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THE EMERGING AND FUTURE ROLE OF BITCOIN AND THE POTENTIAL OF A REGULATORY REGIME FOR THE OUTLAW VIRTUAL CURRENCY SCHEMES

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A B S T R A C T

The proliferation of Internet and virtual communities led to the creation and continuous increase of circulation of virtual currency schemes. The virtual currency that has seen enormous growth both in value and public perception to date is the Bitcoin scheme which is based on a pioneering technology: the decentralised 'blockchain' technology. Bitcoin does not have any physical counterpart with legal tender status and there is no involvement or supervision by central banks or any other authorities in the process. Hence, its fundamental features in the context of cryptocurrency could be considered both beneficial and disadvantageous. However, the risks to which users, central banks and whole economies are exposed, might be mitigated whether Bitcoin scheme would be regulated. While the question of a potential regime for this type of virtual currencies arises, several national authorities, the European Central Bank and international fora express their major interest pertaining to the issue. Although Bitcoin's future role as a currency is a completely hypothetical matter, its technology could transform law not only in terms of new legislation, but also in terms of practice.

A N A L Y T I C A L T A B L E O F C O N T E N T S

Chapter 3 : The perspective of establishing a legal framework for Bitcoin scheme and other virtual currencies

Chapter 4 : Concluding remarks

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List of Abbreviations

ACPR	Autorité de contrôle prudentiel et de résolution
AML/CFT	Anti-money laundering and countering the financing of terrorism
ATO	Australian Tax Office
BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht
Btc	Bitcoin
CBC	Central Bank of Cyprus
CBR	Central Bank of Russia
CEA	Commodity Exchange Act
CFTC	Commodity Futures Trading Commission
DNB	De Nederlandsche Bank
EBA	European Banking Authority
ECB	European Central Bank
ECD	E-Commerce Directive
EMD	Electronic Money Directive
EU	European Union
FATF	Financial Action Task Force
FinCEN	Financial Crimes Enforcement Network
FinMa	Financial Market Supervisory Authority
FSMA	Financial Services and Markets Authority
IMF	International Monetary Fund
ISS	Information Society Services
MiFID 2	Markets in Financial Instruments Directive 2
NPSS	New payment systems and services
NSA	National supervisory authority
P2P	Peer-to-peer
PSD	Payment Services Directive
PSP	Payment service provider
RBA	Reserve Bank of Australia
RBA	Risk-based approach
RBI	Reserve Bank of India
VC	Virtual currency
VPSS	Virtual payment systems and services

I N T R O D U C T I O N

This dissertation is mainly aiming at a comprehensive presentation of the Bitcoin's innovative role pertaining to the growth and development of new or existing financial activities with a view - henceforth – to examine the eventuality of shaping and entering into force a regulatory framework which could mitigate the risks arising from virtual currency schemes' usage.

While virtual communities have proliferated in recent years, the creation and circulation of their own currencies for exchanging goods and services and thereby the provision of a medium of exchange and a unit of account, result a major interest to central banks (also the European Central Bank- hereinafter 'the ECB'), due to their relevance in several areas of the financial system. These virtual currencies schemes do not have any physical counterpart with legal tender status and there is no involvement or supervision by central banks in the process; one of them, the Bitcoin is considered as the most successful and –probably most controversial- virtual currency to date. On that basis, this paper focuses on the Bitcoin scheme which emerged across EU Member States as a great innovation in 2012-2013 and gave further impetus to the current issue of whether virtual currency schemes should or could be regulated.

To that end, the paper is structured in four (4) Chapters:

After a brief review of the history of money, *Chapter 1* is overviewing the money formats, dealing in particular with the difference between the classified digital currencies, in order to attain a smooth transition to the presentation of the basic monetary features of Bitcoin scheme. That is to say, this chapter introduces some technical parts and encloses the benefits of virtual currency schemes' usage in general and Bitcoin's usage in particular.

Chapter 2 examines the potential risks and costs with regard to virtual currencies' extensive integration in the financial system.

Following the immediate response of jurisdictions in view of the lack of regulation, the tone is set in *Chapter 3* which presents the legal status of Bitcoin scheme worldwide and especially in EU Member States. This chapter examines, however, the existing EU legal framework and the possibility of equally applying existing rules to Bitcoin and other virtual currency schemes. Furthermore, there is a detailed analysis of the reaction of Financial Action Task Force (hereinafter 'FATF') in terms of international standard setting bodies and of European Banking Authority (hereinafter 'EBA') in terms of European standard setting bodies. This chapter examines, however, the existing EU legal framework and the possibility of equally applying existing rules to Bitcoin and other virtual currency schemes. In addition, IMF's approach to the matter is outlined.

Finally, *Chapter 4* contains the concluding remarks of the dissertation, i.e.: an overall evaluation of the existing legal basis and the responses for the virtual currency schemes as well as some final considerations on the Bitcoin scheme and its complexity, highlighting its future role and position within the financial system.

For the sake of completeness, all primary and secondary sources are referred to in the main text in footnotes as references and are then carefully listed in the end of the paper.

I would like to sincerely thank several individuals and groups without which this dissertation could not have reached fruition. First, my academic supervisor, Professor Christos Gortsos for offering his time with the greatest patience to hear out and for improving this paper with valuable comments and suggestions. Second, my classmates and Georgia Papalexiou who endured my news update on virtual currencies and Bitcoin scheme, as well as Charalampos Andriotis, Maria Hadjiioannou, Stefanos Gkovosdis-Louvaris and Ion Markopoulos-Mantzouros for their help and support.

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CHAPTER 1

THE INNOVATION OF VIRTUAL CURRENCY SCHEMES PERTAINING TO THE CREATION OF BITCOIN SCHEME AND MONETARY ASPECTS

1.1. Introductory remarks

1.1.1. A short historical review of money

Modern money began with the practice of sovereign coinage, whose origins go back to the very dawn of civilization[1]. That is to say, coins first appeared in eastern Mediterranean during the eight and seventh centuries B.C. and in Far East in 1022 B.C. Nonetheless, the format of money has changed considerably since then. In particular, the early format was commodity money, for instance minted of base metals like copper or bronze alloy with a metallic content of intrinsic value[2] which had uses other than as a medium of exchange. Yet, the format of commodity-backed or representative money appeared around the eighteenth century; pieces of paper (e.g. gold certificates)[3] were used as a claim on the commodity, promoting portability of money and facilitation of transactions[4].

Nowadays, modern economies are based on fiat currencies - which are defined as any legal tender designated by a central authority[5] that circulates and is customarily used and accepted by the issuing country[6]- and resemble to the aforementioned form of commodity-backed money in terms of appearance, but not in terms of concept[7]. Thus, money as a tool created and marked by development, had been readjusted eventually to society's evolution, while maintaining three functions: it is performing a function as a medium of exchange (id est as an intermediary in trade and exchange of goods and services[8]), as a unit of account (which stands for the unit of measure used to value/cost goods, services, assets, liabilities, income, expenses[9]) and as a store of value (meaning an asset that can be saved, retrieved and exchanged at a later time, and be predictably useful when retrieved)[10].

[1] See Cohen (2004), pp. 1-7
[2] Ibid, p. 3
[3] See ECB (2012), p. 9
[4] See Mankiw (2014), p. 220
[5] See ECB (2012), p. 9
[6] See FATF (2014), p. 4
[7] See ECB (2012), p. 9. Commodity-backed money was being redeemed for a commodity.
[8] Ibid
[9] See Mankiw (2008), pp. 338-339
[10] However, older economic texts distinguish a fourth function, the standard of deferred payment 'which is an accepted way to settle a debt - a unit in which debts are denominated , in comparison to modern ones that subsume it under the other functions'. On this issue, see Greco (2001) and Krugman and Wells (2006).

1.1.2. Theoretical analysis of money in the virtual world; background and definition of the terms 'virtual currencies' and 'electronic money'

Likewise, money's evolution could not have stayed unaffected by technological achievements and the creation of the World Wide Web in the mid-1990s which changed society's habits and broadened internet users' needs. In light of Internet World Stats, it is worth mentioning that there has been a tenfold increase in the number of internet users from 1999 to 2013, reaching the third billion in 2014 or else said 40% of the global population [11]. This massive penetration of the Internet caused structural changes in social behaviour such as the proliferation of virtual communities[12] where, other than social networking, the user can buy physical goods and services, play online games or be part of an online environment for gambling. Therefore, the roots of digital currencies can be found in the increased use of computers and Internet.

In some cases, users that carry out transactions use a digital representation of fiat currency in order to electronically transfer value denominated in fiat currency (a.k.a. 'electronic money' or 'e-money')[13]. In essence, e-money is a digital transfer mechanism for fiat currency, which means that it transfers value characterized by legal tender status. In late 1990s, electronic money was mainly consisted of electronic checks and embedded smart cards. With the advent of e-mail, the transactions of electronic money started increasing. People started using credit card details via e-mail to buy goods. Later, the customers started having an online account to avoid transaction fees. However, some communities of the virtual world provide their own salient manifested, new -digital- currencies as a medium of exchange and a unit of account. In all cases, two of the functions of money are operated both by digital and fiat money formats.

The controversy aroused whether digital money fulfilled the store of value function[14] (the third one) was empowered by the creation and circulation of these 'new' released digital currencies as noted above. The ECB did set the question in the 2012 Report amidst a first analysis of virtual currencies, because as it is already mentioned, the store of value is closely affiliated to reliability and safety. With this in mind, the ECB highlighted its doubt about missing these two elements within the context of these new digital currencies created by virtual communities, which have no connection with real/fiat money. Today, the store of value function is considered as fulfilled[15] in several cases. It is apparent that this is a new means of payment for exchanging the goods and services these virtual communities offer, thereby creating a new form of digital money; the virtual currencies. They are defined by standard-setting bodies as 'a digital representation of value that can be digitally traded and

[11] See the statistics at http://www.internetworldstats.com

[12] For the definition of virtual communities, see Rheingold (1993), p. 58: new form of human social life, groups of people linked by their participation in computer networks. People in virtual communities share many of the characteristics of people in ordinary communities, Rheingold says, yet they have no face-to-face contact, are not bound by the constraints of time or place, and use computers to communicate with one another. In other words, a virtual community is a place within cyberspace where individuals interact; the virtual community, in this sense, is analogous to the concept of the public sphere.

[13] See FATF (2014), p. 4

[14] See ECB (2012), p. 11

[15] See EBA (2014), p. 7

that is neither issued by a central bank or authority nor necessarily attached to a fiat currency, but is accepted by natural or legal persons as a means of payment[16]'. It functions as medium of exchange and/or unit of account, and/or store of value but it does not have legal tender status in any jurisdiction, except the fact that in many jurisdictions, a private business, person or organization is free to develop policies on whether or not to accept the physical currency or coins as payment method[17].

As is evident, the usage of the terms 'currency', 'digital currency', 'electronic money' and 'virtual currency' could be misleading ; to that end, a clear classification is required (see below, Table 1). Firstly, the usage of the term currency is allowed even though there is controversy and ambiguity concerning the question whether virtual currency attributes of a 'typical' currency[18]. However, just like in the real economy, in a virtual one the transactions settled are parts of a payment system. Secondly, digital currency can mean a digital representation of either e-money (fiat money) or virtual currency (non-fiat money). Virtual currency as defined above[19] is distinguished from fiat money (a.k.a. real money/national currency)[20] and from e-money, which is a digital representation of fiat money. In particular, according to the Electronic Money Directive (2009/110/EC), electronic money is monetary value as represented by a claim on the issuer which is stored electronically, issued on receipt of funds of an amount not less in value than the monetary value issued and accepted as a means of payment by undertakings other than issuer[21]. The unit of account that the e-money is expressed is traditional fiat money, because the stored funds are expressed in traditional money (e.g. US dollars, euro, etc.). Hence, the link between electronic money and traditional money is preserved and has legal foundation[22].

TABLE 1 : A money matrix

		Money format	
		PHYSICAL	*DIGITAL*
Legal status	*Unregulated*	Certain types of local currencies	Virtual currency
	Regulated	Banknotes and coins (fiat currency)	E-money
			Commercial bank money (deposits)

Source: ECB[23]

Notwithstanding the fact that some features of e-money are also met by virtual currencies, there is one fundamental difference concerning the aforementioned aspect; in virtual currency schemes the unit of account is changed into a virtual one, not in a fiat one. These virtual currencies could be considered as private money or a commodity and are not issued by a

[16] See FATF (2014), p.4 and the EBA Opinion on Virtual Currencies (2014), p. 5
[17] See FATF (2014), p. 13
[18] See EBA (2014), p. 11
[19] See the definition on p. 7 of this paper
[20] On the definition of the term see the FATF Report on Virtual Currencies (2014), p. 4 that refers to 'the coin and paper money of a country that is designated as its legal tender , circulates and is customarily used and accepted as a medium of exchange in the issuing country'.
[21] Electronic Money Directive (2009/110/EC), Article 2, point (2)
[22] See ECB (2012), p. 16
[23] See ECB (2012), p. 11

central bank or a public authority, like e-money that is issued by institutions being subject to prudential supervisory requirements. Some types of virtual currency schemes that are exchanged back-and-forth for fiat money at an exchange rate having an interaction with real economy are called convertible[24] [25] or open[26] [27], whereas others are called non-convertible (or closed); they have almost no link to the real economy and are called 'in-game only' schemes, because they can only be spent within the virtual community[28]. Another key point to mention is that the term convertibility is used only as long as there is offer and acceptance within markets and private participants. To put it another way, it does not imply an ex officio convertibility, because it is not guaranteed by law[29]. However, even a non-convertible/closed virtual currency could be exchanged for fiat currency or another virtual one in an unofficial secondary black market, other than the specific virtual community[30].

Strictly, virtual currencies are not 'currencies' in all cases, because they often meet the exchangeability, not the high liquidity and the wide acceptance in their geography. They are not money, because it is doubtable whether they could perform the three functions of money at the same time and to the same extent as real/fiat money. In theory, they could serve as money for anybody with an internet-cabled computer or device; at present, however, they fulfil the roles of money only to some extent and only for a number of people. They are likely at present to regularly serve all three purposes for perhaps only a few thousand people worldwide and even then only in parallel with users' traditional currencies[31]. Virtual currencies are not e-money - as analyzed above[32] - or legal tender yet. If virtual currencies were legal tenders, the creditor of payment obligation would be required to accept it as full face value and it would be sufficient to discharge a debtor from its payment obligations. Finally, given the fact that they do not represent a claim on the issuer, they are not redeemable.

1.2. Bitcoin overview and basic features

More than 600 different virtual currency schemes (convertible/non-convertible) are said to be in circulation[33] at the time of writing, even though this is in stark contrast to the situation two years ago when it was the only one really known about, Bitcoin is still in the spotlight. It is probably the most successful convertible virtual currency scheme to date, albeit the most

[24] See FATF (2014), p. 4 and EBA (2014), p. 13 that adopt a different categorization from the ECB's three-part classification of virtual currencies, as defined in the ECB Report on Virtual Currency Schemes (2012), p. 6

[25] Examples include: Bitcoin, Ripple, Litecoin, Dash, Stellar

[26] See EBA (2014), p. 13

[27] These virtual currency schemes have bidirectional flows, i.e. they act like any other convertible currency, with two exchange rates (buy and sell), which allow for the purchase of both virtual and/or real goods and services, according to the ECB Report on Virtual Currency Schemes (2012) on pp. 13-14, which, however, adopted, at that time, a different classification (three types of VCs).

[28] Examples include: World of Warcraft (WoW) Gold exclusively used in an online game created by Blizzard Entertainment or Project Entropia Dollars used in Entropia Universe designed by MindArk

[29] See FATF (2014), p. 4

[30] Ibid, p.5

[31] See Bank of England (2014a), p. 3

[32] See p. 8 of this paper

[33] For further information, see the following link : http://www.coinmarketcap.com

contentious. In just five years, Bitcoin scheme has seen enormous growth, both in value and public perception. It accounts for more than 80% of the market capitalisation of the around 500 known decentralised virtual currencies, so Bitcoin scheme still appears as the most prominent of them[34]. This form of currency creation is the gold prospecting of the digital age[35]. It operates at a global level and is used for the purchase for both virtual and real goods and services, competing the official currencies like the euro or the US dollar, even though it is not pegged to any currency- the exchange rate is determined by supply and demand in the market[36].

The importance of Bitcoin scheme lies not so much in its potential to become a substitute for money, but rather in its ability to act as the internet of money[37]. Bitcoin is much more than a substitute - it is like a logical layer for finance[38] that will support a revolution in the way people own and pay for goods and services. Like many underground, countercultural phenomena that suddenly find themselves rapidly adopted, Bitcoin scheme has reached the point of broad influence, with the potential to become of full mainstream acceptance[39]. As it will be discussed in greater detail below, a variety of Bitcoin's unique characteristics have been touted as being particularly attractive to users and may have helped Bitcoin obtain wider acceptance than other virtual currencies. Bitcoin is not the only virtual currency or even the first virtual currency to be introduced to the public. In fact, a number of virtual currencies predate Bitcoin. However, each ultimately failed to reach Bitcoin's current level of popularity and mainstream acceptance. While virtual currencies are nothing new, Bitcoin was developed and introduced in a way that allowed it to obtain a material level of use in the marketplace where other virtual currencies languished.

The Bitcoin[40] phenomenon was a concept proposed and developed by the considered as pseudonymous entity Satoshi Nakamoto[41], with the initial open-source (freely distributable) client software being released on the 9th January 2009[42]. The concept behind bitcoins originated in an online paper published under the pseudonym in November 2008 entitled Bitcoin: A Peer-to-Peer Electronic Cash System. Bitcoin scheme is based on an open[43] peer-to-peer network (P2P) - a network of computers configured to allow certain files and folders

[34] See ECB (2015), p. 6
[35] See BaFin's Annual Report (2013), p.58
[36] See the ECB Report (2012), p. 21
[37] See 'Bitcoin's future: Hidden flipside', (2014) on The Economist website at the following link: http://www.economist.com/news/finance-and-economics/21599054-how-crypto-currency-could-become-internet-money-hidden-flipside
[38] See Dourado's article (2014) on the Umlaut website at the following link: http://theumlaut.com/2014/01/08/Bitcoin-internet-of-money/
[39] See PwC (2014), p. 1
[40] We capitalize Bitcoin when referring to the name of the system and use lower case for the monetary unit (like dollar, euro).
[41] Satoshi means 'clear thinking, quick witted; wise', naka can mean 'medium, inside, or relationship', moto can mean 'origin', or 'foundation'. The controversy about the origin of the inventor and the individual or the team behind this protocol still exists (http//www.coindesk.com).
[42] See Nakamoto's paper (2008) on the famous protocol, available at http://www.bitcoin.org
[43] As a network protocol, Bitcoin is an open tool for provably sending value between any computers connected to the internet, just as the Hypertext Transfer Protocol (HTTP) is an open tool for sending text and pictures. HTTP is accessed with software that is run by network participants: web browsers (e.g. Google Chrome) and web servers (e.g. Apache Tomcat).

to be shared with everyone or with selected users[44] - and maintains a database that lists providers which accept bitcoins[45]. Moreover, it allows online payments to be sent directly from one party to another without going through a financial institution. During the early stages of the money, Bitcoin was hardly known or popular. However, throughout its short history, several occurrences, e.g. releases of newspaper articles boosted its popularity; this resulted in higher amounts of traded bitcoins and higher, but alternating, values against the US- Dollar or the Euro.

Bitcoin, the web-generated currency that allows online transactions without credit cards, direct debits or other traditional forms of payment, differs from other virtual currencies, in spite of the number of common characteristics, since it is the first decentralized digital currency. Some virtual currencies are issued and controlled by an individual or a group of individuals which function as an administrating authority – i.e. a third party that controls the system, issuing the currency, establishing rules, maintaining a central payment ledger and being authorized to withdraw it from circulation[46]- while other virtual currency schemes, i.e. Bitcoin, are issued and operated in a decentralized manner[47]. Bitcoin has no central administrating authority and no central monitoring or oversight. That is to say, it is a distributed, open-source math-based peer to peer scheme, developed by a worldwide collaborative community of 'cyber' volunteers[48]. To put it another way, Bitcoin users perform these tasks themselves. This aspect is established by a feature which launches the innovation that triggered the phenomenon of virtual currency schemes; Bitcoin was designed on a cryptographic basis. Thus, cryptography[49] is the characteristic that secures the transactions and controls the creation of new units of bitcoins[50], turning the scheme into the first cryptocurrency. To be more precise, the cryptocurrency relies on public and private keys[51] to transfer value from one person (individual or entity) to another, and must be cryptographically signed its time it is transferred, meaning it incorporates principles of cryptography to implement a secure decentralized information economy. As will be explained later, the money supply is determined by a specific type of 'mining' activity[52].

1.3. The components of Bitcoin scheme and a general empirical approach to the Bitcoin system functions concerning monetary aspects

The technical aspects of the Bitcoin system seem complex and on that account, a basic and simple description of its functioning is rendered as sufficient explanation of the mechanism, lying within the scope of this paper. Bitcoin scheme has undergone several changes since its

[44] Similar to Bit Torrent
[45] See http://en.bitcoin.it/wiki/Trade
[46] Examples include Second Life Linden Dollars, PerfectMoney, WebMoney Units.
[47] See EBA (2014), p. 13
[48] See FATF (2014), p. 5
[49] Cryptography is defined as the conversion of data into a secret code for transmission over a public network. See the definition on http://www.pcmag.com/encyclopedia
[50] See http://en.wikipedia.org/wiki/Cryptocurrency
[51] Keys are numeric codes that are used to encrypt text for security purposes. See the definition on http://www.pcmag.com/encyclopedia
[52] See ECB (2012), p. 21

first release at 2009, but the mining process and the rules and formats of transactions are described in the Bitcoin Protocol, which is updated and amended regularly by developers in the peer-to-peer network –the type of computer network that is characterised by the absence of a central server[53].

Bitcoin exists solely in electronic form through an online network open to everyone. According to the inventor[54] of the scheme, who can also be the issuer[55] or administrator[56], an electronic coin can be defined as a chain of digital signatures[57]. Each owner has a pair of keys, one public and one private that are saved locally in a file. Thus, bitcoins are computer files similar to mp3 or a text file that can be destroyed or lost and they are stored either on a personal computer or entrusted to an online service. This means their usage is easy, since they are simple files stores.

In order to hold and store, spend or accept bitcoins, all transactions - that are often referred to 'smart contracts' and are designed to take the form of decentralised exchange not reliant upon intermediaries such as banks, exchanges or dealers - must be logged on a public payment ledger (the 'blockchain', a transaction database which turns transactions into a public chain of actions)[58]. When an individual ('A') wishes to transfer bitcoins to another individual ('B'), A creates a message (a 'transaction') containing B's public key and signing off with A's private key. The transaction is then recorded, time stamped and displayed in one "block" of the blockchain as part of the payment processing carried out by Miners. With this in mind, every single bitcoin carries the entire history of the transactions ('block') it has undergone and any transfer from one owner to another becomes part of the code.

However, a bitcoin is stored in such a way that the new owner is the only user allowed to spend it. Owning a bitcoin is perhaps most similar to owning land. The conditio sine qua non of land ownership is identification in the most recent deed within a chain of title found in a public record. The conditio sine qua non of Bitcoin ownership is holding the private key that links to the most recent recipient public address within a chain of title found in the blockchain[59].

