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Throughout the process of writing this report, all participants have contributed equally and are collectively responsible for the content of the report. Hence, it is difficult to separate the work which have been done. Each member has done 1/3 of the total amount of work.

Signatures

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A qualitative study on Bitcoin

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1. Introduction

The topic of this project is the cryptocurrency Bitcoin. In particular, the report focuses on giving a qualitative description of different risks associated with Bitcoin, and what consequences these risks entail for companies and the society. The aim of this study is to give the reader insight into what Bitcoin is, how and why it was created, some brief knowledge about the technology behind it and especially the different risks which are associated with Bitcoin. In particular, the report aims to answer the following question:

What are the major risks associated with Bitcoin, and what consequences do these risks have for companies and the society?

2. Theoretical framework

In this section, theory on Bitcoin will be presented.

2.1 The emergence & definition of Bitcoin

As a consequence of the chaotic circumstances during the Great Recession in 2008, a distrust of the financial system and banks in particular, started to grow more rapidly. An anonymous group or person called Satoshi Nakamoto (as of today's date, it is not known whether Satoshi Nakamoto is a group of people or a single person) addressed the distrust-issue by writing a paper, describing a way for transactions to occur without involving a third party. This created the foundation for a new type of digital currency and/or asset, called Bitcoin. It is a type of digital property that works as a currency and financial asset at the same time. Transactions are made through an integrated blockchain, which will be described later. Bitcoin was created with the main goal to establish a currency which is totally decentralized and therefore not controlled by anyone. Because of this reason, the transaction record of Bitcoin is fully transparent and publicly available (Santos Ferreira, 2018).

The creation of Bitcoin and the Blockchain was a rather revolutionary idea which differs from how traditional fiat currencies and financial systems work. It uses cryptographic proof which allows users to maintain their anonymity. It was on the third of January in 2009 that the Blockchain was launched, and the first Bitcoin-block was mined. About a week later, the first test-transaction was made. About a year later, the first actual economic transaction took place. The first Bitcoin-transactions were finalized on forums on the internet, where salesmen of different products/ services exchanged their products/ services for Bitcoins instead of regular currency (US News, 2022).

2.2 The Blockchain

The Blockchain is one of the most sophisticated and innovative technologies created. A Blockchain is a database that stores information in blocks, or groups. As a transaction takes place, the transaction gets stored in a certain block. Each block has its own capacity and can contain a certain number of transactions, and as the blocks get filled up, they then get linked with previous filled blocks. Together these create a chain, which forms "the Blockchain". The transaction history is publicly available, but no single person can make any alterations by themselves in the information contained in the Blockchain. To make any alterations to the Blockchain, a majority of the network, i.e., 51%, must reach a consensus about what is to be altered (Investopedia, 2022).

The Blockchain uses hashing to make sense of the information stored in each block. Hashing is the process of transforming an input of random length to an output of a fixed length. In the example of a Bitcoin transaction, the hashing algorithm takes a random transaction information and returns a combination of letters, numbers, and special characters to represent that information. This combination is called a hash, and you can simply input the hash that represents the transaction to see where in history the transaction took place. The Bitcoin system relies on the Secure Hashing Algorithm 256, or the SHA-256, to perform the necessary calculations to transform the transactions into secure hash

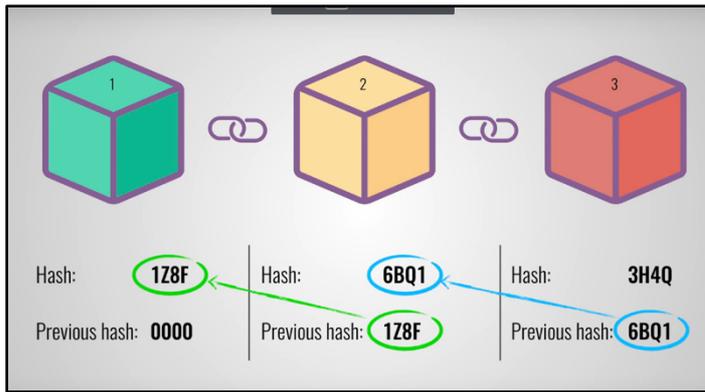


Figure 1: Hashing process of the Blockchain (Onlinehashcrack, 2021).

codes. These hash codes are used for other reasons as well, e.g., addresses, signatures, and crypto mining, which will be presented further down (Onlinehashcrack, 2021).

