

BITCOIN AS MONEY

Economic analysis

Abstract

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Title of publication Bitcoin as money Economics analysis		
Name of Degree Bachelor of Business Administration		
Abstract <p>Bitcoin is a new and curious phenomenon as it brings a fresh and unique way of approaching the concept of money. Bitcoin is ever more often brought up in conversation, which makes it a current research topic.</p> <p>Because of the growth of Bitcoin, there is an increasing amount of skepticism aimed toward it declaring that bitcoin is not money, nor cannot ever become one. The purpose of this thesis is to analyze bitcoin as money. The theoretical framework will be theories from the Austrian school of economic thought regarding the emergence of money and its properties. These theories will be compared with collected primary and secondary data to find out whether bitcoin matches the theories' description of money</p> <p>The thesis begins with the authors' brief description of the core principles and research methodology used in the Austrian school of economic thought, after which the emergence, function, and properties of money are described. Primary data is collected from an online survey. Secondary data is obtained from various books, online books, web articles, forum messages, and academic research. Both primary and secondary data are used to answer research questions.</p> <p>Both primary and secondary data are used to create comparisons to find out what similarities bitcoin has with the theories presented in this thesis. This research uses a deductive approach to answer research questions. The research results show that while bitcoin does function as a medium of exchange, it cannot be considered money yet.</p> <p>This thesis aims to be useful for anyone interested in bitcoin's viability as money. Further research ideas are proposed at the end.</p>		
Keywords Bitcoin, money, economics		

Tiivistelmä

Tekijä(t) Thagapsov Arsen Kozlovskiy Maxim	Julkaisun laji Opinnäytetyö, AMK Sivumäärä 55	Valmistumisaika Syksy 2020
Työn nimi Bitcoin as money Economics analysis		
Tutkinto Tradenomi, Kansainvälinen kauppa		
Tiivistelmä <p>Bitcoin on uusi ja merkillinen ilmiö, joka tuo tuoreen ja ainutlaatuisen lähestymistavan rahan käsitteeseen. Bitcoin nousee yhä useammin puheenaiheeksi, mikä tekee siitä ajankohtaisen tutkimuksen aiheen.</p> <p>Bitcoinin suosion kasvun myötä siihen kohdistuu yhä enemmän kritiikkiä. Monen mielestä bitcoin ei ole rahaa, eikä voisi myöskään koskaan kehittyä siksi. Tämän opinnäytetyön tarkoituksena on tutkia bitcoinia rahana. Teoreettisena pohjana toimii itävaltalaisen taloustieteen lähestymistapa. Tätä teoriaa verrataan kerättyyn primaari- ja sekundaaritietoon, jotta voidaan selvittää vastaako bitcoin teoriassa olevaan rahan kuvaukseen.</p> <p>Opinnäytetyö alkaa itävaltalaisessa taloustieteessä käytettävän tutkimusmetodologian kuvauksesta, jonka jälkeen kartoitetaan teoriassa esitetty rahan alkuperä, tarkoitus ja ominaispiirteet. Primaaritieto on peräisin suoritetusta kyselytutkimuksesta. Sekundaaritieto koostuu painetuista lähteistä, verkkoartikkeleista, foorumiviesteistä ja akateemisista tutkimuksista. Sekä primaaritietoa että sekundaaritietoa käytettiin vastaamaan tutkimuskysymyksiin.</p> <p>Kyselyssä kerättyä tietoa verrataan teoriassa esitettyyn tietoon, jotta kyetään selvittämään mitä yhtäläisyyksiä bitcoinilla on esitetyn teorian kanssa. Opinnäytetyössä käytetään teorialähtöistä deduktiivista päättelyä vastatakseen tutkimuskysymyksiin. Tutkimustulokset osoittavat, että bitcoin toimii vaihdannan välineenä, mutta sitä ei voida kuitenkaan vielä tänään kutsua rahaksi.</p> <p>Tämä opinnäytetyö pyrkii olemaan hyödyllinen kaikille, jotka ovat kiinnostuneita bitcoinin elinkelpoisuudesta rahana. Lopuksi on esitetty ehdotuksia jatkotutkimuksille.</p>		
Asiasanat Bitcoin, raha, taloustiede		

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LIST OF TERMS

ATH: Stands for All-time-High which is the highest a cryptocurrency has been in history in a specified metric (CoinGecko 2020).

Bitcoin (network): Peer-to-peer network that operates by following the Bitcoin protocol. Written capitalized.

Bitcoin (protocol): A set of rules that Bitcoin network participants abide by. Written capitalized.

Bitcoin (unit): The unit or token native to the Bitcoin network. Written non-capitalized.

Fiat money: Money that is not backed by gold or any other precious metals, the nominal value of which is established and guaranteed by the state, regardless of the value of the material used to make them (Investopedia 2020).

Good: A commodity or service that is useful to man but that must be paid for —usually used in the plural (Merriam-Webster 2020).

1 INTRODUCTION

Since its inception on 31st of October 2008 (Nakamoto 2008, 1) Bitcoin has been discussed as an economic phenomenon, from early enthusiasts to state leaders. The pseudonymous creator has clearly stated that they intended bitcoin to be used as money in the most direct meaning (Nakamoto 2008, 1). This has caused many economics enthusiasts of various backgrounds to start examining if it can indeed function as such.

In the beginning, Bitcoin was just an idea in its inventor's head. After the Bitcoin network went live, bitcoin existed for a brief period without any price. Eventually, bitcoin started appreciating in purchasing power and is currently valued at \$310bn in terms of market capitalization according to figure 1. This is the current value the market has assigned to bitcoin.

The road to its current state has been accompanied by skeptics saying that it cannot become money because of several reasons. The goal of this thesis is to offer an economic analysis of bitcoin as a monetary phenomenon. Bitcoin is indisputably used as a monetary medium, and as such, is well suited to be analyzed through known frameworks and theories originating from the Austrian school of economic thought. Although bitcoin is also a technological phenomenon, this thesis will only focus on the economic aspects of bitcoin.

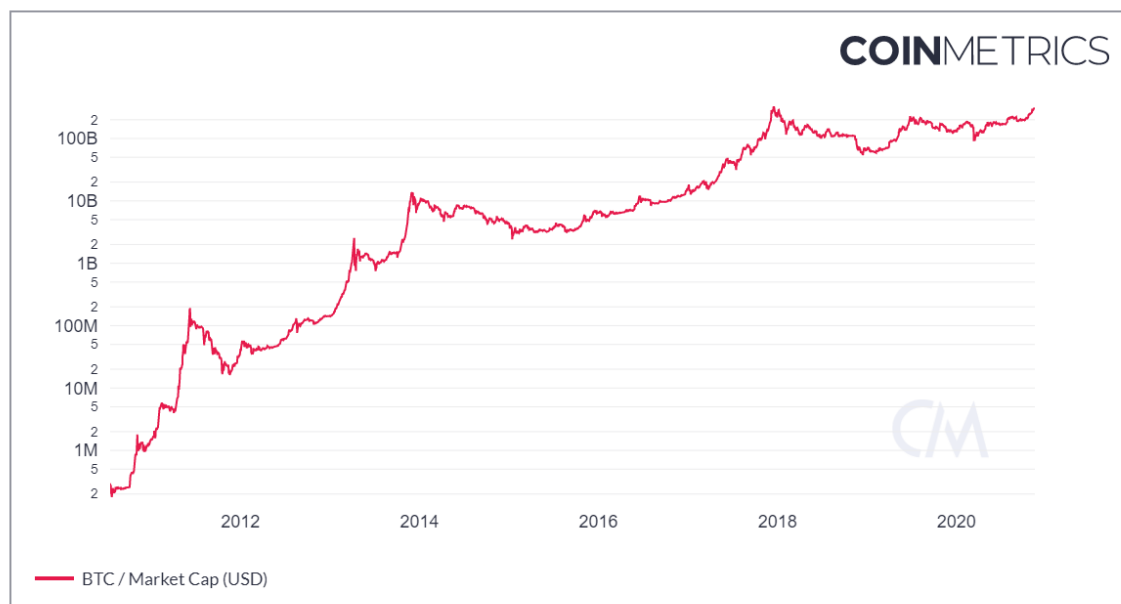


Figure 1 Bitcoin (BTC) Market capitalization BTC/USD (Coinmetrics 2020)

It was chosen to analyze bitcoin through the Austrian economics framework of money because the emergence of bitcoin matches the Austrian theory of the emergence of money. Thus, it is best analyzed through the lens of Austrian economics, as opposed to other

economic schools of thought such as the mainstream dominating schools of New Classicism and New-Keynesianism. Applying the Austrian economic analysis and theory of money to bitcoin is logical as bitcoin has emerged purely from the free market, without a decree of any sort. The Austrian school of thought is chosen for creating parallels with bitcoin because of the observed similarities in Bitcoin's origin and the Austrian description of the origin of money. Money is an integral part of any modern economy because money in itself is a market, and half of every trade in modern economies consists of money. Thus, money influences significantly economies, which is one of the main reasons why this topic was chosen.

1.1 Thesis objective and research questions

The objective of this thesis is to examine bitcoin as money by comparing its emergence, function, characteristics, and market perception with the theories of the Austrian school of economic thought. This thesis examines the core assumptions about money and bitcoin and attempts to create parallels between the two. By providing this comparison, it can be beneficial for further research not only on this specific topic but other economic phenomena that have to do with bitcoin. One of the authors works in a company that deals with cryptocurrency security, and this thesis is partly meant to provide help in formulating ideas about Bitcoin's past, present, and future. Besides, this thesis can be useful to anyone interested in a useful evaluation framework for money or the monetary economics of bitcoin.

There are similar research/books written on this topic that look at bitcoin economics through a different lens. The most similar research is written by Peter Šurda (2012), Konrad Graf (2013a), and Saifedean Ammous (2018), all of which are referenced in this thesis. While focusing on similar topics as previously mentioned authors, this thesis aims to provide a unique perspective on the topic. This thesis focuses on applying collected empirical data to established theoretical frameworks. To the knowledge of the Authors, no research with said approach method and objective has been yet produced.

Research questions

The research question can be divided into one main question and several sub-questions.

Main question

- Is bitcoin money?

Sub-questions

- Why is bitcoin valued?

- If it is not money yet, at what point would it fit the criteria of money?
- How is bitcoin used today?
- What characteristics give bitcoin its monetary value?
- Does bitcoin satisfy the function of money?

1.2 Limitations

In terms of the research, one limitation is the applicability of outdated theory to the current digital environment. Most theories have remained unchanged since their initial inception in the 18th, 19th, and 20th centuries. This research focuses only on the study approach and theory from the Austrian school of economic thought and this school being niche on the global scale limits the scope of the research. While many economic schools of thought overlap in their approach and theory, this thesis only provides one specific way of looking at the research topic.

Another limitation is the focus only on the economic aspects of the research subject. While a short introduction to the technology of bitcoin is provided, it might be too general for readers to understand the nuances of the arguments and data provided in this thesis. The technology is intrinsic to bitcoin, and to understand it as an economic phenomenon would require sufficient knowledge of the technological mechanisms that govern it. Besides, game-theoretical aspects are not considered deeply in the research, even though they are important in understanding how the bitcoin ecosystem and its various stakeholders interact with each other and how the system is glued together via incentive structures.

1.3 Research approach and data collection

The authors have used a deductive research approach. This thesis attempts to examine how the subject of the research fits into the Austrian monetary theory presented in chapter 3. The deductive research approach is the same methodology used in the Austrian school of economic thought.

Data was collected via an online survey that included both closed questions (7) and open questions (2). Combining both qualitative and quantitative data can be used to balance out the limitations and strengths of the whole dataset. This also enriches the quantitative data by providing variables not obtained with closed questions, and vice versa. (Better Evaluation 2020.) Both data were collected in parallel.

Triangulation, also known as a mixed-method is the act of combining multiple research methods for one subject. This can make the data richer and more valid (Kennedy 2009). The qualitative data is used to support quantitative data, and vice versa. Triangulation is a way of increasing the validity and reliability of the research. At the most basic level, this includes combining both closed and open questions using the same data collection tool. (Bryman 2020; Sociology Central 2020.) Data triangulation is used since authors used both data types in data collection and analysis.

Primary data

Primary data was collected from the source of information, which are owners of bitcoin. This data was collected via online surveys. The data collection method used in this thesis was a survey because of the ease of distribution for quick access to primary sources. The survey used a blend of quantitative and qualitative strategies. Data collection via a survey with both closed and open questions allows answers to be more complex because respondents can express their ideas more freely without being limited by the narrowness of closed questions.

The quantitative method of research approach highlights objective measurements by focusing on collecting numerical data and extrapolating it across groups of people. This data is then used to explain studied phenomena. Quantitative research type deals with objectivity, logic, and numbers. The quantitative method is beneficial for deductive studies. (University of Southern California 2020.)

Two of the survey questions were open questions for which thematic analysis was used. Thematic analysis is an analysis method for identifying, analyzing, and reporting patterns (themes) in data. Thematic analysis is advantageous because of its theoretical freedom: it provides a flexible and useful research tool that can potentially provide a rich, detailed, and complex account of data. (Braun & Clarke 2006, 6.)

Theoretical or deductive thematic analysis is driven by the researcher's theoretical interest in a particular area and is more analyst-driven. This type of thematic analysis tends to provide a less rich description of the overall dataset and a more detailed analysis of some specific part of the data. Coding can be performed for specific research questions. (Braun & Clarke 2006, 6.)

Secondary data

Desk research has been conducted to collect data from various secondary sources. These sources include academic research papers, books, articles, theses, blogs, forum posts, and websites. Many sources are articles and electronic books are from the Mises Institute website.

1.4 Ethical considerations

This research was performed according to common ethical principles in research. Ethics protect the rights, welfare, and dignity of research participants (Health Organization 2020). The core ethical considerations are the following:

- No harm to participants
- Informed consent
- No invasion of privacy
- Absence of deception

(Bell & Bryman 2007, 114)

The purpose of the study was explained to the survey respondents beforehand. The survey responses were submitted anonymously, i.e., no personal information can be revealed. Survey respondents' responses were not analyzed individually.

1.5 Thesis structure

The thesis consists of nine (9) chapters which are illustrated in image 1. The introduction provides the research background, objectives, approach, and data collection and analysis methods. After this, the key concepts discussed throughout this thesis will be defined to enhance the readability of the thesis. This is followed by an explanation of the core principles of the Austrian school of economic thought and the relevant monetary theories that are later used to examine bitcoin as a medium of exchange. After presenting the secondary data, the data collection method and data analysis methods used for primary data are explained. Finally, the survey findings are presented, and the thesis is concluded and summarized.

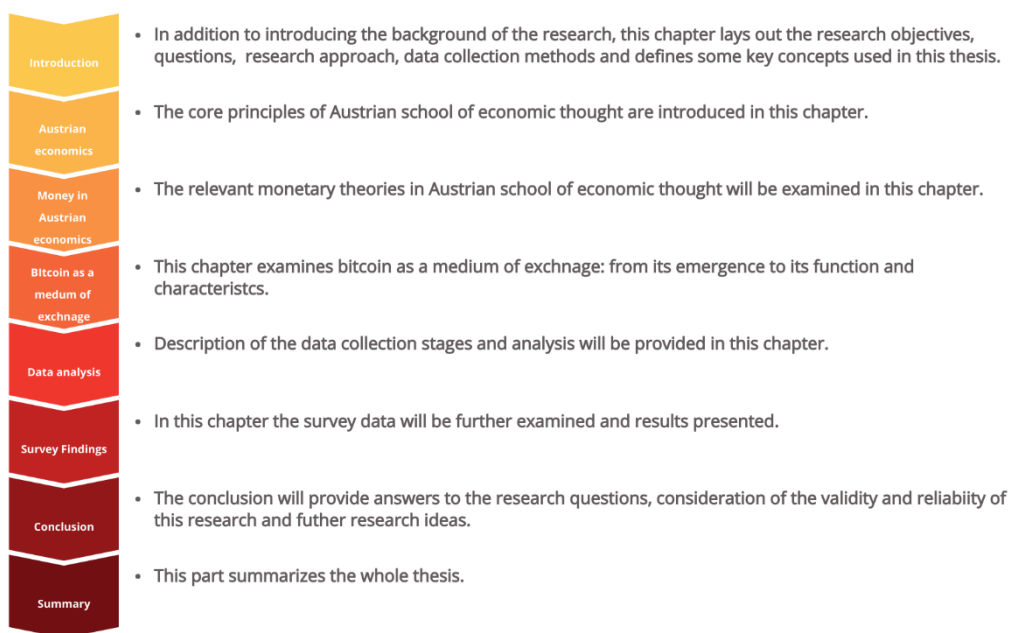


Image 1 Thesis structure

2 AUSTRIAN ECONOMICS

This chapter begins with a short primer on the core study methodology used in the Austrian school of economics. Chapters 2-3 provide a foundational theoretical framework upon which ideas can be built and formulated further.

