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Virtual currency bitcoin in the scope of money definition and store of value

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Abstract

In spite of the fact that a lot of virtual currencies have been created in recent years, bitcoin is the best known from all of them and regularly reported in the news. Currency without identified creator is appreciated by its user for non-centralized running, without any chance of governments to influence the money supply. The advantages of bitcoin, such as very quick payments worldwide, stop of inflations caused by governments trying to solve their own problems or high level of transactions privacy are widely mentioned.

The aim of the article is not to describe the technical issue of bitcoin and explain how this system works, because it has been widely explained in other articles. The aim is focusing on economic aspects of bitcoin, the technical aspects are mentioned only if necessary. For accomplishing the aim the article is split in two parts.

The first part is dedicated to answering the question “What is bitcoin?”. It examines whether bitcoin complies with theoretical, empirical and law definition of money. The law definition of money compliance is done for Czech, German and EU law in general, but attitudes of US and Chinese governments are also mentioned. According to the findings, bitcoin cannot be easily considered as money.

The second part is focused on store of value money function. Better store of value in comparison with fiat currencies should be important advantage of bitcoin. This function examination is based on volatility calculation for bitcoin and other currencies and assets. Comparing of results shows that volatility (and therefore risk) of bitcoin is significantly higher than of other currencies and assets.

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1. Introduction

The virtual currency Bitcoin is one of the striking phenomena of recent years. I have participated in several conferences and meetings focusing exclusively on Bitcoin and listened to the opinions of the participants. Most of these views consider Bitcoin as positive, almost in an exalting way. Bitcoin should represent a decentralized new

currency that is beyond the control of any government. The government can no longer manipulate inflationary with savings of citizens and citizens become free. Due to the anonymity of transactions, tax collection is impossible. The only possibility of funding the state should be crowdfunding, when the people themselves will decide what government project they support. States together will no longer be able to fight in wars, because by disabling of "money printing" they will no longer have the resources to finance wars. Bitcoin is a revolution in remittances, remittances could not be simpler. Bitcoin beats not only companies collecting exorbitant fees for sending money, but seriously threatens the financial intermediation as we know it. Since it is no longer possible to simply create money, it will also make impossible future financial crisis.

I could go on in creating the list of concepts related to Bitcoin. Nevertheless I realized that most of the participants in such meetings are not economists, but computer scientists and technological enthusiasts. It gave me a definite answer to the question why there is so little space devoted to the economic aspects of Bitcoin. In principle, this fact could be explained from two perspectives: Economists either totally missed the onset of revolutionary news on financial markets, or they considered the whole thing as so minor and unrealistic, that they do not feel the need to express their opinions at all. As the time passes, Bitcoin attracts more attention of economists and this article is part of that.

In the following text, I do not intend to deal with technical aspects of Bitcoin and explain, how exactly Bitcoin works. It is really a question more for IT scientists. I want to focus on what Bitcoin is and its aspects as possible and safer store of value.

2. What is Bitcoin?

The question in the headline may seem naive at first glance and the answer is (seemingly) trivial. Bitcoin is usually referred as cryptocurrency, i.e. currency that is encrypted, sometimes as a virtual currency, or more precisely as money and it is in this way that it is perceived by its users and supporters. The first definition, which can be found on portal dedicated to Bitcoin, states "Bitcoin is an innovative payment network and a new kind of money" (bitcoin.org).

2.1. Bitcoin and theoretical definition of money

Answering the question in the form of a clear statement "bitcoin is money" is not entirely unproblematic. The theoretical definition of money considers money as "*any asset that is generally accepted for payment for goods or services, or for debt settlement*" (Revenda et al., 2005, p. 20). In the case of Bitcoin we get inconsistent with the definition with the requirement of general acceptance. Although the rate of Bitcoin usage increases over time, we cannot talk about general acceptance. If we want to argue in favor of Bitcoin, we would have to define the Bitcoin community of users who accept Bitcoin as money. None of us doubts that for example Indonesian Rupiah falls into the category of money, but it is clear that it would be very difficult to purchase something in the Czech Republic (and equally difficult it would be to convert IDR in CZK). Such argument, however, is largely misunderstood due to omission of definition distinction between "money" and "currency". National currency is a form of money (Revenda et al., 2005, p. 28) and therefore we can talk about the general acceptance of the Indonesian Rupiah in Indonesia, the Czech koruna in Czech Republic, but the same cannot be said about Bitcoin, which is not legal tender in any country.