One of the core design features of Bitcoin scheme reflects its fundamental innovation; there are a finite number of bitcoins[60] in the system which is designed so that there is a slow release of additional coins through a process called mining. Participants download a special programme for the purpose and contribute their computer processing power to the mining process, which can be seen as a form of network maintenance for which the reward is new bitcoins. In practice, mining involves solving complex mathematical algorithms by the miners –the people who use their systems to undertake this activity on a voluntary basis. When the

[53] See peer-to-peer definition at http://www.oed.com, Oxford English Dictionary, as designating or relating to a network in which each computer can act as a server for the others, allowing shared access to files and other resources.
[54] See ECB (2015), p. 8
[55] Ibid
[56] See FATF (2014), p. 7
[57] See Nakamoto's paper (2008) on the protocol, available at http://www.bitcoin.org
[58] See ECB (2012), p. 23
[59] See Lloyd's Report (2015), p. 7
[60] 21 million

block is solved, it is immediately placed into the blockchain – who validate a set of transactions (block)[61]. To be included into the blockchain, the block should be 'solved' by the Bitcoin miners. Solving the block basically means finding the unique answer to the mathematical puzzle constituting the block. Likewise, without miners the decentralised Bitcoin scheme would not run smoothly, since they prevent a coin being copied or forged or double spent, considering the fact that there is no central/sole intermediary validating the transactions. As these computational powers –miners- tend to increase, so does the difficulty of the mathematical puzzles to solve[62]. As mentioned, the amount of bitcoins constitutes a kind of reward for solving a block. When the block is solved, the generated reward in the amount of 25 bitcoins (currently) is automatically sent to the randomly chosen Bitcoin address of the miner who has been contributing to the process of solving the block. The acquisition of the reward is always registered as the first transaction of the block and constitutes the essence of the Bitcoin mining. The bitcoins obtained in this way are considered to be mined by the miner. Moreover, the miner may also receive an additional reward in the form of a transaction fee if it has been initially assigned by a payer for the priority confirmation of a transaction.

The Bitcoin network is not, therefore, a tool for transmitting actual bitcoins. It is a tool for building an authoritative public record that records the chain of title for any current bitcoin holdings, and prevents individuals from creating fraudulent entries in that record by attempting to spend some other user's bitcoin or double-spend their bitcoins their own. In respect of double-spending, physical fiat currencies have a manifest built-in solution to this problem: if a consumer exchanges a euro for any good or service, absent illegal activity such as counterfeiting, they are no longer in possession of the unit of the currency and, therefore, cannot spend that one again to buy a another good or service from another vendor. Virtual currencies, which have no physical manifestation, however, cannot rely on this sort of built-in solution. Most virtual currencies have sought to address the problem by 'involving . . . a central clearinghouse to keep a real-time ledger of all transactions [involving the virtual currency'[63]. Implementing a central clearinghouse can mitigate the problem of double spending because any fraudulent transactions will be immediately logged and prevented; however, it can only be effective if the third-party is or should be trusted by the users of the currency. Nakamoto's proposal was unique because it eliminated the need for a third-party clearinghouse by turning over the authority to maintain a ledger of transactions to the users of the currency themselves. According to Nakamoto, mining is a reliable procedure for the security and safety of the system as it provided the incentive to act honestly[64], because 'a user ought to find it more profitable to play by the rules that favour him with more new coins than

[61] See ECB(2015), p. 7
[62] See Shcerbak (2014)
[63] See Wallace' article (2011), on the Wired website at the following link: http://www.wired.com/magazine/2011/11/mf_bitcoin/
[64] See ECB (2012), p. 24

to undermine the system and the validity of his own wealth'[65]. As of June 2015, approximately 14.3 million bitcoins had been mined and are in circulation[66].

Furthermore, a Bitcoin wallet[67], which is installed either on a computer or smart phone or held online, is needed to make and receive Bitcoin payments[68]. Nevertheless, users can also set up and maintain a wallet themselves without making use of a wallet provider[69] [70]. A wallet provides access to a number of addresses each with its own balance of bitcoins, so if a user wishes to pay by bitcoin, he must know the payee's address - just as it is necessary to know the payee's registration and account number to make an ordinary online bank transfer. Once verified by the network, the transaction is considered to be final. The total transaction processing time for bitcoins is said to be between 10 and 60 minutes in such a way that virtual currency payments appear to compare favourably with credit transfers or card payments, particularly between different currency areas[71]. Moreover, they take place on an uninterrupted basis, unlike some traditional payment systems that do not function on a 24/7 basis, except those that concern the 35 countries of the Single Euro Payments Area (SEPA) Agreement[72] and the countries that have established real-time payment services[73]. It is worth mentioning that the total number of transactions converged has almost doubled during a period of one year: in June 2014, transactions reached 41million, while in June 2015 they reached 73 million[74]. Moreover in July 2015 a new bitcoin email transfer service called MoneyPacket.org[75] just adds complexity to the movement of cryptocurrency. In particular, it is a transitionary tool, a new medium for users to get their first bitcoins before the installation of a wallet, expanding its easiness for users.

Therefore, the ecosystem supporting Bitcoin that has been growing exponentially is consisted of a broad list of VC market participants consists mainly of specific, new categories

[65] See Nakamoto's paper (2008) on the protocol, available at http://www.bitcoin.org
[66] Total bitcoins in circulation as calculated at https://blockchain.info/charts/totalbitcoins (last visited June 23, 2015)
[67] There are two types of wallet, which differ as regards their immediate usability versus their safety from cyber crime: online wallets (hot storage) and offline wallets (cold storage).
[68] See FATF (2014), p. 7
[69] See ECB (2015), p. 8
[70] Coinbase and Circle are notable examples.
[71] See EBA (2014), p. 17
[72] See the Regulation (EU) No 260/2012 of the European Parliament and of the Council of 14 March 2012 - establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation (EC) No 924/2009- in the Official Journal of the European Union, L 94/22, 30 March 2012
[73] According to Banking Tech's report on The Irresistible Rise of Real Time Payments (2015), the most successful expedited payments system is U.K.'s Faster Payments Service (FPS) launched in 2008. Other countries that emulated the UK model are Poland, Sweden and Singapore. Australia is also embarking on a program to implement a similar a system by 2016. India, Hong Kong are following suit, among others.
[74] See 'the projected bitcoins long term' data at the following link: https://en.bitcoin.it/Controlled_inflation
[75] A money packet is a file which contains bitcoins, like a digital envelope containing money. Money packets can be shared over email or Dropbox or backed up for storage, like any other file. This website is free and open-source allowing the user to create money packets and claim funds.

of actors which were not present in the payments environment before[76] and that can be classified in three main categories of systems:

(1) the Bitcoin mining community as explained above[77],
(2) Bitcoin exchanges and
(3) merchants who accept bitcoins as payment for goods and services

In general, users that choose to obtain virtual currency for purchasing virtual or real goods and services from specific merchants, for making person-to-person payments (e.g. cross-border) or sending remittances, or for investment purposes, including speculation, are similar to consumers/clients. With this in mind, it is necessary to note the five ways to obtain units: i) purchase; ii) engage in activities that are rewarded with units of virtual currency (e.g. filling out a survey, participating in promotional activity); iii) self-generate units of the currency acting as a miner; iv) receive units as a payment; or v) receive units as a donation/gift[78]. It is worth mentioning that users can buy bitcoins via traditional credit and debit cards or PayPal. Unlike most currencies, Bitcoin amounts are highly divisible. This has led to a desire to create names for smaller denominations of bitcoin amounts, especially since transactions involving whole bitcoins are no longer quite so common. Bitcoin is decentralized, so there is no organization that can set official names for units. Therefore, there are many different units with varying degrees of popularity. Many have adopted the practice of referring to the micro-bitcoin metric sub-unit as "bits": as of 2014,1 bitcoin = 1 000 000.00 bits = 100 000 000 satoshi[79].

In respect of the second category, bitcoins also can be bought and sold on Bitcoin exchanges[80] [81]. These exchanges match buyers and sellers, and help create a market for bitcoins through 'trading platforms' that function as marketplaces[82]. Due to the volume of transactions, these exchanges play a vital role in establishing the value of bitcoins. A transaction on the Bitcoin network is not denominated in real world currency units such as Dollars, Euros or Sterling as they are on PayPal, for example; nor is the value of the currency derived from gold or government fiat. Meanwhile, the Bitcoin value[83] is derived from the value that people assign to it and its value relative to other currencies as determined on an open market, just as the values of real world currencies are determined through exchange rates currently[84]. Similar to stock exchanges, users can buy and sell bitcoins in exchange for popular currencies such as dollars or euros. In a nutshell, traders 'regulate' the cycle between Bitcoin and fiat currencies, while trying to feel the pulse of the price in order to profit from it. A few prominent Bitcoin exchanges include Bitstamp, CoinCorner and BTCN[85].

Besides, merchants are a key component of the Bitcoin ecosystem. These virtual currency actors are users in a trade, business or professional role who accept bitcoins in exchange for goods and services[86] [87] [88]. However, all roles are intertwined, due to the system's particularity

[76] See ECB (2015), p. 4
[77] See this paper, pp. 11-12
[78] See ECB (2015), p. 8
[79] See the Bitcoin Wikipedia at the following link https://en.bitcoin.it/wiki/Units
[80] See FATF (2014), p. 7 for the identification of exchanger/virtual currency exchange
[81] According to the ECB Report on Virtual Currency Schemes- a further analysis (2015), most of them are non-financial companies
[82] Ibid, p. 8
[83] In June 2015, 1 Bitcoin equals to 220,70 Euros and to 248,41 US Dollars.
[84] See Memorandum for Clifford Chance LLP (2014), p. 2
[85] See an updated list of Bitcoin exchanges at the following link: https://en.bitcoin.it/wiki/Category:Exchanges
[86] See EBA (2014), p. 14

where one person can be a miner, a trader and merchant at the same time. Yet they hold an intricate relationship that determines price. For instance, much is said about price when a big merchant adopts Bitcoin as a form of payment. The most common reaction can be summed up in the common phrase among Bitcoin world 'to the moon!'. The logic of this expression is simple: as more people adopt Bitcoin, there will be more demand for it, and its price will be increasing. Then again, the opposite is likely to happen. A big merchant needs lots of fiat to survive, and when it acquires lots of Bitcoin, it needs to sell it. Thus, the supply of tradable bitcoin increases, lowering its market price. However, not all bitcoin-possessing entities share the same urgency to trade them. Although Bitcoin scheme is a virtual currency, its purchasing power is not limited to the Internet. Like online retailers, merchants that operate brick and mortar stores have also been drawn to the perceived advantages of Bitcoin[89]. Merchants, both small and large, have started to accept Bitcoin at store locations[90]. Although the number of stores that accept Bitcoin does not come close to rivaling those that accept more traditional payment methods, this growth provides further evidence of the inroads that Bitcoin continues to make in becoming an increasingly mainstream alternative payment method[91]. Like online retailers, the owners of brick and mortar stores are attracted by Bitcoin scheme's promises of advantages over traditional payment forms (e.g. lower costs[92], potential for growth and publicity).

In addition to market participants named hereinabove, there are other numerous innovative ventures based on Bitcoin, from Bitcoin automated teller machines ('ATMs') to Bitcoin-based investment instruments. There have been a plethora of innovative ventures that draw on the development of Bitcoin. For example, on October 29th 2013, Robocoin started deploying Bitcoin ATMs that allow users to purchase bitcoins in person[93]. From a financial investment perspective, there are also providers of investment vehicles and brokers which facilitate investment in start-up companies and design specific financial products, such as exchange-traded funds (ETFs) or derivatives. Other actors that have appeared are "tumblers", which provide a service for further increasing the anonymity of the payer by making it more difficult to find out where the virtual currency transaction came from.

Equally interesting is the fact that there are already physical coins as a form of Bitcoin scheme. An example would be Casascius physical coin which is made from metal (gold, silver or bronze depending on the denomination) and contains a new keypair (private and public key, as explained in a previous subsection) of a Bitcoin address. The coin is constructed in such a way that the private key could be decoded only if the physical coin is

[87]See an updated list of merchants accepting bitcoins at the following link: https://en.bitcoin.it/wiki/Trade

[88] Despite the media hype, the acceptance of virtual currencies by "bricks-and-mortar" or online shops selling "real" goods and services does not seem widespread; a rough estimate would be three in every 10,000 businesses. A majority of these shops sell computer hardware and software related to Bitcoin. However, others – mainly e-commerce merchants, including one of the world's largest online travel agencies – have started accepting payments in Bitcoin.

[89] See Brito and Castillo (2013), p.11

[90] See Goodale' article (2013) on Business Insider website at the following link: http://www.businessinsider.com/rise-of-bitcoin-2013-11.

[91] See Tu and Meredith (2015), p. 290

[92] See this paper, pp. 18-22

[93] See ABC NEWS (2013) at the following link: http://abcnews.go.com/Technology/bitcoin-atm-conducts-10000-worthtransactions-day/story?id=20730762

visibly damaged[94]. Additionally, banknotes can be constructed similarly to coins[95] and Bitcoin cheques are in a development stage[96]. Finally, there are also Bitcoin debit cards[97].

1.4. Monetary aspects of Bitcoin scheme

As can be seen, the Bitcoin scheme and its functions, including various components, constitute a system which introduces new money as analysed previously. Consequently, Bitcoin supply does not depend on the monetary policy of neither a virtual nor a traditional central bank, but rather evolves based on interested users performing the specific activity of mining. Given statistical analysis results by the Bitcoin society[98], the supply will develop in a predictable growing geometrically pace based on its technical design[99] and will reach its upper limit of 21 million in around 2040. In other words, it mimics the extraction of gold or other precious metals from the Earth in the sense that only a limited amount can ever be mined[100].

In effect, the fixed and determined supply of Bitcoin money indicates that any intervention by a central authority or even an internal VC actor will have no impact on the system as regards the number of bitcoins created[101]. From the quantity theory of money of Austrian School of Economics, it is widely accepted that there is a link between inflation and the money supply. A substantial growth of the money supply through money printing/creating at some point is going to cause a loss of purchasing power. Therefore the Bitcoin system is supposed to avoid inflation[102] in long term, even though Bitcoin supply inflation is currently 10%[103]. To put it differently, inflation may occur if demand is significantly reduced. However, as Bitcoin is a distributed system of currency, if demand were to decrease to such an extent as to cause inflation then the system itself would fail in any case[104]. If Bitcoin continues to be adopted and eventually becomes a mainstream unit of currency then this is unlikely to be of any concern.

On the other hand, the system has been accused of leading to a possible deflationary spiral[105] [106], considering the eventuality of a great increase of Bitcoin users in the near future and a non-proportional increase of velocity of money which will lead to depreciation of the prices of goods and services quoted in bitcoins. However, Bitcoin is not a currency of a country or a currency area and such a hypothetical perspective is not clear[107].

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[94] In contrast, the public key is visible on the outside of the coin.
[95] For instance, Bitbills and Printcoins are forms of Bitcoin banknotes.
[96] The aforementioned Printcoins are also available with 'open' denomination, which means that anyone could fund it in any denomination acting similarly as a cheque.
[97] For example, Nanocard, ANX, Coinkite, Nuovocard, OKPAY
[98] See the Bitcoin Wikipedia at the following link https://en.wikipedia.org/wiki/Bitcoin
[99] Based on the algorithm that issues only 25 new bitcoin every 10 minutes
[100] See Memorandum for Clifford Chance LLP (2014), p. 4
[101] See ECB (2012), p. 25
[102] Ibid
[103] See statistics at the following link: https://en.bitcoin.it/Controlled_inflation
[104] See at the Bitcoin Wikipedia: https://en.bitcoin.it/wiki/Myths#Bitcoin_can.27t_work_because_there_is_no_way_to_control_inflation
[105] See the ECB (2012), p. 25
[106] Paul Krugman was the first to note the deflation risk in the Bitcoin economy, comparing it to the gold standard (2011). See more on New York Times Blogs at the following link: http://krugman.blogs.nytimes.com/2011/09/07/golden-cyberfetters/ . (2011)
[107] See The Economist (2011)

Furthermore, it is generally accepted that a core characteristic of money is that its value is stable, i.e. that its purchasing power is constant. This helps to provide a framework for sound economic development with appropriate use of society's resources. However, the value of the Bitcoin, and thus its purchasing power, has turned out to fluctuate widely against national currencies. It has been stated that the finite Bitcoin supply may exert an underlying upward pressure on its price. This could give Bitcoin holders an incentive to hold on to their bitcoins as an investment rather than spending them, leading again to deflationary effects in a Bitcoin-based economy.

Moreover, while Bitcoin represents one of many private means of payment[108], it entails three peculiarities: it introduces Bitcoin a separate unit of account, it has no single and identified issuer and its quantity is ultimately fixed once and for all. Built around the model of gold, the Bitcoin is a pure asset not related to credit creation processes. It has no central issuer and does not represent anybody's liability. This implies that its quantity cannot be adjusted to variations in demand, and it does not come with anybody's promise to convert it into official currency at a certain rate. Being nobody's liability is a feature the Bitcoin shares with gold. But in contrast to gold, which is customarily used for various products (e.g. electronics, industry, dental fillings or jewellery) and has a commodity value, the Bitcoin has no use value other than serving its role in the Bitcoin system[109].

1.5. The reasons for implementing Bitcoin and similar virtual currency schemes, relating to the finance innovation

There are several reasons for a virtual community to issue its own virtual currency which lie outside the scope of this dissertation. However, when a type of virtual currency with potentially broader perspectives and with wider application like Bitcoin scheme emerges, the question is why use a virtual currency like Bitcoin instead of a real currency such as the Euro or the US Dollar. Supporters of virtual currency schemes attribute numerous advantages to them, while many remain hypothetical as they have often not –yet- materialised.

1.5.1. Potential economic benefits

Some of the advantages for users, i.e. payer and payee, can be characterised as potential economic benefits of financial, practical or conceptual nature[110].

The use of virtual currencies like Bitcoin scheme can help motivate users by simplifying transactions.

In his seminal article, The Problem of Social Cost, Ronald Coase argued that where transaction costs are significant, they may lead to inefficient results if not controlled for[111]. Since Coase published his article in 1960, however, the technological revolution has enabled a reduction in many kinds of transaction costs. Transaction costs associated with Bitcoin scheme are much lower than with traditional payment systems. Firstly, due to the absence of intermediaries and regulatory requirements, transaction fees are generally significantly either lower than those charged for credit and debit card purchases or zero. For that reason, Bitcoin is cost-efficient: especially for the payee, the strongest advantage is the low cost for acceptance. In fact, the payee just needs to open a Bitcoin account and install an e-wallet to be able to receive payments. During the enrolment of a newly set-up wallet into the virtual

[108] See at this paper pp. 6-7
[109] See Beer and Weber (2015), pp. 60-61
[110] See EBA (2014), p. 16
[111] See Coase (1960), pp. 15-16

currency's network, the consumer is not usually requested to agree on a contract with the inventors and to pay them a participation fee[112]. It is important to note that when using a virtual currency like Bitcoin, as opposed to a currency that needs to be converted, there is no foreign exchange cost. Yet, the differences between fiat currency and Bitcoin transaction costs could be considered not that important, due to the Single Euro Payments Area (SEPA) Agreement[113] and the Regulation 924/2009 which eliminates differences in charges for cross-border and national payments in Euros.

Moreover, with transactions in Bitcoin, users might include fees in order to process them faster. The higher the fee, the more priority it gets within the network and the quicker it gets processed. In addition, since there is no way for third parties to identify, track or intercept transactions that are denominated in Bitcoin, one of the major advantages of it is that sales taxes are not added onto any purchases. Consequently, it makes a particularly attractive way to effect micropayments[114], allowing businesses to monetise very low-cost goods or services sold on the Internet[115]. However, according to European Banking Authority's report on virtual currencies, 'as the number of newly issued units decreases over time, users/miners will have to rely more on transaction fees to recoup their investment of processing power', so it would be reasonable to note an increase in the future[116].

Secondly, as it is already mentioned[117], the payer might benefit from a relatively short time for the verification and settlement of the payment transaction and on 24/7 basis. The total transaction processing time for bitcoins is usually less than one hour for decentralised VCS like Bitcoin; it is said to be between 10 and 60 minutes. Furthermore, the speed of verification and settlement are not linked to the geographical location of the sender and receiver. In fact, the reach of each currency is potentially global and almost every modern electronic communication device can access the internet and store a Bitcoin wallet.

Thirdly, Bitcoin purchases are final, so there are no chargebacks or retrievals, like those rife in credit card dealings, yet another way transacting in the virtual currency saves merchants money. Merchants avoid refunding transactions, particularly those based on an alleged non-fulfilment of a contract[118]. Thus, one of the economic benefits that a Bitcoin user would acquire is a kind of certainty of payments received.

Likewise, virtual currency schemes and especially the new-era phenomenon Bitcoin, offer various new types of businesses and business opportunities. In particular, activities (for example, mining) taking place in terms of the Bitcoin system led to the creation of new hardware, services, trade and exchanges platforms[119]. Releases of new software versions and other updates have taken place smoothly and with relative ease[120]. To put it differently, they can contribute to economic growth and development.

They could present some advantages for the payment system at a general level. The most notable one in decentralised virtual currency schemes like Bitcoin is that the processing costs

[112] See the ECB (2015), p. 18
[113] See the Regulation (EU) No 260/2012 of the European Parliament and of the Council of 14 March 2012 - establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation (EC) No 924/2009- in the Official Journal of the European Union, I. 94/22, 30 March 2012
[114] See EBA (2014), p. 16
[115] See FATF (2014), p. 9
[116] See EBA (2014), p. 16
[117] See p. 13 of this paper
[118] See EBA (2014), p. 18
[119] Ibid
[120] See ECB (2015), p. 20

are distributed over multiple subjects, namely the miners. This characteristic allows the network to reach reasonable computing power without requiring any major single investment, and it grants the network a strong scalability, as long as enough miners are willing to participate. This also means that new and agile actors, mostly with a background in IT and knowledge of its possibilities, have been able to enter the world of payments. They are suggesting new payment solutions for the digital age[121].

Furthermore, the digital coins have also become very popular as an investment. Despite the original purpose for bitcoins, many people have viewed them as a means to make money rather than to use as money[122]. This is because the value of bitcoins has changed wildly during the past years. While volatility in the value of Bitcoin may be viewed as a potential risk to retailers that accept Bitcoin as payment, that same volatility is potentially attractive to investors who seek to profit from buying low and selling high. Accordingly, Bitcoin's use in the marketplace is not limited serving as an alternative payment method. Instead, Bitcoin has also developed into an investment opportunity such that there is a growing number of investors who buy and sell bitcoins like one might buy and sell stock or trade traditional currencies[123]. Some commentators have argued that the fluctuation in value and the ability to exchange bitcoins for other currencies has led to hoarding or has actually harmed the adoption of the currency[124]. Regardless of this behaviour, bitcoins appear to be steadily becoming an established and recognized payment system as acceptance and use grows on both the merchant and consumer sides of the market. Accordingly, it is possible categorizing Bitcoin as an asset instead of a currency, or alternatively, accepting that Bitcoin may share traits of both an asset and a currency[125].