Austrian economics is a school of economic thought and a way of economic thinking. Like all other schools of thought, the goal of Austrian economics is to describe the social world. Austrian economics is a framework for economic analysis: it is a set of analytical assumptions about how markets and economies fundamentally work. At the root level, the Austrian analytical framework is analyzing phenomena from specific assumptions and assessing whether various claims hold any truth or if they are based on bad logic. From these assumptions, one can start logically deducting conclusions for various topics. This makes Austrian economics a science of human action based on deductive logic. Deductive thinking is something an individual can think on their own without relying on the external world and without ever experiencing it personally. This thinking is used to discover universally applicable economic laws that govern the social world, which consists of people and their interaction with each other (Accad 2016).

There are some core assumptions in Austrian economics one needs to understand to apply the Austrian analysis framework to the phenomena studied in this research. These assumptions will be examined below.

Human action and praxeology

The core premise is that economics stem from *praxeology*, which is the study of human action. Praxeology is a deductive study methodology where knowledge comes from the power of reasoning. (Polleit 2011.) This means that certain topics are best studied with a logical verbal deduction from observed or previously deduced premises. This can be contrasted with natural sciences where the most basic method of analysis is an experiment. Premises that are taken as truth, can be called *axioms*, which are statements considered as self-evident. The core axiom of praxeology is that of human action, which is the premise that humans act purposefully to achieve their goals, i.e., satisfy their wants. (Polleit 2011.) By using praxeology and deductive reasoning with the axiom of human action as the starting point, it is possible to make both universal and objective conclusions about human behavior. In Austrian economics, praxeology is used because economics is considered a social science and thus, should not rely on methods of natural sciences because they deal with fundamentally different matters.

Methodological individualism

All economizing is based on *methodological individualism*, which is the principle that subjective individual motivation explains social phenomena instead of group dynamics. This implies that the actions of groups cannot explain social phenomena and markets; groups do not think, feel, value, and act, individuals do. To properly explain the actions of a group of people, one should focus on the individuals who act within a group; all economic life both begins and ends with the individual. (Accad 2016.) Thus, all markets are the result of human action, spontaneous occurrences, and are not human design. Markets are evolutionary processes that emerge from individual choices over time. Following this logic, markets are self-organizing and adaptive organisms and, we as humans, cannot construct and reconstruct them as we wish. Another related principle is *methodological singularism*, which means focusing on concrete single actions instead of wholes and universals (Mises 1998, 44).

Methodological subjectivism

Praxeology and economics do not offer value judgment about an individual's goal and whether they are good or bad. It accepts subjective ends as true and does not judge them. (Accad 2016.) It only looks at the tools that individuals use to achieve their individual end goals. Goals are diverse, just as individuals are diverse beings. Methodological subjectivism explains how individuals make judgments and choices based on whatever knowledge they have or think they have, and whatever expectations they entertain concerning the outcome of their judgments and choices. (Walker 2020.) Methodological subjectivism dictates how tastes, preferences, cost, value, and utility are all subjective and only the recipient of a product or a service can evaluate how valuable said product or service is. To understand the actions of an individual, one should try looking at his actions only by the reference of the knowledge, belief, perception, and expectations of this individual. (Kirzner 1992, 64.)

Methodological subjectivism is closely tied to another important concept: *opportunity costs*, which are the costs with which economic actors evaluate the alternatives that must be sacrificed. Austrian economics dictates that opportunity cost is subjective as only the individual himself can know what they imagine they would have gotten out of the choice they did not make because the cost is never experienced. After all, we give it up for another opportunity, and therefore another unknown cost. (Boettke 2020.)

Marginalism

The central concept of the theory of marginal analysis is the theory of marginal utility (Sanchez 2011). This theory states that the overall utility that an individual perceives is

determined by the significance of the last unit added or subtracted from the total amount of units. This results in either positive marginal utility or negative marginal utility, depending on if the added unit increases or decreases overall utility. This is tied to the law of diminishing marginal utility, which dictates that with an increase in the number of goods, their subjective value in an individual's mind diminishes. (Investopedia 2020.) The theory of marginal utility is closely tied to the theory of subjective value which is used to explain the value of all things in the social world (Borders 2012).

Time preference

Another key concept is the time structure of production and consumption, i.e., time preference, which is the ratio at which individuals value the present compared to the future. Is the assumption that all things being equal, individuals prefer their goals to be achieved sooner rather than later. All individuals have a positive time preference, which can be observed by the fact that if they always preferred to reach their goals later than sooner, they would never act. Whenever individuals delay satisfying their wants, it is because of the future anticipation of higher satisfaction than what is available immediately. The future satisfaction needs to be sufficiently valued higher than the present in the individuals' minds for it to compensate for the delay. (Ammous 2018, 74.) The subjective cost of delay is compared with the subjective valuation of higher future satisfaction. The subjective delay thus dictates the degree of time preference.

The very essence of economic science is to discover the laws governing economizing individuals, which is to understand the phenomena which we observe in economic life as resulting from the purposeful economic actions of individuals. To sum up, the scientific approach of Austrian economics is to accept the foundational praxeological reasoning which assumes that individuals engage in purposeful behavior, as opposed to being reflexive to exogenous triggers. And from this axiomatic statement, economics focuses not on how humans should act, but what tools they should use to reach their end goals.

3 MONEY IN AUSTRIAN ECONOMICS

Just like any other product that arises on the free market, money emerges because the market has a problem, and needs something to solve that problem (satisfy a need). The problem was that in times before money existed, individuals trying to trade goods were limited to direct exchange, i.e., barter, which resulted in the problem of the “double-coincidence of wants”. (Hülsmann 2008, 20.) The number of exchanges an individual can undertake is limited because it would require the coincidence of skills, supply, transaction costs, and time (Szabo 2002). These problems can be alleviated with an indirect exchange, which is the function of money. Money emerged to alleviate this problem and to increase the number of possible exchanges. (Murphy 2020.)

The most basic problem of coincidence of wants:

‘A’ wants something that ‘B’ has, but ‘B’ only wants something ‘C’ has, and ‘C’ wants something ‘A’ has.

Before examining more closely what money is, it is beneficial to first understand more precisely why and how it emerges in a free market, what are its functions in an economy, and the common characteristics that monies tend to possess. These topics are examined in the coming chapters, starting from their emergence, their function, and their characteristics.

3.1 Origin of money and theory of salability

While many Austrian economists disagree on various topics regarding the origin of money, the most notable and agreed upon theory on the origin of money is Menger’s theory of salableness. For the sake of clarity, it has been compartmentalized into three stages, which shall be examined in the following subchapter.

From a good to a medium of exchange

The emergence of money arises after a problem in a market where a direct exchange of goods is employed; to facilitate an exchange between two individuals, it requires a double-coincidence of wants (Ammous 2018, 2). What this means is that for a shoemaker to get meat in exchange for his shoes, he needs to find a butcher who also happens to want shoes in exchange for his meat. The problem is that a “double-coincidence of wants” is rare and would require luck for a meat-wanting shoemaker to find by a chance a butcher in need of new shoes. (Ammous 2018, 2; Hülsmann 2008, 20.)

The shoemaker may see that the butcher also needs wheat and that the wheat farmer needs shoes. This scenario would enable the shoemaker to trade his shoes for the farmer’s wheat

to further trade the wheat for butcher's meat, which was the ultimate consumption goal of the shoemaker in the first place. However, these ad hoc scenarios are even more limited in their nature than trade between two parties and would require considerable luck for the shoemaker to find a third party that offers something the butcher wants, and that also wants the shoemaker's shoes. (Menger 2009, 20.)

This series of exchanges can last for a long time until the shoemaker finally gets what he wants, and the same process goes for all goods he wants. One can quickly realize that this kind of indirect exchange is not scalable and logistically problematic. (Ammous 2018, 1.) These problems are emphasized even more when a market matures and the division of labor increases making individuals' wants more precise and sophisticated. As individuals specialize more, it becomes less likely that they can acquire goods that they want in exchange for their more specialized product. (Mises 2009, 31.) These problems create a market fit for a good that can be employed as a medium of indirect exchange, and thus, valued for its ability to facilitate indirect exchange.

From a medium of exchange to a more commonly used medium of exchange

The previously mentioned process is logically followed by a medium of exchange gaining momentum and being used more widely. The extent of how commonly a medium of exchange is used depends on its salability. Salability (liquidity) is the extent to how much economic sacrifice is required for disposing of or acquiring a good, i.e., how easy it is to sell a good at a market at any time, and at any economic price. (Sanchez 2012.) The sacrifice usually comes in form of a discount on the price, or in the cost of delaying the exchange resulting in the seller having to wait until the exchange can take place. The more salable a good is, the easier it is for the owner to exchange it for other goods for a reasonable economic price, i.e., prices corresponding to the general economic situation. Another way of thinking about salability is that it is the narrowness of the gap in which an individual can immediately buy and sell a good (Menger 2009 as cited in Graf 2013a, 11).

A useful example for comparing the salability of different goods are cotton and Sanskrit writings, both worth an equal amount. This example is to demonstrate that an individual selling cotton is in a much better position than someone selling Sanskrit writings because he would not have to search for a long time to find a buyer for his cotton, as opposed to the seller trying to get rid of his writings. The owner of the writings might find a fair price offer for his good, but it might take some time for him to do so. This is because of the difference in the two goods' salability, which puts the owner of the writings at a disadvantage when trying to acquire his desired goods compared to the cotton seller, who will sell his cotton

much more easily: without a discount on the price or waiting long period to find a buyer. (Menger 2009, 25, 36.)

This disadvantageous dynamic is recognized in the market: vendors of less salable goods will generally trade for more salable goods before they trade for the goods, they ultimately want (Murphy 2020). In this subchapter's example, the shoemaker becomes aware that using a more salable good, compared to his shoes, offers him more exchange opportunities for smaller exchange costs. Assuming he is a rational actor, he will be willing to exchange his shoes for this good, even if he does not use it for consumption. This is because him knowing that going to a marketplace with these goods results in better and less costly exchange opportunities as opposed to going there with his shoes. This allows him to attain the goods he ultimately wants to consume with less economic sacrifice, be it in terms of the discount on price or the time to execute a sale. (Menger 2009, 39-40.)

Since salability can be viewed as a proxy for how much demand there is for a good, the salability of a good increases as demand increases creating an upward spiral; a good's high salability draws more demand, which in turn increases its salability further. This again draws more demand, and so on. This process continues until a few goods are regarded as "commonly used media of exchange". (Mises 2009 as cited in Sanchez 2012.) Salability is not static nor a binary characteristic. This means that in different types of economies and different historical periods, different goods possessed different levels of salability based on the type of society and the technological capabilities present in this society. (Ammous 2018, 7.)

From a commonly used medium of exchange to money

The selection process does not stop there. As individuals are incentivized to trade their goods for the most salable of the media of exchange, markets converge on a few monetary media. This process benefits only that medium, while other less salable media of exchange continue their downside spiral until they drop out of the competition entirely. In Mengerian theory, one can think of the money market as a process of elimination where less salable goods are not demanded for their monetary value anymore, and the only goods left after this process of elimination start being regarded as money. (Sanchez 2012.) This results in one dominant medium becoming generally used, which according to the Austrian definition, is money. This process of elimination creates a positive feedback loop which results in people emulating this behavior, furthering the monetization process of a good. (Menger 2009 as cited in Murphy 2020.)

As good is going through the monetization process, less salable goods become simultaneously even less salable resulting in loss of monetary value (Sanchez 2012). Individuals

holding less salable goods will be punished economically as the opportunity cost of holding less salable goods manifests in fewer exchange opportunities and higher costs related to exchange. (Ammous 2018, 6; Sanstedt 2020, 15.) Thus, using inferior media of exchange, as opposed to commonly used superior media of exchange has opportunity costs not only to the individual giving it away but also to the individual receiving it. There is a tendency for less salable goods to be used as media of exchange to be one by one rejected until the last good remained. (Mises 1953 as cited in Shostak 2017.)

Individuals who go the marketplace with a commonly used medium of exchange, i.e., money, have a higher probability of being able to exchange it for the goods that they want for consumption, as opposed to individuals who go there with non-money goods, exactly because of the difference in their salability (Menger 2009, 41-42). As such, money can be described as the most salable good of all. It is not, however, impossible for two goods to be regarded as commonly used media of exchange. One historical example would be that of gold and silver, which were used as money simultaneously. Although possible, the outcome of this involves disadvantages and complicates the process of exchange. (Menger 2009, 33-34.)

It is hard to define “money” because the moment medium of exchange becomes commonly used is ambiguous, and thus, cannot be strictly defined. The broader definition of a medium of exchange is hard to differentiate from the narrower definition of money making the transition from former to latter not sharp, but rather gradual, which is why agreement on the definitions cannot be reached. Whether or not a medium of exchange is money is left to the judgment of the historian and other observers. (Mises 1998, 404.)

Before the idea of a medium of exchange existed, goods had to have demand for their own sake, i.e., not for as media of exchange, but consumption. This creates a feedback loop that pushes the concept of a medium of exchange into the market’s consciousness making individuals aware that they can use these salable goods as media of exchange, in addition to direct consumption. This is further exploited by individuals using this tool to satisfy their wants. (Murphy 2020.)

3.1.1 Regression theorem

Before Mises applied the subjective theory of value to money, Austrian economists experienced circularity in their attempts to explain the value of money: money is valuable because you can exchange goods with it, and you can exchange goods with it because it is valuable.

Mises built upon the Mengerian theory of the most salable good and introduced his regression theorem. The theorem explains that the value of money can be explained by its future

purchasing power, and individuals can speculate on its purchasing power because they observed its purchasing power yesterday. The regression theorem explains how a good can gain original demand as a medium of exchange. According to the theorem, a good must have a prior value-generating direct use before amassing medium-of-exchange demand. In short, the theorem states that monetary good's purchasing power regresses to direct-use demand. (Mises 1949 as cited in Block & Davidson 2015 317-318.) The regression stops until the day when the good was valued for direct consumption, i.e., for its own sake. Hülsmann (2008, 23) explains that the prices that were initially paid for a good's non-monetary uses make it possible for buyers to estimate future prices at which these goods can be sold. It would be extremely risky to buy a good for indirect exchange without ever knowing its past prices, and thus a medium of exchange cannot emerge when this knowledge is lacking.

It is important to note that media of exchange do not become money because of their direct utility (consumption) but rather because of their salability (liquidity). Many goods served as money until they were demonetized because a new more salable and less costly (to transact) money emerged. The properties that can make a good salable are examined in subchapter 3.3.

3.1.2 Proto money

History shows us that some seemingly useless objects were used for monetary functions the same way as consumption goods with direct utility. Some common characteristics between these objects were their prettiness, durability, rarity, portability. (Szabo 2020) Szabo points out (2002) that their security feature was the fact that they were often worn and harder for a thief to steal. These items could be carried, buried, and they lasted generational wealth transfers. These goods seemed to lack any consumption use and were desired for ornamental reasons.

While cannot be considered money per se, they had some of the same monetary functions that media of exchange has: a long-term exchange between generations and sometimes trading between not-so-friendly tribes (Szabo 2002). These objects usually possessed specific characteristics, which include scarcity, divisibility, and durability. These proto monies then gained more adoption, and their usage as mostly long-term media of exchange developed further. Menger (2009, 12–13) himself wondered what the nature of these small disks with no observable use was, that nevertheless, were exchanged between individuals for consumption goods.