The way out of this definition trap in the form of a clear definition of the users' community seems to be impossible. The community is very open, the user may be virtually anyone who wants. The only common feature is just acceptance of Bitcoin. If we accepted such definition benevolence, virtually anything, what is accepted as a value of exchange by few individuals, could become money.

The second problematic area of Bitcoin in relation to the theoretical definition of money is the perception of money as an asset. If the money for the user is an asset, it is logically implied that the issuer constitutes a liability, obligation, which must be satisfied. Although this is a formal relationship today - in practice it is not possible to require an exchange of issued money for another asset by the central bank – this relationship is displayed in the central bank's balance sheet. Nothing like that is valid for Bitcoin. The new issue of money is (temporarily) the consideration for the service provided in the form of operation of the entire system and the receiver puts received Bitcoin to the side of its

assets, with the missing central authority there is also a missing similar accounting record in the issuer balance sheet. New bitcoins are issued on established algorithms, from formal (accounting) point of view "from nothing".

2.2. *Bitcoin and empirical definition of money*

Contemporary monetary theories use, next to theoretical definition of money, empirical definition because the theoretical definition is limited to legal money too. The aim of the empirical definition of money is to deal with the relationship between quantitative development of money and other macroeconomic variables. Therefore, in addition to the definition of money, it copes with the question what money is and what is not in circulation. In order to monitor the development, monetary aggregates are constructed and they represent the sum of cash with a certain degree of liquidity (Revenda et al., 2005, p. 24).

In the case of Bitcoin, the empirical definition is again in serious trouble. It is clear what is and what is not bitcoin. Given that, Bitcoin is not significantly associated with banking system, there is no such thing as Bitcoin term deposits or securities issued in Bitcoin. Bitcoin can be used at any time and therefore differentiation according to the levels of liquidity is meaningless. Bitcoin can be in terms of liquidity equated to money on current accounts in banks, more precisely with regard to speed of the bitcoins transfers we can talk about a "virtual cash". Bitcoin can therefore be clearly included in M1, but no other bitcoin monetary aggregates exist.

To determine what bitcoins are or are not in circulation is very problematic. Number of issued bitcoins at any given time is known, as is known the total number of bitcoins that will be issued. This does not mean that all existing bitcoins are in circulation. It is not even a matter of possible bitcoin savings, i.e. the amount of money that is not deliberately used (like a standard cash money at home in the mattress). The amount of bitcoin is actually reduced by losses. There could be a destruction of the entire data repository to relevant bitcoin account, or the access is lost. Publicly known is the case of a British man, James Howells, who threw his computer disk wallet containing 7,500 Bitcoin out and then searched for it at the local landfill (Novinky.cz, 2013). If you lose your password, the access to relevant wallet will be lost as well. Bitcoins stored on it are therefore de facto out of circulation. While cash money is renewed by the central authority and the access to the current account can be claimed (and money stored on it can be economically used by the bank), in the case of Bitcoin these rules cannot be applied. It cannot be said how much bitcoin are actually usable in the economy and could be stated that after the end of bitcoin emissions, the number of usable bitcoins is going to be decreased.

2.3. *Bitcoin and law definition of money*

The final definition approach to the money, I would like to mention, is the legal definition. Each country somehow defines legal tender and discussions about the legal status of Bitcoin and other virtual currencies take place both in developed economies (USA, EU, including the Czech Republic) and developing economies (China).

Czech legislation is an example of how bitcoin, by its users undoubtedly considered for money, does not meet criteria for legal category of money. The Czech Payment Services Act defines electronic money by following criteria:

Electronic money is monetary value that

- a) represents a claim to the issuer,
- b) is stored on an electronic means of payment,
- c) is issued against receiving of funds in the value not less than the value of issued electronic money
- d) is accepted as means of payment by persons other than the issuer.

(Payment Services Act, § 15, subsection 2)

Bitcoin does not meet criteria to be included in the category of electronic money. As mentioned above, bitcoin does not represent for issuer a liability in its balance sheet and therefore we cannot talk about bitcoins as a claim of the owner to the issuer. This problem is highlighted by the condition of issuing electronic money against receipt of funds. Such an exchange does not occur at all.

