



Department of Economia e Finanza

*Chair of Financial markets
and intermediaries*

Bitcoin and the Role of Banks and Institutions for the Development of this Phenomenon

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1. Introduction

“Using Bitcoin does to the big banks what e-mail does to the Postal Service”.

(Bitcoin Community)

Virtual currencies have experienced an unusual decline over the last few years. The most famous one, Bitcoin, following an extraordinary boom in its first phase of existence, has suffered a significant drop in value against the dollar without any evident signs of recovery. For sure, institutions have played an important role in this fall, since banks and authorities worldwide have instilled a sense of distrust into the general public, being virtual cash a form of money (currently) beyond their jurisdiction. It has to be said that their approach was not that of an “a priori” conviction of the phenomenon, because advantages and strong points have been recognized. These strengths could also be used as a potential stimulus for innovation and economic growth in a world where technological sectors are those driving global development.

Governmental indifference has not provided neither a regulatory framework nor a legal definition yet, except for sporadic national attempts. This latter fact results in huge customers’ uncertainty and brakes to investments toward virtual currency-based businesses; in such a scenario it is also difficult to understand if the current decline might be due to users’ awareness of the shortcomings of Bitcoin, or to their fear of a sudden regulation banning the phenomenon (and thus limiting their interest into this type of activities).

Authorities only agree about the current impossibility for virtual currencies to impose serious risks to financial stability and this may partly justify their common carelessness;

however, it is worth noting that cyber-criminals and hackers have been attracted by the lack of supervision, creating problems to honest citizens willing to use this form of digital cash for its unambiguous benefits. A regulation would be mostly desirable to protect users from frauds and possible theft of electronic portfolios, indeed.

Virtual money's world is controversial and continuously expanding, even if 150 digital currency schemes can already be counted nowadays. Bitcoin can be considered both the first and the most important since the volume of the transactions conducted with it far exceeds that of all the others. But questions should arise spontaneously; why Bitcoin and not those others? Why did it succeed where numerous schemes failed? Several explanations have been provided by experts, regarding its cryptography-ensured safety, or the possibility to generate profit in the process of money creation¹, but maybe to really capture the peculiarity of this virtual currency, it should be enough to read the sentence quoted by the Bitcoin community at the beginning of the introduction. It embodies the desires and the insolence of its creator, Satoshi Nakamoto, to completely replace intermediaries from financial markets, because it is time to change, as in the case of emails and postal code. From this reasoning the answer to the two previously mentioned questions should be: because Bitcoin tries to change the rules. General public has focused its attention particularly on the latter one, also because, differently from other types of virtual cash, its ambitious scope is to finally replace banks and their services, and this absence of intermediaries does not seem to scare citizens². The aim of this thesis is to analyze Bitcoin in all its aspects and to evaluate the different approaches of authorities in dealing with it, commenting how their decisions impacted or may influence its development path.

¹ The concepts of mining and money creation will be explained throughout the text.

² See Appendix 1.

A first distinction between the different concepts of virtual and electronic money is reported, in order to distinguish two apparently similar ideas. Then, an analysis of Bitcoin's theoretical foundations is presented with the scope of introducing the main intuitions behind its creation to the reader. In addition, a presentation of the main advantages and disadvantages is carried out, following a brief summary of the crucial technical matters. The chapter "Banks and Institutions" outlines the points of view of the most important authorities around the world, and is concluded by the report of the Italian situation with the addition of the main contributions emerged from the recent conference organized by ISIMM to discuss about the topic. The impact of the issuance of the institutional reports and main events regarding Bitcoin on its trend is shown in the last chapter, together with the measurement of the cryptocurrency's³ peculiarities. The paper is concluded by the summary of the main results arising from the analysis and by the consideration of potential future scenarios.

³ Bitcoin uses a cryptography-based infrastructure; this is the reason why it is referred to as cryptocurrency throughout the text.

2. What is Bitcoin

2.1 Virtual and Electronic Money

Bitcoin is a system of payment that has to be introduced into the broader concept of virtual currency. This expression identifies “a type of unregulated digital money which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community” (ECB, 2012). Virtual currencies can be classified into three categories depending on their impact on the real economy:

- 1) Closed virtual currency schemes. Also called “in-game only” schemes, these virtual currencies can only be used to purchase virtual necessities; mostly related to on-line games, they have no link with real world.
- 2) Virtual currency schemes with unidirectional flow. This type of currency is obtained through the payment of actual money; however, once the conversion is done, cash remains in virtual format, with no possibility of turning it back to real, and can be accepted to buy real goods and services.
- 3) Virtual currency schemes with bidirectional flow⁴. Users are allowed to buy and sell virtual money according to the exchange rates with real currencies; this ease of conversion relates this type of virtual money to any other real currency. Bitcoin is the most popular example.

⁴ Every time the term “virtual currency” will be used throughout the text, this category would be intended.

A very different field is that of electronic currencies. According to the EC directive 2000/46, electronic money “can be considered an electronic surrogate for coins and banknotes, which is stored on an electronic device such as a chip card or computer memory and which is generally intended for the purpose of effecting electronic payments of limited amounts” (EC Directive 2000/46)⁵. Although they may sound pretty similar concepts, electronic and virtual currencies share roughly only the digital format. In first place, in fact, electronic money is expressed in the same unit of account of traditional currencies (\$, € etc.), differently from its virtual counterpart. For this reason, the latter could be used for speculative aims, since it is possible to make profits with the daily variation of the exchange rate. In second place, electronic currencies are currently highly regulated and issued by a central authority; on the contrary, the supply of the virtual ones is controlled by non-financial companies acting beyond banks’ jurisdiction. Finally, electronic currencies are substantially less exposed to risk than the virtual ones, that in addition to operational risk (also proper of their electronic counterparts) are also subject to liquidity, credit and legal risk, that will be discussed in the section “ 2.4 Main Advantages and Disadvantages”. All the difference presented above are reported in the table below⁶.

⁵ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0046:EN:HTML>

⁶ Presenting a deep and detailed analysis of electronic currencies goes far beyond the purpose of this thesis; the topic is just introduced to make a clear distinction between this concept and the main object of the analysis (Bitcoin and virtual currencies).

	Electronic Money	Virtual Money
Format	Digital	Digital
Unit of account	Traditional (Euro, Dollar etc.)	Invented by the issuer (Bitcoin, Linden Dollar etc.)
Acceptance	Real world	Virtual community
Legal status	Regulated	Non-regulated
Issuer	Legal entity recognized by law	Non-financial private company
Supply	Fix	Variable (depending on issuer's will)
Risk	Operational	Operational, credit, legal and liquidity

Table 1: Electronic and Virtual Money

2.2 Bitcoin's Theoretical Foundations

The first idea of currencies competing beyond the jurisdiction of a central authority could be retrieved in Friedrich August von Hayek's work "*Denationalisation of Money: The Argument Refined*", written in 1990. In this book the author strongly criticizes the financial system and the governments' prerogative of issuing money, indicating monetary policy as the cause (not the cure) of depression. He saw market process as the only required regulation and competition among currencies as the only way to achieve financial stability; in his opinion, investors would trust only those issuers likely to guarantee a stable value of the currency in the long run. This general preference toward safe money suppliers would start a Darwinian selection process, with the outcome of the gradual disappearance of volatile currencies and the survival of only those reliable issuers able to guarantee an enduring stability.