3.2 The essence of Money

The emergence of money is a spontaneous market process where individuals are trying to fulfill their economic interests. Individuals are led by their increasing awareness of their economic interest without any agreement or legislative compulsion to trade their goods in exchange for other, more salable goods. These exchanges are performed to hoard these salable goods, not just for their immediate consumption, but for an opportunity to exchange them later for goods they ultimately desire. (Menger 2009 as cited in Hansen 2020, 31.)

Free market money emerges when individuals begin perceiving the economic advantage they can obtain by exchanging their goods for more salable ones as their exchange opportunities grow because of lower economic costs, satisfying their ultimate wants more effectively. Ultimately, money is a phenomenon of individuals trying to satisfy their wants by acting economically and performing exchange. (Menger 2009, 25, 36.) During the monetization process, an economic actor finds it beneficial to pursue a more effective way to achieve his end goals when resorting to indirect exchange, when he uses a commonly used medium of exchange, and finally when he uses money (Mises 1953, 262).

Money is a good or commodity that serves the purpose of being a medium of exchange on a large enough scale. However, "large enough" cannot be quantitatively assessed as it is subjective, and also there are no measurable thresholds for evaluating how widely a medium of exchange is used, and thus when it is hard to establish at what point exactly a commonly used medium of exchange becomes money. Monies are never random goods chosen for arbitrary reasons. As we have established above, the emergence of money is a competitive "last man standing" type elimination process where presently available different goods are competing based on their characteristics (salability) for the status of being the most salable goods. Winner(s) are chosen by the market of individuals based on their subjective views by individuals attaching extrinsic value to these goods. Individuals are also influenced by the present technological progress within a society (Ammous 2018, 7): it is easy to imagine gold not being very portable or divisible money when humans did not yet know about smelting technology.

No enforcement from authority is required at any step during the monetization process of a good. Money does not emerge from any private initiative nor any entity's goodwill or sacrifice for public gain. Although historically monies have emerged as a free-market process, as described in previous chapters, it is not impossible for money to be instituted through legislation of some sort. This, however, is not the primary mode in which money has originated. (Menger 2009, 38).

Although the generally accepted Austrian theory on the origin of money is described as a spontaneous event, at every step of this market process, a calculated action is done by an individual to improve his/her situation. Money emerges as an outcome of an individual's self-interested actions. No person, or ruler for that matter, conceived of a universal medium of exchange, and no mandate was required to set into motion the transformation from a barter economy to a money economy. (Menger 2009 as cited in Sanchez 2012.)

To conclude, money arises in the market because of a problem; lack of double coincidence of wants. With barter, individuals can rarely get what they want in one, or even two transactions. Having this problem, individuals started noticing increased efficiency when they trade their goods for something that is widely accepted and demanded, and then use this widely accepted good to buy the goods that they desire. The good that is left for the sake of its salability at the end of this market process, which is also called monetization, can be called money.

3.3 Function of money

Money has one core function: facilitating indirect exchange by functioning as a medium of indirect exchange. The functions analyzed below are not separable and distinct utilities, but rather derivative of the medium of exchange-utility, because all uses of money have the sole aim of facilitating exchange in the market. These functions, for the sake of simplicity, are separated to break down money as a phenomenon of exchange. The three purposes are "medium of exchange", "store of value", and "unit of account".

Medium of exchange

Throughout time, money has been described differently by different economic thinkers in different eras. Although differently explained, most tend to converge on one core function: to facilitate indirect exchange by acting as a commonly used medium of exchange. This is the core function of money, and all the other uses are derivatives of this use. Money is a medium of exchange because people will accept it for goods and services and then exchange it further for the goods and services they want (University of Minnesota). Money must be salable, and since the definition of salability is the degree of ease with which an individual can dispose of his goods for a good economic price and without delay, money must serve its purpose in the short term, i.e., it must be liquid.

Store of value

Money serves as a store of value because people are confident that it will keep its value over time, thus they are willing to save it for future exchanges (University of Minnesota).

The increased salability of goods was often caused by their suitability for hoarding, which is an important factor in their qualification for being media of exchange. This dynamic resulted in individuals storing their wealth in a good gaining market recognition, at the expense of other goods. (Mises 1953, 35.) Menger (2007, 283) calls money the most appropriate form for individuals to store their wealth in. Thus, storing value should not be seen as a separate function of money since storing one's wealth in a good that is money is simply deferring one's exchange into the future based on their time preference. This time preference can be explained by the theory of human action, praxeology. This type of exchange can be described as intertemporal because this exchange is related to the past, the present, and the future. The use of the term "store of value" is used in the context of storing one's wealth in a good for eventually exchanging it for another good. If the previous statement holds true, storing one's wealth in a good is not an inherent function but a byproduct of deferred exchange. Store of value function emerges with sufficient salability across time, which in turn is achieved with a good's ability to preserve value with sufficiently low costs for exchange across time.

Fitness for preservation is the wording Menger (2009, 35) uses to describe a characteristic of a highly salable good indicating that money, indeed, satisfies the facilitation of temporal exchange cost-effectively. Mises (1998, 250) also describes the uncertainty of the future as a core driver of demand for money. This explains why individuals store their value in a good that carries the least amount of risk (often money), and that can be liquidated quickly and cheaply: individuals tend to store their wealth in salable goods. One might get the impression that "store of value" and "medium of exchange" are separate functions, when in fact they serve the same fundamental function: indirect exchange. Storing value is a preference for a later exchange instead of an immediate one. In essence, "store of value" function is an indirect exchange with a time component tied to it.

Unit of account

The unit of account function is performing economic calculus. It does not directly satisfy the need for exchange, but it further improves it by acting as a measurement stick for economic calculation in the market. Money makes exchange simple: the price of a good or service is stated in monetary units which makes potential buyers know precisely how much value is wanted in return. (University of Minnesota.) Menger (2007, 278) also argues that a measure of price, i.e., unit of account can also be an attribute of a non-monetary good, he concludes that the function of a measure of price is a byproduct of money, which derives its "money-ness" from being a medium of exchange in the present (direct payment) or future (store of value). Although money cannot measure value, it is reasonable to call it a measure of price:

it is the most useful good in which other goods can be evaluated directly without an unnecessary roundabout procedure (Murphy 2020).

Markets and money are fundamentally social coordination tools that help the division of labor (Ammous 2018, 8-9). Money, being a unit of account enables economic calculation, which in turn, helps individuals participating in the market economy to alter the anticipated course of events in a way that will help them satisfy their wants better. Money is used by profit-seeking entrepreneurs to readjust production and investment to satisfy the demand most optimally. (Murphy 2020.)

To conclude, when examining different functions of money, one can conclude that the sole function of money is to facilitate exchange of value (Menger 2007, 280). Concepts of a “store of value” and a “unit of account” are tied to the idea of deferred exchange of value. It might be helpful to end this chapter by reinforcing the idea that money is always a medium of exchange but outlining specific separate functions via compartmentalization is helpful for the reader to grasp these ideas and examine them more clearly. Storing wealth in a monetary good and using this monetary good for immediate payments are different sides of the same coin, and the only difference is the holding period.

3.4 Properties of money

The core property that defines what is used as money in the free market is salability. Salability is a characteristic of a good that deals with the degree of the economic costs related to disposing of or acquiring it. As we have established before, salability can be described up as follows: a characteristic that lowers the economic costs for exchanging them, i.e., reduces the adversity in reaching their goals. As people become increasingly aware of the differences in the salability of goods, they become ever more inclined to accept exchange opportunities. (Menger 2007, 25.)

We shall return to the previously used example of the shoemaker, who goes to the marketplace with intention of exchanging shoes that are tailored specially for overgrown people. Although he might encounter buyers after some time willing to pay the price he wants for them, it is unarguably clear that for a merchant selling corn it will be much easier to find people that he can trade with to acquire the goods he wants. In this case, corn’s higher salability can be attributed to their consumption utility and divisibility. On the other hand, the market for overgrown people’s shoes can be quite limited.

Salability can be examined mainly in three dimensions: salability across space, across scales, and across time (Ammous 2018, 4). Salability (liquidity) is impossible to measure as most aspects of salability deal with the future making it possible to only estimate to one’s

best, but subjective ability. Salability is also never a fixed constant; it changes based on the technological and economic situation of an economy (Ammous 2018, 7). In one economy, one good is used as money, in another economy, at a different historic period, different money is preferred. While salability is a psychological phenomenon, certain characteristics are valued by humans. These characteristics and why they matter are going to be examined in the following subchapter.

3.4.1 Salability through space

Salability is affected by the ease of transporting or carrying a good across long-distance (Ammous 2018, 4). This is known as *portability*; the cost of transferring a good and the cost of transferring the ownership influences a good's salability across space (Menger, 2009, 30-32, 35). Digital money can be salable in this regard as it is easy to transport but can incur other costs such as the cost of international transactions. Goods that tend to be portable have better salability across space, and thus are more likely to accrue monetary value.

Another important quality of good money is its fungibility, also referred to as homogeneity or uniformity. Monetary units should not differ from each other and should be accepted at the same price (Berg 2018, 3). If money is not fungible, there is a risk of certain units trading at a discount or a premium.

3.4.2 Salability through scales

Salability across scales refers to the cost of using a good in exchanges of different values, and how conveniently a good can be divided into smaller units or grouped into larger units (University of Minnesota). Easily divisible goods can be used more effectively as media of exchange (Ammous 2018, 4; North 1986, 9). The more subunits one can get by dividing a good while not destroying the value for the whole volume, the better the salability across scales (Menger 2009, 30). Divisibility can also be measured by the cost of dividing a unit into subunits. The ability to adjust the value of a good to accurately reflect on the exchange value of another good creates more opportunities to use a good in diverse types of exchanges.

3.4.3 Salability through time

This dimension of salability can be measured with the degree of how well a good preserves its value across time (Ammous 2018, 5). This is tied to the durability of goods because goods that are durable across time are likely to better preserve their value, and, have lower costs of preservation (Menger 2009 as cited in Hansen 2020, 41). Most goods used as

media of exchange were nonperishable, which made it possible to effectively exchange across time.

Another important factor to consider when thinking about salability across time is scarcity, which is the relationship between the supply of a good and the demand for it (Menger 2009, 30-32). The key aspect of scarcity is the dilution resistance of existing stock (Ammous 2018, 5). Creating more units of money inflates the supply of money, thus pushing the money's value per unit down. Part of this aspect is the extent to how well money can resist political limitations imposed on it being transferred from one period of time to another (Menger 2009, 30, 31). This can be characterized as a good's censorship resistance through time. There is a possibility of a temporal (long-term) exchange being censored either by direct confiscation or through time periods in a non-direct way via the previously mentioned dilution of stock (inflation). If an entity can increase the supply of a good, *ceteris paribus*, the value of this good per unit goes down, which decreases the salability through time. To decrease stock dilution, the production cost of these units should not be too low. (Ammous 2018, 4-5.)

3.4.4 Acceptability

Acceptability and recognizability are important characteristics for persuading others to trade with you (Ammous 2018, 7-8). If it takes a long to time investigate whether something is a salable good, it increases the time needed to execute a trade, thus increasing economic sacrifice. Thus, familiarity lowers the costs of exchange. (North 1986, 10.) All previously mentioned intrinsic characteristics do not matter if nobody is willing to accept your good in exchange. Another important factor for salability is the permanence and distribution of demand. Ideally, a good is demanded by individuals that are far away from each other, and by individuals in different time periods. Also, salability is affected by the development of the market, and particularly, the level of speculation present in the market; speculation can expedite the monetization process of a good. (Menger 2009, 32.)

Good money tends to be relatively salable across all dimensions. The greater the number and intensity of previously mentioned characteristics a good possess, the more likely it to become used in indirect exchange. Less salable goods are disposed of for goods that exhibit higher salability, even if they are not desired for consumption. Higher salability results in economic actors' increased knowledge and confidence that this good can be resold easily for lower transaction costs. Information about a good's salability assurances spreads out throughout the economy resulting in goods emerging as media of exchange. (Block & Davidson 2015, 325-326.)

3.5 Definition of money

There is no praxeological difference between a medium of exchange and money. The difference comes down merely to how the word “money” is defined and how it is perceived by individuals. Menger (2009, 11) defines money as the “universal medium of exchange,” meaning it should be accepted by everyone, while Mises (1998, 398) more reasonably maintains it must be “generally-accepted and commonly-used” leaving some room for interpretation. Menger (2009, 20–12) explains that the difference between money and media of exchange that is not yet considered money is the degree of salability. Since this is a question of measurement, it is impossible to make a praxeological separation between the two.

To be money according to the Austrian definition, a good would not only need to function as temporal exchange (store of value) but also in the short term, since money is the most salable good (liquid), i.e., it needs to be easy and fast to dispose or acquire it without much economic sacrifice.

4 THE EMERGENCE OF BITCOIN AND ITS SALABILITY

In this chapter, the emergence of bitcoin will be described and analyzed in the light of the theoretical framework. After this, bitcoin's salability will be examined.

4.1 Technology of bitcoin

Due to the technical nature of Bitcoin, a brief explanation of the core principles of Bitcoin will be explained. This technical explanation is beneficial for examining bitcoin as an economic phenomenon.

The Bitcoin network is a collection of computers around the world that run the same bitcoin software and store all information of the bitcoin blockchain. Bitcoin's blockchain is a data structure formed by a chain of blocks that contain information about every single transaction ever recorded on the Bitcoin network. Computers that make the Bitcoin network have the same list of blocks and transactions making it possible for them to see this information transparently in real-time making it hard to cheat the system. There is no central authority determining how the network is run, but a decentralized network of participants who converge on very specific rules known as *consensus rules*. (Nakamoto 2008, 2-3.) The network is constantly updated as new blocks with new transactions are produced. As soon as the state of the network changes, i.e., a transaction is sent, all network participants can verify that the transactions are according to consensus rules. If they are valid transactions, they can be included in the block that gets produced by a node. These consensus rules are followed on the decentralized peer-to-peer network by various network participants (nodes). All members are equal on the network, and no member has authority on the network to make changes to the rules that govern the network. (Nakamoto 2008, 3-4.)

Bitcoin uses digital signatures: to create a transaction, i.e., spend bitcoin, it requires a specific signature that allows the transaction to happen. This signature is provided by a specific key pair (public key and private key) that unlocks that transaction. (Nakamoto 2008, 2.) This is the method of determining ownership over bitcoin; knowledge of a secret (private key) that allows spending specific bitcoin.

To maintain consensus on the network, Bitcoin's consensus algorithm known as Proof-of-Work stamps blocks so all network participants can follow the correct blockchain, i.e., have the correct network state that the majority agree on. Bitcoin cannot be spent twice due to miners stamping and ordering transactions via Proof-of-Work. (Nakamoto 2008, 4.) There are multiple inbuilt incentive mechanisms to secure these consensus rules.

The bitcoin that are referred to throughout this thesis do not exist in a technical sense. Instead, cryptographically signed inputs and unspent outputs (UTXO) are used within the network (Nakamoto 2008, 5). These UTXOs are measured in the unit that is called 'bitcoin'. UTXOs act as entries on the bitcoin ledger, and every time a private key that controls the UTXO is used to sign and a transaction happens, it is announced to the whole network where network participants can verify that the entry (transaction) was made following the consensus rules. While technically there are no such things as 'bitcoin' the network, this term shall be used when referring to UTXOs.

4.2 Emergence of bitcoin

An illiquid good

On October 31st, 2008, the pseudonymous creator Satoshi Nakamoto publishes his white-paper (2008) on the cryptography mailing list (Nakamoto 2008, 1). At this point, bitcoin is not a good as it does not exist yet. On January 3rd of 2009, the first block was produced on the blockchain (Blockstream 2009a), which resulted in the first bitcoin coming into existence. On October 5th, 2009, after the Bitcoin network went live, the first known bitcoin price offer was posted (Dwdollar 2009). The price for this bitcoin was calculated based on its mining cost, i.e., production cost (see table 3, appendices for specific calculation). According to Mises' (1998, 92-94) definition, bitcoin was considered a good even before it had a price: something that provides means toward an end. This can be observed by the fact that before bitcoin units had prices, they were still used on the network by early contributors (Blockstream 2009b).