Perceiving bitcoin as electronic money is eliminated by the nature of the publisher. Only banks, foreign banks or their branches, domestic or foreign credit unions or foreign electronic money institutions, electronic money issuers of

small extent or Czech Central Bank can issue electronic money (from legal point of view). The electronic money institutions are allowed to issue electronic money on the basis of the issuance of electronic money agreement (Schlossberger, 2012, p. 144). Bitcoin, a decentralized system without institutional operators cannot fulfill this condition.

What is Bitcoin according to the Czech law? Bitcoin does not meet criteria of any category of money and it is necessary to seek its inclusion among other categories. Bitcoin is not according to Czech law security, which is the second category that comes to mind intuitively, because Bitcoin is similarly traded on stock exchanges. There is not any right associated with Bitcoin that could be represented. There is also the question whether bitcoin is a commodity. It is not possible to connect Bitcoin with any type of consumption as it is common for other commodities. The only possibility is the use for other exchange. Bitcoin cannot be referred as a commodity at all.

The Czech law no. 89/2012 Coll. § 489 defines a thing as everything what is different from the person and serves to satisfy the needs of people. Because of bitcoin having no physical substance, it can be considered as an intangible thing as Czech law stated, which is storable on a tangible medium in electronic form. Another possible definition of Bitcoin according to the Czech law is the inclusion under fee stamps of special kind (fee stamps *sui generis*). Fee stamps are defined as means of payment replacing the money that is acquired by paying the amount equal to their nominal value. Determination of the nominal value of Bitcoin is again a problem. Bitcoin does not have, unlike for example tax stamp, nominal value given in Czech Crowns. From the point of view of common sense we could consider the transaction of bitcoin purchase as money exchange (buying one bitcoin for another bitcoin does not make sense, the direct value against any other currency is not determined, the price is a result of market supply and demand). Therefore bitcoin must be referred as fee stamp of special kind (Vrbíková, 2014, p. 138).

Legal directives and authority statements of relevant institutions keep a distance from Bitcoin. Czech Central Bank statement about Bitcoin explicitly states that trading with Bitcoin does not need permission of Central Bank and is not subject to its supervision. That would happen only in the case of derivatives trading on bitcoins, managing funds investing in bitcoins or the execution of payment transactions in connection with organization of trades with bitcoins, if there is a transfer of cashless money or electronic money between buyers and sellers (this definition does not include transfer of money againsts bitcoins). However, the statement also includes some warning that systematic denial of domestic money as payment for goods and services already meets the definition of a criminal offense. Accepting Bitcoin as payment for goods and services, however, is not a problem.

Methodological guideline of the Financial-Analytical department of the Ministry of Finance about approach of liable persons to digital currencies is engaged in the use of digital currency risk as a tool through which track of transferred funds can be interrupted. The definition of bitcoin is not included and bitcoin is perceived more in terms of its function as a payment system. According to the guideline, any payment in excess of 1 000 EUR is perceived as "very risky" and as a suspicious transaction and each transaction with a value higher than EUR 15 000 must be reported (Financial-Analytical dept., 2013).

Recognition of Bitcoin as money in German law is a result of a misunderstanding of German legal specifics. Bitcoin is not recognized in Germany as legal tender or a foreign currency. Bitcoin only meets the criteria of "accounting unit". "Accounting unit" is specific to German law comparable with foreign exchange but with the difference that it is not recognized as a legal means of payment. In this category, values, that serve as private means of payment, which are used in private contracts as means of payment for a specific group of users, are included. It can be therefore referred to bitcoins as "private money." Such classification is a compromise and probably best reflects the nature of use of Bitcoin. At the same time, however, this inclusion implies the need to pay sales tax when trading with Bitcoin (Deutscher Bundestag, 2013, p. 49).

Due to the reflection of European law into Czech law it is not surprising that bitcoin does not meet the definition criteria of electronic money according to European directive on electronic money (2009/110/EC) from the same reasons as in Czech law. Another relevant directive for bitcoin classification may be the Payment Services Directive (2007/64/EC). This directive is dependent on the definition of the electronic money directive and due to this reason the bitcoin gets again out of its definition range. Even on the European level, bitcoin remains outside the category of money and officially it is not categorized with unclear status (ECB, 2012, p. 43). The European Central Bank defines

the virtual currency in its analysis as "*a kind of unregulated digital money, which is subscribed and usually controlled by their developers, and used and accepted by the specific virtual community*" (ECB, 2012, p. 13). However, this is not the official legal definition, but only conceptual clarification. In terms of the ECB definition bitcoin belongs into the category of virtual currency schemes with bidirectional flow. This reflects the fact that legal tender can be exchanged for bitcoin and vice versa, and can be used to purchase goods and services in the real economy (ECB, 2012, p. 14).