Von Hayek also proposed to inhibit governments from their ability of issuing money, figuring this latter power as the main cause of harmful inflation. Indeed, he denied the existence of any type of cost-push inflation (caused by the rise in the monetary values of certain commodities or raw materials), sustaining the idea that the aggregate price of all goods could not

grow unless the purchasers were given more money to buy them. In Hayek's view, government's act of issuing more money following a rise in the price of one specific product, with the only scope of preventing unemployment, was severely to blame for its long-run consequences. In particular, he believes that the initial general stimulus which an increase of the quantity of money provides is chiefly due to the fact that prices and therefore profits turn out to be higher than expected. But this can last only so long as the continuous rise of prices is not generally foreseen. Once people learn to count on it, even a continued rise of prices at the same rate will no longer exert the stimulus that it gave in a first moment. At this point monetary policy, in author's belief, is forced to issue money at an always increasing speed, creating more problems than when the process started; now, in addition to the increased price level, this mechanism has attracted important resources to unprofitable sectors made attractive only by the price increase, causing a huge waste. For this reason government, with its political interest to prevent unemployment from rising, should be deprived from its ability to issue money. As a result, Hayek saw the environment of competing currencies as a better method to solve this problem than a common European currency, "which would ultimately only have the effect of more deeply entrenching the source and root of all monetary evil, the government monopoly of the issue and control of money". Above all, he thought that countries have different economic situations, and the measures to be undertaken by a supranational authority to help one nation to come out of a recession, may not necessarily coincide with the needs of one in a phase of economic boom. This latter nation would be forced to undergo the same treatment because of the same common currency, but this could slow or even stop its growth, resulting in a bad interference of the measure.

Inspired by Hayek's theory, in 1998 a computer cryptographer called Wei Dai proposed for the first time the concept of "crypto-currency"⁷, a new form of money which makes use of cryptography to control its creation and transactions instead of a central authority. However, the first examples of bitcoins date back to 2009, when a mysterious developer known with the pseudonym of Satoshi Nakamoto envisioned a system of money founded on the principles of mathematics and encryption. He rejected the system of trust surrounding fiat currencies, whose value is ensured by some central authority, since in his opinion is impossible to consider reliable a circuit of banks lending money out in waves of credit bubbles with a minimum fraction in reserves.

2.3 How the System Works

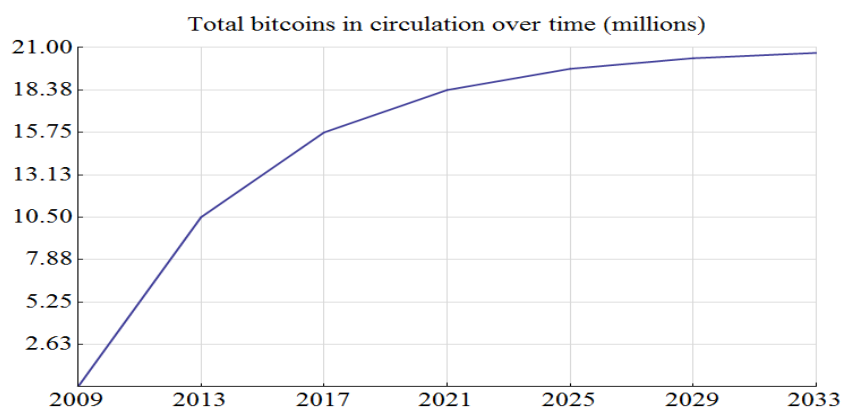
Nakamoto based Bitcoin infrastructure on a decentralized peer-to-peer network. This means that users perform the task themselves without involving any financial or regulatory authority into the transaction. The exchange is carried out through the use of the owners' keys and hashes; the former ones are needed to ensure the safeness of virtual portfolios while the others are a series of data associated to every single bitcoin. Hashes keep track of all the transactions that a cryptocurrency has incurred and will be crucial when the report of the exchange is sent to the network. At this point in time, for a transaction to be considered valid, it has to be checked by special supercomputers, called miners, able to solve complicated algorithms and avoid fraud in the system. When a solution is found, the exchange is validated and the owners of these miners are given 50 new coins. Essentially new money is created every

⁷ <http://www.internationalman.com/articles/making-sense-of-bitcoin>

time validating activity is undertaken, as a reward for the people controlling the process, and this is the only way to generate new currency in this environment.

As time passes, however, algorithms are scheduled to get increasingly harder to solve, in a way that always more resources have to be devolved for being rewarded with new currency and that the supply of money would decrease by a fixed proportion every four years. Bitcoins in

Figure 1, Bitcoins in circulation (Source: HP Security Research Blog)



circulation will be 21 millions in number in 2040 and transaction fees will be the only compensation for miners. Figure 1 shows the geometric reduction in details.

This path, that as shown, increases but at a decreasing rate, is likely to cause a deflationary spiral in some critics' opinion. Different, instead, is the point of view of Bitcoin supporters, that see in this supply a way to make the infrastructure immune to inflation.

2.4 Main Advantages and Disadvantages

Innovation always brings a change. What really makes the difference and distinguishes flashes in the pan from inventions intended to become new standards is the common acceptance of the change. Most people usually share similar impressions; this is what makes them a market. Innovators must always figure them as a monolithic group of consumers, or at least as several packs with the same tastes, but it would be an error to consider them an heterogeneous crowd of

individuals. If the masses are satisfied by existing standards, there is little scope for new entries. It is when there are some problems to be solved that innovations find fertile soil.

Nakamoto saw in Bitcoin a way to improve the functioning of electronic commerce. The first cryptocurrency was born to provide customers with a system of payment with no transaction costs. Exchangers, in fact, could decide to pay a minimum fee on the operation just in case they want to have a more rapid authentication from miners. The tax paid is in any case way lower than those associated with credit card companies. Moreover transactions could be conducted 365 day a year for 24 hours a day, since with no third party involved, the only necessary condition is the availability of the other trader. It is also worth noting that no private entity could manipulate and modify Bitcoin protocol, because protected by cryptography.

As for the safeness of the exchange, algorithms are programmed to avoid the falsification of the cryptocurrency and to ensure merchants against the possibility of frauds. Finally, all transactions are then publicly recorded in a way that everyone could check their validity, without knowing the name of the traders, whose identity is concealed behind a nickname. However, it is really this latter characteristic that made the Bitcoin infrastructure attractive for the wrong people.