The Bitcoin network had activity even before bitcoin had value as a medium of exchange. This was because the use of bitcoin provided means to an end (whatever those might have been). Whether this usage was an ideologically driven contribution to the network or speculation regarding future adoption is not essential. (Shostak 2017.) What is essential, however, is the fact that bitcoin was a good that provided some kind of utility to individuals. If it did not provide any utility, bitcoin would have not been used in the first place. It would make sense to think that bitcoin was originally demanded for its potential of becoming a medium of exchange. This potential and the speculation that was derived from it would benefit early adopters, i.e., it would satisfy a need that they had. Since bitcoin units can only exist in the context of the Bitcoin network, it would make sense that supporting the network in several ways would make its native units (bitcoin) more valuable.

Liquidity via speculation

The first Bitcoin exchange, “Bitcoinmarket”, was introduced in January 2010 (Dwdollar 2009), and since somewhat liquid markets with sell and buy order books, price information, and other exchange mechanisms enabled users to dispose of their bitcoin faster and for better economic prices making bitcoin more liquid (salable). The exchange founder (Dwdollar 2009) in a later forum comment explained that he wants to create a marketplace where people could trade bitcoin for USD and speculate on the value, which would establish a real-time BTC/USD exchange rate.

As a new and unknown good, bitcoin did not have effective markets to establish proper prices and was not very liquid. Thus, the only logical development to happen at this point was for bitcoin to be traded against the most liquid goods: the largest fiat monies such as USD and EUR. It would be unlikely that a bitcoin owner could have found someone willing to part with their consumption goods, since the receiver, without valuing it as collectible or having the desire to speculate on its price or future, would struggle to exchange bitcoin further for the things they want. This is because bitcoin was new and illiquid.

As established above, before bitcoin were used in indirect exchange, they were used in direct exchange with USD and EUR for speculation purposes. This is what can happen when a good emerges in an economy that already has money. (Šurda 2012, 42.) This use provided initial liquidity, which then made it possible for bitcoin to slowly transition into a medium of exchange. Even before bitcoin started developing prices and salability, individuals were willing to spend money or expend other valuable resources (early miners produced bitcoin when it was “worthless”) on bitcoin because this proved to be valuable to them: they derived some kind of utility from “using” bitcoin. Some primitive monies were hoarded as collectibles for speculation for future value appreciation, i.e., for the anticipation of an increase in purchasing power (Szabo 2002). This can be interpreted as speculation, but also as an attempt at storing value. A parallel can be made with early bitcoin ownership.

The bitcoin whitepaper states that bitcoin was specifically designed to function as money (Nakamoto 2008, 1). It seems to be the case that ideologically driven early adopters were expending resources to acquire bitcoin to speculate and bootstrap the system into wider adoption. By valuing, supporting, and speculating on bitcoin’s future they inevitably increased bitcoin’s liquidity, i.e., salability. This might have given that initial push for the previously mentioned first price to emerge after which people started buying it because they anticipated that other people too might value bitcoin for all the characteristics they valued it for (or other characteristics for that matter). What is different today from the days where collectibles were used as money, however, is that today humans can foresee monetary

demand since the concept of a medium of exchange is already well known. This can be contrasted with ancient people not being able to imagine such a thing.

Bitcoin was given away by early adopters (Andresen 2010) simply by completing a captcha. A bitcoin developer at that time, Gavin Andresen, set up a service to give away free bitcoin because he wanted the Bitcoin project to succeed and it is more likely to succeed if people have some bitcoin to try using it. This shows what many early adopters' motivations were: to distribute, increase interest and awareness of this new phenomenon. Just as most achievements in life, this was done by having "skin in the game" and incurring some risk, whether monetary, reputational, emotional or any other type of risk for that matter.

Perhaps the earliest adopter after Satoshi himself, Hal Finney (2008), was thinking how to value bitcoin and how it can get a price when virtually no one would accept it at first. Then he went on to speculate in a thought experiment about the risk-return asymmetry in acquiring very cheap bitcoin with only a few cents of computing energy and waiting for bitcoin to become a valuable global asset. Satoshi foresaw the price increase (Nakamoto 2009) as a bootstrapping mechanism. They predicted that as the number of users would grow, the price per bitcoin unit would also grow, which in turn would attract more users resulting in a positive feedback loop. This is what Menger (2009, 28) described: speculation, exacerbated by speculation markets is what increases the salability of a good. People might be correct in their speculation, which makes their action beneficial as they expedite price discovery for bitcoin.

Praxeology does not concern itself with why individuals speculated on bitcoin. What is important is the fact that it happened because the act of speculation satisfied potentially various subjective needs. It could have been likely a mix of desire for ideologically driven individuals to speculate on the success of the Bitcoin protocol and network, and speculation for pure monetary appreciation. As discussed before, this gave the initial push for bitcoin to begin its road to becoming a liquid medium of exchange.

4.2.1 Bitcoin as a medium of exchange

On May 22nd, the first purchase made with bitcoin was done to buy two pizzas (Hanyecz 2010). Although this trade happened, this can barely be considered even a quasi-indirect exchange (Graf 2013a, 23). This can be counted as the first publicly known use of bitcoin in indirect exchange, which made it a medium of exchange as per the definition. This exchange happened because bitcoin already had a price and liquidity to some degree. A trade would not have been possible if bitcoin were illiquid and had no price on the market.

The moment a good is used in an indirect with more than one exchange and happens between more than two parties, it has served as a medium of exchange. This is where bitcoin entered the elimination-type market process where salable goods compete. As we have established before, only a limited number of individuals recognize the salability of a good. The individuals that were involved in the pizza purchase recognized that bitcoin is a salable good, and thus it gave them the knowledge to use as a medium of exchange. This knowledge spreads out with the increase in knowledge of the good's salability (liquidity). (Menger 2009, 36.) Although extremely limited, bitcoin started to become used to purchase consumption goods as opposed to being only speculated on and traded against fiat monies such as USD.

Hanyecz, who made the infamous pizza purchase, has said later (Moore 2020) that Bitcoin was an "interesting system", but it would not have any value if nobody except him was using it. Indeed, money is a good that has little value as a standalone good. Many economists use Robinson Crusoe, the man stuck on an uninhabited island alone, as an example to explain economic phenomena. In the case of money, we can imagine that it would have no value to Crusoe since he would not be able to trade it with anyone, and he cannot consume it either. Being a social phenomenon, the acceptability of money is an important characteristic. The price and purchasing power of bitcoin was still relatively low, but as more people started recognizing its liquidity and the possibility that it could one day become money (speculation), its liquidity has been growing ever since.

4.2.2 Bitcoin as proto money.

Most media of exchange have some liquidity, which they attain at some point in their monetization process. However, in the case of previously mentioned 'proto monies,' they were seemingly illiquid: trades happened few and far between. While the times in which these proto monies arose were quite different from modern-day, it can be helpful to make a parallel between early proto monies and bitcoin. This is because, just like bitcoin, in many cases, they seemed to have no other uses than being media of exchange. While the times were certainly different, the incentives and the tendency of individuals to speculate seems to remain innate to humans.

If one views bitcoin in the beginning as proto-money, one can see how the early adopters might have had the same mission as early men did: to predict which things are going to be desired by other individuals. Individuals who speculated more successfully than their counterparts managed to acquire wealth by hoarding desirable objects. This can be contrasted to bitcoin, and it can be seen how early users hoarded bitcoin because they, after evaluating its potential salability to be high enough, speculated on other people demanding it in the

future. This speculation was exacerbated by the emergence of speculation markets such as an early bitcoin exchange MtGox. This process would naturally make individuals converge on a few dominant objects creating a feedback loop.

When viewed as proto money or “collectibles”, it makes sense for individuals to acquire bitcoin at early stages, since users believed it could become money one day. Increased usage of bitcoin is what eventually made it transition past this proto money phase. Proto monies having these characteristics (wearability, hide ability) individuals innately perceived the benefit of exchanging “real goods” for these seemingly “useless” objects, possibly thinking that these pretty objects could also be demanded by other individuals that would also perceive the benefit of owning them. Bitcoin could have been also seen as “useless” since the benefits of owning it were not very observable. What is interesting, however, is the fact that the bitcoin exchange MtGox before being a place to trade bitcoin, was an exchange for trading other kinds of collectibles, namely “Magic: The Gathering Online” cards (Graf 2013a, 17).

It can be said that during the first couple of years when bitcoin had no price or purchasing power, it could have been described as collectible or proto money. Only a handful of people had insight and belief that bitcoin could potentially become a liquid monetary good. Just as the bizarre proto monies, bitcoin satisfied someone’s need, and later managed to accrue value monetary value. It is up to debate if the separation between “use value” and “exchange value” is necessary at all. Buying into a medium of exchange is an implicit economic statement that this good (bitcoin) is demanded, and as more people emulate this behavior, bitcoin can develop beyond being “mere collectible” (Graf 2013a, 20).

4.2.3 Bitcoin and regression theorem

At first glance, the emergence of Bitcoin as a medium of exchange does not seem to adhere to Mises’ regression theorem since it seems that bitcoin has never had any direct use other than exchange use. The first attempt to try to fit bitcoin to the regression theorem was the common thesis that the regression theorem only applies to barter economies with no existing money prices. Block and Davidson (2015, 322- 323) argue that bitcoin does not violate the theorem. According to them, there are two circumstances where a good can become a medium of exchange: (1) it needs to emerge from a pure barter economy where there are no prices for money (regressing to its direct use-value, or (2) it emerges in an economy where there are already prices for existing money. The latter describes the circumstance in which bitcoin emerged because of a sophisticated economy that had an existing price structure for money. In this case, the emergence of bitcoin does not violate Mises’ theorem. The same line of thinking can be seen from Hansen (2020, 42). This argument is also made by

Graf (2013a, 12): bitcoin managed to bootstrap its purchasing power because advanced relative money prices existed already which eased bitcoin evolutionary challenges.

Graf (2013b) mentions some of the possible “direct uses” were mystique value, geek appeal, curiosity, challenges for enthusiasts, and social signaling. Following methodological individualism and theory of subjective value, these direct uses do not need to be recognized by anyone else except the individual himself.

However, there have been attempts to point out logical inconsistencies regarding the regression theorem. Some of the pillars of Austrian economics are the theories of subjective value and marginal utility, which have been explained in chapter 2. Voskuil (2020) argues that the theorem violates the theory of subjective value, even though it relies on it; value is always subjective, and thus, can be based on practically anything, in the case of bitcoin, utility as a medium of exchange. Money, like all other goods, is subjected to our valuations based on its utility to us. The law of marginal utility does not deal with “objective” use-value, but with subjective use-value. This means that it does not concern itself with prices, physical or objective properties of a good, but rather its relevance in satisfying individuals’ self-perceived needs. The utility of goods is to satisfy needs, thus anything that satisfies a need has utility, which in turn gives the good value in the minds of individuals resulting in the good having purchasing power. (Bondone 2006, 111–114.) Some users perceived utility in holding bitcoin due to its properties and saw bitcoin and its properties as a means to satisfy their wants.

Since bitcoin was used before it has a price or any liquidity to satisfy a need, it had utility. Whether this utility was direct or monetary is not important. This begs a question if this distinction between direct use value and monetary value is necessary at all. Money is a good that satisfies the need for liquidity, which is derived from the need for exchange. The reason for bitcoin gaining that initial liquidity was most likely speculation and the market that emerged to cater to that speculation. This made it possible to transition from being a good to becoming a medium of exchange. All that is needed for a good to transition from direct exchange to indirect exchange is more demand for this good, regardless of the reason for this demand. From this point, the number of potential indirect exchange opportunities grow. (Graf 2013b).

Nakamoto (2010) suggested that bitcoin could get initial value by people foreseeing its potential usefulness for exchange, even mentioning that collectors could initially spark the initial value. Szabo (2002) suggested that this tendency for individuals to collect rare items can bootstrap the monetization process. Whether it is speculation or other use cases mentioned before, these are all direct uses since they were not used for indirect

exchange. What needs these uses satisfied is an empirical question that can only be asked to the individuals who participated in these actions.

Historically speaking, the likely first media of exchange were wearable beads made from seashells from 120 000 years ago, which seemed to have no use-value other than being pretty collectibles (Ridley 1996, 209). These beads were desired goods, nevertheless. While these peculiar ornamental proto monies/collectible possessed qualities that made them salable, no use value seemed to be required for these proto monies to successfully emerge as monetary media. They emerged because they had characteristics that made them good for monetary functions: trade between tribes to seal pacts, storing value for long periods, and transferring it to the next generations. Economics, and the axiom of human action, does not concern itself with the rationality of actions, but only how to best satisfy wants. Therefore, these previously mentioned uses of bitcoin are not relevant, what is important is that they existed.

The emergence of money is described in chapter 3 as an organic market process where nobody instituted it. While bitcoin was not found, but invented with a clear purpose (Nakamoto 2008,), it still follows the theory, since it was voluntarily adopted by individuals perceiving benefit in doing so: individuals were trying to satisfy their wants, whatever those may have been. Nobody was ever forced to use bitcoin. Bitcoin was offered to the market as a tool for a very old phenomenon: to facilitate exchange either now or in the future.

4.3 Salability of bitcoin

According to the Austrian theory, what determines the success of a medium of exchange in becoming money is its relative salability. Bitcoin is already a medium of exchange and will compete on the money market strictly based on its salability alone, not based on its origin. Salability (liquidity) is what determines bitcoin's popularity as a medium of exchange because liquidity is what minimizes the costs of exchange. To speculate on the use of bitcoin in the future, it is not useful to try to find direct use value for bitcoin, since that is not what will determine the success of bitcoins transition from medium to exchange to a commonly used medium of exchange, i.e., money.

Since the Austrian monetary theory is based on the theory of salability, it is logically consistent to examine bitcoin through the same theoretical framework laid out in chapter 3. This subchapter will examine the salability of bitcoin by looking at the same characteristics as in chapter 3. Also, some new ways of looking at salability are introduced. This is done because the time when most monetary theories discussed in this thesis were invented differs very much from the modern-day world.

The key function of money is to facilitate indirect exchange with the least amount of economic sacrifice. The property that minimizes the costs of exchange is salability. The concept of salability is explained in the previous chapters and now the salability of bitcoin will be examined. This subchapter can be viewed as an answer to one question: how does bitcoin minimize the costs of indirect exchange?

Salability through time

The foundational characteristic of salability through time is *scarcity* and resistance to stock dilution. As per the bitcoin protocol rules, no more than 21,000,000 bitcoin will ever be issued on the network. The block reward, which is the amount of new bitcoin created, gets cut in half every 210,000 blocks, which is approximately 4 years (Hertig 2020). This block reward halving is continued until the new bitcoin production is 0 (the approximately year 2140) (Hertig 2020). These rules are enforced by the consensus rules. While theoretically possible to change the 21 million hard cap, it is highly unlikely due to the consensus around this rule. Even if the demand for bitcoin increases, the total supply cannot be adjusted as with any other good. On the negative side, this reality causes high volatility. While still volatile, figure 2 shows volatility decreasing as the price/market size increases.