The result of the ongoing discussion on the categorization of bitcoin in USA is its designation as "property". As a result of this categorization, American property taxes must be paid. In the USA even mining of bitcoins is regulated, for which is Money Transmitting Licence required. Even in the USA bitcoin is not considered as money (Vrbíková, 2014, p. 137).

Clear statement to bitcoin could be found in Chinese law in the document called Notice on Precautions Against the Risks of Bitcoins issued in December 2013. Bitcoin is defined as "a virtual commodity" and its inclusion in the money category is explicitly excluded together with its use as money. Chinese banks and payment institutions are prohibited from trading with bitcoins. Bitcoins cannot be used for pricing products and services. Providing of any services directly or indirectly related to bitcoin is also excluded, and it is suggested to strengthen supervision of websites that provide services connected to Bitcoin (The Law Library of Congress, 2014, p. 6).

From the above mentioned it is clear that although bitcoins are intuitively considered as money and mostly it is about bitcoins referred in this way, it is not possible to clearly consider virtual currency as money. In terms of acceptance of bitcoins, the legal status is unclear, to be more precise it is not explicitly addressed. In the case when the legal status is explicitly addressed, bitcoins are excluded as money.

To conclude this section, I consider it appropriate to clarify terminological terms of use of bitcoin, BTC and Bitcoin, in which exists a quite large confusion among the authors and which at the same time is closely related to understanding what bitcoin is. Bitcoin (capital B) refers to the whole protocol, software or community. For the purposes of this article Bitcoin may be considered as payment system. On the other hand, bitcoin refers to currency or units of currency. BTC is then generally used abbreviation to imitate the standard three letter abbreviations of different national currencies (eg. CZK, IDR, EUR) (Bitcoin, 2014).

3. Bitcoin and store of value money function

Functions of money are generally distinguished and accepted. There are only difference how many functions of money are distinguished. Jevons in his book from 1875 "Money and the Mechanism of Exchange" defines four basic functions of money: Medium of exchange, common measure of value, standard of value and store of value. In the current theory of money occur other money functions like information function, investment function etc. (Jedlinský, 2014, p. 49-51).

The necessity to recognize the store of value money function express Jevons with following argument: "*But at times a person needs to condense his property into the smallest compass, so that he may hoard it away for a time, or carry it with him on a long journey, or transmit it to a friend in a distant country.*" (Jevons, 2011, p. 22) Obviously we have better possibilities how to transmit property to a friend in a distant country and using of Bitcoin is one of them. But the need to store property is essential part of economy. People must cope with the fact that their incomes are changing in time and hoard some money in good times for possible future bad times. To buy goods that are more expensive than regular salary implies the function of value storing.

A counter-argument against store of value is made for example by Graham (Graham, 1940) who recognizes only two primary functions of money: money as an accounting unit and money as a bearer of options. All other functions are derived from these primary functions. Graham stated that "*Many other things, easy to store, easy to move, and of reasonable vendibility, provide a more than acceptable substitute for money in this respect.*" (Graham, 1940, p. 2) It does not mean that Graham canceled the store of value function at all. The necessity to hold money remains, but is explained as temporary holding and included under bearer of option function.

Bitcoin supporters criticize fiat currencies for their inflation character. Money ruled my government (central banks) are in danger of “money printing” and thus losing its value. According to the opinion of Bitcoin supporters the store of value function is not fulfilled by fiat currencies and in fulfilling this function virtual currencies are the most competitive. There is also the argument that whole success of virtual currencies is based on the fact of non-inflation character.

3.1. Methodology

Unfortunately for this research Bitcoin is not used in a certain country where citizens could primarily earn and save bitcoins and finally buy goods. I decided to evaluate the function of store of value on volatility calculation. Volatility can express the likelihood that the value of one unit of bitcoin or some asset remains stable over time. Stable value is important for medium of exchange money function. Without predicting of future value user cannot store money for future purchases.

Volatility is historical volatility calculated according to following formula.

Formula 1: Historical volatility

$$s = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (x_i - m)^2}$$

where s means standard deviation, n is number of continuous returns, x_i is continuous returns and m mean price change.