Money laundering could be easily conducted in the absence of any regulatory authority and most of the times these coins end up in the hands of unaware honest people. It is also worth noting that the volatility of the exchange rate is still very high⁸, also because cryptocurrency's value is not guaranteed by any bank or institution, being in such a way purely fiduciary: on February the 10th 2013, an important Bitcoin trade platform called MtGox announced a loss equivalent to \$620 million (the major part owned by the customers) following a hacker attack,

⁸ Volatility will be analyzed later in the text.

stimulating a general sense of panic and inevitably causing the drop of the exchange rate⁹. Furthermore, as previously mentioned, virtual currencies, unlike their electronic counterparts, are exposed to several types of dangers, namely credit, legal and liquidity risks. Credit risk represents the uncertainty associated to the inability of the non-financial companies governing exchange platforms to endow their clients with real money when they want to convert bitcoins back to actual cash or to repay a due obligation. This possibility arises because nowadays there is no regulation imposing a minimum capital requirement for those firms; the situation could eventually change with a future legal constraint. Legal risk, instead, occurs because not being a legal tender status, Bitcoin overcomes authorities' jurisdictions and thus citizens are not protected by law against any kind of fraud. Liquidity risk, in turn, may materialize if suddenly all the actors using a virtual currency scheme ceased to use it. In such a scenario no one would agree to exchange real money for digital cash and the ultimate owners of cyber portfolios would end up holding assets with no value.

Lastly, the number of people with whom to trade is currently really low, because the general public is not still conscious of the existence of Bitcoin. All these matters, together with the fact that the software governing the infrastructure is still to be improved, can be considered the main drawbacks of the cryptocurrency. Table 2 summarizes what has just been said.

⁹ <http://www.technologyreview.com/view/526161/the-troubling-holes-in-mtgoxs-account-of-how-it-lost-600-million-in-bitcoins/>

Advantages	Disadvantages
Low transaction costs	Money laundering
Possibility to trade 365 days a year	High volatility
Scarce possibility of fraud	Limited acceptance
Transparency (public records of transactions)	Software to be improved
Impossibility to modify Bitcoin protocol	Liquidity, credit and legal risks

Table 2: Main Advantages and Disadvantages

We now pass to the examination of the actual consequences for the financial system, being Bitcoin, as already mentioned, a phenomenon still weakly regulated.

3. Banks and Institutions

Bitcoin has been highly debated and discussed, being by now a worldwide phenomenon. Countries adopted different approaches toward virtual currency schemes. In general, European authorities move in the direction of a (partial) disapproval, especially for consumers' safeguard, given that a strict regulation is not registered yet. European Central Bank (ECB) and European Banking Authority (EBA) warned citizens about the use of virtual currencies and this latter fact could have played an important role in the recent slowdown of the phenomenon, as we will see in the last section "The Evidence of Data". However not all nations adopted such a skeptical approach; we now analyze the main contributions.

3.1 European Central Bank (ECB)

One of the first authorities to express its opinion about Bitcoin and virtual currencies in general was the European Central Bank (ECB) with a report in 2012. All their possible risks are deeply outlined and analyzed in this text. Particular attention is devoted to the analysis of the consequences for the payment system, the price levels, central bank's reputation and financial environment. The main conclusions drawn by this report are that currently the phenomenon does not represent a big problem, but the situation has to be constantly monitored, since if the number of "virtual users" increased, the situation could rapidly change.

As for price stability, the ECB concludes that at this point in time, when virtual currencies are not that common and their value is not important relative to that of the real market, substantial risks have not been detected. The attitude of ECB was influenced by the Chinese case

of a virtual currency scheme introduced by the telecommunication company Tencent (labeled Q-coin). This type of digital money was first used to purchase telecom services from the above mentioned company, but after some time merchants started to accept Tencent's innovation as a means of payment and consumers began to use Q-coins for the most diverse uses (logically giving rise to a flourishing black market). The resulting value of the whole platform reached several billion yuan within one year, forcing Chinese authorities to ban the innovative trade because of possible prices distortions caused by the interaction of Q-coins with the real economy. Quoting Peng and Sun (2009), the ECB stressed the importance of the incorporation of data relative to virtual currency schemes into central banks' monetary statistics, with the scope of monitoring the phenomenon.

The situation is similar with regard to the financial stability: the current numbers do not alarm experts, but the situation could dramatically change in case of an evolution of Bitcoin toward the banking environment. Indeed, financial stability could be undermined if banks started to treat virtual portfolios as real deposits and pay interests to their owners. In any case, this scenario is a remote hypothesis and at this point is not worth considering its evolutions.

Furthermore, ECB warns consumers against the difficulties possibly incurred when virtual currencies are used as a system of payment. Although critical drawbacks are not found in this field neither, in fact, within the virtual community users could expose themselves to several kinds of dangers, namely liquidity, operational, credit and legal risk.

Finally, another point stressed by the report is the possible repercussion of incidents arising from virtual currencies disasters on the perceived reputation of the central bank. Being a matter of money, Bitcoin could lead citizens to blame ECB for their losses. This latter fact might badly influence, for example, the ability of conducting an efficient and effective monetary

policy due to a loss of confidence from the public. Like in the cases of payment system, price levels and financial environment, however, the current magnitude of the phenomenon is not so frightening for the central bank.

3.2 European Banking Authority (EBA)

Virtual currencies have been highly criticized by regulatory entities because (currently) they do not undergo any legal restraints. On the 4th of July 2014, a document was published by the European Banking Authority (EBA), labeled “EBA opinion on virtual currencies”, where a strong complaint is carried on. The risks that users could encounter when trading with virtual currencies are what attracts EBA’s attention the most.

A long list of shortcomings of the cryptocurrency is showed in the institutional report, ranging from the identity theft of the user during an exchange, to the inability of the non-financial firms governing the trade platforms to repay consumers in case of bankruptcy. Moreover, it is also underlined the fact that nowadays Bitcoin and other virtual currencies could rely on smaller fees with respect to credit card companies mostly because unregulated, and that, for this reason, the situation could change in a not so distant future when the regulation is expected to take place. In any case, the most important contribution of this article is the expositions of potential legal approaches to be adopted.

EBA figured the development of Bitcoin as a potential stimulus for economic growth. In fact, it would increase exponentially the quantity of resources devolved to high-tech sectors (historically the main determinants of growth in the last 20 years) through mining activity that, as

explained before, would require always bigger efforts and newer technologies¹⁰. In any case, a necessary condition would be the creation of a governance body accountable for compliance purposes (to protect ECB reputation in case of a financial disaster) and the mandatory identity disclosure for the users, in a way to prevent the impossibility to retrieve a criminal in the case of illegal money laundering or other frauds. Finally, and maybe most important, a capital requirement for the non-financial companies governing the exchange platforms is asked, in order to shelter consumers from huge losses deriving from the inability to convert virtual currencies back to real money.

Even if EBA did not intend to demolish a priori Bitcoin, in the section “4.3 High Volatility” it will be shown how big the impact of this report had been on consumers’ confidence and cryptocurrency’s value.

¹⁰ The increasing difficulty to undertake mining activity will be shown in chapter “4.2 Harder Mining”.

3.3 Bitcoin in the world

Table 1 — Venture capital invested in Bitcoin companies, by country		
Countries	Value (\$M)	No. of companies
United States	68.1	16
Canada	10.5	2
China	8.0	3
United Kingdom	5.0	2
Singapore	3.8	2
South Korea	0.8	2
Australia	0.7	2
Sweden	0.6	1

Figure 2: VC invested in Bitcoin companies, by country (Source: Coindesk.com)

Figure 2 shows the venture capital in million dollars invested in Bitcoin companies by country. As we can easily grasp, the amount spent is almost everywhere below the 10 millions, with the two only exceptions of Canada and United States.