In addition, access to basic financial services is a significant hindrance to combating poverty[126] or to financial inclusion outside the European Union[127]. Due to the impediments to developing traditional branch banking in under-developed areas, people in developing countries have turned to mobile banking services for their financial needs. Bitcoin scheme is able to provide people in developing counties with inexpensive access to financial services on a global scale. This is beginning to be seen in countries such as Kenya, Tanzania and Afghanistan, where the closed-system mobile payment service M-Pesa has been particularly successful; the Wallet service provider Kipochi recently developed a product that allows M-Pesa users to exchange bitcoins[128]. Bitcoin may also be able to provide relief to countries with strict capital controls as there is no central authority that can reverse transactions or prevent the exchange of bitcoins between countries.

Bitcoin therefore provides an alternative in countries with devalued currencies or frozen capital markets. For example, some Argentines have adopted Bitcoin in response to the country's high inflation rate and strict capital controls; demand was so high in Argentina that one popular Bitcoin exchange immediately planned to open an office in the country. With its volatile currency and dysfunctional banks, the country was the first perfect place to experiment with a new digital currency[129]. Argentines, at least the most technologically savvy of them, are turning to bitcoin as a way to exchange their pesos for what they're actually

[121] See ECB (2015), p. 19
[122] See Surowiecki (2011), p.106
[123] See Tu and Meredith (2015), p. 293
[124] See Surowiecki (2011), p.106
[125] See Tu and Meredith (2015), p. 293
[126] See Brito and Castillo (2013), pp. 14-15
[127] See EBA (2014), p. 18
[128] See Memorandum for Clifford Chance LLP (2014), p. 5
[129] See Popper (2015)

worth, rather than what the government says they should be worth[130]. Bitcoin, in other words, is simply a way for Argentines to make an end-run around their banking system, which works with the Argentine government to force its citizens to use the ever-devaluing peso. Similarly, ex Minister of Finance of Greece, Yanis Varoufakis, who is considered as a Bitcoin and virtual currencies' supporter, has said, during the debt crisis in Greece, he would consider as a solution creating a parallel digital currency, using Bitcoin's digital security and transparency[131]; as a consequence, he characterised Bitcoin as a 'future-tax coin'[132]. He asserted that Bitcoin or a Bitcoin-style currency 'is the smartest move to beat corruption and tax evasion, all transactions will be recorded to the Greek Ministry of Finance new secure and dedicated Bitcoin servers and will be tracked at any given moment', after explaining that it could be implemented into Greeks' day to day life by using a special mini computerized card with a chip. He also suggested that the technology of Bitcoin, if suitably adapted, can be employed profitably in the eurozone as a weapon against deflation.

Finally, another benefit of Bitcoin, albeit possibly unintended, is that it provides financial stability where a national currency is unstable[133]. To put it differently, bitcoins are also very attractive to citizens and governments of sanctioned nations[134]. For instance, in 2012, the Iranian Rial was experiencing hyperinflation[135]. At the same time, there was a shortfall of US Dollar in Iran due to sanctions by the United States and its allies. Unable to buy the more stable US Dollar and faced with holding onto the hyper-inflating Rial, some Iranians turned to bitcoins as a haven for financial stability. The value of bitcoins was deemed more stable than the Rial and funds could easily be transferred into and out of Iran over the Internet.

1.5.2. Potential individual benefits

Except the alleged economic advantages, whether real or only perceived, which could have an impact as an advancement for society or some market participants, individuals might also benefit from aspects that Bitcoin scheme can provide.

In the first place, virtual currency payment transactions do not require the provision of personal or sensitive data[136], because public and private key encryption was created especially for the Internet age, as opposed to credit cards which have no private values or tokens other than the physical card, which is unnecessary for online transactions. Credit cards data and passwords are secret information that could be stolen or forged, but are required in case of conventional payment methods. On the other hand, coinwallet addresses are public but anonymous, thus the public ledger of Bitcoin creates a money trail and prevents double spending. Hence, when a user sends a bitcoin, he 'signs' the transaction by combining public and private keys together, and applying a mathematical function to them. Then a certificate is created that proves the transaction came from this specific user. This greatly increases privacy

[130] See related Matthews' article(2015) on Fortune website at the following link: http://fortune.com/2015/05/04/bitcoin-argentina/

[131] See Paul Mason's article (2015) on Guardian site at the following link: http://www.theguardian.com/commentisfree/2015/feb/22/can-a-parallel-digital-currency-solve-the-greek-financial-crisis

[132] See related article at http://www.yanisvaroufakis.eu

[133] See the Bitcoin project at the following link: https://bitcoin.org/en/faq#what-are-the-advantages-of-bitcoin

[134] See Turpin (2014), p. 359

[135] See Jon Matonis' article (2012a) on Forbes website at the following link http://www.forbes.com/sites/jonmatonis/2012/10/09/as-inflation-rages-iniran-bitcoin-software-not-available.

[136] See EBA (2014), p. 19

when compared to traditional currency systems and conventional payment methods, where third parties potentially have access to personal financial data. Silicon Valley engineer Stuart Eichert mentions how 'Bitcoin is like cash, whoever has them owns them, so processing and transacting can be really safe for customers. Unlike the recent attack on Target, customers using Bitcoin leave no data behind that can be used to steal their identity or print fake credit cards'[137]. At this point it is important to note that - contrary to common belief - Bitcoin transactions are not, strictly speaking, anonymous, to the extent that the Bitcoin protocol makes it possible to trace all transactions to and from a pseudonymous Bitcoin address, which can eventually be linked to a particular identity[138].

Secondly, supporters of virtual currencies assert that Bitcoin is more trustworthy than fiat currencies, basing their opinion on the absence or limited interference of public authorities in charge of money supply[139]. In particular, governments' or central banks' power to control the supply of money could lead theoretically to instability or political risks. For instance, in 25 March 2013, a €10 billion international bail-out by the Eurogroup, the European Commission (EC), European Central Bank (ECB) and the International Monetary Fund (IMF) was announced, in return for Cyprus agreeing to close the country's second largest bank, the Cyprus Popular Bank (also known as Laiki Bank), imposing a one-time bank deposit levy on all uninsured deposits there, and possibly around 48% of uninsured deposits in the Bank of Cyprus (the island's largest commercial bank), many held by wealthy citizens of other countries (many of them from Russia) who were using Cyprus as tax heaven[140]. This could not happen to Bitcoin's circulation due to the decentralisation of its system[141]. Thus Cyprus was a perfect place for experimenting Bitcoin's useful function. In particular, Bitcoin scheme was growing slowly until the announcement of the unprecedented bail-in for Cypriot banks. The country was a catalyst for the big increase in Bitcoin scheme's price, because depositors withdrew funds and transferred them to bitcoins[142]. It is worth mentioning that the first Bitcoin ATM globally was installed in Cyprus.

In addition following the establishment of capital controls and bank holiday in Greece in July 2015 -amidst the debt crisis-, Bitcoin usage miming Cypriots' (and Argentines') method is considered helpful. Using Bitcoin allowed Greeks to transfer money out of bank accounts or out of country. New customers depositing at least 50 Euros with BTCGreece, the only Greek-based Bitcoin exchange, open solely to Greeks, rose by 400% during this period,

[137] See article on the Forbes site (2014) at the following link: http://www.forbes.com/sites/groupthink/2014/02/13/why-we-accept-bitcoin/
[138] See Brito and Castillo (2013)
[139] See EBA (2014), p. 19
[140] See Ehrenfreund's article (2013) on Washington Post at the following link: http://www.washingtonpost.com/business/cypriot-banks-to-reopen-amid-criticism-of-bailout/2013/03/27/dd56757c-96e1-11e2-b68f-dc5c4b47e519_story.html
[141] See Jon Matonis' arcticle (2012) on Forbes website at the following link: http://www.forbes.com/sites/jonmatonis/2012/10/09/as-inflation-rages-iniran-bitcoin-software-not-available.
[142] See Hargreaves article (2013), on CNNMoney website at the following link: http://money.cnn.com/2013/03/28/investing/bitcoin-cyprus/

according to its founder[143]. In general, Bitcoin supporters argue that Bitcoin is particularly well-suited to avoid capital controls and it is about 'preventing monetary tyranny'[144].

In this case, the reason why Bitcoin is a big deal in China and other countries with potentially unstable political and economic situations might be explained. Given that bitcoins are nearly impossible to forge and can be taken and spent across national borders but still are able to be transported easily (say, compared with gold bars), there is no need for state backing[145]. Many people are attracted to a means of payment that does not involve a state actor and use bitcoins out of a distrust of any government to oversee their currency[146]. However, the influence of money supply from a central bank or authority does not automatically mean that the superior alternative is to have money supply set by an algorithm, as in Bitcoin scheme[147].

[143] See Mandravelis' article (2015) at Kathimerini

[144] See Matonis' article (2012b) at Forbes website at the following link: http://www.forbes.com/sites/jonmatonis/2012/10/04/bitcoin-prevents-monetary-tyranny/ . According to the writer, monetary tyranny can be deliberate inflation, persecutory capital controls, prearranged defaults within banking system.

[145] See Greenberg (2011), p. 40

[146] See Birch's article (2011) at the following link: http://www.prospectmagazine.co.uk/2011/07/bitcoin-economist-new-york-times-currency-mining/

[147] See EBA (2014), p. 19

C H A P T E R 2

INHERENT RISKS ACCOMPANYING BITCOIN SCHEME IN VIEW OF THE CURRENT LACK OF REGULATION AND THEIR CAUSAL DRIVERS

2.1. Introductory remarks

From time to time, Bitcoin scheme is surrounded by controversy. Bitcoin offers the promise of major benefits – for example through bringing global payment technology to populations unable to access or afford conventional banking methods – but it is subject to security risk and legitimate concerns over its potential to be exploited. All advantages that are launched with the more recent wide emergence of Bitcoin, whether real or only perceived, have to be weighed against real disadvantages and even risks for users of virtual currencies (including the Bitcoin), either when acting as consumers, specifically as payers, or as (temporary) holders of virtual currency[148]. As there are currently no safeguards to protect users, they are exposed to several potential risks. Bitcoin risk has been brought into sharp focus by high profile losses such as that suffered by the original Bitcoin Exchange, Mt. Gox, in 2014[149] and by the company MyCoin in 2015 [150]. Furthermore, Bitcoin losses from fraud and theft in 2014 represented a much higher share of the overall volume of transactions compared with credit card fraud. These factors, when combined with the intangible and novel nature of Bitcoin, have served to generate a high degree of uncertainty over its security and credibility as a store of value. According to European Banking Authority[151], more than seventy (70) risks can be identified as arising from decentralised virtual currency schemes. Despite the fact that some of them are specific to virtual currencies, solely in connection with their innovative cryptographic and decentralised functions, some of them are either identical or similar to risks arising from conventional financial services or products.

The most relevant risks are listed hereunder and are specifically linked to the common characteristics of Bitcoin and of virtual currency schemes that follow the innovation of the decentralised feature. The risks are classified into five (5) categories[152] : i) risks to users; ii) risks to other market participants; iii) risks relating to central banks' tasks; iv) risks concerning the financial integrity; and v) risks to regulators. Furthermore, the causal drivers are also identified for each risk, as these will indicate the eventuality or not of the establishment of regulatory measures that might be required to mitigate the risk drivers. However, a ranking of the outlined risks cannot be determined or certain, due to their recent remarkable ascent[153]. Quantifying risk is difficult within the Bitcoin industry. The technology is new, early entrepreneurs show wide-ranging skill, caution and capability, and best practices are still being determined and implemented. Insofar as there is not quantitative and qualitative

[148] See ECB (2015), p. 20

[149] M.t. Gox (previously the world's largest Bitcoin exchange) has been in bankruptcy proceedings in the Japanese courts since a major hack in which nearly 850,000 bitcoins were stolen by hackers. Wired Magazine reported in November 2013 that customers were experiencing delays of weeks to months in withdrawing funds from their accounts. The article said that the company had 'effectively been frozen out of the U.S. banking system because of its regulatory problems'.

[150] The company MyCoin came under the spotlight following allegations of fraud, apparently leaving its investors with a loss of €342 million. See at the following link: http://www.zdnet.com/article/mycoin-closes-its-doors-387-million-in-investor-funds-vanishes/

[151] See EBA (2014), p. 22

[152] Ibid. See also ECB (2012), p. 33

[153] See EBA (2014), p. 21

evidence collected during a sufficient amount of time, a complete and severe attempt for a final risk assessment cannot be performed[154]. Moreover, it is important to highlight that this chapter is not intended to be a concluding analysis against the usage of Bitcoin, but an overview of information and data from respectable sources and papers noting possible challenges and existing risks.

2.2. Risks to users and other market participants

As mentioned earlier[155], potential virtual currency/Bitcoin actors are virtual currency market participants, i.e. users, merchants, trade platforms, exchanges, processing service providers, wallet providers, inventors, administrators etc. Virtual currencies create numerous risks for users and the other market participants. Thus, it is considered wise to present the risks they ought to confront in the same section as the Bitcoin ecosystem is comprised of the total of the market participants[156].

According to Bitcoin adversaries but also typical users, as well as respectable sources, several risks arise even though there is no intended usage or purpose of converging transactions and exchanges (buying, holding and selling bitcoins). These risks are based on the technology of virtual currency schemes and mostly, on the decentralised character and the cryptographic feature. These features of Bitcoin are novel and can be difficult to comprehend for non-specialists, making it the first challenge to be faced by a user. The nature of a virtual currencies and especially of the controversial Bitcoin, hampers users to access independent and objective information that would explain their advantages and disadvantages explicitly and clearly[157]. Hence, (not only) a novice user might not be in a position to identify and assess any consequences from virtual currency usage. It is worth highlighting that another risk arising is the information inequality and the insider know-how that benefit some market participants[158], leading others to losses.

On the one hand, the Bitcoin scheme is a decentralised system where no central organiser can undermine the system and disappear with all its funds. On the other hand, s explained in a previous section of this paper[159], a decentralised virtual currency like Bitcoin implies that there is no central administrating authority and no central monitoring or oversight[160], turning cryptographic systems into digital heavens full of risks. Bitcoin scheme is by design made in such a way that no central authority could intervene to stabilise exchange rates[161]. This may occur drop in value for a user, making the priority of the risk really high. Because there is no jurisdiction in which they operate, they are held in the cyberspace accounts a.k.a. the online wallets; so, these cryptocurrency accounts are anonymous. Users can start as many online 'wallets' as they want to buy or mine/create new bitcoins and trade them without ever providing any identifying information. Surely, one of the primary benefits of Bitcoin scheme is anonymity in transactions, due to the security of personal data offered[162]. Moreover, via the new service of transferring bitcoins via e-mail without the requirement of a wallet, the

[154] See EBA (2014), p. 21
[155] See this paper, pp. 11-15
[156] See this paper, pp. 13-14
[157] See EBA (2014), p. 25
[158] Ibid, p. 26
[159] See this paper, pp. 9-11
[160] See FATF (2014), p. 5
[161] See EBA (2014), p. 23
[162] See this paper, p. 19

situation gets more complicated. However, it is precisely this characteristic of anonymity[163] (or pseudonymity[164]) that drives many of the concerns related to Bitcoin. Anonymous users, due to the possibility of change the functioning of the scheme, may set up an exchange without fulfilling the licensing or authorisation requirements[165] or make changes to the protocol of the virtual currency introducing errors[166]. In that case, another user could suffer loss.

Furthermore, when it comes to counterparties, anyone can anonymously create a virtual currency scheme like Bitcoin or mispresent a computer file as Bitcoin, including the name of this genuine virtual currency. Once the user detects the misrepresentation, there is no reversibility of transactions. First, because the programme is constructed that way; second, because the counterparty is anonymous and third, there are no legal contracts[167]. In respect of these, anonymity could undermine the enforcement of any legal contracts that may exist by failing to meet contractual settlement obligations; a user cannot identify the counterparty who may have insufficient own funds or the Bitcoin market could become temporarily illiquid. In addition, a market participant may suffer losses from delays in the recovery of a unit or the freezing of the market.

The fact that Bitcoin exchanges are not legally incorporated in jurisdictions and cannot therefore be subjected to regulatory requirements, gives the opportunity to outlaws to act fraudulently[168]. In addition, a user that performs the process of mining may not receive a fair share of mined Bitcoin units[169]. Likewise, a user may suffer loss caused by hacking of the exchange; due to the absence of requirements, an exchange may not have implemented the appropriate security measures[170]. The hacking of encryption as well as an e-wallet theft are possible, because e-wallets and bitcoins are stored on the user's computer or device. Unfortunately, the user has no refund right after the fraud, because, unlike conventional accounts, there is no provision for protection[171]. Users do not benefit from legal protection such as redeem ability or a deposit guaranty scheme, and are more exposed to the various risks that regulation usually mitigates[172]. The same risk, of course, may arise from a simple malfunction of the software[173] installed for the Bitcoin usage. Moreover, the inconsistency of legal and regulatory treatment leads, consequently, to the absence of tax treatment. This may potentially lead authorities to treat Bitcoin, for example, as property forcing users to track and pay capital gains. Thus, when in most jurisdictions the taxation regime is not yet clearly defined it might change unexpectedly, inducing additional costs for users. In addition, any contractual relationships that market participants may have forged could be rendered illegal or

[163] According to FATF Report on Virtual Currencies (2014), in order to ensure the anonymity of Bitcoin transactions, there are also extensions of Bitcoin wallets like Dark Wallet which is basically an auto-anonymiser.
[164] See ECB (2015), p. 22
[165] See EBA (2014), p. 23
[166] Ibid, p. 24
[167] Ibid
[168] Ibid, p. 23
[169] Ibid, p.24
[170] See the M.t. Gox scandal on this paper, p. 21 and footnote 125, p. 21 and on the Telegraph website at the following link: http://www.telegraph.co.uk/finance/currency/10686698/Bitcoin-exchange-MtGox-faced-150000-hack-attacks-every-second.html
[171] See EBA (2014), p. 25
[172] See ECB (2015), p. 20
[173] See EBA (2014), p. 25

unenforceable[174] , or even a general behaviour of a user could be considered as violation[175], after the application of a regulation.

Except these risks that appear in a general sense regardless of the intended usage, several challenges have to be faced by users predominately when bitcoins are used as a means of payment. Firstly, the transaction between the counterparties is endowed with anonymity, so they are not known to one another, resulting in the inexistence of a potential legal contract that could be enforced. In case of insufficiency of own funds to meet any payment obligations or of unreliability of the payment service or of fragility of IT security infrastructure, a user suffer loss. The failing of the counterparty to meet contractual payment or settlement obligations is a high risk, as assessed by the European Banking Authority[176]. There are no arrangements in place in Bitcoin to certify the counterparty, given the high level of anonymity and the consequent de facto inability to identify the counterparty of a transaction/ operation involving bitcoins. In payment systems, this risk is mitigated by appropriate safeguards, i.e. access requirements and know-your-customer requirements.

Secondly, due to the absence of control and oversight by a central authority, the process of transactions through the modern Bitcoin cyber world is based on trust. Whether trust does not exist and a purchase is incorrectly or fraudulently debited from an e-wallet[177], the user is in danger of losses. Furthermore, a user might not be able to convert Bitcoin into fiat currencies (or not at a reasonable price), or might not be able to access their stored bitcoins. These risks emerge when an exchange that is anonymously created is all of a sudden out of business, due to lack of liquidity[178]. The same could also happen when the user's bitcoins are stored on an exchange that is 'going concern', i.e. is still functioning without an immediate threat of liquidation; however, they find themselves unable to access them, because the exchange is not bound by any legal contract and not subject to regulatory conduct[179]. Moreover, unlike losing password to bank accounts, credit or debit cards, the inexistence of central administrative authority in Bitcoin scheme exacerbates the fact that no identity is attached to the e-wallet. Thus, e-wallets can be hacked when ownership cannot be proven and passwords cannot be re-issued[180]. Finally, in respect of Bitcoin as a means of payment, the users do not have guarantee that the merchants accept this particular scheme on a permanent basis. A merchant, for instance, may switch between various virtual currency schemes or solely accept legal tender in notes and coins[181]. Lack of continuity is a fundamental risk for payers and payees.

It is worth mentioning that while financial institutions are subject to supervision by authorities, users might wrongly assume that the Bitcoin scheme and the key actors involved are also regulated or supervised. This confusion may in particular arise from the apparent similarity of virtual currencies like Bitcoin to certain forms of money or electronic retail payment instruments. Specifically, the apparent similarity to e-money may lead users to believe that a redemption obligation could also apply to Bitcoin scheme. In that case, users may suffer loss from lack of information because as explained above, when using virtual currencies as a means of payment for goods and services, users are not protected by any

[174] See EBA (2014), p. 26
[175] Ibid, p.25
[176]Ibid, p. 27
[177] Ibid
[178] Ibid, pp. 27-28
[179] Ibid, p.28
[180] Ibid
[181] Ibid, p. 27

refund rights offered for (unauthorised) transfers from a conventional payment account, as for instance it is under EU law[182].

An additional concern stemming from Bitcoin is the potential for investment scams. Individuals may use Bitcoin scheme not only as a means of payment but also as an investment. For instance, a user may just hold bitcoins in units or in investment products such as exchange traded funds (ETFs) or contracts for difference (CFD)[183]. Due to the difficulty in classifying Bitcoin, opportunistic individuals may engage in activities that swindle unsuspecting people of their bitcoins while skirting the law. For example, although the case is closed[184], it was alleged that the owner of Bitcoin Savings and Trust, Trendon T. Shavers, operated the equivalent of a Ponzi scheme[185] which is a fraudulent investment operation where the operator, an individual or organization, pays returns to its investors from new capital paid to the operators by new investors, rather than from profit earned by the operator. Operators of Ponzi schemes usually entice new investors by offering higher returns than other investments, in the form of short-term returns that are either abnormally high or unusually consistent. Shavers solicited investments in bitcoins, promised interest to investors, improperly paid investor withdrawals with new investments of bitcoins, and misappropriated bitcoins for personal use[186], including thousands of dollars worth of bitcoins to trade qith on the Japan-based –at that time- Mt Gox Bitcoin exchange and later filter into a personal bank account and money account via the payment processor Dwolla. It is notable that in his defence, Shavers argued that Bitcoin investments were not securities because Bitcoin is not money and is not regulated by the United States of America[187]. Thus, he argued that he did not violate any U.S. securities' laws.

In addition, a user investing in regulated financial instruments using unregulated virtual currency schemes such as Bitcoin as an underlying may suffer unexpected loss[188]. Moreover, a user might suffer loss as a result of manipulation of Bitcoin prices[189]. This has several causal drivers, for example, the low market depth and the general opaqueness of virtual currency markets; the absence of any central authority that could provide price stability; the ability of a small number of large Bitcoin holders to influence pricing. All these may also lead to spreading of unreliable exchange rate data[190]; yet another risk that arises for Bitcoin investors. Another key fact to remember is the risk of inability of execution of the exchange order at the expected price. Due to the low market depth as well as the cash poor of the virtual currency exchanges, Bitcoin investors may find it difficult to sell when they are interested in.