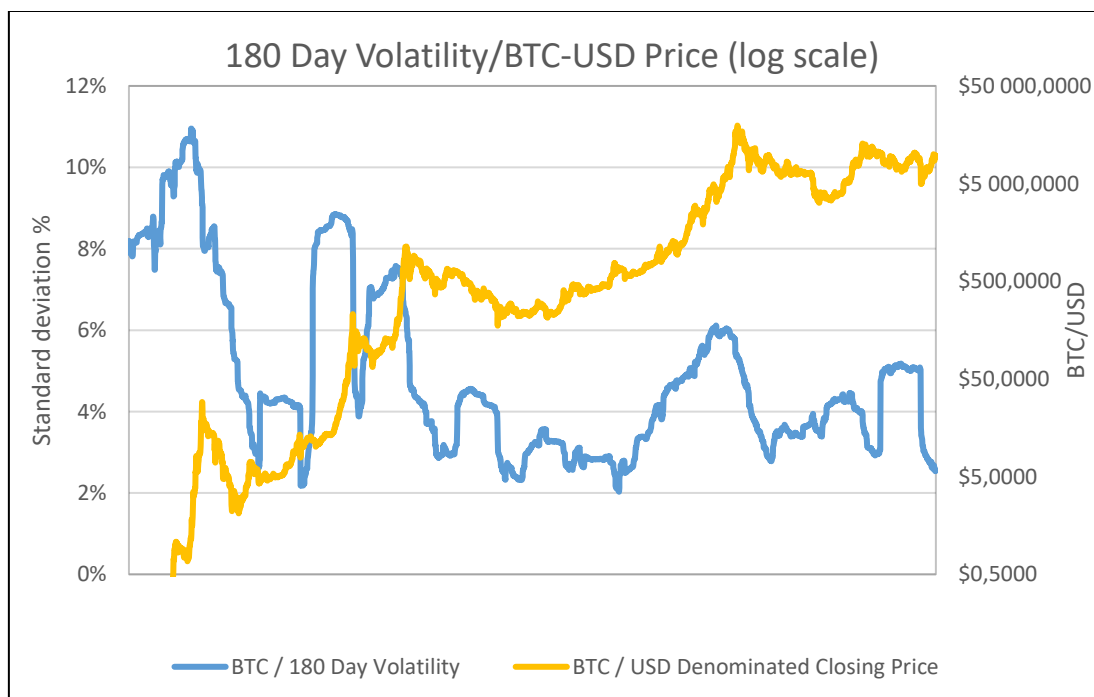


Figure 2 BTC 180 Day Volatility/BTC-USD Price (Coinmetrics 2020)

Stock dilution refers to how much the existing stock (supply) is diluted with new supply. The supply schedule is pre-determined making it highly predictable, which could make it a reliable store of value and a unit of account. Figure 3 shows a diminishing annual inflation rate

with block halvings creating clear supply shocks (see November 2012, July 2016, and May 2020).

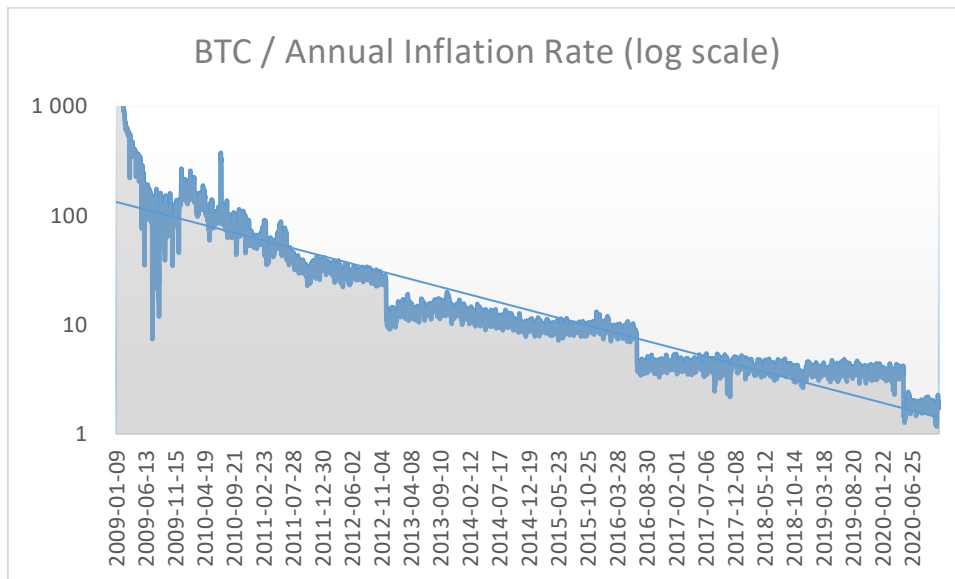


Figure 3 BTC annual inflation rate (Blockchain 2020)

Stock dilution can be quantified with a stock/ flow ratio. Ammous (2018, 5–6) describes the stock/flow ratio as a measure of monetary “hardness”. The measure is a ratio of new supply and existing stock of units. In essence, it indicates how hard it is to produce new units relative to the existing stock. Bitcoin’s stock/flow compared to gold and silver can be observed in figure 14 (see appendices). Figure 4 shows a divergence between the bitcoin inflation rate (new supply) and the existing bitcoin that has been produced already (existing stock). This means that with every halving occurring approximately 4 years, the new supply production (inflation) gets cut in half and existing supply growth decreases. This illustrates the long-term predictability of Bitcoin’s hardness, which is one aspect of scarcity. The second side being demand, which cannot be predicted. The hardness of money can be viewed as its resistance to new production.

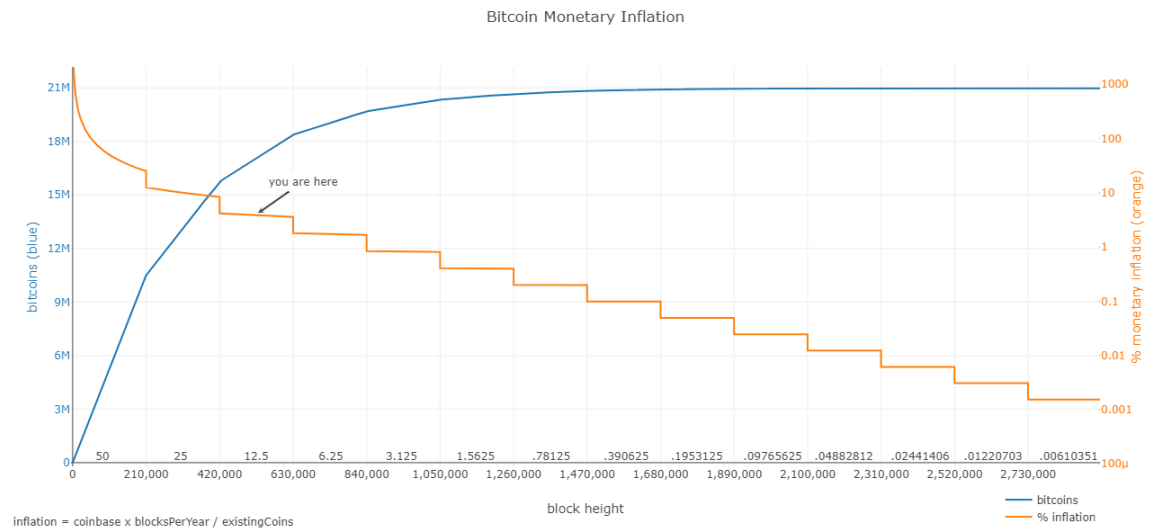


Figure 4 BTC monetary inflation/BTC supply (BashCo 2020)

The key component to bitcoin's hardness is a process called *difficulty adjustment*. This process happens every 2016 blocks or approximately every 2 weeks (Kapilkov 2020). It adjusts the difficulty of producing new blocks based on how much energy on the network is expended for block production. If there is a lot of energy and blocks are found too quickly, the difficulty of producing blocks adjusts upward. The same process works in reverse when there is too little energy and blocks are produced too slow. This process returns the block production time to its 10-minute average. (Nakamoto 2008, 3.) Figure 5 shows historical difficulty levels, which means more energy is being spent on producing bitcoin. The unit in figure 5 representing difficulty is the number of tries needed on average to yield success (produce a new block). Bitcoin production can be expedited only to a very limited degree. This makes unexpected or additional stock dilution impossible. On the contrary, it makes stock dilution pre-determined. (Nakamoto 2008, 3.)

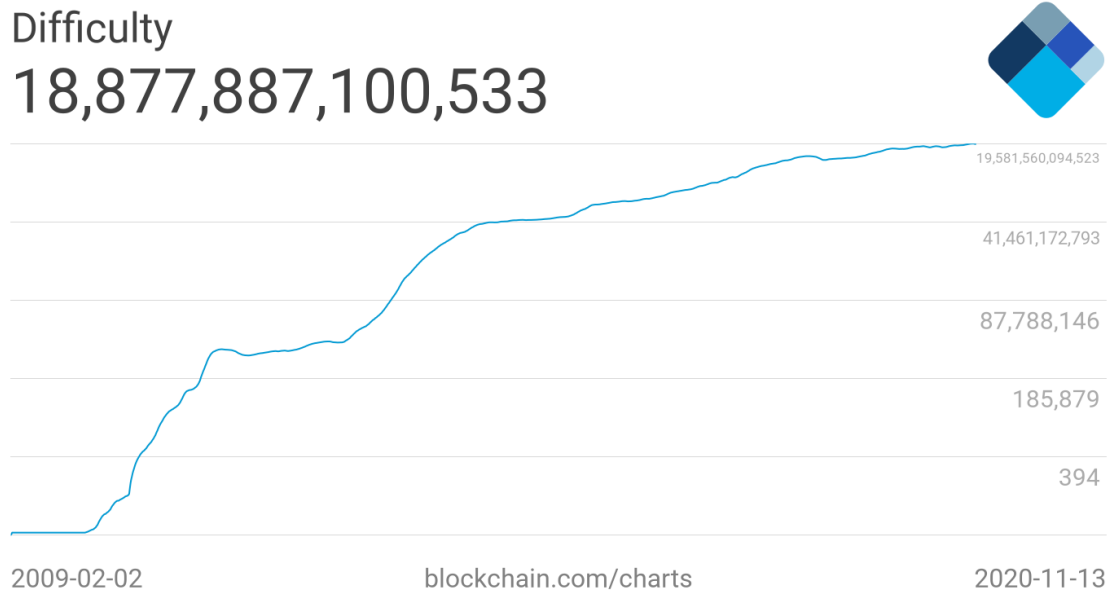


Figure 5 Bitcoin Difficulty 30 Day Average (Blockchain.com)

Hard capped supply by itself does not equate to scarcity; it is the relationship of supply and aggregate market demand for bitcoin that makes it scarce. The capped supply simply keeps the bitcoin supply resistant to ad hoc stock dilution.

Bitcoin also introduces the concept of *digital scarcity*. Traditionally, digital goods such as files and images have been non-scarce since they can be copied easily, and attempts to make them non-copiable have manifested through intellectual property laws, copyrights, and digital rights management (Smith 2017). These have proven to be ineffective (Electronic Frontier Foundation 2015). Bitcoin is a breakthrough in the sense that it introduced digital scarcity without needing an intermediary to verify the integrity of the payment, which was previously impossible with digital payments (Ammous 2018, 169). Technically speaking, everything in bitcoin can be copied since it is code, but in doing so the bitcoin copy would be out of consensus with the network, i.e., not part of the same network anymore.

The supply of bitcoin can be audited at very low costs. Auditing the monetary supply of Bitcoin can be done independently with a simple command (`bitcoincli-gettxoutsetinfo`) in the Bitcoin software client, which makes verifying supply cheap and fast.

As per the Austrian theory, another important quality for salability through time is the *durability* of a good. Bitcoin itself is code, and code is numbers and letters, which are non-tangible concepts that do not decay with time. Another point to consider that does not relate to bitcoin's durability per se is how durable are the ways in which people store their private keys; some might prefer to stamp them on a piece of steel while others have chosen to

store them in their memory. This issue, however, is not intrinsic to the issue of bitcoins' durability. Being intangible, bitcoin is durable and has low storage costs.

Bitcoin is valued by the market by its resistance to consensus rule changes, i.e., for its *immutability*. Ammous (2018, 222-227) mentions that the immutability is derived from the incentive structure where different network participants are incentivized to uphold the current consensus rules. Even not so controversial changes are hard to create because of the distributed nature of the Bitcoin network; many different and adversarial parties need to agree on changes that might not be well understood and create bugs in the software. This results in an aversion to changes in the code. (Ammous 2018, 225.) To change something in the main Bitcoin software implementation known as "Bitcoin Core" would require large enough consensus and support which is hard to reach.

Salability through space

The most visible characteristic that affects salability across space is the good's *portability*. Bitcoin by nature is portable. When it comes to bitcoin, thinking about portability in the traditional sense is not useful. This is because bitcoin cannot be carried around like tangible goods; bitcoin are not stored in data storage devices or software. Bitcoin the units are entries on the decentralized database that is called bitcoin's blockchain. These units are controlled via private keys that are used to provide digital signatures to prove control over the units. Carrying these signatures, which are essentially strings of numbers has minimal costs. Portability in terms of sending bitcoin on its native network depends on the preferred settlement time. Currently, a transaction of 100,000,000 EUR can be sent on the bitcoin network for less than 40 cents and have a final settlement in 10 minutes which makes bitcoin quite portable. However, if one were to buy a cup of coffee for 1 EUR and spend 40 cents on network fees, in that case, bitcoin cannot be considered very portable. It has been observed that the bitcoin network's settlement layer is not suitable for small payments in the long term, meaning that bitcoin, generally speaking, is portable for big transfers.

Censorship resistance can be viewed as a defense mechanism against political influence over money. Bitcoin, as a system, was built to be trust-minimized (Nakamoto 2008); cheap verification enables one to delegate more of the trust in math and software instead of institutions. This design creates less trust in third parties, which are as Szabo (2002) calls them, "security holes". Bitcoin can be verified with small costs by running the bitcoin software. The storage requirement for running a full validating bitcoin client is 350 gigabytes, which can be achieved on most computers or by using external hard drives which are not costly to acquire. It is this characteristic that made it possible to circumvent trusted third parties, to

whom this verification was outsourced. This low cost of verifiability makes it hard to send counterfeited bitcoin to a bitcoin client that is validating the ruleset.

Bitcoin is *fungible* at the network level: the units are indistinguishable from each other in the eyes of the network. Being a public blockchain observable by anyone, bitcoin can be “tainted” after being used in nefarious activity. This taint, however, is attached to bitcoin by the humans, not the network itself. Nevertheless, this can become a problem, and there might become a widespread practice of separating “clean” and “dirty” bitcoin, which might cause them to be traded either at a discount or a premium, depending on their history and proximity with illegal usage. There are, however, attempts to increase the fungibility of bitcoin with various privacy techniques (Samourai, Wasabi, Joinmarket) that are meant to improve anonymity by obfuscating the heuristics used by companies analyzing the blockchain and giving this information to law enforcement.

Salability through scales

In theory, bitcoin can be divided into a hundred million units. These units are called satoshis. Although theoretically possible to divide bitcoin infinitely, sending very small amounts is not possible in some cases due to network fees that would make the transaction either uneconomical or technically unspendable. Another point to consider is the fact that in the case where the valuation of the smallest unit of bitcoin becomes too valuable for low-value transactions, the currently smallest unit can be technically divided into even smaller units. This combined with future potential programmability makes bitcoin highly salable through scales.

Acceptability

Bitcoin acceptance by various businesses and individuals has been growing steadily. Image 2 shows the development of bitcoin as a means of payment at various venues. The maps in the image are taken on the 4th of November 5 years apart. In 2015 there were 7406 venues accepting bitcoin, and in 2020 the number is 18634 venues, an increase of 151,6%.

This growth can be partly explained by the world getting more digitalized (OECD 2018). Another explanation is the increased knowledge among people about what characteristics can make a monetary medium good. When ancient proto money was adopted people were drawn to these objects without having empirical data on which characteristics constitute good money. Being a new invention, bitcoin had the benefit of being created and used by individuals more or less aware of monetary economics, which could have been a factor in expediting bitcoin’s fast adoption.