In February 2014 Canadian government announced the introduction of legal amendments against money

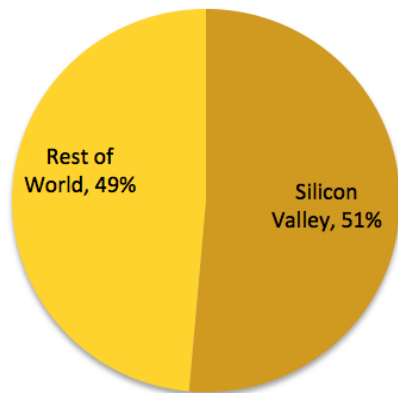
laundering, with the aim of controlling risks of virtual currencies in a more effective manner. This could be seen as an opening toward cryptocurrency's world: aware of a strict regulation, banks could cease to be skeptical¹¹ toward companies operating with Bitcoin, which, conscious of this scepticism, could decide to set their legal base elsewhere (generating an economic loss for the Canadian economy as a whole). The same line of reasoning has been embraced by Germany, which was one of the first countries in the world to provide a regulatory framework for the phenomenon. In July 2013 the first partnership between a bank (Fidor) and a company operating with Bitcoin (Bitcoin Deutschland GmbH, controlling the exchange platform Bitcoin.de) has been registered, encouraging firms making business out of virtual cash to settle in Germany. It

¹¹ The skepticism derived from the possibility to get in contact with illegally laundered money.

could be considered a turning point in the virtual cash history, since it is a first time that a financial intermediary (namely the worst enemy) decides to supply services to a cryptocurrency-based company.

As it could be easily noticed from the figure above, United States are far ahead of all other countries as a matter of venture capital invested in Bitcoin companies, with a distance of almost \$60 million from the second in the ranking (Canada). It is also interesting to note that

Figure 3: VC invested in Bitcoin companies
(Source: Coindesk.com)



when dealing with innovation, Silicon Valley often represents the technology frontier.

Figure 3 shows the venture capital invested in Bitcoin companies: more than half of the global resources devolved to the cryptocurrency is concentrated in the area south of San Francisco. This huge amount (mainly ascribable to Coinbase, a company endowed with more than \$31 million) could be partially explained by the regulatory approach followed by national authorities. A legal status has been given to Bitcoin by the American tax agency (IRS), classifying virtual cash as a legal property and mandating the taxation on its capital gains; if on the one hand the regulation could deter customers, it has the clear advantage of clarifying the rules so much so that the State of New York is about to issue “Bitlicenses” for businesses with the aim of augmenting the confidence of the general public.

If for the three just cited countries a common sense of opening has been observed, the situation is not similar in other places, though. China, for example, has banned banks from using bitcoins (and in the section 4.3 “High Volatility” a huge impact of this event will be detected on

the cryptocurrency value). Similarly, Russia recently declared the ruble the only currency with whom to display prices of goods and services, essentially rendering the individuals legally prosecutable in case of a non observation of such a mandate.

There is not an international agreement about the regulatory approach to follow, as emerged from the text; as we will see in the following section, Italy lies somewhere between the complete approval and the unconditional denial.

3.4 Bitcoin in Italy

Bank of Italy published in January 2015 its point of view about virtual currency schemes in the “*Comunicazione Del 30 Gennaio 2015 – Valute Virtuali*”; in this document the Italian institute follows the already mentioned EBA’s approach. In fact, it discourages banks and other financial intermediaries from buying, holding or selling this form of digital cash. As for what concerns the future scenarios, Bank of Italy does not take a clear position and declines all possible regulation to a much broader European background.

In order to discuss about the theme, a convention has recently been organized by ISIMM in Rome. In this context, all the economic profiles, juridical matters, risks and opportunities of Bitcoin have been analyzed and commented by numerous experts of the topic. Several interesting contributions emerged and some are reported in the following paragraph.

Professor Luca Fantacci, for example, points out the innovativeness of Bitcoin and its capacity, through mining activity, to create purchasing power (in opposition to the simple traditional currencies’ capability to transfer it). However he is very skeptical about the development of the phenomenon, considering the environment of cash generation “dramatically inadequate” because whereas the supply is predetermined, demand is at the mercy of daily

oscillations of the exchange rate, which are augmented by speculative waves. He concludes observing that, unlike Bitcoin, other virtual currency schemes are complementary to traditional money; it is really this presumption to replace dollars or euros that represents a huge drawback for the cryptocurrency.

Professors Maurizio Franzini and Massimo Molinari, presented an interesting contribution about the current uses of Bitcoin. It arises that almost all the top 10 applications are linked to illegal activities.

Figure 4, Main uses of Bitcoin (Souce: Franzini and Molinari)

Silk Road Website in January-July 2012		
categoria	numero di items	percentuali
Weed	3338	13.70%
Drugs	2193	9.00%
Prescription	1784	7.30%
Benzodiazepines	1193	4.90%
Books	955	3.90%
Cannabis	877	3.60%
Hash	820	3.40%
Cocaine	630	2.60%
Pills	473	1.90%

Moreover, the previous work detected a low velocity of circulation (defined as the number of times a unit of cash is used in a given period of time) of bitcoins; this fact will be later analyzed in section “3. The Evidence of Data”. Given all these findings, they claim that if the situation remains unchanged, Bitcoin is expected to become the principal means for conducting

illegal practices instead that a valuable tool for the real economy; a regulation would be also required for the general public, more than for the risks for the stability of the financial system.

Another contribution is offered by professor Gianluigi Ciacci, who focuses on the possible risks of the virtual cash but above all recognizes its potential, underlining the fact that the New York Stock Exchange newly introduced a Bitcoin-based index (which will display the value of a single unit based on the current exchanges).

Paola Giucca of the Bank of Italy¹² discredited the cryptocurrency, saying that it is not true at all that payments are immediate, since it could take up to 10 minutes to validate the transaction with the mining process and that costs, though low, are far from negligible.

Carmelo Salleo (ECB), instead, provides the audience with a comprehensive economic perspective: treating Bitcoin as a standard currency may be incorrect, in his opinion. What makes it different from the Dollar or the Euro is its fixed issuance, that by definition, does not change in relation to the transactions and this is why it should be treated as a property asset. Furthermore Salleo wonders what would it happen when the amount of bitcoins in circulation will reach 21 million in 2040; he claims that at that point in time transaction costs will be forced to rise, since mining activity would not have any further scope, and all this would bring Bitcoin to lose its competitive advantage toward traditional and electronic currencies. Finally, another interesting consideration drawn by the ECB's employee is about the value of the cryptocurrency. He meditates on why it has increased so much and furnishes two personal answers; excess demand (in contraposition to a fixed supply) could be a possibility, or alternatively a speculative bubble (people bought it because they expected a profit at the moment of a future sale). Bitcoin's value

¹² The opinions expressed by the participants of the congress do not necessarily coincide with those of the institutions they work for.

would eventually stabilize, if it is in fact the case of a simple excess demand, or drop when people understand the limited utility of the asset, if we consider the case of a bubble.