As blocks get added to the Blockchain, the hash code from the previous block gets added to the latest. This makes hacking and stealing cryptocurrency extremely difficult. As mentioned before, unless a majority reaches a consensus, nothing in the Blockchain can be changed. Therefore, if an unauthorized actor attempts to steal

cryptocurrency from the Blockchain, by making certain alternations, he or she must control at least 51% of the Blockchain. Otherwise, the network would know that unauthorized changes have been made and the attempt would be ruled as illegitimate (Investopedia, 2022).

2.3 Bitcoin mining

Bitcoin mining is the process in which new Bitcoins are created. The mining process consists of an algorithm which is supposed to be solved, and when someone succeeds the reward is paid out in terms of Bitcoin. The algorithm may sound like some advanced math puzzle, but in reality, it consists of a 64 digit hexadecimal number (a number consisting of 64 digits where each digit has a random possibility of 16 different characters). The solution is created by a computer through the process of guessing a random number meeting these criteria, which would solve the equation (Investopedia, 2022).

Once a computer gets the right guess, it becomes the temporary “banker” (who is responsible for finalizing transactions in the Blockchain). The mining program used for solving the algorithm now determines a group of currently pending transactions and puts them together into a block, this block then gets updated to the Blockchain (99Bitcoins, 2022).

Together the block and the solution to the algorithm is sent out to the entire network so it can be validated by the other computers. When a computer validates the solution, it updates its own copy of the Blockchain with the new transactions included in the recently created block. As a compensation for the time and energy spent to solve the algorithm and updating the blockchain, the actor who manage to do this gets a fixed Bitcoin payment, called a block reward. Block rewards started at 50 Bitcoin in 2009 and halves every 210 000 blocks. The current block reward is set at 6.25 Bitcoins. Eventually, after halving 64 times, the block reward will reach zero. Additionally, any transaction fees attached to the transactions inserted to the block will also get paid out (Coinmarketcap, 2022).

3. Bitcoin risks

In this section, different risks associated with Bitcoin will be presented.

3.1 Volatility risks

Since Bitcoin was made available for the public, its price has increased from only fractions of a dollar up to thousands of dollars. It is not uncommon that the price of Bitcoin either rises or falls by many thousands of dollars, just within a couple days (Investopedia, 2022).

But what is it really that makes the price of Bitcoin so extremely volatile? As one might guess, there is no unambiguous answer to this question. The reason for the great volatility can be derived from numerous factors, which will be presented in what follows next.

3.1.1 Supply and demand

One of the key drivers of the Bitcoin price is the interaction between supply and demand in the Bitcoin market. What drives demand is primarily the value of Bitcoin as an instrument of exchange, that is, its value in future exchanges. The supply is given by the number of Bitcoins in circulation on the market, which is publicly known. The way of which supply-demand impacts the price of Bitcoin, can be expressed mathematically. It is assumed that market participants must convert Bitcoins into some other currency, as they operate in economies using, e.g., Euros to buy production factors. Assume that B denotes the total amount of Bitcoin circulating on a certain market, and that P^B denotes the exchange rate of Bitcoin (that is, Euro per unit of Bitcoin). Then the aggregate supply of Bitcoin money, denoted M^S , is given by:

$$(1) \quad M^S = P^B B \quad (2) \quad M^D = \frac{PY}{V} \quad (3) \quad P^B = \frac{PY}{VB}$$

Furthermore, the demand for Bitcoin circulating in the market, denoted M^D , depends on the general price (P) of services and goods, according to assumptions made. M^D also depends on Y , which represents the size of the Bitcoin economy and the velocity of Bitcoin circulation, denoted V . In particular, the bitcoin velocity is a measure of the frequency at which Bitcoin is used for purchases of services and goods in a market. The velocity is dependent on the opportunity cost for holding it. M^D is given by (2). The equilibrium between supply and demand, i.e., (1) and (2), gives the expression (3) for the equilibrium price. In a hypothetical, perfect market, the price equilibrium given by (3), entails that the price of Bitcoin decreases with the velocity and the total amount of Bitcoin available on the market increases. In contrast, the price increases with the size of the Bitcoin economy and the price level (Ciaian, Rajcaniova & Kancs, 2014).