However, the most serious drawback for the user of virtual currency schemes is their potentially high volatility, particularly in the case of those with bi-directional flow[191]. In general, virtual currency's volatility and price depend on five main actors: i) the supply of money and other issuer actions, ii) the dimension of the network, i.e. how many users and merchants use and accept them (as the size of network grows, the currency's value increases accordingly), iii) the clear and transparent policy and good security measures that generate

[182] See ECB (2015), p. 23
[183] See EBA (2014), p. 28
[184] See more information at the following link: http://www.coindesk.com/bitcoin-ponzi-scheme-operator-pleads-not-guilty-to-fraud/
[185] See the U.S. Securities and Exchange Commission's Investor Alert (2013), pp. 1-2
[186] Ibid
[187] See Salyer's article (2013) on Bloomberg website at the following link: http://www.bloomberg.com/news/2013-08-07/ponzi-scheme-charge-is-goodnews-for-bitcoin.html.
[188] See EBA (2014), p. 29
[189] Ibid
[190] Ibid
[191] See ECB (2015), p. 23

confidence, iv) the issuer's reputation and v) the speculations concerning the future value and history of attacks[192]. The history of Bitcoin shows that this exchange rate of a virtual currency can be highly volatile. The price of a Bitcoin unit depends on the extent to which it is adopted and accepted as mainstream, which is uncertain[193]. The value of bitcoins has fluctuated dramatically since 2011 in what has closely resembled traditional speculative bubbles[194]. The participation of novice investors pushes up the value of Bitcoin scheme, until it is over-valued and, as a result, subsequently drops, losing significant amounts of money in the process[195]. Consequently, users as Bitcoin holders will at some point either have to cash back their virtual currency holdings into currency or use them to buy goods, the price of which is usually quoted in currencies and therefore unstable in the case of payments in virtual currency.

After highlighting a severe number of challenges accepted and potentially faced by the users, it is important not to overlook a number of risks that arise to other market participants: three (3) genres of non-user market participants, i.e. the exchanges, the merchants, the e-wallet providers or the administrators. In respect of exchanges, potential inabilities of fulfilling payment obligation either they are denominated in Bitcoin or in fiat currencies and of controlling their own operation (IT environment, continuity of the system) affect them significantly, as well as their creditors. The causal driver of these risks is the lack of appropriate governance arrangements to oversee transactions (and the lack of funds to repay creditors in the first case)[196].

On the other hand, merchants ought to face the risk of not being reimbursed by reason of the double-spending problem. As explained earlier[197], the act of spending a Bitcoin unit does not remove its data from the ownership of the original holder. Given the specificity of the Bitcoin scheme's design, there is no guarantee that a particular bitcoin uses the predicted verification approach via its add to the public transaction ledger[198] (a.k.a. the blockchain). In addition, once the merchant receives bitcoins, there is no guarantee that they will be able to spend them, for example to pay invoices or tax liabilities, with zero probability of a redeemer of last resort[199]. Bitcoin scheme, as well as virtual currency schemes in general, is not legal tender and its acceptance depends on the voluntary consent by other market participants. Equally important is the uncertainty of the exchange rate between Bitcoin and fiat currencies, often within short periods and due to unpredictable events, which has also significant impact on merchants' status[200]. In addition, due the merchants often face the majority of compensation claims from customers/users who have problems with the transactions performed[201].

Finally, other non-user participants such as electronic wallet providers and administrators are also exposed to risks. E-wallets are digital files and are threatened by internet hacking[202]

[192] See ECB (2012), p. 38
[193] See EBA (2014), p. 29
[194] See Memorandum for Clifford Chance LLP (2014), p. 5
[195] See Salmon's article (2013) on Medium website at the following link: https://medium.com/money-banking/2b5ef79482cb
[196] See EBA (2014), p. 30
[197] See at this paper, pp. 12-13
[198] Ibid
[199] See EBA (2014), p. 31
[200] Ibid
[201] Ibid
[202] Ibid

and other security or functionality[203] breaches thereof, facing compensation claims from customers/users.

However, wallet providers and administrators offer four common ways that mitigate the risk of attacks. These are: robust typical PC security, cold-storage, multi-signature wallets, or leaving custody of private keys with the customer (i.e. offering hybrid wallets). In particular, cold-storage refers to an offline Bitcoin wallet[204], i.e. a Bitcoin wallet that is not connected to the Internet and it intends to help protect the stored virtual currency against hacking and theft[205]. Multi-signature wallets involve assigning bitcoins to public addresses linked to multiple private keys, which functions as a hypothetical safe deposit box at a bank: you have one key, your banker has the other, and both are required to open the box. Finally, an institution could avoid losing keys by choosing never to hold them in the first place. Blockchain.info, for example, is an online service that helps users secure their bitcoins, but never actually learns or holds the keys that its customers utilise to prove their control over Bitcoin holdings.

2.3. Potential impact on central banks' tasks

As shown in previous sections, virtual currency schemes have become relevant in several areas that traditionally fall within the scope of the financial system and especially so in relation to the tasks of central banks. In effect, focusing on the potential impact Bitcoin scheme and other similar virtual currency schemes may have in relation to the following central bank tasks: price stability, financial stability and payment system stability. Consequently, it seems to be appropriate to highlight a possible extent of the effect in these areas, considering simultaneously the limited information and statistics about virtual currency schemes that would be needed for a clear and complete overview.

2.3.1. Risks to price stability

Bitcoin scheme as an innovation to payment systems might somehow influence price stability and monetary policy. As explained earlier in the context of the theoretical and comparative analysis of virtual currency schemes generally, Bitcoin's convertibility[206] to fiat currencies via exchanges back-and-forth at an exchange rate leads to interaction with the real economy. In addition, Bitcoin scheme could have a significant impact on monetary policy or price stability, whether it influenced the supply of money. Hence, challenges that could be acknowledged are[207] the preservation of the unit of account, any risks relating to the monetary policy and distortions concerning the information content of monetary aggregates. In essence, the convertible/open virtual currency scheme that this dissertation examines, could modify central bank's task of price stability, if it is deemed to be that influential in terms of three aspects[208]: i) the quantity of money; ii) the velocity of money, the use of cash and the measurement of monetary aggregates; iii) the interaction with the real economy.

[203] See EBA (2014), p. 32
[204] On the other hand, hot storage wallets are online bitcoin wallets that are more vulnerable to hacking and theft.
[205] See FATF (2014), p. 7
[206] See also this paper, pp. 8-9
[207] See ECB (2012), p. 33
[208] See ECB (2012), p. 34

Firstly, regarding the supply of money which is assessed in terms of fiat currencies[209], currently Bitcoin scheme does not pose a risk for price stability in practice, provided that the issuance volume of the virtual currency continues to be stable and their usage not that wide. Despite the increases of the issued bitcoins, the ratio of market capitalisation to the money supply of the major currencies is still low[210]. However, this picture could change, due to Bitcoin's high exchange rate volatility. Thus, the quantity of money could be influenced at some point, but at least not yet.

Secondly, in terms of velocity of money[211], Bitcoin scheme's impact will largely depend on the number of active users/consumers willing to pay with it and merchants willing to accept their payments[212]. The increase in the use of bitcoins might lead to a decrease in the use of fiat currencies, having a substitution effect on central bank money[213]. This effect would hamper the measurement of monetary aggregates[214]. However, in the short to medium term, no significant impact can be expected[215].

Thirdly, the interaction between Bitcoin scheme and the real economy is worth monitoring; bitcoins act as medium of exchange in the real goods trade and real GDP could be affected. The number of Bitcoins will be limited to 21 million. Virtual currency scheme inventors or administrators could issue excessive amounts in order to profit from the placement of the funds. Moreover, if the number of Bitcoin users starts growing exponentially, and assuming that the velocity of money does not increase proportionally, long term appreciation of the currency can be expected or a depreciation of the prices of the goods and services quoted in Bitcoin[216]. The example of China where a virtual currency evolved into illegal money scheme seems to be a warning for the impact on the real money supply. According to 2012 ECB Report, 'Eurosystem central banks will keep monitoring the developments of virtual currency schemes, particularly as regards their issued volumes and their interactions with the real world'.

However, the greatest hypothetical risk would be a 'Bitcoinised' economy, where everybody sought to conduct the totality of their day-to-day transactions entirely with Bitcoin scheme and switch into the national fiat currency when strictly necessary for interaction with the state (such as to pay taxes)[217]. Thus, the central bank's ability to influence price-setting and real activity would be severely impaired[218].

[209] The number of bitcoins in circulation as of July 2015 was 14,352,850 . Taken the market exchange rates for Bitcoins (€ 247.73, USD 270.32), the money supply was around €3,5 billion and USD 3,8 billion.
[210] See ECB (2015), p. 26
[211] The velocity of money is the average frequency with which a unit of money is spent in an economy.
[212] See ECB (2015), p. 26
[213] Ibid, p.27
[214] Broad categories measuring the total value of the money supply within an economy
[215] See ECB (2012), p. 37
[216] See Credit Agricole (2014), p. 7
[217] See Bank of England (2014a), p. 9
[218] Ibid

2.3.2. Risks to financial stability

An increase in the usage of Bitcoin scheme is conceivable and thus surveillance of the take-up of it is important from a financial stability perspective. In the context of Bitcoin, as it works outside the banking system, the main source of instability would be the exchange rates. The build-up of financial stability risks would be likely under the following conditions whether Bitcoin scheme becomes more widely used in regular payments, if greater links to the real economy develop, including through the presence of financial institutions participating in this kind of scheme and if no structural developments are envisaged that would make it inherently more stable. Bitcoin scheme tends to be inherently unstable for several reasons[219], such as low volumes traded, lack of legal certainty, speculation and past cyber attacks.

However, the situation could change in the future, if Bitcoin becomes an alternative to traditional currencies, thereby introducing instability in the system as a result of its volatility[220]. If marked increases in prices were to occur, it is possible that the total valuation may become large enough such that a price crash might have implications for financial stability in this manner. Furthermore, there is speculation on Bitcoin's evolvement; banks could act as a depository for users' e-wallets, connecting the 'traditional' financial sector with Bitcoin world. Thus, according to 2015 ECB Report, the Eurosystem intends to continue monitoring the volumes traded and exchange rate dynamics of Bitcoin scheme, in order to avoid jeopardy in the financial stability. Over time, these would be more likely to emerge[221]. Recent increases in the network are largely attributed to speculation, and only marginally to growing interest from customers or merchants. Furthermore, the regulatory environment of Bitcoin that will evolve of the coming years will have a significant impact on the potential risk.

2.3.3. Risks to payment system stability

As highlighted earlier, one of the benefits offered to the Bitcoin user is the low value payment which is settled on a gross and real-time basis. Yet the settlement of the payment activity within Bitcoin scheme –as well as in all decentralised virtual currencies- is handled via a separate payment system by a non-regulated institution, i.e. the issuer of the scheme, which means that the system is not currently subject to oversight by a central bank or an authority.[222] However, it is worth highlighting that Bitcoin governance is not completely decentralised: there is the Bitcoin Foundation, which describes its tasks as standardisation (funding the Bitcoin infrastructure, including a core development team), protection (maintenance, improvement and legal protection of the integrity of the technical protocol underlying the operation of Bitcoin) and promotion of the Bitcoin system, but does not represent the issuer of the currency[223]. The Foundation is based on voluntary membership and

[219] See also at this paper, p. 26
[220] See ECB (2012), p. 39
[221] See Bank of England (2014a), p. 9
[222] On the other hand, one of the ECB/Eurosystem's tasks is to promote the smooth operation of payment systems. Oversight can apply on payment systems or on payment instruments. As regards systems, oversight would normally focus on systemically (or prominently) important payment systems.
[223] This is replaced by a decentralised process of mining as described earlier.

voting and other rights depend on the size of the fee (based on four membership classes with different rights). Whereas central banks' role in the monetary and payment system is based on a legal mandate of the polity of the currency area and its ability to issue currency, the Bitcoin Foundation lacks such ingredients and therefore cannot fulfill the role of a central bank. Indeed, deliberately designing a system without a central bank is one of the cornerstones of the Bitcoin concept[224].

Thus, despite the fact that Bitcoin is a combination of a virtual currency and rules and procedures enabling transfers which are similar to a (retail[225]) payment system[226], the Bitcoin payment system has no substantial connection with the conventional payment systems in terms of transactions[227]. For traditional payments, payment service providers (PSPs)[228] participate in payment systems to be able to offer various payment services to users[229]. Hence, in particular within European Union, there has been published in the Official Journal of the EU (OJ), the Regulation of the European Central Bank (ECB) on oversight requirements for systemically important payment systems[230] which lays down oversight requirements for both large value payment systems and systemically important retail payment systems and applies to (conventional) payment systems operated by both central banks and private operators (subject to certain exemptions) and the Directive 2007/64/EC of the European Parliament and of the Council on payment services in the internal market which provides legal framework within which all payment service providers must operate[231]. Therefore, central banks' oversight activities aim to achieve safe and efficient payment and settlement systems, and contribute to financial stability and the proper functioning of the economy as a whole[232].

However, in respect of Bitcoin, users participate directly in the system and face thereof the payment system-like risks which appear to conventional systems. Hence, Bitcoin payment systems face the following risks that users fetch and withstand these themselves, as there is no supervision of the issuer or oversight of the system as a whole or investor protection and deposit guarantee schemes: i) credit risk; ii) liquidity risk; iii) operational risk; and iv) legal risk[233].

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[224] See Beer and Weber (2015) , p. 60

[225] According to Article 2 of Regulation (EU) No 260/2012 **,** retail payment system' means a payment system the main purpose of which is to process, clear or settle credit transfers or direct debits, which are generally bundled together for transmission and are primarily of small amount and low priority.

[226] According to Article 2 of Regulation (EU) No 795/2014**,** payment system means a formal arrangement between three or more participants, not counting possible settlement banks, central counterparties, clearing houses or indirect participants, with common rules and standardised arrangements for the execution of transfer orders between the participants.

[227] See ECB (2012), p. 40

[228] A payment service provider (PSP) offers shops online services for accepting electronic payments by a variety of payment methods including credit card, bank-based payments such as direct debit, bank transfer, and real-time bank transfer based on online banking. Typically, they use a software as a service model and form a single payment gateway for their clients (merchants) to multiple payment methods.

[229] See ECB (2015), p. 27

[230] See Regulation (EU) No 795/2014

[231] See this paper, pp. 55-56

[232] See ECB (2012), p. 41

[233] See Regulation (EU) No 795/2014, Article 2

In particular, users could be in peril of credit risk which is identified as the risk that a counterparty, whether a participant or other entity, will be unable to fully meet its financial obligations when they fall due or at any time in the future[234]; in other words, it cannot be certain whether the settlement institution, i.e. the issuer, is able to fully meet its financial obligations in the short or in the long term.

Secondly, liquidity is another issue that users ought to consider. It is identified as the risk that a counterparty, whether a participant or other entity, will have insufficient funds to meet its financial obligations when they fall due, although it may have sufficient funds to do so in the future[235]. The settlement institution might not provide the liquidity as and when expected, causing significant material loss in value, mainly owing to the uncertain and overdue conversion of bitcoins into fiat currencies.

Thirdly, operational risks means the risk that deficiencies in information systems or internal processes, human error, management failures, or disruptions caused by external events or outsourced services and that will result in the reduction, deterioration or breakdown of services provided[236] by a payment system. Thus, the operation of the system to which Bitcoin accounts are held could amplify risks, because currently no one is certain about the continuity of the system in respect of performance and/or business[237].

In addition, as it is noted within several Bitcoin aspects, legal uncertainty which exists because of the absence of regulatory framework intensifies the other risks. Hence, this risk may arise from the application of law or regulation, usually resulting in a loss[238].

Given the importance of the losses which come as consequences of the aforementioned four (4) risks to payment system stability, it is worth mentioning that comparing to a conventional banking system where a central bank presents no default risk and acts as a lender of last resort in cases of payment incidents or liquidity shortages, the Bitcoin system cannot ensure users. Per contra, this aspect of these risks is very difficult to avoid or to mitigate, as this aspect is inherent to the decentralised virtual currency concept to which Bitcoin is based and is beneficial in a different manner[239]. However, going by a rule of thumb, the level of safety is clearly below that of commercial bank money[240] [241].

Again because of their size, Bitcoin does not pose a threat to payment system stability yet. However, the overall situation as regards payment system stability might change if: i) large financial sector players interconnected to the global banking system started offering services

[234] See Regulation (EU) No 795/2014, Article 2
[235] Ibid
[236] Ibid
[237] See also at this paper pp. 24, 25, 27
[238] See Article 2 of Regulation (EU) No 795/2014
[239] See also at this paper, pp. 17-22
[240] See ECB (2012), p. 40
[241] But that may start to change, at least in Europe. Bit-Coin Central, one of the many online Bitcoin exchanges,announced that it was teaming up with Aqoba, a local payment service provider in France, to keep funds on behalf of third-parties in payment accounts. While this does not make Bit-Coin Central a bank (as it cannot invest the Bitcoins it holds), it will bring some peace of mind for users when doing business in bitcoins, as Aqoba works as an intermediary for Bitcoin transactions. While BitCoin Central asserts it is not a bank, it is performing bank-like functions. Eventually, Bitcoins could be used as a way to replace the euro in many everyday bank transactions.

related to Bitcoin scheme; and/or, ii) a significant increase in users and the volume of transactions took place (for example due to the acceptance of virtual currencies by large e-commerce merchants)[242]. To put it differently, if Bitcoin scheme participated significantly into the regular financial system and/or was used on a large scale[243] , the overall economy would be exposed to disruptions caused by Bitcoin transactions and assets that were blocked, delayed and so on[244]. If this did happen, a major incident involving large amounts of bitcoins might theoretically trigger payment disruptions within its environment or even transmit shocks to traditional payment systems through financial institutions participating in this kind of virtual currencies and in traditional payment systems.

Moreover, electronic payment instruments, e-money and/or specific payment solutions such as e-commerce will suffer from lack of confidence by users and consumers, in spite of the fact that virtual currencies like Bitcoin scheme are totally different[245].

Nonetheless, there are cases that payment systems and payment service providers are linked to Bitcoin scheme; for example, payment system providers which use fiat currencies and also provide Bitcoin services[246]. These payment service providers might be exposed to a sudden establishment of a regulatory framework which will render any contractual relationships illegal or unenforceable, with associated impacts on the liquidity of the service provider. The issue of liquidity could also cause failure of meeting the contractual obligation of the payment system provider to the payment system participants, as well as potential operation problems. Moreover, a payment system provider which also offers virtual currency payment services could suffer loss and reputational risk when it provides unregulated services such as transactions using bitcoins that subsequently fail to perform[247].

Then again, the growth of Bitcoin scheme will continue and for that reason, technical or other weaknesses should be reconsidered. Besides that, some elements of the technological set-up of Bitcoin scheme could perhaps serve as the inspiration or even basis for traditional payment service providers to offer innovative payment solutions which will be subject to regulation and supervision but will be strengthened by the specific characteristics that identify virtual currencies. Obviously the ECB and other central banks of the Eurosystem, as well as central banks worldwide, will continue to monitor developments thereof, as regards the use of virtual currency schemes and especially Bitcoin for payments and their role as an alternative to traditional payment systems.

2.4. A threat to financial integrity

Bitcoin scheme can bear undisclosed features, putting users at a disadvantage, due to the decentralised system allowing anonymous person-to-person transactions that do not require and provide identification and verification of participants without any central body's oversight. It thus offers a level of potential anonymity which is rendered impossible with traditional credit and debit cards or older online payment systems. In the absence of third-

[242] See ECB (2015), p. 27
[243] Ibid
[244] See EBA (2014), p. 36
[245] See at this paper, pp. 8-9
[246] For instance, Dwolla
[247] See EBA (2014), p. 35

parties, transactions take place only between two individuals and, as is the case when paying for items and services in cash; no record is explicitly made of the individuals involved. The public keys used in transactions are recorded but these are not currently tied to anyone's identity. However, in the sense that all transactions to and from a particular Bitcoin address can be traced, it is more accurate to describe Bitcoin as pseudonymous rather that anonymous.

Hence, Bitcoin scheme that is convertible into currencies is potentially vulnerable to illicit use, since it has global borderless reach, is accessible through internet and may facilitate anonymous/pseudonymous funding and anonymous/pseudonymous payments. Lack of transparency can easily be exploited for fraudulent activities. In any case, Bitcoin scheme could easily be used for illegal purposes, i.e. terrorist financing, money laundering and other aspects of financial crime, jeopardising the financial system integrity. It goes without saying that the misuse of the financial system to channel criminal or even clean money to terrorist purposes poses a clear risk to the integrity, proper functioning, reputation and stability of the financial system[248].

2.4.1. Money laundering and terrorist financing risks

Bitcoin, this virtual online currency seems to be gaining traction and legitimacy among those who need to transfer or launder their cash outside of the prying eyes of regulators**.** Bitcoin potentially allows any user—legitimate or criminal—to transfer money at near instantaneous speed at little or no cost, with very low barriers to entry, while remaining virtually anonymous without what could otherwise require a public paper trail. There is no central oversight body and anti-money laundering software currently available to monitor and identify suspicious transaction patterns[249]. Law enforcement cannot focus on a central location or entity for investigative or asset seizure purposes[250]. Users' abilities to exchange bitcoins directly for other currencies, to transfer through an endless number of different Bitcoin addresses for obfuscation, and to trade with other users for physical goods further frustrates anti-money laundering and countering the financing of terrorism (AML/CFT) efforts. Essentially, Bitcoin and analogous virtual currencies could enable money launderers and criminals to move illicit funds faster, cheaper, and more discretely than ever before. The popularity of Bitcoin among criminals has called for new approaches to fighting financial crime committed in or settled through Bitcoin scheme.

At this point it is proper to define money laundering and terrorist financing. Hence, money laundering as the following conduct when committed intentionally is defined as i) the conversion or transfer of property derived from criminal activity to conceal or disguise its illicit origin; ii) the concealment or disguise of the true nature, source, location, disposition, movement or ownership of property known to have been derived from criminal activity; iii) the acquisition, possession or use of property known to have been derived from criminal activity; iv) the participation, or assistance, in the commission of any of the activities already mentioned[251]. Terrorist financing is the provision or collection of funds to carry out any of offences on combating terrorism[252], such as hostage taking, the drawing-up of false administrative documents and the leadership of a terrorist group[253]. In essence, money

[248] See the Proposal for a Directive of the European Parliament and of the Council on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing - COM/2013/045 final - 2013/0025 (COD), Explanatory Memorandum, Section 5, point (5)
[249] See the FATF Report on Virtual Currencies (2014), p. 9
[250] Ibid
[251] See the Directive 2005/60/EC , Article 1, paragraph 2
[252] Ibid, Article 1, paragraph 4
[253] See the Council Framework Decision of 13 June 2002 on combating terrorism (2002/475/JHA), Articles 1-2

laundering is the process by which money— proceeds of illegal activities—is rendered clean, allowing the money to be used for legal activities. Terrorist financing is similar, except that it allows 'clean' money to be used for illegal activities and is often considered under the same umbrella as money laundering. It is pertinent to note that money laundering activities contributes to the deteriorating state of most economies around the world. In most cases, funds and other benefits sought to be laundered are proceeds of bribery and corruption, which is rampant in under-developed and developing countries. More often than not, political leaders who have looted public funds at such countries stash them in foreign accounts operated in developed countries.

In the context of Bitcoin scheme, criminals are able to launder proceeds of crime because they can deposit and transfer money anonymously, globally, rapidly and irrevocably[254]. According to Rob Wainwright (head of the EU law enforcement agency for criminal intelligence, Europol), 'virtual currencies are being used as an instrument to facilitate crime, particularly in regard to the laundering of illicit profits'[255]. The Bitcoin infrastructure is complex while spread across globe and not confined to -yet accepted- to jurisdictional borders, exacerbating any attempt of intercepting transactions. Criminals, terrorists or related users are able to disguise the origins of criminal proceeds, undermining the ability of enforcement authorities to obtain evidence and recover criminal assets[256]. The difficulties posed by anonymity[257] are exacerbated by the ease in movement of funds across borders, and the speed at which the industry operates. The challenges of identifying suspicious activity and tracking customer activity increase significantly when anonymity shields the customer identity, hinders the identification of sources of funds and the economic purpose of a transaction[258]. Moreover, criminals or terrorists may also use the Bitcoin remittance system – not only their accounts- to finance illegal purposes. Finally, another risk related to these risks against financial integrity is the one that arises because market participants could be led by individuals who are not 'fit and proper'[259].