Slightly different is the starting point of the two politicians invited by ISIMM, Sergio Boccadutri and Stefano Quintarelli. The former, responsible for the innovation section of PD, hopes for a common definition at European level. Once the phenomenon is classified, in fact, it could turn out to be way easier for policymakers' purposes to provide a regulatory framework for it. It is the customer safeguard, specifically, the main scope for a legal path. Nowadays Bitcoin users are not protected against the risk of frauds, theft of digital portfolios and incurrence in laundered money, and for all these reasons something has to be done changing the current situation of inattention. Stefano Quintarelli, lastly, is maybe the one who stresses the potential of the cryptocurrency the most. His vision of Bitcoin as an opportunity is strengthened by the recent application of the Block Chain (the infrastructure where all transaction are recorded) to the different fields, like the use of fingerprints to access to a determined private space (this has been possible by the database order and recognition capability of the algorithm governing the technology). However, he also considers the importance of a regulation, since presently one could make huge profits in Bitcoin without any law ruling the taxation policy to follow.

As this latter paragraph has put in evidence, there is not a common agreement about the approach to adopt toward the phenomenon; some say that it has no future and that could never act as a support for the real economy, while others recognize potential developments for innovation and growth. The only certainty is that everybody agrees that a supervision is needed mainly in regard to citizens safeguard. The next section focuses on the evidence of data and tries to capture if the general skepticism of banks and institutions has somehow put a brake to the development of Bitcoin.

4. The Evidence of Data

In this last section some data are reported to stress the features that we have discussed so far. The focus will be mainly on the high volatility, the growing difficulty to undertake mining activity and the low velocity of circulation of bitcoins. Great attention will be devolved to the impact of institutional news.

4.1 Low Velocity of Circulation

In section “3.4 Bitcoin in Italy” it has been anticipated that a low velocity of the cryptocurrency has been recognized. Velocity of money is defined as “the average number of times per year (turnover) that a dollar is spent in buying the total amount of goods and services produced in the economy” (Mishkin, 2012). In practical terms this concept represents how often a unit of a currency is used in the purchase of an item, thus passing from hand to hand; a high velocity is associated with an economy where exchange is frequent and the same coin is handled again and again by different actors. On the other hand, a low velocity may signal a stagnant economy; money is not easily transferred and, hence, trade is obstructed. A small turnover may alternatively be linked to speculative practices: one may decide to hold her own coins and use them just when the possibility of making profit materializes. This latter case would be well associated with Bitcoin, which presents high exchange rate fluctuations¹³.

¹³ As we will see more in depth in the section “High Volatility”

The figure below shows the results of Franzini and Molinari.

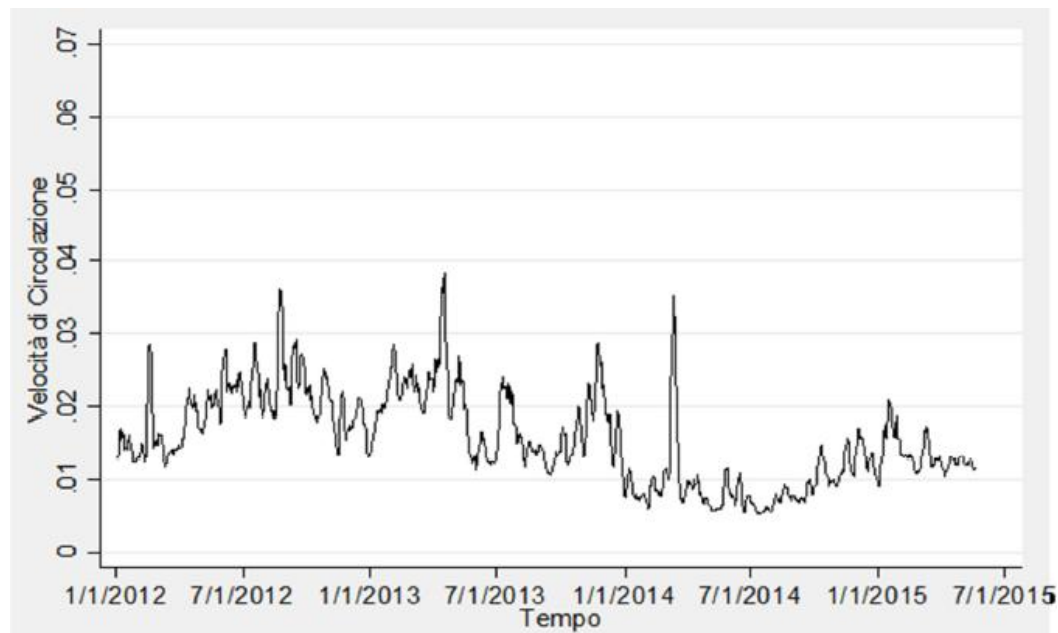
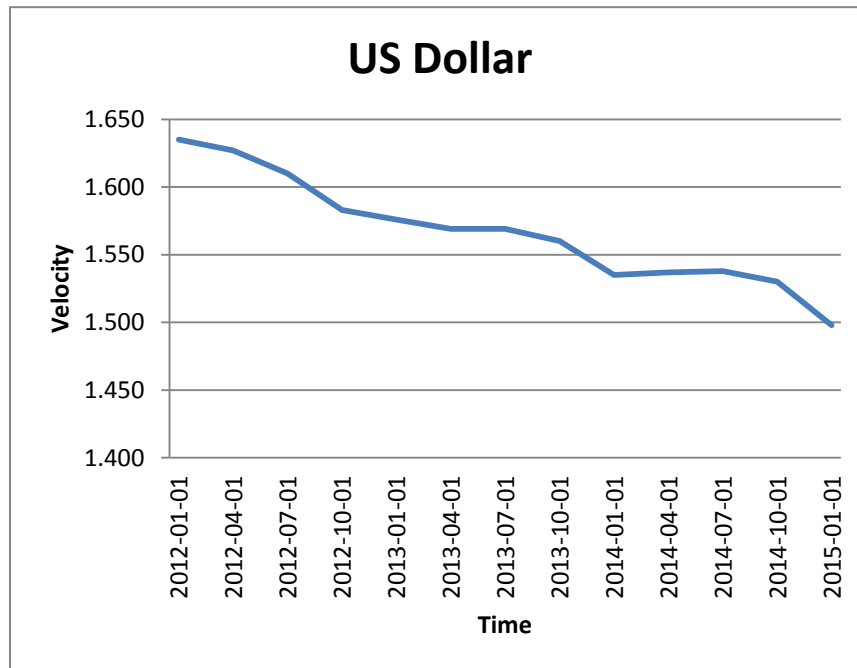


Figure 5: Velocity of circulation of Bitcoin (Source: Franzini and Molinari)

The x-axis displays the time period for whom values are computed, while on the y-axis the velocity of Bitcoin is reported. The graph exhibits an almost constant trend, since the initial and the final values are roughly equal to 0.012 in velocity. As in the case of the exchange rate between dollar and the cryptocurrency, the trend exhibits high fluctuations, synonym of low stability. With respect to the magnitude of the numbers, it is interesting to compare these results with those regarding traditional currencies. Graph 1 shows the velocity of circulation of the dollar for the same time frame of the Franzini and Molinari study.