3.1.2 Actions of investors

Another key driver of the Bitcoin price are the actions of actors who invest in it. The demand of Bitcoin increases because supply is becoming increasingly limited. One-third of all Bitcoins available, were possessed by the top 10,000 investors at the end of 2020, according to the National Bureau of Economic Research. The largest Bitcoin holders are called “Bitcoin Whales”. These investors largely impact the volatility, since if one or several whales would begin to sell their assets, prices would fall, and other whales or general investors would probably start panic selling as well. However, there is a ceiling for the amount of Bitcoin which can be liquidated (i.e., turned in to cash) in a single day, which is about 50 000 dollars. If the price of a Bitcoin stays around today’s value, which at the point of writing this report is around 50 000 dollars, large investors can only turn one coin per day into cash. Then other investors would begin selling as well, and prices would go down before anyone with a possession larger than 50 000 dollars in coins could sell them all, which then would result in very big and quick losses (Investopedia, 2022).

3.1.3 Media portrayal

Through the use of media platforms, people from various places in the world get the opportunity to post and discuss different subjects with other people. According to various studies, the price of Bitcoin is directly affected by its portrayal in the media. For instance, this was made very clear when Elon Musk, in February 2021, announced that Tesla had purchased 1.5 billion dollars worth of Bitcoin. As a consequence of this announcement, Bitcoin hit its (up until that point) all time high of 44 000 dollars. Furthermore, Tesla also declared that they would start accepting Bitcoin in exchange for their products. This statement made Bitcoin trending for several weeks to come and its value increased dramatically. In contrast, trends in social media can have a harmful impact as well. This has been exemplified by the Bitcoin price dipping to record lows on occasions when news of crypto exchange hacks has been trending on social media (The Gazette, 2021).

In addition, the studies of (Bai, Mai, Shan & Wang, 2018) indicate that social media is vital to the general public’s acceptance of Bitcoin. They establish that bullish (term for being optimistic) posts entails positive returns. Whereas, on the other hand, bearish (term for being pessimistic) entails

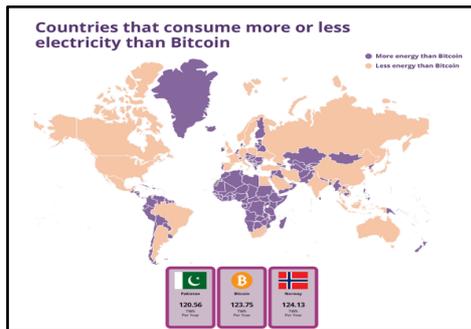


Figure 2: Countries that consume more or less electricity than Bitcoin. (Moneysupermarket, 2021).

negative returns. The higher the level of disagreement among the public, being reflected in different comment sections, results in a higher exchange of trading volume.

3.2 Environmental risks

Mining Bitcoins requires huge amounts of energy. The high energy consumption is causing a big concern for the environment, because the majority of the energy used for Bitcoin mining comes from nonrenewable energy sources. In China, who is the world leader in Bitcoin mining-facilities, most of the energy comes from coal power plants (Lou, 2019).

The second part of Bitcoin which concerns the global environment are the transactions. One Bitcoin transaction requires enormous amounts of energy and is very ineffective. In a study done in 2021, it was shown that one single Bitcoin transaction was using 1173 KiloWatt hours (KWh) of energy. The same amount of energy could be used to power the average UK home for more than three months. The same study showed that Bitcoin alone was using more energy annually than 185 different countries, and could be compared to the annual energy consumption of Norway (Moneysupermarket, 2021).

While considering the high energy consumption caused by Bitcoin, the question which arises is whether another less energy consuming method could be implemented to Bitcoin to provide the needed security within the Blockchain network (Lisk Foundation, 2019).