Despite the fact that there are no real statistics on criminal activity associated with bitcoins, there are specific examples that bitcoins are used for less-than honourable pursuits[260]. Hundreds of millions of dollars' worth of bitcoins have been stolen from businesses and large Bitcoin currency exchanges; the infamous 'Silk Road dealt in this currency. Silk road was a hidden website[261] which functioned as an online market of illegal drugs[262], weapons, stolen identity information and other unlawful goods and services anonymously and beyond the reach of law enforcement, with narcotics trafficking, computer hacking and money laundering conspiracies[263], and its payment system functioned as an

[254] See EBA (2014), p. 32

[255] For more information, see Reuters website (2014) at the following link: http://www.reuters.com/article/2014/03/24/us-bitcoin-europol-money-laundering idUSBREA2N1A420140324

[256] See EBA (2014), p. 33

[257] However, proponents of the digital currency are quick to point out that unlike cash, Bitcoin scheme is not totally anonymous, since a public record is made of every transaction and consequently can be traced (in theory) by law enforcement organizations. With appropriate monitoring and investigating, it would prove difficult for criminals to conceal their trails as each bitcoin is identifiable by its unique transaction history.

[258] See KPMG (2014)

[259] See EBA (2014), p. 33

[260] See Kaplanov (2012), p. 44

[261] Silk Road was used by several thousand drug dealers and unlawful distributors.

[262] One could purchase, among other things,206 any of 340 different illegal drugs from individual.

[263] See FATF (2014), p. 11

internal Bitcoin bank[264]. The secret to Silk Road's existence was its perceived anonymity; both buyers and sellers were unidentifiable (through the site itself), and the site lived in a dark, supposedly untraceable corner of the Internet[265]. Criminal prosecution has implicated some of the most publicly respected members of the Bitcoin community[266].

According to an academic study at Carnegie Mellon University[267], Bitcoin has helped transfer approximately $1.2 million dollars in sales of illegal narcotics associated with the Silk Road Marketplace through the use of its virtual currency. This study illustrates the exploitation of the virtual currency industry as a breeding ground for laundering money associated with various illegal activities. Following this report, money laundering, narcotics trafficking, and cybercrime are part of the dark side of Bitcoin. Bitcoin scheme was featured in relation to these types of charges as a means of payment. Thus, criminals engaging in a wide range of illegal activities are attracted to the use of virtual currencies due to the anonymity which they offer. While there are many legitimate businesses and individuals that use this service, it can also be exploited by terrorists, human traffickers, drug smugglers, illegal weapons dealers, Ponzi scheme[268] operators and other types of fraudsters.

However, the value of bitcoins to those who wish to conduct illegal activity anonymously was not limited to Silk Road. There are sites that offer firearms, scrubbed of their serial numbers, for sale to anonymous buyers[269]. Similar marketplaces could be created to foster the sale of any type of goods, legal or not. Already, successors to Silk Road have begun to emerge[270].

Gambling sites also turned to Bitcoin to protect customer privacy and to receive funds from customers unable to use other payment methods[271].

In addition to traditional layering methods, Bitcoin scheme uses specialised laundering services known as 'tumblers' or 'mixers'. 'Tumblers' are services which allow users to transfer their cryptocurrencies into a pool of funds and then receive them back (minus a small commission) into newly generated 'clean' addresses, thereby breaking the financial trail[272].

In addition, in respect of terrorist financing, the Islamic State of Iraq and Syria (ISIS) that has been called the world's richest terror group begun to use cryptocurrencies such as Bitcoin scheme as it looks for anonymous and untraceable ways to transfer money[273]. Al-Khilafah

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[264] See FATF (2014) for further information on the matter

[265] See Chen's article (2011) on Gawker website at the following link: http://gawker.com/the-underground-website.where-you-can-buy-any-drug-imag-30818160

[266] One of them was Charlie Shrem, who was arrested for money laundering in early 2014. See indicatively Russell's article (2014) on Business Insider website at the following link: http://www.businessinsider.com/charlie-shrem-arrestedbitcoin-ceo-2014-1

[267] See KPMG (2014)

[268] See also at this paper, p.26

[269] See Smith's article (2013) on Huffington Post website at the following link: http://www.huffingtonpost.com/2013/04/15/bit coin-guns

[270] See Jeffries' article (2013) on The Verge website at the following link: http://www.the...verge.com/2013/10/4/4799770/drug-dealers-setup-mini-silk-roads-after-federal-bust

[271] See Matonis (2013) on the Forbes website at the following link Forbes. January 22, 2013. http://www.forbes.com/sites/jonmatonis/2013/01/22/bitcoin-casinos-release-2012-earnings/ for example, Satoshi Dice offers a simple betting game in which a player wins if a dice roll is less than the player's chosen number. This service reported 2012 earnings of approximately 33,000 bitcoins (or roughly $403,000 at the applicable rates) with an average monthly growth of 78% at the time

[272] See Europol Assessment (2014), pp. 40-42

[273] See article at the website of Kathimerini (2015) at the following link http://www.kathimerini.gr/831795/article/oikonomia/die8nhs-oikonomia/bitcoin-xrhsimopoiei-to-islamiko-kratos

Aridat: The Caliphate Has Returned, a pro-ISIS blog, discusses how Bitcoins can be used to fund the caliphate. The post states that they are untraceable by Western governments and, therefore, they will not be stopped by regulatory screening processes. The blog then discusses the decentralised nature of virtual currencies, specifically stating that they are able to access markets that cross all borders and nation-state regulations to send money instantly and in a way that is untraceable by 'Kafir' governments.

Obviously, since the September 11, 2001 US attacks, this illegal type of funding has received significant attention in the international community. The level of attention has been submitted to be even more than the attention money laundering has received in recent times[274]. It is said that one of the major sources of terrorist financing is through donations from monies diverted from legitimate charitable donations.134 It is noted that Bitcoin has increasingly been used by several groups (legitimate and illicit) to receive donations[275].

There are legitimate concerns thereof that the absence of regulation and potential anonymity of transactions in the Bitcoin network could afford real advantages for criminals. Nevertheless, it should be remembered that a Bitcoin transaction does leave a digital trail. It is essential for the long-term viability of Bitcoin scheme that it does not become synonymous with crime, and the Bitcoin community should co-operate with law enforcement agencies to prevent exploitation by criminal networks, in spite of the difficulties of applying and enforcing anti-money laundering laws and regulations, as well as those countering the financing of terrorism (AML/CFT), in the presence of complex infrastructures to transfer funds or execute payments involving several (not always identifiable) entities which are often spread across several countries. In addition to that Bitcoin issuers or their related service providers (e.g. wallet providers, exchanges) can be located in jurisdictions that do not perform effective AML/CFT controls[276].

It is evident that Bitcoin scheme currently poses a wide range of money laundering risks which are particular to its industry, but also compound the more traditional money laundering challenges that financial institutions face today. Law enforcement agents, via the aid of international community and cooperation, have responded to the threat of money laundering by putting in place mechanisms that curb money laundering. The Financial Action Task Force (FATF), Interpol and other enforcement agencies are empowered to fight money laundering in conjunction with national law enforcement agencies. Some of these mechanisms, particularly might be proper against money laundering within Bitcoin scheme, as it shall be discussed later on.

However, the question is how the digital-currency industry can address AML risks because Bitcoin scheme and the other virtual currencies will reach their potential only if the industry acts quickly to reduce AML risks. Three actions are especially necessary, of which two can be taken at the firm level, while the third requires coordination across the industry[277]. A first initiative is comprised of the development of strong anti-money laundering and sanctions programmes that Bitcoin and digital-currency firms in general will implement against the risks of digital-currency transactions, considering the eventuality of voluntarily imposing bank-level standards for customer identification and verification and enhancing due diligence for certain groups of customers. Applying for necessary state licenses, or by acting as the agent of a registered and licensed firm could be another initiative that might be taken from the digital-currency industry. Finally, developing information-sharing mechanisms on user identities but the industry will need to balance AML controls with best-practice privacy

[274] See Ogunbadewa (2014)
[275] See Graham, Bell and Elliot (2003), p.57
[276] See ECB (2015), p. 28
[277] See Shapiro (2013), pp. 5-7

controls that assure customers that their identities and transactions will remain private maintaining one of the fundamental features of Bitcoin design: the anonymity within the system.

2.4.2. Other risks of financial crime

Risks to financial integrity also comprise other risks of financial crime. Financial crime, which is a subset of financial abuse, can refer to any non-violent crime that generally results in a financial loss, including financial fraud[278]. In particular, criminals might use Bitcoin exchanges to avoid the regulated financial sector and trade in illegal commodities[279] or to practice anonymous extortion[280] due to lack of transparency and personal identification. Moreover, criminal organisations can use it for settlement of internal or inter-organisation payment needs[281] making it more feasible to engage in criminal activity. In addition it is worth mentioning that excluding individuals, even jurisdictions are able to avoid seizure of assets and confiscation, as well as international embargos and financial sanctions[282], because decentralised Bitcoin transactions are not based on entities on which embargos and sanctions could be imposed.

However, this category of risks also includes a range of illegal activities such as tax avoidance and evasion. In general, a Bitcoin scheme user may generate income. The value of a bitcoin fluctuates and as a result it can be sold in higher values than the original purchase price and thus generate income gain for the seller[283]. Moreover, bitcoins can be received by merchants as payment for goods and services and therefore be taxable as though the merchant received units of a fiat currency. Ultimately, due to the anonymity provided by the system's design and infrastructure, there is potential for users to with-hold reporting Bitcoin-related income[284].

In particular, tax evaders are able to obtain income denominated in Bitcoin, outside monitored fiat currency payment systems[285]. From a tax-evasion point of view, they are particularly attractive. Bitcoins as cryptocurrencies possess the two most important characteristics of a traditional tax haven. First, because there is no jurisdiction in which they operate, they are not subject to taxation at source. Second, Bitcoin accounts are anonymous and users can install several e-wallets to buy or mine bitcoins and trade them without ever providing any identifying information. Significantly, Bitcoin and other similar virtual currency schemes offer one additional major advantage to tax-evaders that traditional tax havens do not: the operation of Bitcoin is not dependent on the existence of financial intermediaries such as banks. Bitcoin is exchangeable peer-to-peer by definition. Bitcoin thus seems immune to the developing international anti-evasion regime. Bitcoin scheme has the potential to become super tax haven thereof. Furthermore, a user might use Bitcoin e-wallets or e-mail transfer service[286] in order to receive and save his funds in Bitcoin, but not to send or sell.

The most compelling evidence is the fact that tax-free trading of Bitcoin scheme faces a first legal test at the European Court of Justice after Swedish authorities sought to extend

[278] See the IMF Background Paper (2001), p. 3
[279] See EBA (2014), p. 32
[280] Ibid, p.34
[281] Ibid
[282] Ibid
[283] See Kien and Ly (2014), p. 595
[284] Ibid
[285] See EBA (2014), p.35
[286] See Moneypacket.org

existing levies to virtual currencies. The European Court of Justice must decide if transactions between virtual and traditional currencies can be classed as a service under European value-added tax rules (VAT), and if so, whether such trades are tax-exempt, according to a court filing. Based on the request for a preliminary ruling[287], the Luxembourg-based tribunal is examining a dispute between Sweden's tax agency (Skatteverket) and David Hedqvist, who attempted to start selling bitcoins on his website. Sweden's tax authorities are challenging an earlier Swedish court ruling that said VAT should not be charged on Bitcoin trades. Hedqvist said he initially sought a court ruling to clarify how Bitcoin should be taxed after he did not get clear answers from Swedish tax authorities. According to Hedqvist, the currency is slowly gaining popularity in Sweden and would gradually gain more impetus 'if there were no legal uncertainties'. However, if that European Court of Justice decides to impose VAT regulations on member nations with Bitcoin businesses, they could suffer an economic setback[288]. Others could miss out on the opportunity to establish business initiatives associated with Bitcoin scheme. VAT is one way the EU raises tax revenues. It is essentially a consumption tax, paid by buyers as part of the purchase price. As with all tax policies, this one could wind up actually lessening government revenue by weakening economic momentum. For solid economic reasons, when the EU's top court issues its decision, the global currency industries will be paying close attention[289]. The European Court of Justice, set up to make sure EU law is applied equally across member states, is still considering this request for guidance on the tax status of Bitcoin.

Yet, the real challenge is to develop enforcement mechanisms that allow tax authorities to discover funds hidden in Bitcoin accounts. It seems that authorities have not taken this course of action because of the relatively small size of the economic exchange facilitated by Bitcoin scheme and other cryptocurrencies; or, in the alternative, because the problem is wrongly associated with the insignificant volume of virtual economies[290]. As noted, the cryptocurrencies market is expected to grow.

2.5. Risks to regulatory authorities

The virtual currency industry and specifically the Bitcoin phenomenon, has been under increased scrutiny to implement controls by regulators, investors, and businesses alike. Even though virtual currencies have been around for many years, the recent evolutions in the industry through the emergence of Bitcoin scheme and other similarly structured forums have resulted in the development gaps in regulations. Hence, regulatory authorities themselves incur risks, in spite of their inactivity or their inefficiency in case of a decision of regulation[291].

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[287] See Case C-264/14 (2014/C 245/09), Request for a preliminary ruling from the Högsta förvaltningsdomstolen of Sweden lodged on 2 June 2014 — Skatteverket v David Hedqvist, published in the Official Journal of the European Union C 245/7, 28.7.2014

[288]However, citing existing exemptions for currency and money transactions in Europe's VAT Directive, Advocate General Juliane Kokott of the European Court of Justice said in an opinion document: 'I therefore propose that the Court should reply...[that] these operations are exempt from tax under section 135, paragraph 1, point e) of the VAT Directive'. In other words, she urged the court to opt against applying a tax to bitcoin purchases and sales. She further argued that bitcoin, while not legal tender, is still a form of money.

[289] See White's article (2014)on Bloomberg website at the following link:
http://www.bloomberg.com/news/print/2014-07-30/bitcoin-tax-free-transactions-face-test-at-top-eu-court.html

[290] See Marian (2013), p. 8

[291] See EBA (2014), p. 36

The risks may be of reputational or legal nature or because the Bitcoin/virtual currency scheme activity threatens the objectives that the regulatory authority aims to attain.

2.5.1. Reputational risks

The reputation of regulatory authorities, either public authorities or central banks, is a fundamental issue regarding the efficiency and effectiveness of the tasks conferred on them. However, maintaining their reputation could be undermined by the usage of the most popular among a whole host of virtual currency schemes, the Bitcoin scheme, despite of the fact that these authorities might not be responsible. While it is gaining momentum, the possibility of a reputational impact in the event of an incident within Bitcoin scheme should be highly considered.

With this in mind, many authorities are now focusing on how these virtual currencies can be used and misused. Although the impact of a failure of a virtual currency scheme would be limited, assuming they are not that grown in size yet, the probability should be taken into account as a result of the high volatility and instability of Bitcoin scheme and the broad media coverage it receives[292]. For instance, regarding the ECB's tasks, the reputational risk is comprised of the risk of deterioration of the reputation, credibility or public image and it may arise even if ECB is not responsible[293], because Bitcoin scheme is about payments and the average person does not perceive that this clearly is not a case for the ECB. The proper know-how concerning the statutory and legal point of view is missing and the reputational impact might be negative.

On the other hand, regulatory authorities might decide to regulate Bitcoin and similar virtual currency schemes. In that case, if the chosen regulatory approach is unsuccessful due to an incomplete analysis of risks or an arbitrage by market participants or inadequacy of measures that were imposed, the reputational risk could obviously occur[294]. Furthermore, the same could happen whether the regulators do not establish a framework for Bitcoin scheme, because of the interaction that exists between financial institutions[295] which are subject to regulation and supervision, and virtual currencies as explained earlier[296].

Finally, Bitcoin scheme offers similar services just as conventional payment systems in fiat currencies. Yet, the same risks occur[297] to both payment systems, traditional and Bitcoin-like, compromising the objectives of the regulatory authorities[298].

2.5.2. Legal risks

In respect of regulatory authorities, there are also risks of legal nature. In particular, once the regulators decide to establish a legal framework or guidelines which will be imposed on virtual currency schemes such as Bitcoin scheme, several contractual relationships already created within the Bitcoin exchange and among market participants, could be rendered illegal or unenforceable, as it is already mentioned from a market participant point of view[299]. Therefore, the market participants may consider litigation actions against the regulatory authority which introduced the regulation[300].

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[292] See ECB (2012), p. 45
[293] Ibid, p. 45
[294] See EBA (2014), p. 36
[295] Ibid
[296] See also this paper, pp. 28-30
[297] Ibid, pp. 31-33
[298] See EBA (2014), p. 36
[299] See also this paper, p. 24
[300] See EBA (2014), p. 37

2.5.3. Risks to competition objectives

A third category of risks that regulatory authorities might face in respect of Bitcoin scheme and other similar –mainly decentralised- virtual currencies is related to the objectives placed to attain by them. Firstly, if regulators decide to establish a framework for virtual currency schemes, they should maintain balance between virtual and traditional/fiat currencies. The regulation which will be earmarked, for instance, for Bitcoin scheme should not cause an unequal management when compared to the regulation established for a fiat currency. Different activities with the same function and the same risk profile like the payment and financial services offered should not be regulated with a differing degree of intensity[301].

Moreover, another risk added is the reduce of the competition for the conventional/traditional payments services due to the diminishment of participants in fiat currency markets caused by cost pressures arising from the precedence of the eventuality of less regulated Bitcoin scheme[302].

Finally, an excessive regulatory approach for Bitcoin scheme and other virtual currency schemes may prevent innovation and novel technological features which could develop the payment services, but it may also prevent new entrants to the market in general. For this reason, the analysis and the overview of the risks arising should be complete and sufficient as well as the identification of the suitable measures imposed[303].

[301] See EBA (2014), p. 37
[302] Ibid
[303] Ibid

C H A P T E R 3

THE PERSPECTIVE OF ESTABLISHING A LEGAL FRAMEWORK FOR BITCOIN SCHEME AND OTHER VIRTUAL CURRENCIES

3.1. The non-existence of a clear legal basis for the virtual currency schemes in International and European Law and the controversy whether they should or could be regulated. Legal perspective of the Bitcoin scheme

Taking into consideration the current situation as it is postulated through the previous chapters and focusing predominately on the substantial innovative features of decentralised virtual currencies such as Bitcoin scheme and the potential benefits or risks which all set the tone, this dissertation will seek to provide clarity on the topic of lack of regulation for this genre of currencies. The main controversy around Bitcoin scheme arises in the context of the absence of a legal framework. When borderless peer-to-peer Bitcoin scheme was released in 2009 by the pseudonymous developer Satoshi Nakamoto, it was initially regarded as an interesting, yet unlikely attempt at creating an alternative currency (or cryptocurrency) that subsists independently from the traditional financial system[304]. Initially, the service operated entirely outside of the traditional financial system and had very few users. As a result it evaded the attention of both regulators and the mainstream public[305]. However, virtual currencies and especially the decentralised Bitcoin represent an example of technology overtaking legislation; while the perceived benefits of Bitcoin have enticed new users, merchants, investors, and businesses, the innovative nature of Bitcoin raised regulatory concerns. In particular, while the Bitcoin 'e-conomy' is flourishing, users are anxious about the scheme's legal status and the possibility of crackdown[306]. Although Bitcoin might be difficult to shut down because of its decentralised nature[307], a crackdown on this scheme via law enforcement may nevertheless cause a crisis of confidence[308].Thus, it will be fruitful to perceive the main dilemma question which follows as a consequence: regulated or non-regulated virtual currency schemes such as Bitcoin.

The inherent instability of Bitcoin scheme and similar virtual currencies - as already described- can be explained by one of the most critical aspects, i.e. the lack of proper legal basis[309] for this novel type of payment system. The legal basis for payment systems, according to European law, ensures a level playing field for all payment systems maintaining consumer choice, in order to safeguard consumer cost, safety and efficiency, ensures provisions on prudential requirements, the access of new payment service providers to the market, information requirements, and the respective rights and obligations of payment services users and providers[310]. Obviously, Bitcoin scheme does not have any of these aspects, lacking of

[304] See Grinberg (2012), p. 161
[305] See Tu and Meredith (2013), p. 296
[306] See Grinberg (2012), p. 161
[307] As it was explained earlier, there is no server that could be shut down if any authorities deemed it necessary. The rise of peer-to-peer technologies such as Bitcoin scheme eliminates a layer of intermediation from the networks they create; in the case of Bitcoin, people can technically send money from one wallet to another without going through middlemen. Law enforcement has long relied on financial intermediaries to help them prevent, detect, and investigate illegal transactions.
[308] See Grinberg (2012), p. 161
[309] See ECB (2012), p. 42
[310] See Directive 2007/64/EC, paragraphs 3-4

legal basis. According to Castronova (2001), the non-existence of a clear legal basis for virtual currency schemes in general is an illustration of the overall existing lack of understanding about virtual economies and their impact on the real economy. For instance, it is not clear to what extent virtual production should be considered when estimating the production of wealth per capita. The current national income and product accounts do not assign any value to online assets[311]. Moreover, two related aspects that could be considered are how to tax individual income earned through virtual currency transactions and how to define and protect virtual properties[312].

Nonetheless, it is usual that regulation does not reach the technological milestones at the expected times. Plus the innovation that Bitcoin scheme is endowed with, is widely considered as a thorny issue for regulators. Firstly in terms of technical background, the required know-how is difficult to be reached due to the high-level and continuously progressing technology used as well as the rapidly changing nature of decentralised schemes such as Bitcoin which could be differentiated directly and sharply. The knowledge asymmetry between the inventors/ issuers of digital 'e-conomies', the developers of the programmes and the regulatory authorities is incommensurate. That being the case, launching rules is being hindered. In addition, according to the ECB (2015) the phenomenon is still relatively new and also moving into different areas, that it would be too early to try making new, tailor-made legislation[313]. The regulators will have to spend time figuring out who is using in a way that they do not end up penalising businesses that are using it legitimately.

Secondly in terms of bundling into generic words of money or currency[314], there is still controversy and vagueness when defining and/or classifying virtual currencies, exacerbating the establishment of a regulatory framework or even the adjustment of existing legal framework[315]. For various regulatory purposes, it is important to define or classify Bitcoin scheme and other similar virtual currencies. To be more precise, from a legal perspective, money is anything that is used widely to exchange value in transactions. The term currency is used for 'minted' forms of money; nowadays usually taking the form of coins and banknotes[316]. Certainly in respect of Bitcoin scheme, the most popular and most commonly used virtual currency at the time of writing has a limited function as a medium of exchange because it is not yet so widely accepted among the general public. In addition, the high volatility of their exchange rates to currencies – and therefore in terms of most goods and services – renders virtual currency useless as a store of value even for short-time purposes, let alone for the purpose of being a longer-term savings instrument. Hence, this leads to insufficiency of it as unit of account[317]. Therefore, virtual currencies such as Bitcoin cannot be regarded as full forms of money at the moment. They are not currency either, and no virtual currency is a currency[318] [319]. Bicoin's 'failure' to function as a medium of exchange, unit of

[311] See ECB (2012), p. 42
[312] See Chu (2008)
[313] See ECB (2015), p. 24
[314] Ibid, p. 25
[315] See PSD and EMD, later on this paper, pp. 56-57
[316] See ECB (2015), p. 24
[317] Ibid. The economic perspective of money and virtual currencies i.e. the three functions of money is already explained in p.9.
[318] See ECB (2015), p. 24

account, and store of value constitutes a practical counterexample to the notion that money is the product of social convention[320]. On the other hand, given that the currency has only been in circulation for almost six years, others might revise this conclusion to find that the jury is still out on whether Bitcoin can come to function as money by social convention[321]. However, the term 'virtual currency scheme(s)' (VCs) is used throughout this dissertation to describe both the aspect of exchange value and that of the inherent or in-built mechanisms ensuring that value can be transferred, following the ECB opinion on the matter.