Graph 1: Own Calculations of US dollar's velocity of circulation (Data source: Federal Reserve Bank of St. Louis)

Although a decreasing trend is inspected, the lowest value approximates 1.5 in velocity, exponentially greater than those associated with Bitcoin.

These numbers seem to confirm the hypothesis of a strong speculative predisposition of the

cryptocurrency. It sounds a little strange that an instrument initially born to ease the exchange among traders (and thus supposed to exhibit a high velocity) turned out to be characterized by a low turnover and be used mainly for speculation. We now pass to the examination of the growing difficulty to undertake mining activity, using the time needed to validate a transaction as a proxy for it.

4.2 Harder Mining

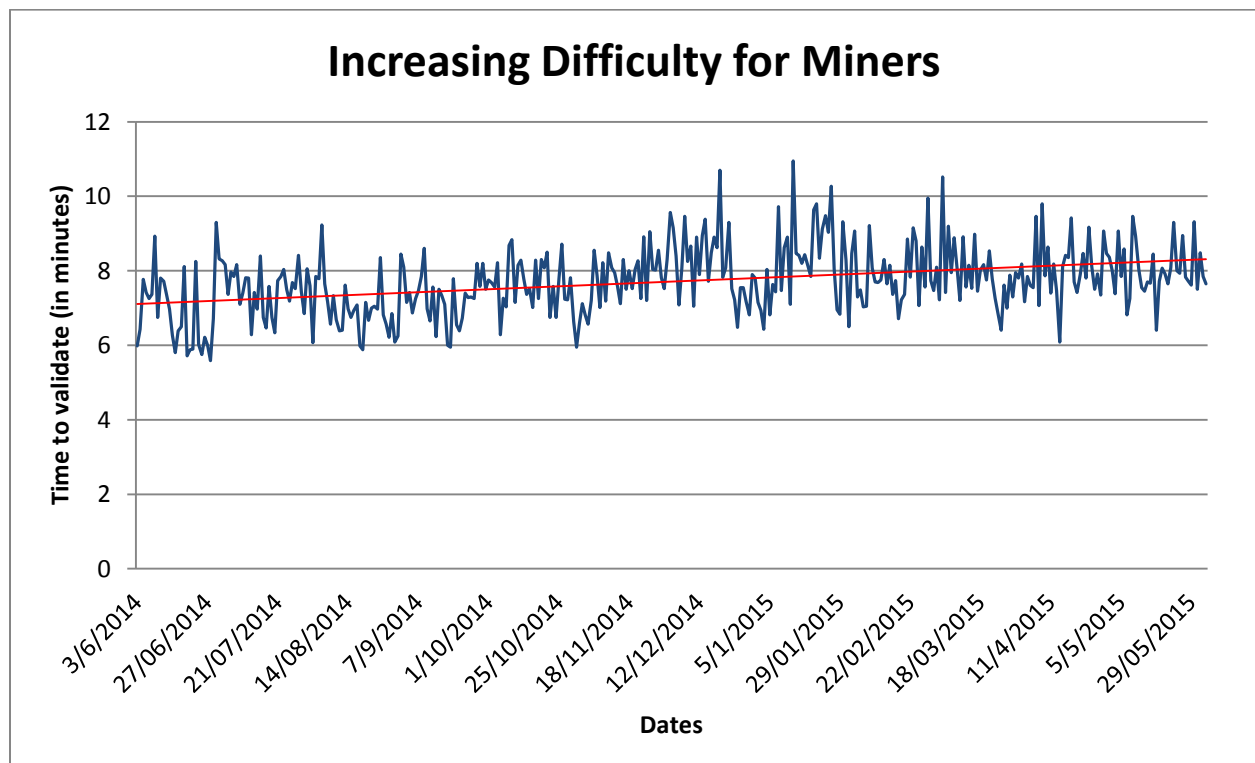
It has already been said in section 2, that every time a miner (a special supercomputer) validates an exchange, its owner is rewarded with 50 newly created units of the cryptocurrency. This activity could generate high profits, but it has to be considered that algorithms associated to every transaction are programmed to get increasingly difficult to solve as time passes. One point of view shared by numerous people is that Bitcoin, through mining activity, could be a potential for innovation. Exchange validation would continuously ask for bigger and more powerful computers, and the scenario of high profits would force inventors to create better machines which may find profitable uses also in other fields, as in the case of the Block Chain used for security aims through fingerprints (mentioned in section 3). This innovating activity might have the final result of pushing forward the technology frontier.

For years scholars have been studying the relation between technology and economic growth, detecting a significantly positive correlation. Paul Romer, in his publication “Increasing Returns and Long Run Growth” dated 1986, claimed that a perpetual development could have been achieved through innovating activity done for profit. Given a large enough market, in fact, innovators could find it profitable to sell their inventions, which in turn could help others to come out with new technologies (spillover assumption). Related to Bitcoin, mining activity could be seen as an opportunity to obtain revenues (reward of 50 new coins for every validate transaction), and its increasing difficulty may represent the incentive to innovate and create new technologies. Zeira (1998), on the other hand, starting from the assumption of perfect capital markets (where salary of a worker is equal to her marginal productivity) demonstrates that labor wage (equal to output per worker, whose growth is used as a proxy for economic development) is positively correlated with the level of technology. If it is true that mining brings to

technological improvement to solve always harder algorithms, a positive impact of Bitcoin on the growth of a country should be expected. European Banking Authority in its report dated July 2014 seem to follow the same line of reasoning; in the paragraph labeled “Contribution to economic growth” (page 18) recognizes that “the activity of mining has spawn the development of specialized mining hardware [...] as well as demand for safe storage capacities” and that virtual currencies “have spawned new types of businesses that did not exist before”.

The evidence shows that the difficulty to validate transactions is increasing over time. The graph below plots the trend of the time needed for miners to solve a problem, used as a proxy for hardness to come out with a solution. The time period in examination is on the x-axis, while the y-axis measures the time to confirm a single transaction for miners in minutes. The pattern is really unstable but the tendency line shows a significant increasing trend; in less than a year validation phase increased by more than one minute (from 7.1 to 8.2).

Graph 2: Own calculations of time to validate the transactions (Data source: Blockchain.info)



These results have an important implication: they demonstrate that even though a greater amount of resources is devolved to Bitcoin, it is still not enough to keep the authentication time constant. It should be kept in mind that the speed of transaction evaluation represents one of the advantages of the cryptocurrency; the smaller it is, the lower the possibility of frauds, because in the moments in which the process is going on, data are more subject to cyber-attacks from hackers. In few words, if the rate of technology used by miners does not grow more rapidly than how is doing now, always more time will be needed to validate a transaction and Bitcoin would risk to lose maybe its biggest perceived advantage. Indeed, the Italian Consumers Association (Unione Nazionale Consumatori) asked 227 random people what advantage do they expect from a digital currency, and 107 (47.14% of the total) answered that the safety of transactions should be the most important one. Result are reported in Figure 6 (the green area represents the mentioned 107 interviewees) .