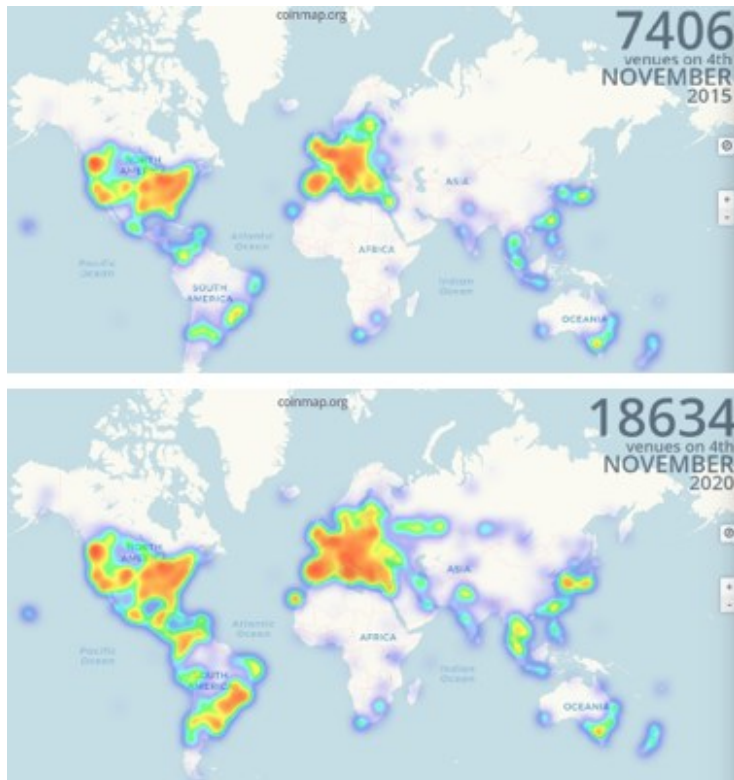


Image 2 Number of venues accepting bitcoin (Coinmap 2020)

While image 2 only shows the venues that have officially announced that they accept bitcoin, other companies and individuals might accept bitcoin for their products and services. Other metrics to examine this topic are the total value transferred and the transaction count on the bitcoin network. While not an indicator of bitcoin's acceptability per se, this metric can give an idea of how much activity there is on the Bitcoin network. Figure 6 shows the historical 30-day moving average of the total value transferred on the Bitcoin network. Transfer value was at an all-time high in December 2017 after which it has not reached previous ATH (All-Time-High) currently being 53.9 % down. More optimistically, the transaction count is holding its level better being 22.2 % down from its December 2017 ATH. Coincidentally, figure 2 shows that the BTC/USD price was also at an ATH in December 2017 indicating that price and network activity are cyclical and correlated.

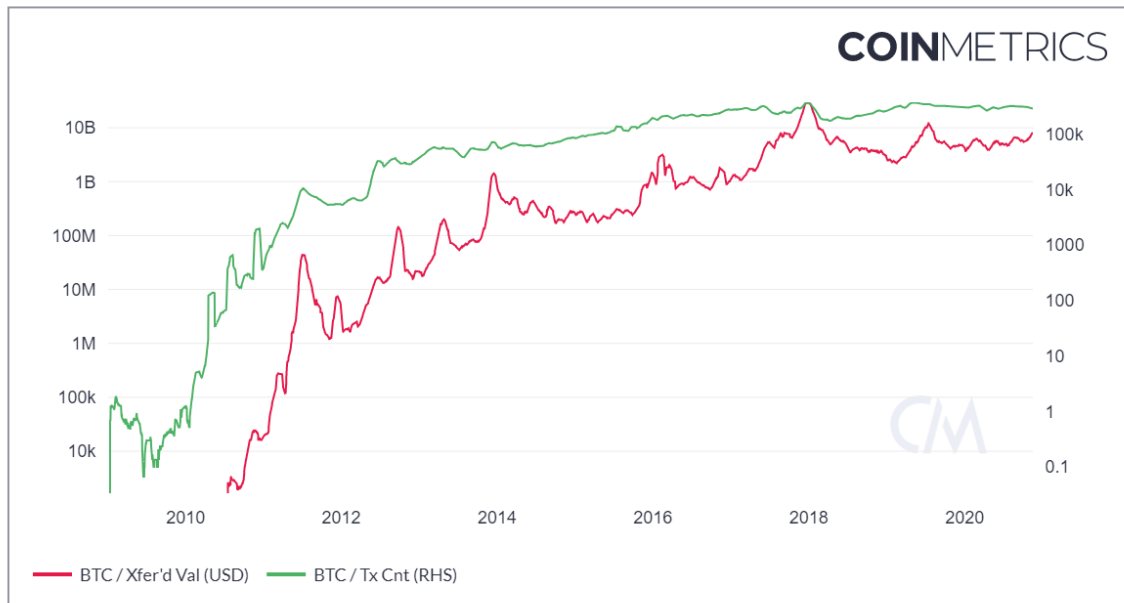


Figure 6 30-day moving average transfer value in USD/ 30-day moving average transaction count (Coinmetrics 2020)

To conclude, the reason salability is fundamental for monetary media is because it decreases transaction costs. These costs are not only the costs of sending the monetary unit from point A to point B but other less visible costs too. Figure 7 shows different costs related to using a medium of exchange in immediate time or in deferred exchange (store of value). Friction, in figure 7, can be summarized as all the costs of indirect exchange, from acquisition and preservation to disposing of a good.

$$F = 1 - (1 - x_s) e^{-pt} (1 - x_b)$$

where:

- F is the friction in trade when using an intermediate medium of exchange,
- x is the cost of interpersonal exchange (validation, divisibility, spread, transportation, taxes, ...) of the goods you have for a particular medium of exchange (x_s), or of that intermediate asset for the goods you want to purchase (x_b).
- e is the exponential function (used for calculating continuous compounding interests),
- p are the costs of storage and preservation (stocks growth or demand contraction, custody or credit risk, other risks/insurance, ...),
- t is the holding period.

Figure 7 Transaction costs (Fernando Nieto, @fnietom)

The characteristic contributing to the costs of exchange is salability which in turn is derived from specific characteristics (see chapter 3). In essence, media of exchange that lower costs of exchange tend to become even more salable because of this.

5 EMPIRICAL RESEARCH AND DATA ANALYSIS

This part aims to describe how empirical research was carried out and how the collected data was analyzed. Both quantitative and qualitative research methods were used.

5.1 Data collection

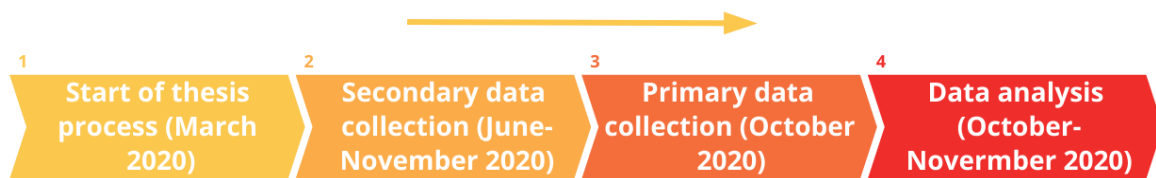


Figure 8 Data collection and analysis process

Figure 8 shows that the process started in March 2020, followed by the primary data collection (survey) and ending in data analysis performed in October-November 2020. One survey template was used for all participants because the purpose of this survey was to find out how bitcoin is viewed by the market, the main reasons why bitcoin owners hold/use bitcoin, how they view its properties, obstacles, and how they view bitcoin as money in a general sense.

A total of 273 respondents participated in the survey. Participants were contacted by direct message via social media platform Twitter, messaging platform Telegram, and group email at one of the author's cryptocurrency-related workplace (Ledger SAS). The respondents were chosen based on if they own bitcoin. This prerequisite was made clear before inviting respondents to participate in the survey. The survey was conducted via Google Forms survey platform. Other than bitcoin ownership, no other information is known about the respondents. This was done to achieve honest and accurate answers. The survey consisted of closed questions (7) and open questions (2) where respondents could answer in their own words.

Survey questions were chosen based on the research question and sub-questions laid out in chapter 1. Three (3) of the questions were one-choice questions, four (4) questions were multiple-choice questions, and two (2) remaining questions were open questions. All questions were voluntary, which resulted in some respondents not answering all the questions. Some respondents provided incoherent answers in the open questions-part of the survey which caused these answers to be discarded from the dataset.

To avoid survey fatigue, the number of questions was kept at nine (9) and the questions were formulated engagingly and interestingly so that they would resonate with the respondents. This data collection method was chosen because of its fast and wide reach. Using a survey also makes it possible for respondents to consider their responses without being rushed. Questions were kept short and concise to avoid subjectivity and misunderstandings in answers.

5.1.1 Limitations

The limitations of the data collection method are regarding the nature of the questions and how they relate to the survey participants. Firstly, the respondents might not answer the questions or not answer truthfully because the questions may be too personal, and respondents might want to protect their privacy. Secondly, the respondents might have different interpretations of the survey questions, or problems understanding some of the questions which can cause subjective or skewed results. In some cases, respondents can go through the questions fast without fully reading them which can affect the validity of the data. This manifested in some incoherent answers, which were discarded from the dataset. Also, the respondents might have a hidden bias: being too mentally or financially invested in the subject of the survey, which could potentially lead to inaccuracies. This inaccuracy can be caused by the respondents who see the studied topic in an overly positive light. The topic of bitcoin can be emotional because of respondents being financially invested in it. Lastly, the sample taken from a large population might not be representative of the wider population because of respondents being demographically too homogenous as the sample group.

5.2 Data analysis

Quantitative method

Data from closed questions (7) were compiled into figures for numerical visualization. This visualization helps readers see the results in a quick and user-friendly way.

Qualitative method

Open questions (2) were analyzed using thematic analysis to identify many times occurring themes in respondents' answers. From start to finish, thematic analysis can be performed in six distinct phases.

Six phases of thematic analysis:

- Phase 1: familiarizing yourself with the data

- Phase 2: generating initial codes
- Phase 3: searching for themes
- Phase 4: reviewing themes
- Phase 5: defining and naming themes
- Phase 6: producing the report.

(Braun and Clarke 2006, 15-23)

First, the data was familiarized with, after which the data was coded into sections that describe their content. A free online qualitative tool **Taguette** was used for coding. The codes were selected to describe ideas in respondents' answers. All the relevant phrases were highlighted and assigned a code that described them. The codes were collated into themes that encompass multiple similar codes. Codes that were too vague, irrelevant, or rare were discarded. Themes whose codes occurred less than five times we also discarded. Lastly, these themes were named and defined. These themes were used to answer the thesis' research questions.

Both closed (7) and open (2) questions were used to see how both quantitative and qualitative primary data complements theory and secondary empirical data. This was done to see how the analyzed data can contribute to answering the research question and sub-questions. Parallels will be made between empirical primary and secondary data, and the theoretical framework laid out in chapter 3.

As established previously, money serves the purpose of a medium of exchange. To examine how bitcoin holds up as a medium of exchange, it is required to see how bitcoin is being used by the market today. Since money, being a market in itself, is a social phenomenon, it is logical to collect and analyze primary data directly from the users of this money.

6 SURVEY FINDINGS

This chapter analyzes the results of the survey. The questions will be examined in the same order they were presented to the respondents in the survey.

Quantitative data

Most people owning bitcoin were part of the younger generations. The sample group included some older individuals, but these were small minorities.

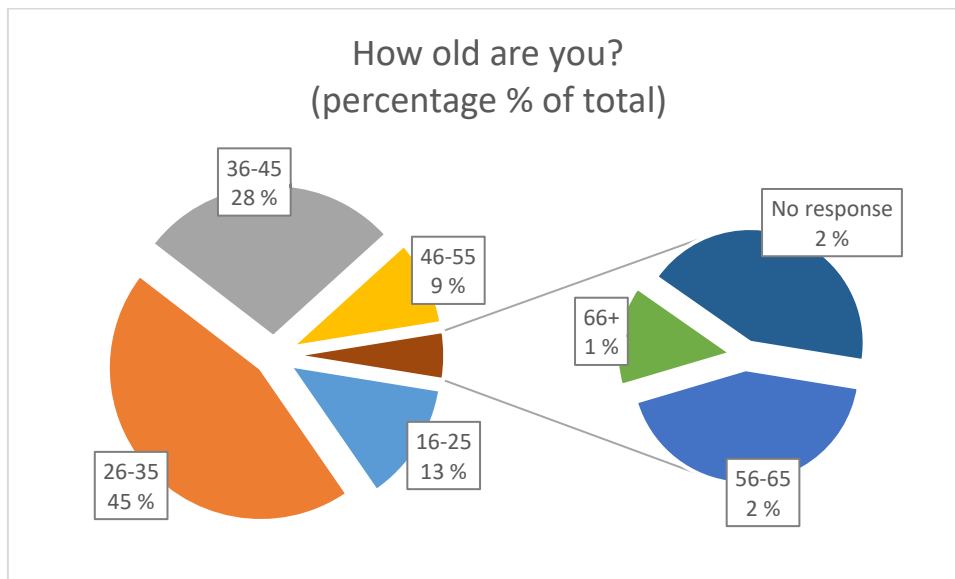


Figure 9 Age distribution

Bitcoin usage is concentrated in the millennial generation. Figure 9 shows that the biggest age group was 26-35 followed by 36-45 and 16-25. These age groups are also the ones that are more familiar with the internet and have access to it (Clement 2020), which explains the popularity of bitcoin as a digital asset in these age groups.

There are various reasons for buying bitcoin and many of the respondents chose several options for these questions. Some of the answers overlap to some extent and can be perceived as complementary to each other.

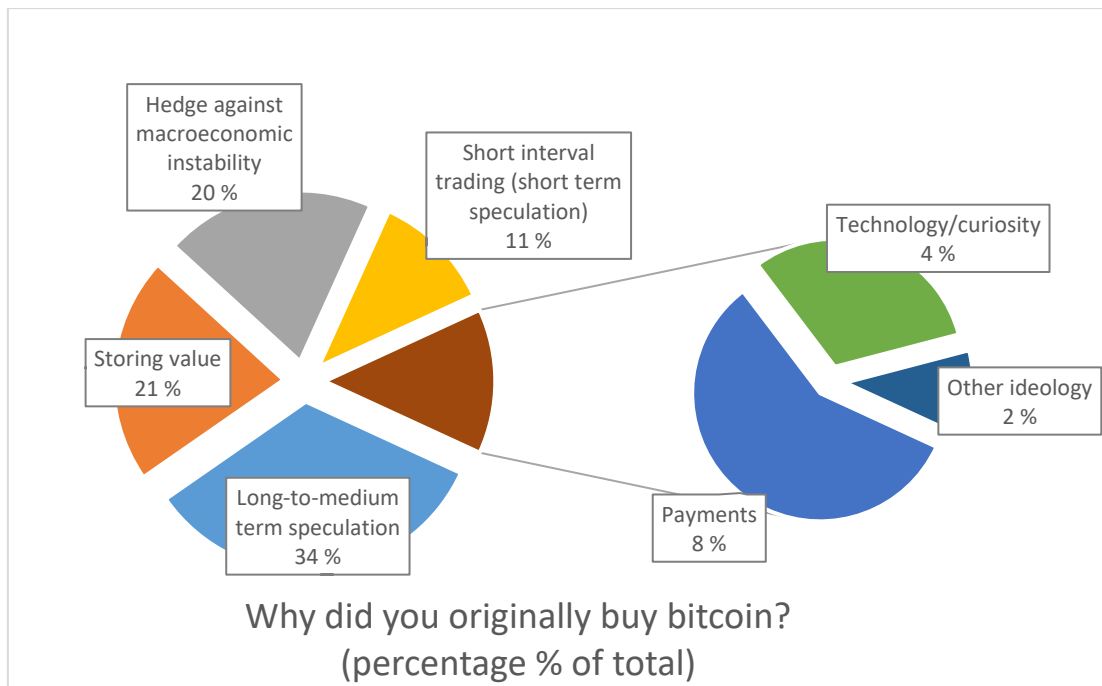


Figure 10 Why did you originally buy bitcoin?

Just as in the early days of bitcoin, speculation plays an important role today. According to figure 10, the most popular reason for buying bitcoin long-to-medium-term is speculation which indicates users' anticipation for price appreciation. Because bitcoin is young (11 years old), and the price action is almost as volatile as before (see figure 2) a parallel can be drawn between the earliest users and current newcomers: both groups came to speculate on the possible monetization of bitcoin. Storing value and payments were also reasons for buying bitcoin, but speculation is the main driver. People are buying bitcoin for the same reasons as predicted by Nakamoto and Finney in chapter 4 (speculation). Another big reason for buying bitcoin is to hedge against macroeconomic instability, which is another way of speculating on the global macro scene.

Storing value is currently the biggest use case as opposed to long-to-medium term speculation. The sample group has remained the same but their usage has shifted.