Examining the obstacles aforementioned concerning the –till now- deficiency of a regulatory approach, the problem remains thereof, diffusing the ability and purposes of reaching a legal basis and establishing a legal framework. This uncertainty hurdles the determination of what legal rules should apply to Bitcoin, in what way and to what extent, and how and what regulatory bodies should oversee the compliance of Bitcoin society and ecosystem with these rules. Yet, the risks[322] arising while virtual currencies such as Bitcoin and other decentralised schemes emerge, lead to an additional –yet fundamental- question: whether virtual currencies should be regulated. It is sure that a regulatory prohibition of Bitcoin and virtual currencies' circulation should be out of the table; as said before, the tremendous opportunities offered via these schemes and the significant progress of technology should be postulated conditions of ensuring the free circulation of cryptos. Prohibition would be overinclusive; it takes a product that has multiple uses—many of them legitimate—and tries to ban it or wish it out of existence[323].

A point often overlooked is the fact that a feature of cryptocurrencies that makes them an attractive alternative is their distributed nature which makes them resistant to law enforcement disruption and government control - a premise at the heart of the cryptocurrency philosophy[324]. For that reason, Bitcoin scheme as a pioneer is a 'niche' currency relative to other denominations which are subject to legislation. The special and 'privy' Bitcoin characteristic is the ingenious decentralised feature which has as a consequence the absence of a central authority and oversight without requiring the involvement of a financial institution or third party. Therefore, whether authorities decide to set legal provisions, the keystone of their structure should imperatively estimate (or/and even respect) the specificity of the systems like that of Bitcoin based on a global peer-to-peer network functioning under the specific protocol, in order to avoid the over-regulation at the outset. Drawing from lessons of advanced digital economies that have reaped the internet's benefits for economy and society, international and European regulatory bodies and governments need to follow an

[319] See ECB (2015), p. 23. It is worth mentioning that even if the terms virtual 'currency' and virtual 'currency schemes' are used widely, Eurosystem central banks do not recognise that these concepts would belong to the world of money or currency as used in economic literature, nor is virtual currency money, currency or a currency from a legal perspective.
[320] See Mittal (2012), p.18
[321] Ibid
[322] See this paper, chapter 2
[323] For instance, China is a country where Bitcoin is prohibited.
[324] See Europol Assessment (2014), pp. 40-42

adaptive style when considering regulations for Bitcoin intermediaries, relying on experimentation and adjustment[325].

Albeit the hinderance of these aspects, the risks as presented in a previous section within this dissertation indicate that even for its own further development and wider usage, Bitcoin may require the implementation of a conceptually new legislation[326]. However, the requirements of such legislation would be practically impossible to impose on the Bitcoin network, since it is practically impossible to amend the Bitcoin protocol without the consensus of the majority of Bitcoin stakeholders. It is hard to imagine how modifications of the protocol, representing the interests of certain international and European regulatory bodies, can be embraced by the majority of the Bitcoin community being international per se. This scenario seems to be ideal, but difficult to be realised. Therefore, it is not only the lack of clarity about Bitcoin's legal classification that hinders the implementation of regulation, but the a priori unregulated nature of Bitcoin itself.

3.2. Possible strategy for regulation of the Bitcoin scheme

Accordingly, this dissertation proceeds under the following assumptions and qualifications: all Bitcoin and virtual currency schemes' stakeholders are solely interested in the preservation of the ingenious and innovative features of the system, but they are also interested in the limitation of the various risks stemming from their usage. In particular, users are interested in consumer protection as it is legally offered within jurisdictions; exchanges and merchants might aim to the establishment of determined legal statuses and legal requirements to comply with; and finally, the regulatory bodies have recently started to examine and assess solutions and efficient tools to mitigate the existing risks emerging from the novelties but also to ensure their tremendous benefits and safeguard the new 'e-conomy'[327]. Hence, both the Bitcoin stakeholders and the regulatory bodies can be considered the participants in the issue of the regulation of Bitcoin. This is the reason why the best solution to the issue would be the strategic regulation ensuring the balance of the participants' interests and facilitating the development of the potential of cryptocurrencies and considering four interconnected aspects covering different levels of the functionality of Bitcoin. These aspects are (a) the conceptual level; (b) the level of user interaction; (c) the level of interaction between users and merchants; and (d) the level of interaction between users and exchanges.

Firstly, at the conceptual level, Bitcoin may be considered by analogy with decentralised neutral technologies such as email or Internet telephony which also function within the Internet at a protocol level and are unregulated[328]. Even though their service providers are subject to regulation –in contrast with Bitcoin that itself is a service provider-, they are considered as technologies which remain unregulated. This measure could be helpful in terms of conceptual level.

Secondly, there should be a method of mitigating risks which are posed by Bitcoin users' lack of information on the principles of Bitcoin's functionality, and exclude potential legal

[325] See Boston Consulting Group (2012)
[326] See Shcherbak (2014)
[327] Ibid
[328] Ibid

risks faced by Bitcoin miners because of the initiation of creation of bitcoins[329]. The user community should be officially informed of the underlying principles of Bitcoin's functionality and the risks stemming from the usage of Bitcoin, via the issuance of relevant official statements and/or warnings by regulatory bodies.

Thirdly, the 'relationship' between consumers and merchants is unsettled due to the uncertainty of the mechanism of reimbursement of consumer's payments by the merchant when the consumer exercises the right of withdrawal or the current lack of clarity in respect of the applicability of taxation in Bitcoin transactions. These issues might be envisaged through guidance issued by regulatory bodies[330]. In respect of taxation, since the profit of the Bitcoin merchant as a taxpayer can be denominated either in fiat currency or in bitcoins, a visible solution to tax the merchant's profit is to impose the tax on the sum denominated in fiat currency. Hence, Bitcoin merchants should be allowed to accept bitcoins as a payment only on conditions that the bitcoins will be subsequently converted into traditional currency with the following placement of the funds on the merchant's bank account[331].

Finally, the fourth aspect is comprised of the interaction between users and exchanges. The designation of Bitcoin exchanges as part of the currency's ecosystem might ensure the implementation of know-your-customer and anti-money laundering policies by such exchanges, which could substantially lessen the scale of the usage of Bitcoin for the purposes of money laundering and other types of financial crime.

However, the current levels of criminal activity and second, of its causal driver, the financial anonymity within the market should be taken as benchmarks in general. The risks concerning criminal activity show the road for regulation, but in a way that the rules do not reduce the level of criminal activity; they ensure that decentralised virtual cryptocurrencies such as Bitcoin do not increase the criminality. Any regulation should prevent cryptocurrencies from becoming a vehicle for criminal activity. It is also worth mentioning that the anonymity as an appealing and beneficial feature of these schemes should be maintained - any regulatory framework should not decrease the current level of financial anonymity. However, regulation is also not aimed at increasing the level of anonymity. Finally, the regulatory framework should assume that, if no new regulatory costs are imposed on the legitimate use of cryptocurrencies, the market will allow the new technology to develop to the extent that it offers benefits (other than anonymity) that fiat currencies do not[332].

3.3. Legal status and regulation of Bitcoin in selected national jurisdictions as an impetus for international and European responses

That being said, the question of how to deal with Bitcoin scheme is becoming a regulatory priority, as adoption of the virtual currency spreads and governments panic. A number of authorities such as central banks, supervisory authorities and other government agencies have developed an interest in virtual currencies and are dealing with the subject coming out with

[329] See Shcherbak (2014)
[330] Ibid
[331] Ibid
[332] See Marian (2015), p. 59

plans on how Bitcoin should be treated under their law and whether they intend to formalise or acknowledge and regulate them. Several countries have already taken initiatives related to the Bitcoin scheme.

It is notable that bitcoins have already had a substantially mixed reception in various countries which is still undefined or changing in many of them. While some countries have explicitly allowed its use and trade, others have banned or severely restricted it and at the same time various government agencies, departments, and courts have classified bitcoins differently. Hence, their responses can be classified into four broad categories: warnings, statements and clarifications on the legal status, (future) actions in licensing and/or supervision, and issuing bans[333]. Topics covered include whether bitcoins are recognized as legal tender and/or are free to use, the possibility of negative impacts on the national currency, concerns about fraud, and how transactions using the Bitcoin system are viewed by tax authorities. This section is aiming thereof to outline some of the national authorities' actions and reactions within their jurisdictions as responses and initiatives (still in infancy) to the new digital-currency era -the Bitcoin scheme, albeit most countries are in a wait-and-see mode.

First, United States of America where most Bitcoin users live is at the fore when it comes to Bitcoin regulation. The United States has been one of the nations to offer the most support to Bitcoin, at least at the Federal level, leading the way for a number of nations when it comes to addressing this growing technology. Notably, the Chair of the Board of Governors of the Federal Reserve System, Janet Yellen, said at a US Senate banking committee hearing in February 2014: 'It's important to understand that this is a payment innovation that's happening outside the banking industry. [...] The Federal Reserve simply does not have the authority to regulate Bitcoin in any way'[334].

However, each US state has its own financial regulators and laws and each approaches Bitcoin differently. In June 2014 California Assemblyman Roger Dickinson (D–Sacramento) submitted draft legislation and the Bill was filed with the California State Assembly on February 2015 (Assembly Bill 1326 relating to virtual currencies) in order to legalise bitcoin and other forms of alternative and digital currency[335]. California is an example of a positive step that lawmakers and regulators can take: if old laws are unclear—and seem to prohibit Bitcoin, then they should be examined and possibly amended, or a guidance should be published to make it clear when Bitcoin can be used[336]. The Bill defines 'virtual currency as any type of digital unit that is used as a medium of exchange or a form of digitally stored value or that is incorporated into payment system technology; virtual currency shall be broadly construed to include digital units of exchange that (1) have a centralised repository or administrator, (2) are decentralised and have no centralised repository or administrator, or (3) may be created or obtained by computing or manufacturing effort; virtual currency shall not be construed to include digital units that are used solely within online gaming platforms with no market or application outside of those gaming platforms, nor shall virtual currency be

[333] See ECB (2015), p. 30
[334] Ibid, p. 31
[335] See Cosco's article (2014) on Business Insider website at the following link: http://www.businessinsider.com/bitcoin-llegal-in-california-2014-6
[336] See Ramasastry (2014)

construed to include digital units that are used exclusively as part of a customer affinity or rewards programme, and can be applied solely as payment for purchases with the issuer or other designated merchants, but cannot be converted into, or redeemed for, fiat currency'.

As of May 2015, New York state is the only state with a final bitcoin rule[337]. In 2014, the New York State Department of Financial Services had officially invited bitcoin exchanges to apply with them[338], and published draft regulations for virtual currency businesses[339]. Businesses would have to provide transaction receipts, disclosures about risks, policies to handle customer complaints, maintain a cybersecurity program, hire a compliance officer and verify details about their customers to follow anti-money-laundering rules, per Financial Crimes Enforcement Network (FinCEN)[340]. In addition, Bitcoin is taxed as capital gains, for exchanges and mining.

Furthermore, the U.S. Commodity Futures Trading Commission (hereinafter 'the CFTC'), albeit the fact that has not yet announced any specific policy or regulatory regime for cryptocurrency derivatives, has broad enforcement authority over Bitcoin and other cryptos, because they likely fall under the Commodity Exchange Act's (CEA's) broad definition of commodity. In particular, in September 2015, the CFTC took further into official recognition than ever before, defining Bitcoin and other digital currencies as 'commodities'. 'While there is a lot of excitement surrounding bitcoin and other virtual currencies, innovation does not excuse those acting in this space from following the same rules applicable to all participants in the commodity derivatives markets', said CFTC director of enforcement Aitan Goelma[341]. Whether the CFTC will regulate Bitcoin swaps and forwards as it does with foreign exchange transactions or other commodities or if an entirely new increased regulatory regime will apply that seem to inevitably stem from CFTC's decision recognising Bitcoin as an official commodity, remains to be seen[342].

Second, in Brazil, Bitcoin is also regulated under a 2013 law that discusses both mobile payment systems and electronic currencies[343]. In particular, Brazil enacted Law No. 12,865, which created the possibility for the normalization of mobile payment systems and the creation of electronic currencies, including the Bitcoin scheme. It is worth noting that Bitcoin is not regulated as a currency because the Central Bank considers it too small to apply any specific currency regulation. Within the Brazilian law digital currencies are defined as the resources stored on a device or electronic system that allow the user to perform a payment transaction. The law also authorises the Brazilian Central Bank to issue the necessary norms

[337] See Popper's article (2015) on New York Times website at the following link: http://www.nytimes.com/2015/05/08/business/dealbook/bitcoin-exchange-receives-first-license-in-new-york-state.html?_r=1

[338] See New York State Department of Financial Services (2014)

[339] See Vigna's article (2014) for WSJ at the following link: http://blogs.wsj.com/moneybeat/2014/07/17/ny-financial-regulator-releases-draft-of-bitlicense-for-bitcoin-businesses/

[340] This is a bureau and one of lead agencies of the United States Department of the Treasury in the fight against money laundering.

[341] See Chang's article (2015) for Digital Trends website at the following link: http://www.digitaltrends.com/business/cftc-defines-bitcoin-as-commmodity/

[342] See Latham & Watkins (2015), pp. 1-4

[343] See The Law Library of Congress (2014), p. 3

and instructions for the fulfilment of digital currency provisions. However, the Brazilian government is still studying how to define Bitcoin in Brazil. The first analysis concluded that Bitcoin is not a currency from a regulatory point of view; for tax purposes, bitcoins are treated as a financial asset.

China is still a conundrum for the approach towards Bitcoin scheme. In particular, the Central Bank of China and other authorities (ministries and commissions) declared that Bitcoin is not a currency and it should not be considered as such in terms of circulation and usage. China defined Bitcoin as special virtual commodity[344]. Based on the 'Notice on Precautions against the Risks of bitcoins' (2013) issued by the aforementioned authorities, its usage is prohibited for financial institutions: they cannot use or involve themselves with bitcoins, not even trading bitcoins with Chinese Yuan or foreign currencies[345]. The Notice further has set amplified requirements for the oversight of Internet websites related to Bitcoin scheme.

In Russia there is no regulation yet for Bitcoin[346] or even a bill explicitly banning Bitcoin, but Central Bank admits that bitcoins can be restricted and are illegal according to article 140 of the Russian Civil Code, which recognizes the Russian ruble as the exclusive means of payment in the Russian Federation and requires that all prices for financial transactions conducted in Russia be defined in rubles[347]. Furthermore, in 2015, Roskomnadzor, Russia's media regulator, has blacklisted several Bitcoin information and resource sites in accordance with a court ruling September 2014. Bitcoin's use has been under threat in Russia as its legal status has grown murkier over the course of the past year: Russia's Central Bank (CBR) issued a statement, warning against the use of virtual currencies due to potential ties to "money laundering or terrorist activities[348]. Finally, Russian authorities quoted as saying: 'cyber currencies including the most well known, Bitcoin, are money substituted and cannot be used by individuals and legal entities'[349].

In addition, the Central Bank of Iceland reportedly stated that engaging in foreign exchange trading with bitcoins is prohibited, based on the country's Foreign Exchange Act[350] and Indonesia also reacted in a similar way becoming the latest country to prohibit Bitcoin scheme and declaring it as illegal[351].

Furthermore, Indonesia has become the latest country to ban the use of the Bitcoin virtual currency and Bank Indonesia declares Bitcoin as illegal currency[352], while Banco Central de Bolivia, the central bank of Bolivia, issued a resolution banning bitcoin in 2014[353].

[344] See The Law Library of Congress (2014), p. 6
[345] Ibid
[346] Ibid, p. 18
[347] See Tolkachev and Osipova (2013)
[348] See RT's article (2015), at the following link: http://www.rt.com/news/222215-russia-bans-bitcoin-sites/
[349] See Baczynska's article (2014) on Reuters website at the following link: http://www.reuters.com/article/2014/02/09/us-russia-bitcoin-idUSBREA1806620140209
[350] See The Law Library of Congress (2014), p. 11
[351] Ibid, p. 12
[352] See Chandra's article (2014) on Yahoo News Singapore at the following link: https://sg.news.yahoo.com/bank-indonesia-declares-bitcoin-illegal-currency-143458870.html

On the other hand, Canada enacted legislation regulating Bitcoin scheme and other virtual currencies[354]. In particular, the country's Proceeds of Crime (Money Laundering) and Terrorist Financing Act of 2000 was amended (2014) to extend to both foreign and domestic businesses working in the Bitcoin and digital currency sectors in Canada. Approving a national Bitcoin law as a matter of anti-money laundering law should not be discounted, even though Bitcoin is not considered as a legal tender. A point that should not be overlooked is that Canada is the second most popular destination for venture capital invested in Bitcoin companies, behind the United States and ahead of China.

India and in particular the Reserve Bank of India (RBI) has cautioned the users, holders and traders of virtual currencies (VCs), including Bitcoin scheme about the potential financial, operational, legal, customer protection and security related risks that they are exposing themselves to[355].The Reserve Bank has also stated that it is presently examining the issues associated with the usage, holding and trading of virtual currencies under the extant legal and regulatory framework of the country, including Foreign Exchange and Payment Systems laws and regulations.

In Australia, while the Australian Taxation Office (ATO) had monitored the Bitcoin during 2012-2013, including its volatility, its acceptance and interaction with conventional currencies, the governor of the Reserve Bank of Australia (RBA) said that there was nothing to stop people holding or transacting in other currencies in Australia, including the bitcoins[356].

In spite of Bitcoin's resonance in Argentina[357], the country does not recognise the scheme a legal currency stricto sensu, since it is not issued by the government monetary authority and it is not legal tender. Therefore, they may be considered money but not legal currency[358].

Hong Kong has stated that it wants to expand its e-money directive to cover Bitcoin as a medium of exchange[359]. Moreover, the treasury secretary there said existing laws forbid its use for fraud or money laundering[360].

Denmark's position on the matter is totally different. According to the National Bank of Denmark, virtual currencies could be regulated by Danish law if they have an issuer. In that case, they are normally either electronic money or payment substitutes. Whether they belong in one category or the other generally depends on whether they can be used with others than the issuer. If this is the case, they are usually defined as electronic money. Conversely, bitcoins and similar solutions with no central issuer are not covered by Danish Payment

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[353] See Banco Central de Bolivia (2014)
[354] See Rubenfeld's article (2015) on Wall Street Journal website, at the following link: http://blogs.wsj.com/riskandcompliance/2014/06/23/canada-enacts-bitcoin-regulations/
[355] RBI (2013)
[356] See Hartge-Hazelman's article (2013) on the Australian Financial Review, at the following link: http://www.afr.com/p/national/glenn_stevens_says_bitcoins_show_GWLQFcefJfF4RmiE0Z08AJ
[357] See this paper, pp. 20-21
[358] See The Law Library of Congress (2014), p. 2
[359] See CPSS (today CPMI) -World Bank Forum Report on Retail payments
[360] See The Law Library of Congress (2014), p. 11

Services Act[361]. Nevertheless, according to Denmark authorities, Bitcoin should be treated as an electronic service and earnings from its use would therefore be taxable[362].

In Sweden, the Swedish Central Bank announced in 2014 that they would treat the cryptocurrencies as an asset, similar to stamps, art, and antiques, and not as a currency. Basically, this means Sweden imposes capital gain taxes on cryptocurrency transactions.

In respect of the United Kingdom policy, there have been brief overviews by the Bank of England's explaining its position towards Bitcoin (2014)[363]. However, the government considers that 'digital currencies represent an interesting development in payments technology, the potential advantages are clearest for purposes such as micro-payments and cross-border transactions' and according to Treasury Report of March 2015, is planning to apply anti-money laundering (AML) regulations to digital currency exchanges, doing a first major attempt to cope with the regulatory and consumer safety issues surrounding digital currencies. According to the government, Bitcoin is legal, but has not yet been ruled as a currency. Instead, Bitcoin is considered a 'single use voucher', which leaves it liable for value-added taxes[364]. This has been strongly criticized by those selling bitcoins as being "a show stopper for the UK Bitcoin industry[365].

In Cyprus, one of the places that Bitcoin scheme recognises great acceptance, their usage is not regulated[366]. However, the Central Bank (CBC) directly acknowledged for the first time in 2014 that Bitcoin is not illegal, but again highlighted the risks of using an unregulated digital currency[367].

The Federal Financial Supervisory Authority (hereinafter BaFin) in Germany conducted a supervisory and legal evaluation, taking into account also the risks inherent with the trading of bitcoins, which resulted in a so called 'expert article' in December 2013 ('Bitcoins: Aufsichtliche Bewertung und Risiken für Nutzer', 'Bitcoins: Supervisory evaluation and risks for users of 19 December 2013'). Although BaFin considers Bitcoin as a risky financial investment and warns users to deal with it, the fact that BaFin decided to publish an expert article at all underlines the growing importance of Bitcoins. According to this expert article bitcoins are so called units of account (Rechnungseinheiten) and thus financial instruments in the meaning of the German Banking Act (Kreditwesengesetz). These units of account (Rechnungseinheiten) are substitute currencies, which are used as means of payment in multilateral clearing circles on the basis of an agreement under private law. In a nutshell BaFin clarifies that Bitcoin is neither currency or legal tender nor e-money in the meaning of the German Payment Services Supervision Act (Zahlungsdiensteaufsichtsgesetz).

[361] See Danmarks Nationalbank (2014), p. 87
[362] See The Law Library of Congress (2014), p. 7
[363] See Bank of England (2014a, 2014b)
[364] See Beigel's article (2013) at the following link: https://99bitcoins.com/bitcoin-worldwide-adoption-status/
[365] See The Law Library of Congress (2014), p. 23
[366] Ibid, p. 7
[367] See Hazou's article (2014) on the Cyprus Mail website at the following link: http://cyprus-mail.com/2014/02/26/central-bank-says-bitcoin-is-not-illegal/

Furthermore, according to BaFin, as a rule, commercial trading of Bitcoins is regulated[368]. Furthermore, Deutsche Bundesbank has given such warnings in interviews[369].

On the other hand, the National Bank of Belgium has no intention of intervening in bitcoin business or regulating it, according to the Belgium Bitcoin Association. In particular, the Minister of Finance indicated that government intervention with regard to the Bitcoin system does not appear necessary at the present time[370]. On 16th January 2014, however, the central bank issued a joint warning with the Belgian Financial Services and Markets Authority (FSMA) that digital currencies are not issued by any central authority, and as such are at risk of volatility, fraud, and business non-acceptance.

In Switzerland, FinMa, the Swiss Financial Market Supervisory Authority, has issued a report warning about the 'increased money laundering risk' posed by Bitcoin scheme, along with similar financial technologies and business practices, and suggests stronger due diligence[371].