Volatility is calculated for recent 4 years. This time period is justified as time period when Bitcoin became more known in public.

In the next step are calculated results compared with volatility of gold. Gold is often discussed as asset representing ideal money for everybody who does not like fiat currency and emphasizes intrinsic value of money. Fiat currencies should be also included to comparison as real competitor of virtual currencies. I have decided to choose two currencies: Euro and Polish Zloty (PLN). Euro is chosen as an important world currency that had a lot trouble in recent years. PLN is chosen as a currency representing an economy of medium size. Prices (exchange rates) are express in USD.

3.2. Results

Results of calculations are shown in the table below.

Table 1. Historical volatility of BTC, Gold, EUR and PLN

	2011	2012	2013	2014
Gold	20%	15%	21%	14%
EUR	12%	8%	7%	6%
PLN	19%	14%	10%	8%
BTC	158%	65%	163%	78%

Source: calculations by author

The lowest volatility is reached for Euro. It is about 10 % in last three years, within last three years even less than 10 %. Both currencies evinces the lowest volatility from the sample. Maybe it is little bit surprising that volatility of currencies is lower than volatility of gold, generally considered as safe asset. However, the gold volatility is very close to currencies volatility. On the other hand the volatility of bitcoins is significantly higher implying that hold property in this system is more risky.

This findings lead me to make another comparison based on different types of assets volatility calculation. As a first type of asset I chose Dax index. Dax index represents blue chips shares on German stock exchange. As the second

type of asset I chose Apple shares. To invest in a stock of company represents quite risky operation with possible loss of 100 % of investment in the case of bankruptcy. Apple was chosen randomly as a well known large company. Results of calculations are shown below.

Table 2. Historical volatility of BTC, Dax and Apple

	2011	2012	2013	2014
Dax	29%	19%	14%	17%
Apple	26%	29%	29%	22%
BTC	158%	65%	163%	78%

Source: calculations by author

Calculated results are very similar to the previous comparison. As expected, volatility of Dax is lower than volatility of Apple shares. The only exception was year 2011. Second expected result is that Dax volatility is greater than gold volatility. Again, there is an exception in the year 2013.

In this comparison the same result as in the previous comparison occurred: volatility of BTC is significantly higher than all mentioned assets. There is no doubt that it is possible to find blue chip share with similar high volatility as BTC reached. With higher likelihood is easier to find such a share in other sectors of economy – middle or small companies. It should be noted too, that some currencies could evince high volatility or high inflation in unstable time of economy. The question is whether does it make sense to prefer BTC as a store of value when this volatile market behavior is common for almost whole time of its existence.

Volatility could be misleading in the case that price is constantly decreasing or increasing. A constant increasing is expected by Bitcoin supporters. This idea is based on the fact that the amount of bitcoins is increasing slower than the amount of fiat currencies unit (and should be stopped after 2050 on predetermined number of units). The chart of BTC price within the observed years is shown below:



Fig. 1. Bitcoin price within 2011 - 2014

Source: Google Finance

The chart shows that there is not constant appreciation of bitcoin. Appreciation in 2013 looks like bubble with slow bursting in 2014. Users storing savings on the edge of 2013/2014 would not be happy within the next year. Finally, it is clear that Bitcoin users do not have to store their savings in Bitcoin. It is possible to have convert money from local currency to Bitcoin only for the transaction. In this case is Bitcoin used only as payment system, not as money. All arguments about advantages of Bitcoin as money are not relevant then.

4. Conclusion

It was showed by comparing the characteristics of Bitcoin with commonly used definitions of money (theoretical, empirical and legal) that although Bitcoin is widely reported to be money, it does not meet criteria of used definitions. Legal definitions rather ignore the nature of Bitcoin and in the case of Bitcoin being explicitly mentioned in the law; it is done in connection with prohibiting of usage.

In the second part was showed, based on comparing historical volatility for BTC and assets like currencies, gold and shares, that to hoard bitcoins is more risky than hold other types of assets. It cancels the store of value money function of Bitcoin.

The most innovative contribution of Bitcoin remains in the function as a payment network. However, it cannot be missed that operations of this network are not guaranteed and bear certain risk. If there was another efficient payment network implemented by banks or official institutions in the future, and if this payment network brought appropriate guarantees as those provided by current payment system, the competitive advantage of Bitcoin would be eliminated.

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