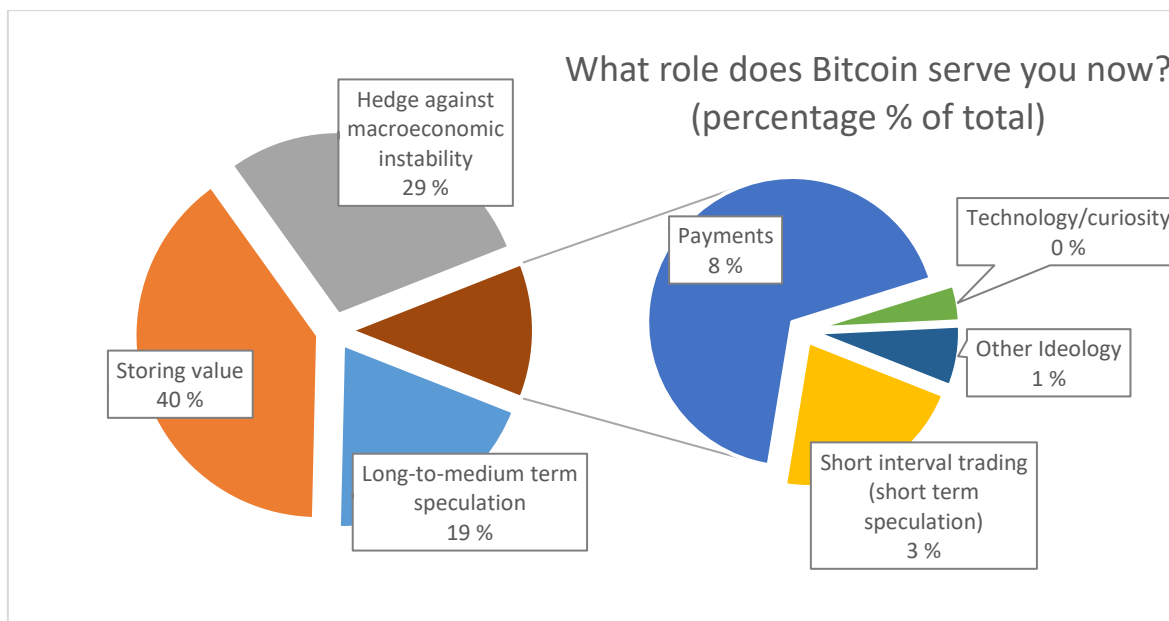


Figure 11 What role does Bitcoin serve you now?

Contrasting figure 11 with figure 10 also shows that the “storing value” reason has doubled after holding bitcoin for a while indicating growing trust that bitcoin can effectively store their value. Storing value or deferred exchange is valued more than short time frame exchanges, i.e., payments. A significant part of the respondents owns bitcoin to hedge against macroeconomic instability, which implies a perception of bitcoin as a safe-haven asset. This is indirectly tied to the idea that bitcoin is a scarce and uncorrelated asset that can potentially preserve value during macroeconomic turbulence. This data indicates growing trust in bitcoin’s ability to store value more effectively. A parallel can be drawn to Mises’ (1998, 250) explanation that money is held because of future uncertainty.

As per Menger’s explanation in chapter 3, speculation can play a significant role in the monetization process. This speculation could be the reason why holding bitcoin for longer periods is more popular than using it to pay for goods and services. Bitcoin seems to be benefiting from the Mengerian positive feedback loop also described in chapter 3, which could explain bitcoin owners’ tendency to hold it for longer periods, instead of disposing of it fast. Speculation can be a strong factor in the emergence of media of exchange. While both short term and long-term speculation have decreased, they are still a significant reason for bitcoin ownership (see figure 11). Even for more seasoned bitcoin owners, speculation plays a role in their usage.

Other smaller reasons for ownership were grouped under either technological curiosity or other ideological reasons that could not be grouped with anything else.

The division between the most important qualities perceived by bitcoin users is diverse. Respondents could pick multiple qualities and chose the ones that they felt were the most important in their opinion. The most valued quality was scarcity, followed by censorship-resistance and verifiability. This shows that fixed supply is the driving force in bitcoin's demand. Censorship-resistance refers to the ability to send bitcoin through space and time without needing to trust third parties. Verifiability could refer to both ability to verify the existing supply (computer command) or the total supply (Bitcoin source code). The qualities below cannot be ranked in order of importance or have a value attached to them because their importance is subjective. Also, it is impossible to tell to what extent these qualities contribute to bitcoin's liquidity (salability).

The acceptability of bitcoin is more important than its divisibility, but not as important as the qualities that make bitcoin salable through time (scarcity). This is because bitcoin is going through its monetization process (as described in subchapter 3.1) and is currently considered as "digital gold" (Gogo 2020) more than a currency for direct payments (Hajric & Wagner 2020).

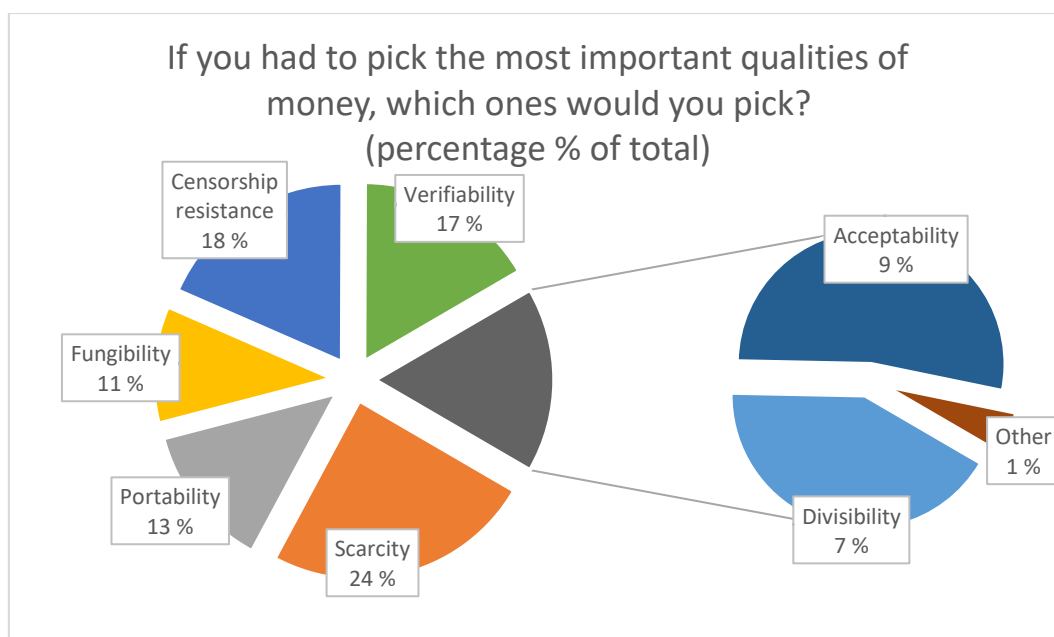


Figure 12 The most important qualities of money

There are various obstacles to bitcoin becoming global money perceived by bitcoin users. According to figure 13, the obstacle that stands out is overregulation by law enforcement agencies. Because of the non-censorable and pseudonymous nature of bitcoin, governments proclaim that cryptocurrencies pose risks that outweigh their advantages (Parker 2018). This thinking leads to authorities attempting to regulate bitcoin usage with consumer

protection in mind. This kind of overregulation has caused some companies and startups to shut down (Smith 2020).

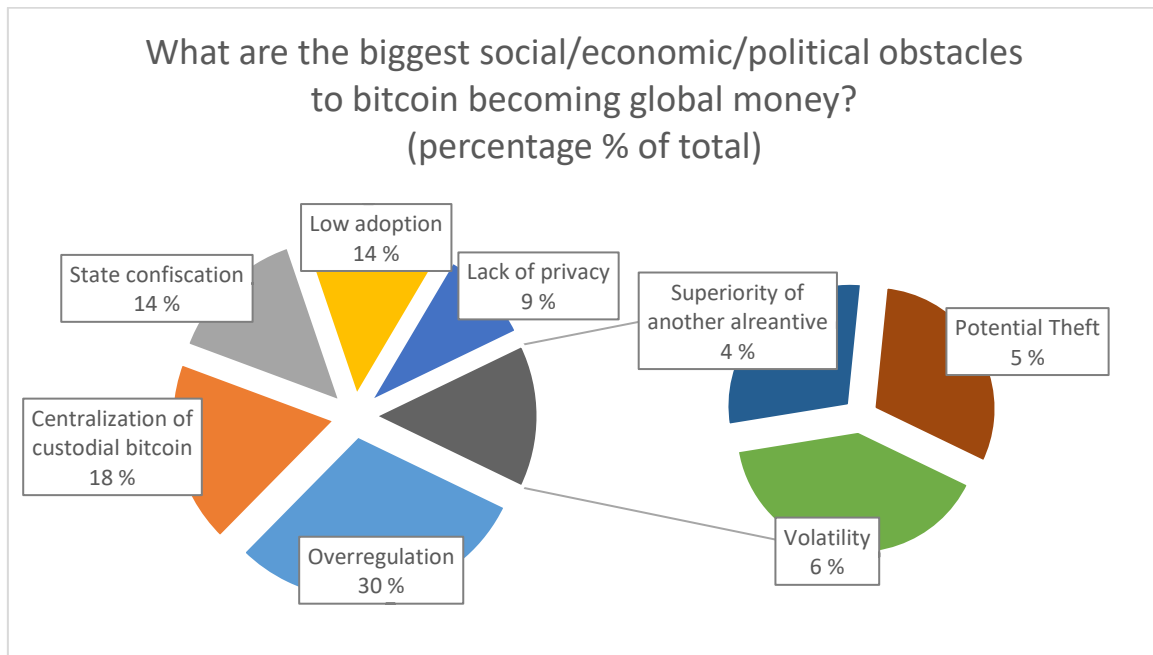


Figure 13 The biggest obstacles in bitcoin becoming money

The second biggest obstacle is the centralization of bitcoin in custodians' control which is tied to overregulation since governments can more easily regulate bitcoin that is held in institutions' custody. Custodial bitcoin is regulated to a higher degree than bitcoin held by its owners (Adeyanju 2020). This would also weaken the decentralization of the network due to bitcoin owners not practicing self-custody with their private keys or running their own Bitcoin software client. This in turn would make the Bitcoin network possibly less censorship-resistant as these custodians would have total control over the bitcoin that they custody. State confiscation is the third biggest obstacle. Overregulation, state confiscation, and bitcoin custody centralization are all linked to bitcoin's ability to transfer value without requiring trust, i.e., censorship resistance, which was found to be the second biggest reason that bitcoin owners currently own bitcoin (see figure 11). It should also be considered that these factors are not intrinsic to bitcoin as a monetary media, but rather extrinsic factors caused by government intervention.

Another obstacle that decreases bitcoin's salability is low adoption. As discussed in chapter 3, acceptability is a key factor in a medium of exchange gaining salability. What should be noted, is that "adoption" does not always translate into the acceptability of bitcoin. Adoption, in this case, can also be considered as an increase in individuals holding bitcoin (storing value) for longer periods without ever using it for payments. This can be observed in figure 11 which shows that storing value is currently a more important use case than payments.

Being perceived mainly as a store of value can explain the fact that bitcoin's volatility and lack of privacy are not seen as big obstacles since storing value, as opposed to payments, is not seen as needing stable prices or privacy.

Qualitative data

Question 1: What gives bitcoin value in your view?

Scarcity

The major theme in this data is scarcity: to quantify this theme, over half of the data set dealt with scarcity. In combination with the findings from previously analyzed data, it is evident that this characteristic is what respondents value over all other characteristics. This finding can be extrapolated to a wider audience and assume other people value bitcoin because of this too. Currently, big companies operating in the cryptocurrency space are buying more bitcoin is being produced, which causes negative supply shocks. This is contrasted with the fact that the supply of bitcoin cannot be expanded resulting in upward price pressure. (Nagarajan 2020.) These dynamics make bitcoin even more scarce, and thus more valued by its users.

Censorship-resistance

The second major identified theme is censorship-resistance. As discussed earlier, this can be seen as censorship through time (stock dilution) or space (censorship of payments). This quality is essential for bitcoin to be a successful store of value since the ability to store value necessitates the ability to not have one's savings diluted via inflation. The ability to make payments without being censored is also important if bitcoin is to become more widely accepted and used for payments. Overregulation and state confiscation were the biggest obstacles (see figure 13) in bitcoin's monetization process, which are both effectively circumvented by bitcoin's resistance to confiscation and censorship. Today bitcoin is predominantly used for payments in the most oppressed regimes around the world (Ahlborg 2019). Furthermore, both types of censorship-resistance can be seen as a hedge against globally rising fiscal and monetary irresponsibility (Carvalho & Wilson 2020) or rising authoritarianism from governments (World Politics Review 2020).

Immutability

The third-largest theme is immutability, which refers to Bitcoin's source code's resistance to change. This can again be tied to individuals' usage of bitcoin as a store of value, as immutability makes bitcoin robust and hard to change, i.e., people can rely upon that bitcoin will not go through drastic changes that would make it less scarce or less

ensorship-resistant. Besides, if things can be changed arbitrarily in bitcoin, all qualities that are valued right now can be changed. Ultimately, the immutability of bitcoin is valued because it preserves all the other qualities that make it useful to people, the biggest of which are scarcity and censorship resistance, as found out in this research.

Portability

The last significant identified theme was portability. Respondents seem to appreciate the ability to send bitcoin across space. Nakamoto (2009) described in a thought experiment a metal as scarce as gold, boring grey in color, and not useful for industrial or ornamental use but could be transported over a communication layer. This is one way of looking at bitcoin: scarce but not restricted by spatial limitations, i.e., can be transported anywhere via a communication medium. It operates outside the banking system infrastructure (Adham 2019) and can be transferred any time of the day with a final settlement as fast as 10 minutes. Tangible assets being non-portable is seen as a limitation (Zimwara 2020). Previous results (see figure 11) have shown that bitcoin is currently used more as a store of value, which might be the reason why portability, a quality usually attributed to payments, is the least prevalent theme in this dataset.

Question 2: At what point would you say bitcoin has succeeded as money?

Bitcoin is already money

The thematic analysis shows that “Bitcoin is already money” is the most prevalent theme. Respondents provided quite differing views on why they considered bitcoin as already money. The most common answer was that it became money as soon as it served a role in indirect exchange, but here we return to the problem of assessing the degree of salability (liquidity) and how individuals interpret it. The responses were based purely on empirical observations that were affected by the respondent's subjective ideas on what constitutes money. This theme will not be examined closer since it does not directly answer the thesis' research questions.

Acceptability

The second biggest theme that appeared was the acceptability of bitcoin. The respondents gave various “thresholds” of acceptability: some interpreted sufficient acceptability as being able to buy basic necessities, while others explained that bitcoin needs to be accepted at every corner store to be considered money. While some of the biggest merchants accept bitcoin as payment (see image 2), it cannot be widely used as of today.

Market capitalization/price

A third major theme was “Market capitalization/price”. This indicates that many of the respondents would consider bitcoin to be money if it were to reach a certain price level or total market capitalization. The surpassing of the gold’s market cap was frequently mentioned as an important milestone for bitcoin to be considered money. Gold and bitcoin can be seen as similar competitors since both arose from the free market.

Nation-states/big companies owning/using bitcoin

The fourth-biggest identified theme was “Nation-states/big companies owning/using bitcoin”. This usage mostly refers to having bitcoin as an asset in the national or company balance sheets. Currently, there are no known occurrences of nation-states publicly announcing ownership of bitcoin. The second identified trend in this theme was paying taxes with bitcoin, which is currently possible in the canton of Zug, Switzerland (Canton of Zug 2020).

Store of value/volatility

The fifth biggest theme was “store of value/volatility”. Because of bitcoin being censorship-resistant to dilution and confiscation, the main challenger for bitcoin’s ability to store value long term is volatility. According to respondents, sufficiently low volatility would signify that bitcoin might be considered money. Bitcoin’s volatility is on a downward trend (see figure 2).

Unit of account

“Unit of Account” theme was the smallest identified theme, which indicates that the moment goods and services are priced globally in bitcoin is the moment it could be considered money. Graf (2013a, 40) argues that a better criterion for qualification as money, instead of the vague “commonly used” would be the unit in which most people measure prices and do the economic calculation. Bitcoin is already used as a unit of account in some contexts. These include enthusiasts denominating goods and services in bitcoin or satoshis, Bitcoin wallet software removing fiat references (Samourai 2018), and bitcoin services pricing their offering in bitcoin or satoshis (Lightning Roulette). These instances are not common yet, due to fiat monies still being dominant units of account. While the definition is itself is clear, this phenomenon is hard to access quantitatively due to contextual differences.