The Finnish Tax Authority (Vero Skatt) issued instructions on virtual currencies' (and Bitcoin) taxation. When the currency is used as a form of payment for goods and services, it is treated as a trade, and the increase in value that the currency might have gained after it was obtained is taxable[372]. The Central Bank (Finlands Bank) has stated that Bitcoin scheme does not fulfil the criteria for a currency or a payment instrument[373].

Moreover, Banque de France issued a warning about risks related to the Bitcoin scheme, adding its voice to growing concerns about the unregulated, online money[374] [375]. The French prudential supervisor (Autorité de contrôle prudentiel et de résolution - ACPR) has announced that it regards the activity of receiving funds denominated in a currency with legal tender status from a Bitcoin purchaser and transferring those funds to a Bitcoin seller as offering a type of payment service that requires authorisation as a payment services provider[376]. Furthermore, in June 2014 the French government issued a paper pertaining to the matter of 'Regulating Virtual Currencies', making recommendations to prevent these schemes from being used for fraudulent purposes and money laundering[377].

A similar approach was expressed by the Dutch Minister of Finance, Jeroen Dijsselbloem, who highlighted that the Bitcoin scheme as an alternative currency cannot be seen as 'electronic money' because it fails the definition set by the Dutch law[378]. According to the Act

[368] For further information, see BaFin's website.
[369] See ECB (2015), p. 30
[370] See Sénat de Bélgique (2013)
[371] See FinMa (2014)
[372] See The Law Library of Congress (2014), p. 9
[373] See Bank of Finland (2014)
[374] See Banque de France (2013)
[375] It is worth highlighting that in the context of French banking private sector, one of France's largest banks had been looking to hire developers with a focus on Bitcoin scheme.
[376] See ACPR (2014)
[377] See République français (2014)
[378] See Collin's article (2013) on 24 Oranges website at the following link: http://www.24oranges.nl/2013/06/17/bitcoin-income-shall-be-taxed-dijsselbloem-says/

on Financial Supervision (Wet op het financieel toezicht) of the Netherlands[379], bitcoins do not represent a claim on the issuer and they are not necessarily issued in exchange for money, they are not electronic money[380]. Moreover, the Dutch Central Bank (De Nederlandsche Bank - DNB) has published a warning (2013) about the possible use of Bitcoin in money laundering and financing terrorism, the lack of supervision, price fluctuations and security risks.

Continuing with Spain, this was the second country in the world to seize bitcoins during an investigation of fraudulent transactions via bitcoins. Even though bitcoins are not considered as a legal currency in Spain too, they may be considered digital goods or things under the Spanish Civil Code[381].

Last but not least in this indicative list of national authorities' initiatives and positions concerning the Bitcoin phenomenon is the Isle of Man, an island between the west coast of England and Northern Ireland. The island will be the first place in the world to pass a complete, new and sole regulatory framework for the alternative payment method of Bitcoin scheme, creating a jurisdiction for the industry, which means it has a practical responsibility and authority on how the marketplace operates. The island is known for actively promoting the use of the online currency, and is favoured by startups. In essence, the Isle of Man is selling itself as a global hub for crypto-currency start-ups with low taxation, 'pragmatic' regulation and high-speed internet. But it could be its thriving gambling industry which helps to create 'Crypto Valley'[382].

In a word, following this indicative presentation of national responses to Bitcoin and/or similar virtual currencies, number of authorities specifically pointed out that, legally, Bitcoin is not a currency, does not have the status of legal tender and/or does not meet the definition of a financial instrument, while others are considering the possible licensing and supervision of certain Bitcoin related services[383]. In some countries, certain activities related to virtual currencies are banned. Thus, national responses differ, partly depending on the part of the world they originate from and on the type of authority[384].

3.3.1. The EU response to the emerging virtual currency schemes

Following national authorities' actions related to virtual currency schemes and especially related to the emerge of Bitcoin, which has recently erupted, the European Union (hereinafter the 'EU') could not stay uninvolved. Albeit the EU has passed no specific legislation relative to the status of the Bitcoin as a currency, several warnings, opinions and reports have been

[379] The Act defines 'electronic money' as 'a monetary value stored on an electronic device or stored on-distance in a central accounting record', and an 'electronic money institution' as 'a party, not being a bank, whose business it is to obtain the disposal of funds in exchange for which electronic money with which payments can be made is issued, also to parties other than the party issuing the electronic money'.
[380] See The Law Library of Congress (2014), p. 15
[381] See Código Civil (CIVIL CODE), Articles 335, 337 & 345
[382] See Sparkes' article (2014) on The Telegraph website at the following link: http://www.telegraph.co.uk/technology/11109256/Creating-a-Bitcoin-Island-just-off-the-English-coast.html
[383] See ECB (2015), p. 31
[384] Ibid, p. 32

published since 2012 in order to outline the novelty of virtual currencies and present assessments after monitoring and evaluating mainly the crypto Bitcoin scheme and its special innovative features.

With this in mind, at this point of the dissertation it is considered as significant to highlight the basic elements of the responses deriving from EU's institutions, regulatory authorities/agencies, but first the likelihood or unlikelihood of adoption of the existing legal framework to the innovation of Bitcoin scheme.

3.3.1.A. *Bitcoin scheme within the existing EU legal framework (Electronic Money Directive 2009/110/EC and the Payment Services Directive 2007/64/EC)*

As described earlier, the situation regarding Bitcoin's legal framework is still far from clear. However, when attempting to apply legislation to virtual currency schemes such as Bitcoin, there are some who suggest that Bitcoin scheme falls under existing EU legal framework: first, the Electronic Money Directive 2009/110/EC (hereinafter 'the EMD'). In general, the EMD focuses on modernising EU rules on electronic money, especially bringing the prudential regime for electronic money institutions, into line with the requirements for payment institutions in the Payment Services Directive. Furthermore, this Directive aims to enable new, innovative and secure electronic money services to be designed, provide market access to new companies and foster real and effective competition between all market participants. In essence, the EMD is a harmonisation Directive that created a common EU framework for the regulation of financial institutions that issue e-money.

This Directive uses three criteria to define electronic money, introducing a new definition: (i) it should be stored electronically; (ii) issued on receipt of funds of an amount not less in value than the monetary value issued; and (iii) accepted as a means of payment by undertakings other than the issuer[385]. Furthermore, it distinguishes several categories of e-money issuers, among which are credit institutions and e-money institutions. Pursuant to the EMD, 'electronic money issuers issue e-money at par value on the receipt of the funds'[386]. Moreover, e-money issuers shall redeem, at any moment and at par value, the monetary value of e-money held upon request of the e-money holder[387]. Accordingly, Bitcoin could fall under the e-money definition, whether it complied with the second criterion. In spite of its compliance with the first and the third criteria, Bitcoin is not a monetary value represented by a claim on the issuer and is not issued on receipt of funds. Moreover, 'issuing' is not the term to be applicable in the case of Bitcoin, since this term refers to centralised schemes and bitcoins are not issued by any entity[388]; it should be taken into account that the mining activity leads to money creation without the receipt of funds[389]. Furthermore, the principle of

[385] See EMD 2009/110/EC, Article 2
[386] Ibid, Article 11 par. 1
[387] Ibid, Article 11 par.2. As rule of thumb: if a virtual currency is prepaid, it is e-money with the regulatory requirement of redeem ability at par value. Only non-prepaid currencies in closed systems (like Bitcoin or some in-game currencies) could be considered as non-regulated virtual currencies in the EU.
[388] See Shcherbak (2014)
[389] See Jacobs (2011)

redemption of the monetary value of e-money cannot be applied in the case of Bitcoin, since there is no legal entity in charge of issuing bitcoins on receipt of funds and the redemption of the monetary value of bitcoins upon request of the holder. Therefore, EMD is not applicable to Bitcoin scheme (and similar decentralised virtual currency schemes)[390]. Probably the inclusion of virtual currencies in a new (third) EMD, according to people knowledgeable with the matter, is going to result in the heavy regulation of the matter.

Another suggestion concerning whether Bitcoin scheme falls under existing EU legal framework is the application of the Payment Services Directive 2007/64/EC (hereinafter 'the PSD') which aims to guarantee fair and open access to payments markets and to increase consumer protection. In general, this Directive prescribes rules related to the execution of payments through electronic money. Hence, the Bitcoin scheme falls outside the scope of PSD because this Directive does not regulate the issuance of electronic money, nor does it amend the prudential regulation of electronic money institutions as provided for in the EMD and because payment institutions introduced are not permitted to issue electronic money[391]. However, current legislative process is leading to the adoption of PSD2[392]; whether Bitcoin would be regulated under the revised Payment Services Directive (PSD2) depends on if it is considered to be a currency, due to European Commission's PSD2 proposals. They, if introduced as drafted, apply some of the rules where payment services are provided 'in any currency'[393]. This wording would seemingly allow for the regime to be applied to Bitcoin.

On the other hand, since Bitcoin carries a value derived from the market demand and supply, one can assume that Bitcoin represents the ownership over a financial asset, and therefore is a financial instrument. The new Markets in Financial Instruments Directive (hereinafter, 'the MiFID 2')[394] covers undertakings the regular occupation or business of which is to provide investment services and/or perform investment activities on a professional basis'[395], and protects investors within the EU[396]. The MiFID 2 applies to, inter alia, investment firms and credit institutions providing payment services[397]. Since Bitcoin is not an undertaking, the MiFID 2 is not applicable to it[398].

Furthermore, thinking about the nature of Bitcoin scheme, it is reasonable to consider that it could fall under the definition of information society service (hereinafter, 'ISS') as it is introduced in the E-Commerce Directive (hereinafter, 'the ECD')[399]. In particular, defining an

[390] See ECB (2012), p. 43
[391] See ECB (2012), p. 43
[392] Proposal for a Directive of the European Parliament and of the Council on payment services in the internal market and amending Directives 2002/65/EC, 2013/36/EU and 2009/110/EC and repealing Directive 2007/64/EC [COM/2013/0547 final - 2013/0264 (COD)]
[393] Ibid, Article 2 par. 2
[394] See the Directive (EU) No. 2014/65 of the European Parliament and of the Council of 15 May 2014, published at the Official Journal of the EU at 12.6.2014, L 173/349 (MiFID 2)
[395] See MiFID 2, Recital 7
[396] Ibid, Recital 31
[397] Ibid, Recital 1
[398] See Shcherbak (2014)
[399] See the Directive (EC) No. 2000/31of the European Parliament and of the Council of 8 June 2000 on certain legal aspects of information society services, in particular electronic commerce, in the

ISS, the ECD refers to the ISS Directive[400] which, in turn, designates an ISS as 'any service normally provided for remuneration (criterion 1), at a distance (criterion 2, meaning that the service is provided without the parties being simultaneously present[401]), by electronic means (criterion 3)[402] and at the individual request of a recipient of services (criterion 4)'[403]. Concerning the second and third criteria, Bitcoin seems to meet them. Yet, Bitcoin scheme is publicly accessible and is not provided as a service for remuneration, and is not a centralised system where a user requests to be offered services. Thus, the ECD, as well as the ISS Directive are not also applicable.

3.3.1.B. *The 2015 ECB Report as a follow-up to the 2012 ECB Report highlighting the remarks*

Obviously the ECB could not be uninterested in the case of Bitcoin scheme, considering advisable to strive for a common understanding and, thereafter, to formulate a coordinated response. Thus, in October 2012 the ECB took into account the resemblance of virtual currencies such as Bitcoin scheme to fiat money and conventional payment systems, carrying out thereof a detailed analysis, especially in view of its role as a catalyst for payment systems and its oversight role and making a first formal attempt to discuss the issue on a European basis.

The ECB's 2012 Report on Virtual Currency Schemes briefly analysed the legal status of Bitcoin under EU legislation, after outlining the basic innovative features of decentralised cryptocurrencies and the function of the system that led the European institution to examine the underlying technology of virtual currencies such as Bitcoin and inform the EU member states and the EU citizens. The ECB 2012 Report includes two case studies of the virtual currencies Bitcoin and Linden Dollar (of the Second Life virtual community). Based on its findings, it proceeds to discuss the relevance of such private unregulated (at least at the time being) currency schemes for central banks, published as an official view of the ECB.

However, the ECB has recently released another cryptocurrency paper, expanding on its 2012 Report and offering analysis on the current state of the digital currency space and doing the proper update to 2012 Report. The new ECB Report titled 'Virtual currency schemes – a further analysis' and published on February 2015, does not regard Bitcoin as money/currency, but classifies digital currencies as 'digital representations' of value. The 2015 Report did outline the basics working principles behind digital currencies, a good portion of it: outlined current and potential future issues that cryptocurrencies may pose to member states of the EU,

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Internal Market ('Directive on electronic commerce') , Official Journal L 178 , 17/07/2000 P. 0001 - 0016

[400] See the Directive (EC) No. 98/34 ('ISS Directive') of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (OJ L204/37)

[401] See the ISS Directive, Article 1 par. 1 point 2

[402] Ibid, meaning the service is sent initially and received at its destination by means of electronic equipment for the processing […] and storage of data, and entirely transmitted, conveyed and received by wire, by radio, by optical means or by other electromagnetic mean

[403] Ibid

and the ECB itself. The Report concluded that – as long as cryptocurrencies are not widely used, their impact will be minimal.

The ECB is well aware of virtual currencies and as the 2015 Report specifically stated: 'Eurosystem central banks will keep monitoring the developments of virtual currencies, particularly as regards their issued volumes and their interactions with the real world'. This response related to the growth of Bitcoin scheme and similar virtual currencies is mainly justified by the supervisory tasks recently assigned to ECB[404]. The 2012 Report did not cover the prudential supervision of credit institutions, as this was not yet an integral part of the tasks of the ECB. Hence, today the ECB, in its supervisory role, is in a position to monitor the extent to which the financial institutions it supervises, are involved with virtual currencies, and in these cases assess the risks that these activities entail for them[405].

3.3.1.C. *The 2014 EBA Opinion proposing a regulatory framework and the 2015 technical paper*

One of the tasks of the European Banking Authority (hereinafter 'the EBA'), in accordance with Article 9 of its founding regulation, is to monitor new and existing financial activities and to adopt guidelines and recommendations with a view to promoting the safety and soundness of markets and convergence in regulatory practice. In addition, a legal basis for involvement of the agency to the matter could be found in Article 1(3) that mandates the EBA to act in the field of activities of credit institutions, financial conglomerates, investment firms, payment institutions and e-money institutions in relation to issues not directly covered in the Capital Requirements Directive, Payment Services Directive and the E-Money Directive. Therefore, producing a guidance document in June 2014 titled 'The EBA Opinion on Virtual Currencies', the European standard-setting body outlined the risks and potential benefits of virtual currencies such as Bitcoin scheme. The Opinion is a follow-up to the EBA Warning[406] to consumers on virtual currencies and to the EBA Consumers Trends Report of February 2014 that raised the question of whether virtual currencies ought to be regulated and announced that the agency intended to establish a cross-sector task force to examine this issue.

In the Opinion, based on its analysis, the EBA concluded to the proposal of regulatory approaches in order to address risks derived from the usage of virtual currencies such as Bitcoin. First, as an immediate response, the EBA addressed the Opinion on the new generation of decentralised virtual currencies to the EU Council, the Commission and the European Parliament setting out the components that a regulatory approach to virtual currencies should include and proposing the establishment of new legislation or amendment of existing legislation to establish those aspects of the regulatory regime proposed that are not already established in European Law. The Opinion was also addressed to national supervisory authorities (NSAs) recommending the discouragement of financial institutions from the usage of VCs while no regulatory regime is in place. Moreover, it recommends that EU legislators should consider declaring virtual currency exchanges as 'obliged entities' that must comply

[404]See the Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the (micro-) prudential supervision of credit institutions (SSM Regulation)
[405] See ECB (2015), p. 28
[406] Issued on December 2013, highlighting the possible risks a consumer may face when buying, holding or trading virtual currencies such as Bitcoin scheme.

with AML/CFT requirements set out in the EU Anti-Money Laundering Directive[407]. In general, the EBA is aiming to build a common supervisory culture and practice across the EU, and ensure there are uniform procedures and consistent approaches throughout[408]. However, European legislators did not follow the EBA's recommendation about obliged entities in the Anti-Money Laundering Directive (AMLD4).

On the other hand, according to the EBA, the appropriate response would require a substantial body of regulation, some components of which would be unprecedented, perhaps untested and in need of further development/assessment and of resources for enforcement[409]. In essence, it is a long-term regulatory approach proposed by EBA that includes the following: (i) the creation of a non-governmental entity called the 'scheme governance authority' establishing and governing the rules for the use of a particular VC scheme; (ii) compliance of exchanges, and any other non-user market participants that interact with fiat currencies with customer due diligence (CDD) requirements, aiming to mitigate the risks arising from anonymity; (iii) the set of fitness and probity standards concerning market participants; (iv) the mandatory incorporation of each VC market participant as legal person[410]; (v) transparent price formation and requirements against market abuse for exchanges; (vi) authorisation and corporate governance; (vii) capital requirements for market participants, in order to ensure the sufficiency of funds in terms of meeting their financial obligations; (viii) separation of client accounts; (ix) evidence of secure IT systems; (x) legal provision of payment guarantee and refunds; (xi) separation of virtual currency schemes from conventional payment systems, in order to safeguard financial soundness and settlement obligations of the regulated financial entity. It is worth mentioning that the study also recognises that Bitcoin is a global network, requiring 'global', clear and transparent regulatory response[411].

Finally, the EBA published another paper as a response-examination of virtual currencies in May 2015 ('Cryptotechnologies, a major IT innovation and catalyst for change'). This working paper happens to be more technical and analyses the matter in depth that is out of the scope of this dissertation. However, it is an additional initiative of the regulatory agency that should not be overlooked.

3.3.2. The 2015 FATF Guidance on risk-based approach as an update to the 2014 FATF Report and recommendations for virtual currency schemes pertaining to AML/CFT risks

As explained in a previous section of this paper[412], virtual currency payment products and services (VCPPS) such as Bitcoin scheme present money laundering and terrorist financing (ML/FT) risks. The FATF, as an international body that sets standards for anti-money laundering and combating terrorist financing, made a first substantial preliminary assessment of these ML/FT risks as a response in the June 2014 Virtual Currencies Report- Key Definitions and Potential AML/CFT Risks. In essence, the 2014 FATF Report is a quick summary of the digital currency system, but, as implied by the title, also looks into the risks that could arise from the technology, as a follow-up to the general 2013 FATF Guidance for a risk-based approach to prepaid cards, mobile payments and internet-based payment services which was somehow the introduction to the then called new payment products and services

[407] Ibid, p. 44
[408] Ibid, p. 45
[409] See EBA (2014), p. 38
[410] So that it could be sued or sue itself.
[411] See EBA (2014), pp. 39-43
[412] See at this paper, pp. 24-43

(NPPS). Furthermore, it presents evidence of fraudulent activities performed via the usage of Bitcoin scheme (related to the notorious Mt Gox scandal) and similar virtual currencies (related to Liberty Reserve).

However, the growing presence of virtual currencies requires a moiré specific risk-based approach to mitigate the potential ill effects. For that reason, the FATF issued a 48-page guidance document in 29th June 2015 titled 'Guidance for a Risk-Based Approach to Virtual Currencies'. It is more extensive and provides ways to help the private sector identify money laundering and terrorist financing risks in the virtual currency area, and for national authorities to develop legal and regulatory frameworks for addressing that risk. To put it differently, part of the staged approach is focusing on the points of intersection that provide gateways to the regulated financial system, in particular, convertible virtual currency exchangers. The Guidance explains the application of the risk-based approach to AML/CFT measures in the virtual currency context identifies the entities involved in virtual currency payment products and services (VCPPS) and clarifies the application of the relevant FATF Recommendations to convertible virtual currency exchangers. Finally, the Guidance provides, among other things, recommendations and encourages member nations to adopt regulations and guidelines similar to those applicable to traditional financial institutions to reduce risk exposure to the banking system. In particular, pertaining to recommendations, the FATF suggests among others that countries need to identify, understand, and assess the country's ML/FT risks and to take action aimed at effectively mitigating those risks and even if a country decides not to regulate virtual currencies with respect to non-ML/TF risks, such as consumer protection, prudential safety and soundness, and network security, it still should take prompt action to identify, assess, and apply a RBA to mitigate the ML/TF risks associated with virtual currencies under the relevant FATF Recommendations[413]. Furthermore, the 2015 FATF Guidance recommends that countries may consider developing national coordination mechanisms that facilitate appropriate risk-based AML/CFT regulation and supervision across various VC products and services[414]. Moreover, Recommendations direct countries to register or license natural or legal persons that provide MVTS in the country, and ensure their compliance with the relevant AML/CFT measures[415] and to have a range of effective, proportionate and dissuasive sanctions (criminal, civil or administrative) available to deal with natural or legal persons that fail to comply with the applicable AML/CFT requirements[416].

3.3.3. Bitcoin scheme and similar virtual currencies within the reach of IMF

The International Monetary Fund (hereinafter 'the IMF') drafted a 'Monetary and Financial Statistics Manual & Compilation'. The document has a 'Draft' watermark and a meta-data creation date of June 26, 2014. Chapter No 4 of the manual is entitled 'Classification of Financial Assets and Liabilities' which includes in part classifications of 'Monetary Gold and Special Drawing Rights' and 'Currency and Deposits'. Under 'Currency and Deposits' it is stated that 'not all electronic payments involve electronic money; for instance, credit cards or debit cards are not electronic money because no monetary value is stored on them; and store cards or internet-based currency (such as Bitcoin scheme) are not electronic money because these are not widely accepted as a medium of exchange'. Moreover, it is assumed that Bitcoin also does not meet the definition of a currency as it is not issued or authorised by a central bank or government.

[413] See FATF (2015), pp. 7-8
[414] Ibid, p. 9
[415] Ibid, p. 10
[416] Ibid

Even though the IMF's reference to virtual currencies does not have the strength and dynamics of the other responses aforementioned, it is discussable that the IMF can be used to counter the threat posed by Bitcoin and similar virtual currency schemes. The reasons are that the IMF is an organisation specifically designed in order to stabilise the global economic system via the foreign currency exchange and regulating Bitcoin falls squarely within the IMF's goals, as outlined by Article 1 of the Articles of Agreement[417].In both of these respects, the IMF could be able to coordinate a global response[418].

[417] In particular, the purposes of the IMF are (i) To promote international monetary cooperation through a permanent institution which provides the machinery for consultation and collaboration on international monetary problems; (ii) To facilitate the expansion and balanced growth of international trade, and to contribute thereby to the promotion and maintenance of high levels of employment and real income and to the development of the productive resources of all members as primary objectives of economic policy; (iii) To promote exchange stability, to maintain orderly exchange arrangements among members, and to avoid competitive exchange depreciation; (iv) To assist in the establishment of a multilateral system of payments in respect of current transactions between members and in the elimination of foreign exchange restrictions which hamper the growth of world trade; (v) To give confidence to members by making the general resources of the Fund temporarily available to them under adequate safeguards, thus providing them with opportunity to correct maladjustments in their balance of payments without resorting to measures destructive of national or international prosperity; (vi) In accordance with the above, to shorten the duration and lessen the degree of disequilibrium in the international balances of payments of members.