3.3 Legal risks

For an asset to be characterized as a currency it must be issued, used, and accepted by some country. Bitcoin however may fulfill two of the criteria above, but it remains to be acknowledged as a currency for a specific country. Hence, if one is very strict, it should not be referred to as a currency. Therefore, issues regarding Bitcoin arise in several areas. One major question is: how should the government tax crypto currency profits? As Bitcoin is treated as property, it is also taxed as such. For that reason, investors are obliged to report each transaction made with crypto assets and convert it into the regular currency used in the country that the investor lives and pays taxes in. This imposes the investor to be utterly thorough when converting these transactions, making it unnecessarily burdensome work. In addition, the United States classifies crypto assets as capital assets, meaning that investors must pay capital gain taxes on each crypto asset they own.

Further, account hacking has also been a major issue with holding Bitcoin on the internet. As an account is the only barrier between a person and getting hold of the person's Bitcoin, many people have had their accounts hacked and therefore their money stolen. As Bitcoin is decentralized and no third-party actor controls the market, having your account hacked means that there is no way to regain your lost belongings. This means that not only is an investor risking money as they invest in highly volatile assets, but they stand to lose all their investments by some incident not even remotely connected to the fluctuations of the market. This is one of the major reasons many people stay away from long term investments regarding Bitcoin (Freeman Law, 2021).

Cryptocurrencies can be a very suitable way to launder money, even though the transactions are transparent and recorded within the Blockchain. The reason for this is that the transaction data is not linked to any names or any other personal information. Instead, every transaction is linked to usernames and specific accounts. The fact that cryptocurrencies like Bitcoin are somewhat anonymous and challenging for law enforcement agencies to track, makes it an exceptional tool for criminal and terrorist networks to use without the same risk of being traced (van Wegberg, Oerlemans, van Deventer, 2018).

This risk of Bitcoin being used for criminal purchases and indirectly helping criminals to hide their

activities is further confirmed by a study done by Europol in 2015, which showed that 40% of all identified criminal-to-criminal payments were done solely via Bitcoin (Europol, 2015).

Experts estimate that money laundering in cryptocurrencies will become more common in the future, especially if cryptocurrencies are established as general means of payment (Weaver, 2018).

4. Analysis and conclusions

In this section, consequences of different risks associated with Bitcoin will be presented from two different perspectives.

4.1 Consequences of the risks for companies

Of course, companies that accept Bitcoin as a means of payment are going to be directly affected by the volatility of the price, which may cause uncertainty within the business. Furthermore, companies that only accept fiat currencies are also affected by volatility, but probably not to the same (sometimes extreme) extent. On the other hand, the volatility of Bitcoin may also be seen as a possibility for individual companies. Since Bitcoin is seen as a financial asset as well as a currency, companies can profit from great volatility if assets are purchased and sold at favorable times.

As described earlier, volatility is affected by e.g., the actions of investors and media portrayal. Companies who either consider accepting Bitcoin as a means of payment or as a financial asset used for trading, are therefore going to have to increase their knowledge within these areas. In particular, companies must be aware of the volatility-risks (or possibilities) of Bitcoin and which factors that affect it, but at the same time, they must understand that knowledge within these areas does not give a guarantee as to what the future will bring.

In an earlier section, environmental risks associated with Bitcoin were described. Today, it is widely known that companies who intend to be competitive and have a leading position within their business are forced to take the sustainability issue seriously, and adapt their business according to new sustainability requirements. The environmental risk of Bitcoin might not be the risk which is spoken about firsthand today. However, it is reasonable to expect that this is going to be even more discussed and paid attention to in the future. As previously discussed, the way Bitcoin is working today in terms of its environmental impact is not applicable to the future, assuming that Bitcoin wants to be a market leader. To conclude, companies will have to make a strategic decision as to whether to adopt Bitcoin as a means of payment or as a financial asset used for trading, given its environmental impact.

Finally, companies will also have to consider the legal risks associated with Bitcoin. As described earlier, the use of Bitcoin might, e.g., entail money laundering. Turning “dirty money” clean is a way of supporting criminal organizations and their activities, and there is undoubtedly a moral aspect for companies to consider here.