7 CONCLUSION

What separates the emergence of bitcoin from other monies is the fact that it was not discovered but invented (Nakamoto 2008, 1) for the sole purpose of functioning as a medium of exchange, i.e., to transfer value through space and time, and it did so at an extraordinary pace. Bitcoin was evaluated in terms of its origin, salability, and market perception. Emerging from the free market as a tool for more effective exchange, bitcoin matches to a high degree the Austrian description of money.

There are many potential obstacles for bitcoin's adoption as monetary. Issues such as over-regulation, centralization of the network, lack of privacy, and increase in custodial bitcoin. These issues, however, could be solved by entrepreneurs who perceive the benefit of strengthening the Bitcoin network and thus increase the salability of bitcoin.

As Mises explained, there is a tendency for only a few dominant monies to prevail as commonly used media of exchange. This dynamic might not sit well with various governments that are currently enjoying the monopoly status with their respective fiat monies, and we might see some sort of crackdown on bitcoin users and businesses. Hayek (YouTube 2015) predicted that the only way people will get the money out of the government is by some "sly roundabout way", which can be viewed in parallel with Bitcoin's birth on the ideologically influenced cypherpunks' mailing list in 2008.

E-gold and the Liberty Dollar were shut down by governments. Even the conducted survey indicated that individuals owning bitcoin see over-regulation as the biggest obstacle to bitcoin adoption. Nakamoto (2009a) himself mentioned that the failure of earlier e-cash systems was due to their centrally controlled nature, which made it easy for governments to shut them down.

Since its inception, the Bitcoin network has been strengthening by various metrics. These metrics include global hash rate, i.e., how much energy is spent on bitcoin production (figure 15, see appendices) and market capitalization (figure 2). The world is getting only more digitized and connected (OECD 2018), which would make sense for a liquid, borderless, and digital e-cash such as bitcoin to become ever more popular. The survey found out that the biggest age groups using bitcoin are digital natives.

As of today, bitcoin circulates at a higher rate than before due to the ever-growing exchange opportunities its holders' encounter. As for the Austrian definition of money, bitcoin has some way to go before it can reach this status. Money is an economic phenomenon, and economics study human action of the social world, and just like all social phenomena, the process of monetization is not linear, but rather exponential. As the utility of the money

increases with every individual demanding it, the monetization process of bitcoin might be significantly faster due to its nativity to the digital world, exacerbated by its incentive structure that takes into account an axiomatic truth: individuals act to satisfy their wants.

7.1 Answer to research questions

Main question

- Is bitcoin money?

According to the definition of the Austrian school of economic thought, to be money bitcoin needs to be a universally or commonly used medium of exchange. This thesis has attempted to answer this question by looking at various primary and secondary sources. While not yet “universally” used by people, it could be considered a commonly used medium of exchange in certain narrow contexts. Besides, the word “commonly” is not a scale or measurement, and thus cannot be quantified. Money is a social phenomenon and there is no definitive and generally agreed-upon way of measuring the “moneyness” of a good.

The question on how “commonly used” a medium of exchange must be to satisfy the definition of money (1) can only be interpreted subjectively, (2) contextually, and (3) empirically since there is no convergence between users of a medium of exchange on what this definition means exactly. If the definition “the most used” medium of exchange, that would disqualify bitcoin, but it would also disqualify every fiat money except for US dollars and Euro. Then again, if we use the definition of “commonly used”, it is evident that even US dollars or Euro are not commonly used in countries like Sweden or Norway.

The consensus among survey participants is that bitcoin is already money, but this result could be skewed by their strong personal bias. The survey found that bitcoin needs to be accepted to a certain extent to be considered money. It was discovered that while growing every year, bitcoin acceptability is still low in the grand scheme of things, which would mean that it cannot be called money yet. Therefore, this seemingly simple question is problematic to answer without defining a specified angle or evaluation framework that could be used to examine this topic. Only by looking at specific predefined metrics, it is possible to assess how “commonly” a medium of exchange is used.

Sub-questions

- Why is bitcoin valued?

While being valued for various reasons, bitcoin is mostly valued for its ability to store value. While still volatile, bitcoin is perceived to be useful for its ability to store value without its

supply being diluted. This finding can be also seen in the characteristics that are valued by its users: scarcity and censorship resistance.

- Does bitcoin fit the criteria of money? If not, at what point would it?

As addressed in the main question, bitcoin can fit the criteria of money if examined in a specific context. In a general sense, bitcoin cannot be considered money yet since it is not widely used. It could be considered money when it reaches a certain level of acceptability or size in terms of total market capitalization.

- How is bitcoin used today?

Bitcoin is mostly used as a vehicle for storing wealth, hedge against macroeconomic instability, and long-term speculation. While it is used for payments, this use case is minimal compared to formerly mentioned use cases.

- What characteristics give bitcoin its monetary value?

The major identified characteristics that give bitcoin its monetary value are the following:

Scarcity, i.e., its limited supply relative to its demand.

Censorship-resistance, i.e., the ability to send bitcoin through space and time without trusted third parties inflating the value away or stopping the payment from reaching its destination.

Verifiability, i.e., the ability for bitcoin users to verify the integrity of the source code, verify the validity of the payment and that it is according to rules, and the ability to verify the existing supply of bitcoin.

Immutability, i.e., the fact that bitcoin cannot be easily changed resulting in the predictability of the protocol, the network, and the unit.

- Does bitcoin satisfy the function of money?

The function of money is being a medium of exchange. Since money is the most salable (liquid) good, this implies that money should satisfy the need for liquidity also in the short term, i.e., it should be easy and cheap to dispose of it. Currently, bitcoin has developed markets and can be sold easily and cheaply. However, if the usage of bitcoin stays mainly as storing value, which it is currently, this can cause low velocity (circulation). Low velocity can hinder its liquidity, which is not desired for a medium of exchange. As of now, bitcoin does satisfy the function of money as it is used as a medium of exchange for both long-term payments (store of value) and short-term payments.

7.2 Reliability and validity

Validity

Validity refers to how well the collected data covers the area of the research questions, i.e., how well it measures what it is supposed to measure (Ghauri and Gronhaug 2005 as cited in Taherdoost 2020, 28).

To ensure the validity of the results, respondents were given the option to write their thoughts instead of being locked into premade answer options. The survey was reviewed by a third party to ensure readability, i.e., opening potentially difficult or misleading concepts. No scores or ratings were used since the research subject deals with a social phenomenon and instead, a verbal measurement was chosen. Questions were worded without subjective bias, concisely, and precisely. Because of the anonymity, it is impossible to assess how well they represent the general population. The questions were curated to collect the most relevant data for answering the research question. Measured phenomena were chosen based on existing research, findings, and observed knowledge, which increased their relevance in answering the research questions.

Reliability

Reliability is how stable and consistent the measurement of the result is (Carmines and Zeller 1979 as cited in Taherdoost 2020, 3). Reliability is also about repeatability: a test is reliable if it produces the same result under the same conditions (Kalton and Moser 1989 as cited in Taherdoost 2020, 33).

Because of the standardized data collection method used for this research, all respondents were contacted in the same way and the questions were phrased identically. Since the research topic was narrow, multiple questions were set to measure the same thing but from a different perspective, which resulted in findings that reinforced each other. These steps were considered at the beginning of the research to ensure overall consistency in interpretation and thus consistency in the results. The results of a new survey could be different only because of changes in the studied subject (Bitcoin), but this matter is outside the scope of the research's reliability.

7.3 Further studies

Bitcoin provides an empirical case study with an extreme level of documentation. While ancient shell money traders cannot be interviewed, most people that were involved with bitcoin at some point can still be personally interviewed for further research. Bitcoin is a textbook example of the origins of money, that can also be observed in real-time. For

enthusiasts of Austrian economics or bitcoin, it might be interesting to not only study the origin and qualities of bitcoin as was done in this thesis but also the wider implications for economies of this novel and curious monetary asset that we call bitcoin.

8 SUMMARY

The objective of this thesis was to examine bitcoin via the lens of the Austrian school of economic thought and create parallels between the empirical data and theory. This was done to answer the research questions that relate to bitcoin's usage and viability as money. The first two chapters were a theoretical framework consisting of various secondary data sources. Introducing data in these chapters is relevant for comparing the survey findings to it. The empirical research was conducted via an online survey. To collect the empirical data, an online survey containing both qualitative and quantitative data was carried out. The collected data was analyzed by compiling data from the closed questions into figures and creating a report from the data in the open questions via thematic analysis.

The findings of the survey revealed various similarities between the observed primary, secondary data, and the theory. To be precise, bitcoin's emergence was found to resemble the theories of the emergence of money and to have functions and qualities that are usually attributed to monetary media. Specific exchanges, namely long-term temporal exchanges were found to be preferred over direct short-term exchanges. The core characteristics found to be valued over other characteristics are scarcity and censorship resistance, which are the fundamental value proposition of bitcoin. Finally, the research questions were answered, and further research suggestions were made.

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APPENDICES

2009 Exchange Rate



During 2009 my exchange rate was calculated by dividing \$1.00 by the [average amount of electricity required to run a computer with high CPU for a year, 1331.5 kWh](#), multiplied by the [the average residential cost of electricity in the United States for the previous year, \\$0.1136](#), divided by 12 months divided by the number of bitcoins generated by my computer over the past 30 days.

[Current Exchange Rate](#)

Mid-Market Bitcoin Exchange Rate History

\$1.00 USD =	1,392.33 BTC	01/01-15/2010
\$1.00 USD =	1,451.83 BTC	12/31/2009
\$1.00 USD =	1,555.24 BTC	12/30/2009
\$1.00 USD =	1,578.77 BTC	12/29/2009
\$1.00 USD =	1,578.77 BTC	12/28/2009
\$1.00 USD =	1,578.77 BTC	12/27/2009
\$1.00 USD =	1,578.77 BTC	12/26/2009
\$1.00 USD =	1,578.77 BTC	12/25/2009
\$1.00 USD =	1,578.77 BTC	12/24/2009
\$1.00 USD =	1,578.77 BTC	12/23/2009
\$1.00 USD =	1,578.77 BTC	12/22/2009
\$1.00 USD =	1,594.63 BTC	12/21/2009
\$1.00 USD =	1,594.63 BTC	12/20/2009
\$1.00 USD =	1,586.70 BTC	12/19/2009
\$1.00 USD =	1,622.40 BTC	12/18/2009
\$1.00 USD =	1,630.33 BTC	12/17/2009
\$1.00 USD =	1,606.53 BTC	12/16/2009
\$1.00 USD =	1,626.37 BTC	12/15/2009
\$1.00 USD =	1,626.37 BTC	12/14/2009
\$1.00 USD =	1,618.43 BTC	12/13/2009
\$1.00 USD =	1,562.90 BTC	12/12/2009
\$1.00 USD =	1,503.40 BTC	12/11/2009

Table 1 BTC/USD exchange rate calculation (New Liberty Standard 2009)

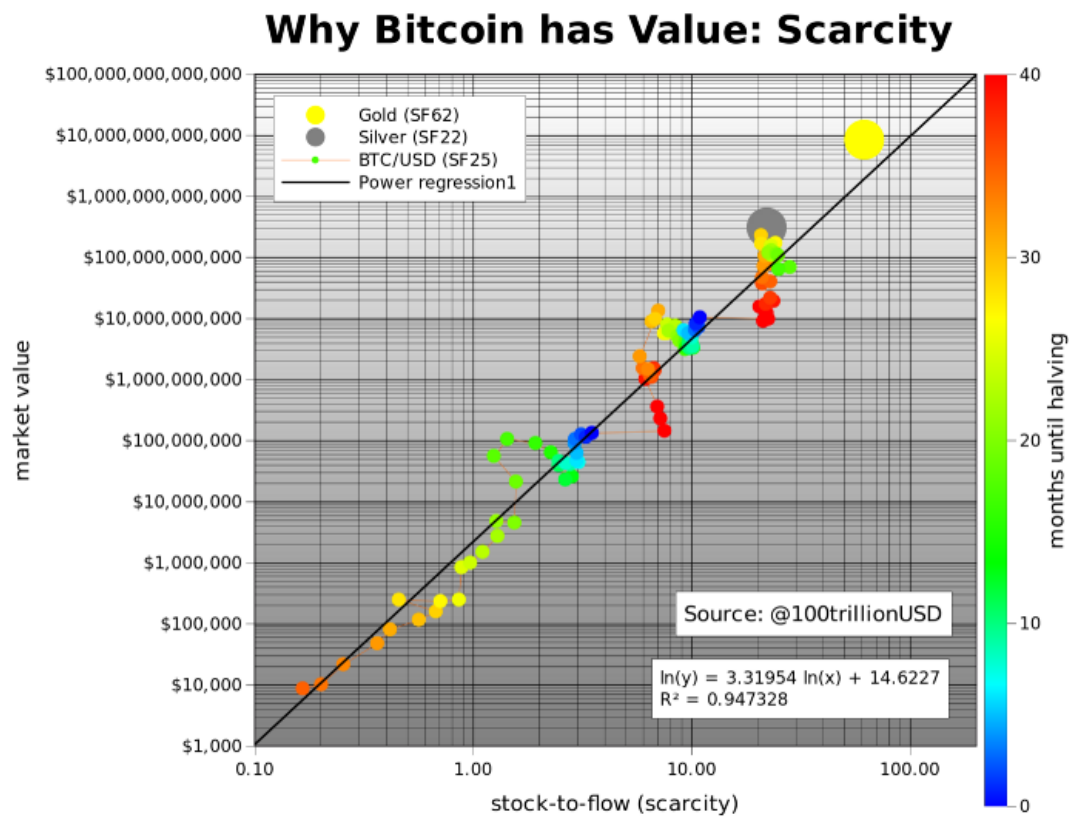


Figure 14 Why Bitcoin has Value: Scarcity (Stock/Flow) (PlanB 2019)

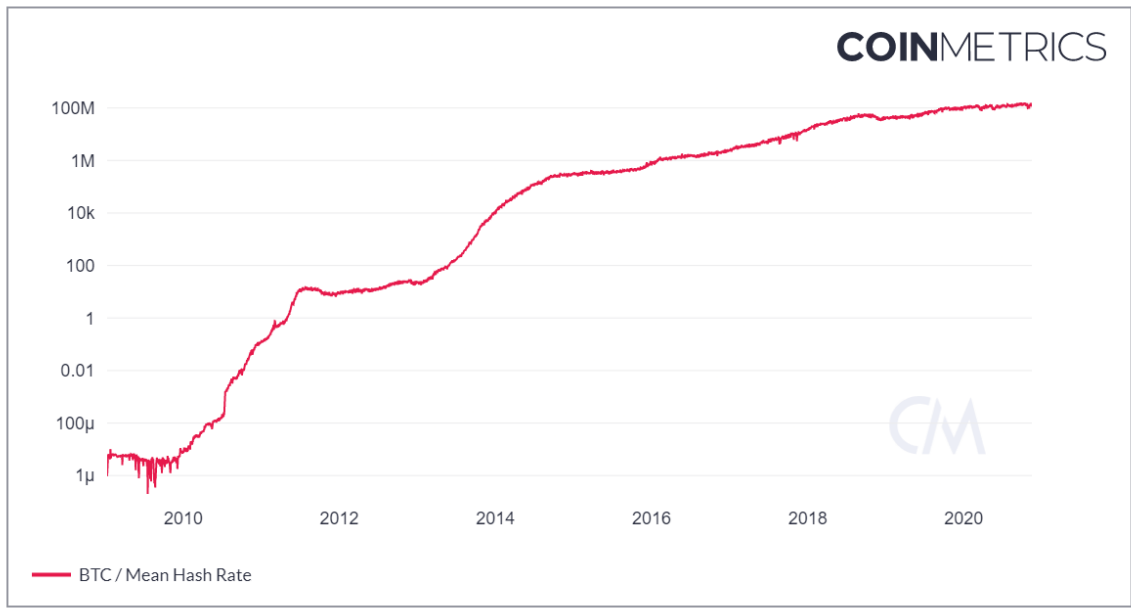


Figure 15 BTC Global hash rate (Coinmetrics 2020)