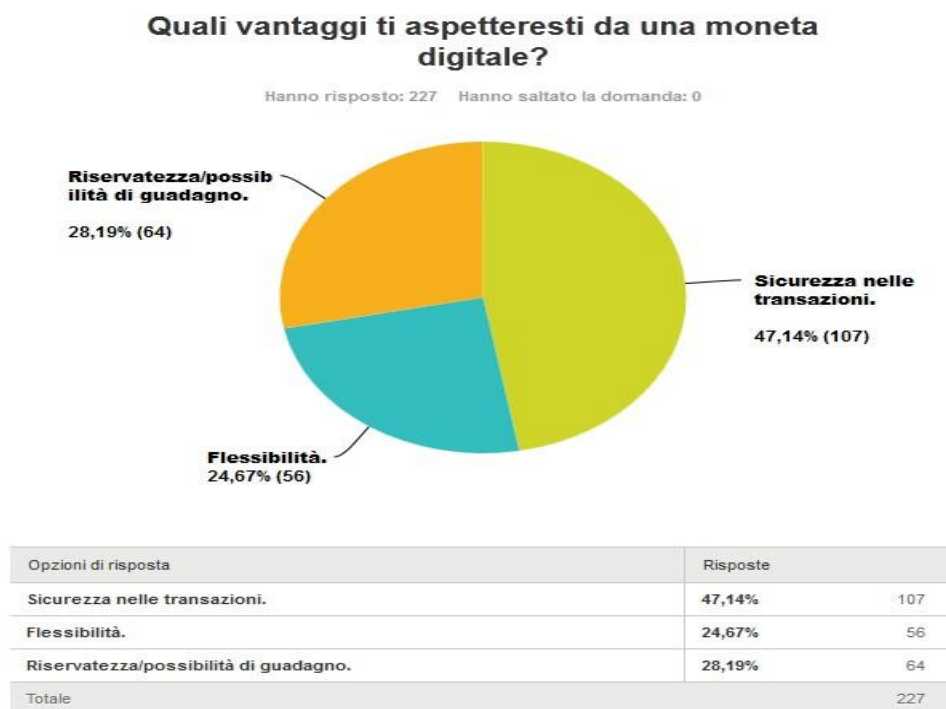
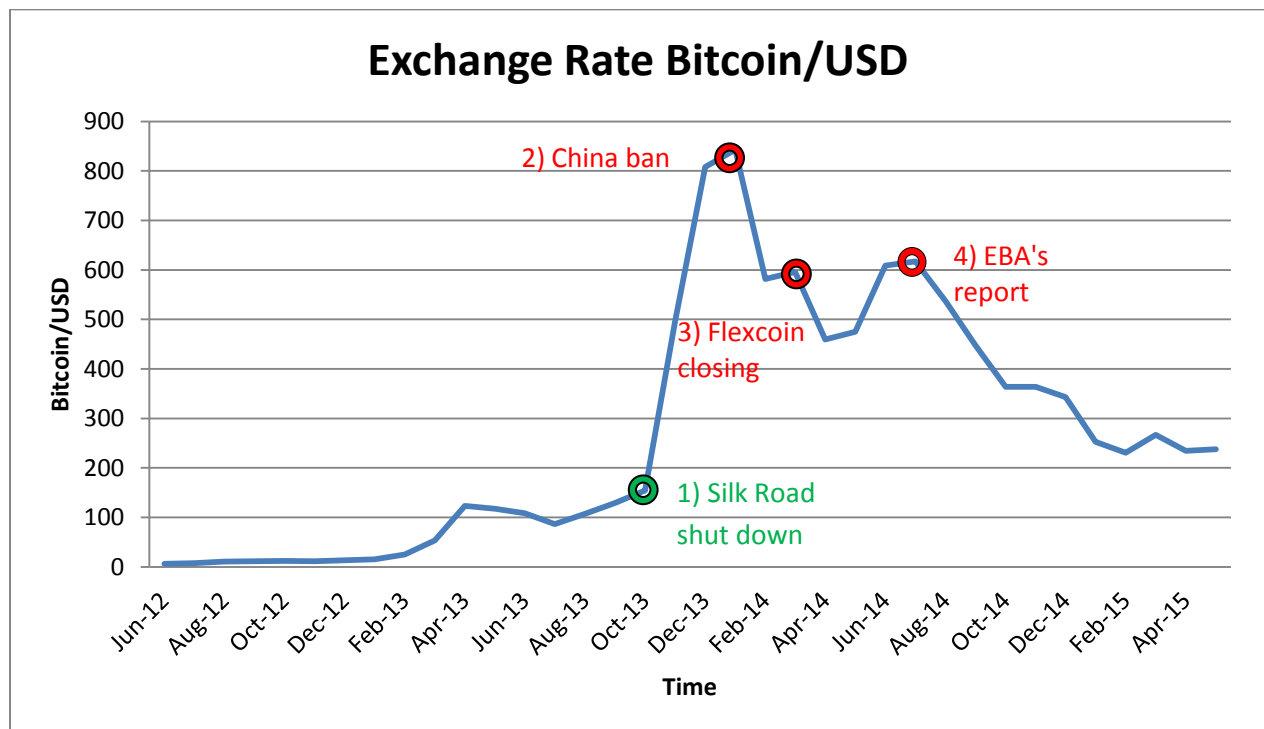


Figure 6, Requested Advantages of virtual currencies (Source: Unione Nazionale Consumatori)

The situation could change, in any case, if a regulatory framework was provided; it could be in fact, that investments in the direction of validation activity may currently have a brake due to the uncertainty surrounding Bitcoin. Nowadays, if one decided to invest in miners, she would do it aware of the risk that suddenly a new law could be enforced to ban the cryptocurrency (and thus her own business). Anticipating this scenario the investor would logically take the decision to use those resources for other scopes.

Once again, regulation represents the turning point; institutions may be able to remove the impediments and burst the industry of mining activity. It could also have the positive externality of giving incentives to innovate and, thus, generate economic growth, as professors Zeira and Romer claimed. As usual, authorities have the possibility to decide Bitcoin's destiny.

4.3 High Volatility



Graph 3: Own calculations of the exchange rate Bitcoin/US dollar (Data from oanda.com)

Graph 3 shows the path of the exchange rate between Bitcoin and US dollar in the time period June 2012 – April 2015. It is astonishing to see how in less than 3 months (from October 2013 until December 2013) the value of one unit increased of approximately 700 dollars. To really capture the profit that could have been realized buying the cryptocurrency in its early stages, it is interesting to report the story of a (lucky) Norwegian guy called Kristoffer Koch. During his thesis about encryption, in 2009, he became aware of Bitcoin and he decided to buy the equivalent of \$27. He then lost the keys of his online portfolio, finding them 4 years later. He suddenly realized that his initial investment turned into \$886.000,00, which were used to buy a house in the wealthier part of Oslo.

Beyond these cases of high profits in the first stage of existence, we can easily imagine how huge the losses had been when the rate suffered from the sudden drops of the second phase. After December 2013 an almost always decreasing trend has characterized the virtual currency exchange rate against the dollar. A brief analysis of the main peaks and falls is provided.