[418] See Plassaras (2013), pp. 19-21

CHAPTER 4
CONCLUDING REMARKS

4.1. An overall assessment of the initiatives related to the establishment of a legal basis for Bitcoin scheme and considerations on its potential to become a supranational currency

As presented within this dissertation, national authorities have been the first to take initiatives in order to inform or warn, evaluate and/or define Bitcoin scheme. This new web-generated decentralised currency scheme is such a rapidly changing technological environment that governments should be updating their responses to cryptocurrencies almost daily. The majority of actions or reactions in the context of national jurisdictions might be characterised as mediocre. National authorities' decisions are somehow expecting supranational responses preferring to comply with standards which will be common. Perhaps this might be a way to set out a regime - if a regime will be set out at last - which will be broad, outcomes focused, technology neutral and future proof to the extent possible.

However, the EBA's, the FATF's and the ECB's approaches and mainly their recent papers published in 2014-2015 were much more focused to the core, notwithstanding the fact that a substantial movement towards the establishment of a legislation especially in respect of the EU has not been expressed yet. Furthermore, the majority of warnings, guides, statements or clarifications did remain predominately at evaluating the negative aspects of the usage of virtual currencies. The pioneering aspects of this new form of payment and depository even at their current stage provide a variety of insights about market design and the behaviour of buyers and sellers. The digital currency revolution is already happening in deposit taking, online trading, mobile payments, and merchant processing; Bitcoin scheme is an ingenious digital artefact which might be helpful in terms of technical know-how for conventional banking systems. The legacy of the Bitcoin experience should be that we move toward a system of stable economic units of measurement, a system empowered by sophisticated mechanisms of electronic payment[419].

In particular, the described scheme as being is a technology that could make existing systems 'redundant'. According to Johann Palychata of BNP Paribas (2015), it is in fact primarily a disruptive open source technology for the financial world. Bitcoin is therefore sometimes called the 'internet of money'. Its core is the first successful attempt for a secure and decentralised register and it should be considered as an important invention. For that reason, it is sure that conventional payment systems and banking technology could be improved and move a step forward whether their experts would be based on the design of the Bitcoin scheme and novel system of decentralised cryptocurrencies. New banking technology and innovation will develop the 'traditional' features offering ingenious opportunities for clients; large multinationals and financial institutions could incorporate its decentralised technology into their payment and database systems. Furthermore, if applied widely to the inner workings of our global economy, this model could slash trillions in financial fees; computerise much of the work done by payment processors, government property-title offices, lawyers and accountants; and create opportunities for billions of people who do not

[419] See Schiller's article (2014) on New York Times website at the following link: http://www.nytimes.com/2014/03/02/business/in-search-of-a-stable-electronic-currency.html?_r=0

currently have bank accounts[420]. In case of the practice of law, the blockchain technology which was launched by Bitcoin scheme will however change the way of approaching contracts and enforcement among other aspects of the practice. In the future, transactional lawyers may draft contracts that reseble how developers code software applications[421]. In fact, future lawyers will likely need basic-to-intermediate training in coding in order to implement smart contracts based on blockchain and understand the intricacies of how these systems work[422]. If Bitcoin thus becomes an ubiquitous if largely invisible part of the world economy, many believe that its price will rise[423]. Based on this aspect, regulators should consider the contribution of the innovation and its general good, apart from focusing solely on the perils, as mentioned earlier.

On the other hand, the future role of Bitcoin scheme as a supranational currency is ultimately hypothetical and meaningless at this moment. Several economists are quite certain about the bubble effect caused by the volatile pricing and supply cap of Bitcoin scheme, characterising it as an experimental currency. In the context of legal ambiguity, the future is uncertain; each country regards Bitcoin differently and regulations are constantly evolving while international and European institutions and bodies are monitoring and assessing the situation. However, there is an increasing expectation that regulators provide security for Bitcoin use or storage and clarity on Bitcoin laws. Money laundering, terrorist financing, consumer and other risks related to an unregulated payment system should be the motives for a complete, specific, certain and definite regulatory response at the outset. Yet legal tender – the special status the government can give to certain forms of money in its jurisdiction meaning that this money is recognised by law as valid for meeting a financial obligation- is a controversial issue that the authorities have to deal with, even though legal tender is variously defined in different jurisdictions. While openness and innovation should be facilitated, one should not sacrifice the good to the perfect or the future to the present by seeking simply to maintain a tenuous technological status quo in the face of inexorable pressure to change. Rather, legislators should establish the principles that will blunt the most unappealing features of a more locked-down technological future while acknowledging that unprecedented and, too many who work with information technology, genuinely unthinkable boundaries could likely become the rules from which we must negotiate exceptions[424]. The certain is that Bitcoin will continue to coexist with all national currencies at least in the next years, offering a global, non-national alternative to people everywhere. No digital currency will soon dislodge the hard currencies, but Bitcoin is not a currency. It is a radically new, decentralised system for managing the way societies exchange value. It is, quite simply, one of the most powerful innovations in finance.

4.2. Final remarks

Bitcoin scheme is unique not because it is a virtual currency, but because it is proof of concept of a decentralised non-issued electronic currency that has no legal tender but has grown as a technological phenomenon during the last five years. Bitcoin is the novel virtual

[420] See Casey and Vigna (2015) on The Wall Street Journal website at the following link: http://www.wsj.com/articles/the-revolutionary-power-of-digital-currency-1422035061

[421] For example, Honduras has already committed to replacing existing real estate records with blockchain (the Bitcoin one) technology, which one day will allow for its citizens to sell or buy a house via a mobile application.

[422] See Dewey and Amuial's article (2015) on Big Law Business-Legal Communities of Bloomberg website at the following link: https://bol.bna.com/blockchain-technology-will-transform-the-practice-of-law/

[423] Ibid

[424] See Zittrain (2006), pp. 1977-1978

currency that has triggered with the proliferation of Internet and has the potential to be a significant player in the micropayment and virtual world commerce markets, in spite of the fact that it is not legally accepted by all jurisdictions. It has no connection with central authorities or central issuer and intermediaries; users can easily hold, buy and sell bitcoins in an exchange rate that is based on the popularity and acceptance of the scheme. Its fundamental characteristics are the innovative features of decentralisation as already stated and of cryptography, which allows the performance of transactions in anonymity/pseudonymity promptly and with zero or low fees, as well as the mining which is the process of creating new units of Bitcoin via users/volunteers; the miners. This work outlined the advantages and potential benefits of Bitcoin's usage, but also the risks that arise and create controversy around Bitcoin and the other decentralised virtual currency schemes, highlighting especially the financial crime or the consumer insecurity.

This last aspect as showed in this dissertation is the one that motivated national authorities as well as the ECB, the EBA and the FATF, to monitor and evaluate the situation in order to publish guidelines for users and consumers. The question whether Bitcoin scheme should be or could be regulated, is an issue which continues to exist and is assessed by regulatory authorities and standard-setters. At this moment, under the existing legal and pragmatic framework, regulation of virtual currencies is at a very early stage and most regulatory regimes are not well or properly designed to cater for this type of payment system.

B I B L I O G R A P H Y

PRIMARY SOURCES

European Law

1. Regulations

Regulation (EU) No. 795/2014 of the European Central Bank of 3 July 2014 *on oversight requirements for systemically important payment systems* (ECB/2014/28, OJ L 217, 23.7.2014, pp. 16-30)

Regulation (EU) No 1024/2013 of 15 October 2013 conferring specific tasks on the European Central Bank concerning policies relating to the (micro-) prudential supervision of credit institutions (SSM Regulation) (OJ L 287, 29.10.2013, p. 63)

Regulation (EU) No 260/2012 of the European Parliament and of the Council of 14 March 2012 *'establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation (EC) No 924/2009*' (OJ L 94, 30.03.2012, pp. 22-36)

2. Directives

Directive (EU) No. 2014/65 (MiFID 2) of the European Parliament and of the Council of 15 May 2014 *on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU(recast)* (OJ L 173, 12.6.2014)

Directive 2009/110/EC of the European Parliament and of the Council of 16 September 2009 *'on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC'* (OJ L 267, 10.10.2009, pp. 7-17)

Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 *on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC* (OJ L 319, 5.12.2007, pp. 1-36)

Directive 2005/60/EC of the European Parliament and of the Council of 26 October 2005 *on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing* (OJ L 309, 25.11.2005, pp. 15-36)

Directive (EC) No. 2000/31of the European Parliament and of the Council of 8 June *2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market ('Directive on electronic commerce')* (OJ L 178 , 17/07/2000, pp. 1 -16)

Directive (EC) No. 98/34 of the European Parliament and of the Council of 22 June 1998 *laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services* (OJ L 204)

3. Decisions

Council Framework Decision of 13 June 2002 *on combating terrorism (*2002/475/JHA, OJ L 164, 22.06.2002, pp. 3-7)

4. EU case law

Case C-264/14 (2014/C 245/09), Request for a preliminary ruling from the Högsta förvaltningsdomstolen of Sweden lodged on 2 June 2014 — Skatteverket v David Hedqvist, (OJ L C 245/7, 28.7.2014)

Other

Autorité de Contrôle Prudentiel et de Résolution – ACPR (2014), Communiqué de presse de l' ACPR aux operations sur Bitcoins en France

Bundesanstalt für Finanzdienstleistungsaufsicht – BaFin (2013), Annual Report

Banco Central de Bolivia (2014), Producion de Directorio No 144

Bank of England (2014a), The economics of digital currencies, Quarterly Bulletin Q3

Bank of England (2014b), Innovations in payment technologies and the emergence of digital currencies, Quarterly Bulletin Q3

Bank of Finland (2014), Bitcoin involves risks

Banque de France (2013), Les dangers liés au développements des monnaies virtuelles: l' exemple de Bitcoin

CPSS (CPMI)-World Bank Forum (2012), Report on Retail Payments

Danmarks Nationalbank (2014), Report on Virtual Currencies

European Banking Authority (2014), Opinion on Virtual Currencies (EBA/Op/2014/08)

European Central Bank (2015), Report on Virtual Currency Schemes- a further analysis

European Central Bank (2012), Report on Virtual Currency Schemes

Europol (2014), The Internet organised crime threat Assessment (IOCTA)

Financial Action Task Force (2015), Guidance for a Risk-Based Approach to Virtual Currencies

Financial Action Task Force (2014), Report on Virtual Currencies – Key Definitions and Potential AML/CFT Risks

Financial Market Supervisory Authority(2014), Fact Sheet on Bitcoins

International Monetary Fund (2001), Financial System Abuse, Financial Crime and Money Laundering— Background Paper

New York State Department of Financial Services (2013), Public Order In the matter of virtual currency exchanges

Proposal for a Directive of the European Parliament and of the Council of 2013 on payment services in the internal market and amending Directives 2002/65/EC, 2013/36/EU and 2009/110/EC and repealing Directive 2007/64/EC (COM/2013/0547 final - 2013/0264 COD)

Proposal for a Directive of the European Parliament and of the Council of 2013 on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing (COM/2013/045 final - 2013/0025 COD)

République Francaise (2014), Regulating Virtual Currencies/Recommendations to prevent virtual currencies from being used for fraudulent purposes and money laundering

Reserve Bank of India (2014), RBI cautions users of virtual currendcies against risks

Sénat de Bélgique (2013), Question écrite No. 5-8723 de Martin Tallinan du 16 avril 2013 au Ministre de Finances

U.S. Securities and Exchange Commission's Investor Alert (2013) on Ponzi Schemes, No. 153/7/13

SECONDARY SOURCES

B

Baczynska, G. (2014): Russian authorities say Bitcoin illegal, Reuters, 9 February 2014, available at the following link http://www.reuters.com/article/2014/02/09/us-russia-bitcoin-idUSBREA1806620140209

Banking Tech, The (2015): The Irresistible Rise of Real Time Payments, 19 May 2015, available at the following link http://www.bankingtech.com/298351/the-irresistible-rise-of-real-time-payments/

Beer, C. and B. Weber (2015): Bitcoin- The Promise and Limits of Private Innovation in Monetary and Payment Systems, Monetary Policy and the Economy, Q4/2014, pp. 53-66

Birch, D. (2011): Bits in pieces, Prospect Magazine, Issue of August 2011, United Kingdom, also available at the following link http://www.prospectmagazine.co.uk/science-and-technology/bitcoin-economist-new-york-times-currency-mining

Boston Consulting Group (2012): Adapt and Adopt: Governments' role in Internet policy

Brito, J. and A. Castillo (2013): Bitcoin, A primer for policymakers, Mercatus Center, George Mason University, Virginia, USA

C

Castrovova, E. (2002): On virtual economies, CESifo Working Paper Series, No, 752

Chang, L. (2015): The Bitcoin was just recognized as an official commodity by the CFTC, Digital Trends, 20 September 2015, available at the following link http://www.digitaltrends.com/business/cftc-defines-bitcoin-as-commmodity/

Chen, A. (2011): The Underground Website Where You Can Buy Any Drug Imaginable, Gawker, 6 January 2011, available at the following link http://gawker.com/the-underground-website-where-you-can-buy-any-drug-imag-30818160

Chu, P. (2008): Virtual currency and taxation issues, E-Commerce Law and Policy, November 2008

Clifford and Chance LLP (2014): Memorandum – Bitcoins: An Overview, 6 January 2014

Coase, R.H. (1960): The Problem of Social Cost, Journal of Law and Economics, Vol. 3, pp. 15-16

Cohen, B. (2004): The Future of Money, Princeton University Press, Princeton, New Jersey, USA, pp. 1-7

Cosco, J, (2014): Bitcoin Is Actually Illegal In California, But That Could Change Soon, Business Insider, June 2014, available at the following link http://www.businessinsider.com/bitcoin-llegal-in-california-2014-6

Credit Agricole (2014): Macro-Insight-Bitcoin, Markets and Investment Solutions, Issue 25, September 2014

D

Dewey, J. And S. Amuial (2015): Blockchain Technology will transform the practice of Law, Big Law Business- Legal Communities, Bloomberg BNA, 25 June 2015, available at

the following link: https://bol.bna.com/blockchain-technology-will-transform-the-practice-of-law/

Dourado, El. (2014): Bitcoin isn't Money—It's the Internet of Money, The Ümlaut, 8 January 2014, available at the following link https://theumlaut.com/2014/01/08/bitcoin-internet-of-money/

E

Economist, The (2011): Virtual currency Bits and Bob, 16 June 2011

Economist, The (2014): Bitcoin's future: Hidden flipside, available at the following link: http://www.economist.com/news/finance-and-economics/21599054-how-crypto-currency-could-become-internet-money-hidden-flipside

Ehrenfreud, M. (2013): Cypriot banks to reopen amid criticism of bailout, Washington Post, 27 March 2013, available at the following link http://www.washingtonpost.com/business/cypriot-banks-to-reopen-amid-criticism-of-bailout/2013/03/27/dd56757c-96e1-11e2-b68f-dc5c4b47e519_story.html

G

Goodale, Gl. (2013): The Rise of Bitcoin: Is it a Solution or a Menace?, Business Insider, 23 November 2013, available at the following link http://www.businessinsider.com/rise-of-bitcoin-2013-11

Graham, T., Bell, E. and N. Elliot (2003): Money Laundering, Butterworths Compliance Series, Reed Elsevier, United Kingdom

Greco, T.H. (2001): Money: Understanding and Creating Alternatives to Legal Tender, White River Junction, Chelsea Green Publishing Company, Vermont, USA

Greenberg, A. (2011): Cryptocurrency, Forbes, 9 May 2011, p. 40

Grinberg, R. (2012): Bitcoin, an innovative alternarive digital currency, Hastings Science and Technology Law Journal

H

Hargreaves, S. (2013): Bitcoin prices surge post-Cyprus bailout, CNNMoney, March 2013, available at the following link http://money.cnn.com/2013/03/28/investing/bitcoin-cyprus/

Hazou, E. (2014): Central Bank says Bitcoin is not illegal, Cyprus Mail, 26 February 2014, available at the following link http://cyprus-mail.com/2014/02/26/central-bank-says-bitcoin-is-not-illegal/

J

Jeffries, A. (2013): After Silk Road's demise, online drug dealing moves to new sites, The Verge, 4 October 2013, available at http://www.theverge.com/2013/10/4/4799770/drug-dealers-set-up-mini-silk-roads-after-federal-bust

K

Kaplanov, N. (2012): Nerdy Money: Bitcoin, the private digital currency and the case against its regulation, Temple University Legal Studies Research Paper, Temple Law Review, March 2012, USA

Kien, M. and M. Ly (2014): Coining Bitcoin's Legal Bits: Examiningthe regulatory framework for Bitcoin and Virtual Currencies, Harvard Journal of Law and Technology, Volume 27, No. 2, Spring 2014, pp. 588-608

KPMG (2014): Virtually Unregulated - Countering Virtual Currency Money Laundering in the 21st Century, October 2014

Krugman, P. And R. Wells (2006): Economics, Worth Publishers, New York, USA

L

Law Library Congress, The (2014): Regulation of Bitcoin in Selected Jurisdictions, January 2014

Latham and Watkins LLP (2015): Client Alert Commentary: Regulatory Notes on Bitcoin and other cryptocurrency derivatives, No. 1838, June 2015

Lloyd's (2015): Emerging Risk Report: Bitcoin – Risk Factors for Insurance, Innovation Series, p. 7

M

Mandravelis, V. (2015): Capital controls caused increase of Bitcoin transactions, Kathimerini, 9 July 2015, available at the following link http://www.kathimerini.gr/822812/article/oikonomia/ellhnikh-oikonomia/ay3hsh-synallagwn-me-bitcoin-eferan-ta-capital-controls

Mankiw, G. (2008): Principles of Macroeconomics, South-western Cengage Learning, Mason, Ohio, USA, pp. 338-339

Mankiw, G. (2014): Principles of Economics, South-western Cengage Learning, Mason, Ohio, USA, p. 220

Marian, O. (2015): A conceptual framework for the regulation of cryptocurrencies, University of Chicago Law Review Dialogue 53

Marian, O. (2013): Are cryptocurrencies Super Tax Havens?, Michigan Law Review, No. 112

Mason, P. (2015): Can a Bitcoin-style virtual currency solve the Greek financial crisis?, The Guardian, 22 February 2015, available at the following link http://www.theguardian.com/commentisfree/2015/feb/22/can-a-parallel-digital-currency-solve-the-greek-financial-crisis

Matonis, J. (2013): Bitcoin Casinos Release 2012 Earnings, Forbes, 22 January 2013, available at the following link http://www.forbes.com/sites/jonmatonis/2013/01/22/bitcoin-casinos-release-2012-earnings/

Matonis, J. (2012a): As inflation rages in Iran, Bitcoin software not available, October 2012, available at http://www.forbes.com/sites/jonmatonis/2012/10/09/as-inflation-rages-iniran-bitcoin-software-not-available

Matonis, J. (2012b): Bitcoin prevents monetary tyranny, Forbes, October 2012, available at the following link http://www.forbes.com/sites/jonmatonis/2012/10/04/bitcoin-prevents-monetary-tyranny/

Matthews, C. (2015): Bitcoin's Argentina 'revolution': No reason to be bullish on bitcoin, Fortune, 4 May 2015, available at the following link http://fortune.com/2015/05/04/bitcoin-argentina/

Mittal, S. (2012): Is Bitcoin Money? Bitcoin and alternatice theories of money, Harvard University Law School, April 2012

N

Nakamoto, S. (2008): Bitcoin: A peer-to-peer Electronic Cash System, available at https://bitcoin.org/bitcoin.pdf

O

Ogunbandewa, A.A. (2014): The virtues and Risks Inherent in the Bitcoin Virtual Currency, University of Wales System - Cardiff Law School, Social Science Research Network, April 2014

P

Plassaras, N. (2013): Regulating digital currencies: Bringing Bitcoin within the reach of imf, Chicago Journal of International Law

Popper, N. (2015): Bitcoin Exchange receives First Licence in New York State , The New York Times, May 2015, available at the following link http://www.nytimes.com/2015/05/08/business/dealbook/bitcoin-exchange-receives-first-license-in-new-york-state.html

PriceWaterhouseCoopers (2014): Virtual Currencies – out of the deep web into the light, March 2014

R

Ramasastry, A. (2014): Bitcoin: if you can't ban it, should you regulate it? – The merits of legalisation, Verdict - Legal Analysis and Commentary

Rheingold, H. (1993): A slice of life in my virtual community, In L.M. Harasim (Ed.), Global networks: Computers and international communication, MIT Press, London, United Kingdom, p.58

Rubenfeld, S. (2014): Canada enacts Bitcoin regulations, Risk and Compliance Journal, Wall Street Journal, February 2014, available at the following link http://blogs.wsj.com/riskandcompliance/2014/06/23/canada-enacts-bitcoin-regulations/

S

Salmon, F. (2013): The Bitcoin Bubble and the Future of Currency, Medium, April 2013, available at the following link https://medium.com/@felixsalmon/the-bitcoin-bubble-and-the-future-of-currency-2b5ef79482cb

Salyer, K. (2013): Ponzi-Scheme Charge Is Good News for Bitcoin, Bloomberg, 7 August 2013, available at the following link http://www.bloombergview.com/articles/2013-08-07/ponzi-scheme-charge-is-good-news-for-bitcoin

Shapiro, A. (2013): The way forward for Digital Currencies, Promontory Sightlines In Focus, 18 September 2013

Shcerbak, S. (2014): How should Bitcoin be Regulated?, European Journal of Legal Studies, European University Institute, Issue 15, Volume 7, Spring-Summer 2014

Smith, J. (2013): How Bitcoin Sales Of Guns Could Undermine New Rules, Huffington Post, 15 April 2013, available at http://www.huffingtonpost.com/2013/04/15/bitcoin-guns_n_3070828.html

Surowiecki, J. (2011): Cryptocurrency- The Bitcoin, MIT Technology Review, 114

T

Tolkachev, A. and K. Osipova (2013): Possibilities and risks of using Bitcoin in Russia, ATPLaw.ru

Tu, K. and M. Meredith (2015): Rethinking Virtual Currency Regulation in the Bitcoin Age, Washington Law Review, Vol. 90, p. 271-347

Turpin, J. (2014): Bitcoin - The Economic case for a Global, Virtual Currency operating in an unexplored Legal Framework, Indiana Journal of Global Legal Studies, Vol. 21, Issue 1, Article 13, Winter 2014, pp. 335-368

V

Vigna, P. (2014): NY Financial Regulator Releases Draft of 'Bitlicense' for Bitcoin Businesses, The Wall Street Journal, 17 July 2014, available at the following link http://blogs.wsj.com/moneybeat/2014/07/17/ny-financial-regulator-releases-draft-of-bitlicense-for-bitcoin-businesses/

W

Wallace, B. (2011): The Rise and Fall of Bitcoin, Wired Magazine, 23 November 2011, available at the following link http://www.wired.com/2011/11/mf_bitcoin/

White, A. (2014): Bitcoin Tax-Free Transactions Face Test at Top EU Court, Bloomberg, 30 July 2014, available at the following link http://www.bloomberg.com/news/print/2014-07-30/bitcoin-tax-free-transactions-face-test-at-top-eu-court.html

Z

Zittrain, J. (2006): The Generative Internet, Harvard Law Review, Vol. 119, p. 174

Useful websites:

https://blockchain.info/
http://www.coindesk.com
https://en.bitcoin.it
http://eur-lex.europa.eu/
http://www.eba.europa.eu
http://www.ecb.europa.eu
http://www.europa.eu
http://www.fatf.org
http://www.oecd.org/
http://yanisvaroufakis.eu/
http://99bitcoins.com