4.2 Consequences of the risks at society level

How volatility risks may affect societies is not as intuitive as for companies, since it depends on to which extent Bitcoin is an established means of payment in a particular society. In the extreme case, where Bitcoin has completely replaced ordinary fiat currencies, volatility is going to affect the society in a much greater way, compared to if it only functions as a complementing currency. However, in the much hypothetical case where Bitcoin is the exclusive currency within an economy, numerous amounts of risk-analyses would need to be conducted to even initiate the process of replacing the current fiat currency with Bitcoin, which makes it difficult to analyze the volatility risk for societies.

As stated earlier, Bitcoin requires a lot of energy for its mining and transaction processes. It is not close to as energy efficient as most of the established currencies used for transactions in today's society. If this extra energy does not come from renewable energy sources, it would have a negative impact on the climate, as it would speed up the global warming process. However, discussing the consequences of global warming goes beyond the purpose of this text.

If Bitcoin as a means of payment becomes more common in societies, this will most likely facilitate accelerated growth of criminal activity. As in the case of volatility risk, if Bitcoin is the exclusively used currency within an economy, it is again very likely that a lot of analyzes would have been made to prevent the growth of criminal activity in the best possible way. It is also important to note that illegal and criminal opportunities are not something that is rare, or exclusive to Bitcoin for that matter, it is something that almost always comes as a consequence of new implementations.

The rapid growth of decentralized cryptocurrencies like Bitcoin removes the risk of banks and governments controlling and manipulating the digital assets and properties. But this also means that the banks and governments will be left with less influence over its people and other nations. This could create a hostile environment. As a consequence of decreasing influence from governments, companies get larger influence and individuals become increasingly independent.

If Bitcoin were to be the main currency used in the world right now, it would change the whole nature of the tragic situation that is currently happening between Ukraine and Russia. The decentralized currency would most likely mean that it would be a lot harder to apply sanctions to the Russian nation. The civilian's personal savings and other assets would probably not be as affected by the crisis.

The size of the risks and the potential benefits strongly depends on how the specific society is run today. For countries where there is a low degree of corruption and where the financial system is working well, the risks become bigger because the society is changing from a system that already works well. In a situation where the country is not as well run financially or where there are conflicts and other insecurities, a decentralized financial system like Bitcoin could be a better solution.

4.3 Conclusions

As stated earlier, the aim of this study was to find the major risks associated with Bitcoin and analyze what consequences these risks have for companies and the society. The major risks which have been identified are the risks caused by high volatility, the increased criminal activity that could emerge from the possible implementation of a new financial system, and the negative effect Bitcoin could have on the climate.

As earlier discussed, all risks associated with establishing Bitcoin as the exclusive currency within an economy would require numerous amounts of risk analyses before the actual implementation could be made. As a result, these would clarify both which risks that are present, and the probability of the risks being handled before they become a major problem would increase.

Furthermore, these risk analyses would need to be both qualitative and quantitative. The qualitative approach is necessary for identifying the risks, while the quantitative approach is essential for estimating the size of the risks. Hence, the qualitative approach analysis is required to be performed prior to the quantitative one, and the one without the other is rather useless. This is well summarized by the following quote: "If one does not understand the real-world situation well enough, the best quantitative tools will not help".

5. Recommendations for further reading

One of the purposes of the underlying report is to give the reader a qualitative introduction and basic understanding of how Bitcoin works, and the major risks involved. To further grasp the concepts of Bitcoin, the reader should also consider a quantitative analysis of Bitcoin where the following article could be of great aid: <https://doi.org/10.1016/j.procs.2022.01.152>

If the reader wishes to deepen their knowledge in the legal issues regarding Bitcoin, the following article would be useful: <https://doi.org/10.1016/B978-0-12-802117-0.00013-8>

As for the environmental aspect of Bitcoin, the reader should consider reading about the e-waste problems caused by Bitcoin. The following article should be helpful:
<https://doi.org/10.1016/j.resconrec.2021.105901>

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