Four main elements of interests may be detected in the graph:

- 1) Silk Road shut down
- 2) China ban
- 3) Flexcoin closing
- 4) EBA's report

The 3 marked with the red circles coincide with 3 events having a bad impact on Bitcoin, thus causing the exchange rate to drop, while that marked with the green circle corresponds to a

good piece of news for investors. In particular, in October 2013 the FBI shut down an online market place called the “Silk Road”. Heroin, cocaine, LSD were sold in this cyber-underworld, together with fake IDs and hacking tools. The payment for all this items were made with bitcoins and the general public expected a huge fall of the cryptocurrency value; unexpectedly, the exchange rate against the dollar restarted to rise, because the event showed that only a small part of all units of the virtual currency were used in the largest illegal marketplace. The result was a renovated consumers confidence originating a boom that brought one single bitcoin to be worth almost \$850.

If a prompt and massive effect of good events on the cryptocurrency value has been observed, the same can be said for bad news (the red circles on the graph). For example, after the already cited burst, an alarming collapse happened. As it was previously anticipated in the section “3.3 Bitcoin In the World”, Chinese government announced a ban for banks in December 2013, prohibiting the use of the cryptocurrency to financial intermediaries. As a consequence, BTC China, the largest oriental exchange platform, informed the public about its decision to deny any further yuan deposits. If we follow Carmelo Salleo’s line of reasoning (mentioned in the section “3.4 Bitcoin in Italy”) of a speculative practice causing price to increase, this was the event that forced the bubble to explode and the decline to begin. This fall ceased for less than a month in February 2014, resuming in March (second red circle: 3) Flexcoin closing). At that moment, in fact, a Canadian Bitcoin bank labeled Flexcoin declared its closing due to a hacker attack resulting in a \$600.000 loss. In any case, the most long-lasting value decline (almost 7 months from July 2014 until February 2015) may be connected to the already anticipated warning for banks and citizens of the European Banking Authority (third red circle: 4) EBA’s report). Investors suddenly became aware of all the possible risks they were incurring and,

together with the possible scenario proposed by the report of a strict regulation potentially endangering easy profits, trust was seriously weakened. The pattern eventually recovered, even if without a substantial rise, in March 2015.

The main result of this section is that a high instability of the cryptocurrency has been recently observed. These numbers put in evidence that Bitcoin's is still incapable of absorbing negative shocks. The paradox lies exactly here; some critics sustain the idea of a necessary regulation to facilitate the value stabilization, but on the contrary, others claim that this proposed law enforcement would only result in the definitive decline of the phenomenon. This common disagreement is probably the main reason of the current situation of stalemate.

5. Conclusions and Future Scenarios

It has been shown how Bitcoin is currently experiencing a long-lasting period of decline. Some of the faults of this drop have to be addressed to supervisory institutions all over the world, which, as proposed in the section 4, considerably impacted on the cryptocurrency's value through their negative reports. On the other hand, it is worth noting that even the most adverse critics recognize unambiguous advantages; more than the low transaction costs (that maybe would increase in the future both for stagnant supply and for a regulation) potential incentives for economic growth have been retrieved in the increasing difficulty of mining activity. Moreover, the Blockchain, the infrastructure governing Bitcoin circuit, could find possible uses in completely different fields.

The current absence of a precise regulatory framework has been suggested to be one of the possible brakes for the phenomenon; both investors and customers currently lie unprotected when undertaking their respective activities of financing miners and using Bitcoin as a means of payment. Without such a safeguard, they decide to devolve their resources to other scopes, limiting the growth of the system.

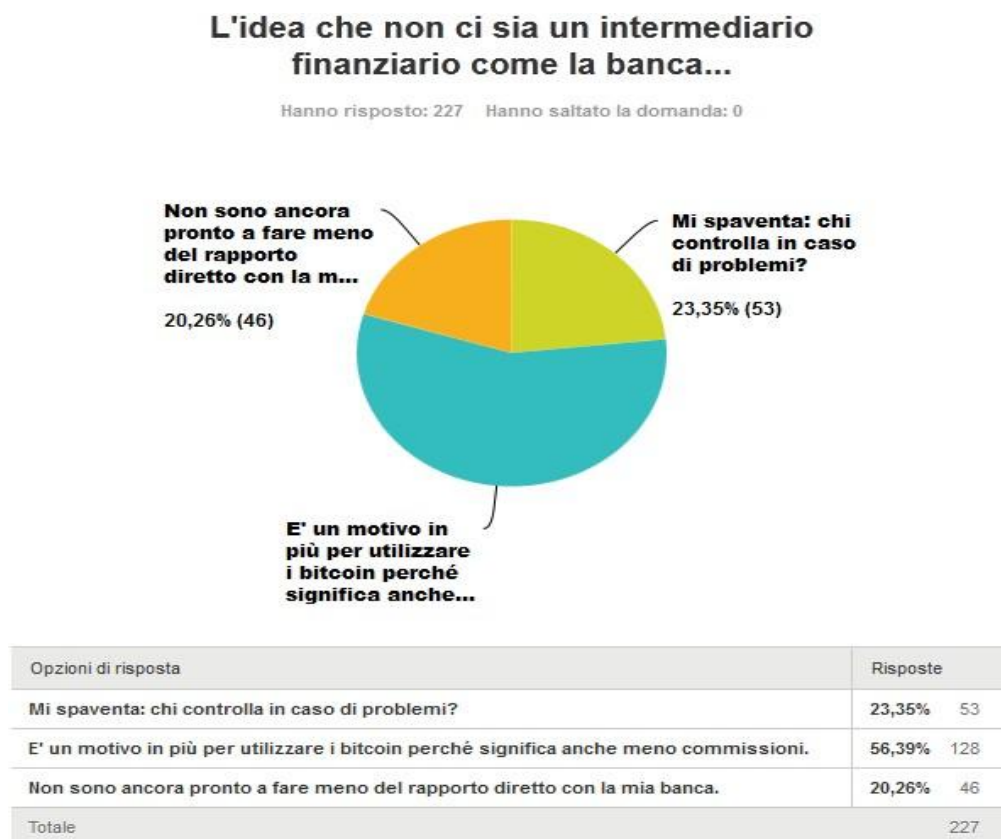
It may sound strange that a currency which was meant to ease the electronic commerce and, thus, be used for exchange purposes, is presently exhibiting a low velocity, synonym of a predisposition for speculative aims. Also this fact could be due to the lack of supervision, and the same holds for the main uses of the cryptocurrency, shown to be related to illegal practices.

If the recent trend continued, Bitcoin would cease to exist. Banks and institutions seem to have the power to remove all the impediments to the phenomenon simply providing a regulatory framework but it does not appear to be their immediate concern, given that current magnitude is

not enough to damage the financial system. In any case, a rapid resolution of this problem is crucial to protect honest citizens that want to use Bitcoin for their transactions.

Appendix 1: Survey of the Italian Unione Nazionale Consumatori

Figure 7: Survey about the absence of financial intermediaries (Source: Unione Nazionale Consumatori)



Even if the sample cannot be considered reliable for its limited dimensions (227), it emerges that more than the 56% of the interviewees (light blue area) is not afraid of the absence of financial intermediaries.

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