underlying technologies provide a crucial opportunity to the financial system to transform into an advanced level.

#### References

- [1] Atici G. (2017). Global financial crisis and Islamic financial products. *China-USA Business Review*, 173, 549-556.
- [2] Yermack D. (2013). Is bitcoin a real currency? An economic appraisal. *NBER Working Paper Series*, 19747, 1-24.
- [3] **Book:**
- [4] Cecchetti, S., G., & Schoenholz, K. L. (2011). *Money, banking, and financial markets*. (3rd ed.). New York: McGraw-Hill/Irwin.
- [5] Hayek, F. A. (1974). *Denationalisation of money*. Sussex: Goron Pro-print.
- [6] Hayek, F. A. (1931) *Prices and production*. New York: Augustus M. Kelly
- [7] Mises, L. V. (1953). *Theory of Money and Credit*. New Haven: Yale University Press
- [8] Mises, L. V., & Hayek, F. A. (1933). *Monetary theory and the trade cycle*. New York: Sentry Press
- [9] Mishkin, F. S. (2016). *The economics of money, banking, and financial markets* (11th ed.). England: Pearson.
- [10] Pagliery, J. (2014). *Bitcoin: and the future of money*. Chicago Press: Triumph Books.
- [11] Rothbard, M. N. (2009). *Economic depressions*. Alabama: Ludwig von Mises Institute.
- Reference to a web source:**
- [12] Back, Adam, (2002), *Hashcash-A Denial of Service Counter-Measure*. [Online] Available: <http://www.hashcash.org/papers/hashcash.pdf> (September 12, 2018)
- [13] Bank for International Settlements, *Central Bank Digital Currencies*. [Online] Available: <https://www.bis.org/cpmi/publ/d174.htm> (September 5, 2018)
- [14] Carbon Black, *Threat Report: Cryptocurrency Gold Rush on the Dark Web* [Online] Available: <https://www.carbonblack.com/2018/06/07/carbon-black-threat-report-cryptocurrency-gold-rush-dark-web/>(November 20, 2018)
- [15] Chaum, David (1982), *Blind Signatures for Untraceable Payments*. [Online] Available: <http://sceweb.sce.uhcl.edu/yang/teaching/csci5234WebSecurityFall2011/Chaum-blind-signatures.PDF> (September 10, 2018)
- [16] Dai, Wei, (2002), *B-Money*. [Online] Available: <http://www.weidai.com/bmoney.txt> (September 16, 2018).
- [17] Dwork, Cynthia & Naor, Moni, (1992), *Pricing via Processing or Combatting Junk Mail*. [Online] Available: <http://www.wisdom.weizmann.ac.il/~naor/PAPERS/pvp.pdf> (November 16, 2018)
- [18] ElBahrawy, A., Alessandretti, L., Kandler, A., Pastor-Satorras, R., and Baronchelli, (2017), *A. Bitcoin ecology: Quantifying and Modelling the Longterm Dynamics of the Cryptocurrency Market*. [Online] Available: <https://www.semanticscholar.org> (November 7, 2018)
- [19] European Central Bank (ECB) (2012), *Virtual Currency Schemes*. [Online] Available: <http://www.ecb.int/pub/pdf/other/virtualcurrencyschemes201210en.pdf> (November 10, 2018).
- [20] Fatas, Antonio, & Weder, Beatrice, *Making (some) Sense of Cryptocurrencies: When Payments Systems Redefine Money*. (2018) [Online] Available: <https://voxeu.org/article/making-some-sense-cryptocurrencies> (September 21, 2018)

- [21] Hileman, Garrick & Michel Rauchs, (2017), Global Cryptocurrency Benchmarking Study. [Online] Available: <https://www.jbs.cam.ac.uk/faculty-research/centres/alternative-finance/publications/global-cryptocurrency/#.XB0TY1UzblU> (November 1, 2018)
- [22] Nakamoto, Satoshi, (2008). Bitcoin: A Peer-to-Peer Electronic Cash System, [Online] Available: <http://bitcoin.org/bitcoin.pdf> (August 15, 2018)
- [23] [news.bitcoin.com](https://news.bitcoin.com) (November 15, 2018)
- [24] Niepelt, Dirk, (2016), Central Banking and Bitcoin: Not Yet a Threat. [Online] Available: <https://voxeu.org/article/central-banking-and-bitcoin-not-yet-threat> (September 15, 2018)
- [25] Roubini, Nouriel & Byrne, Preston, (2018), The Blockchain Pipe Dream [Online] Available: <https://www.project-syndicate.org/commentary/blockchain-technology-limited-applications-by-nouriel-roubini-and-preston-byrne-2018-03?barrier=accesspaylog> (November 15, 2018)
- [26] Yardeni Research, Inc. (2017), Global Economic Briefing: Central Bank Balance Sheets. [Online] Available: <https://www.yardeni.com> (November 10, 2018)
- [27] <https://www.ntu.org> (September 18, 2018)
- [28] <https://www.independent.co.uk/news/business/bitcoin-latest-news-outlawed-nobel-prize-winner-joseph-stiglitz-comments-a8083416.html> (November 1, 2018)