

# PRACE NAUKOWE

Uniwersytetu Ekonomicznego we Wrocławiu

# RESEARCH PAPERS

of Wrocław University of Economics

Nr 397

## **Finance and Accounting for Sustainable Development – Responsibility, Ethic, Financial Stability**

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Publishing House of Wrocław University of Economics  
Wrocław 2015

Copy-editing: Marcin Orszulak

Layout: Barbara Łopusiewicz

Proof-reading: Barbara Cibis

Typesetting: Małgorzata Czupryńska

Cover design: Beata Dębska

The present publication is partially funded by the Regional Environment Protection and Water Resource Management Fund in Wrocław

Publikacja dofinansowana ze środków Wojewódzkiego Funduszu Ochrony Środowiska i Gospodarki Wodnej we Wrocławiu



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Information on submitting and reviewing papers is available on

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[www.pracnaukowe.ue.wroc.pl](http://www.pracnaukowe.ue.wroc.pl)

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Wrocław 2015

**ISSN 1899-3192**

**e- ISSN 2392-0041**

**ISBN 978-83-7695-521-6**

The original version: printed

Publication may be ordered in Publishing House

tel./fax 71 36-80-602; e-mail: [econbook@ue.wroc.pl](mailto:econbook@ue.wroc.pl)

[www.ksiegarnia.ue.wroc.pl](http://www.ksiegarnia.ue.wroc.pl)

Printing: TOTEM

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## DIGITAL CURRENCIES AND THEIR IMPACT ON MONETARY SYSTEMS

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## WALUTY CYFROWE I ICH WPŁYW NA SYSTEMY MONETARNE

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DOI: 10.15611/pn.2015.397.12

**Summary:** The purpose of this paper is to verify the following thesis: Digital money affects the global monetary system, has an impact on the demand for real money, may cause it to increase or decrease, leading to problems in forecasting the supply volume of real money. Cryptocurrencies are relatively new, developing rapidly thanks to ICT innovations. The extent of digital money is still too small to pose a threat to national monetary systems, but may have a bearing on the demand for real money. Growing popularity of digital currencies due to their characteristics has to be taken under consideration while assessing a future shape of the global monetary system.

**Keywords:** digital money, digital currencies, monetary systems, cryptocurrency.

**Streszczenie:** Celem opracowania jest przeprowadzenie weryfikacji następującej tezy: pieniądź cyfrowy ma wpływ na system monetarny na świecie, wpływa na popyt na pieniądź realny, może prowadzić do jego wzrostu i spadku, co prowadzi do problemów z prognozowaniem wielkości podaży pieniądza rzeczywistego. Kryptowaluty są względnie nowe, rozwijają się szybko dzięki innowacjom techniczno-komunikacyjnym. Wartość walut wirtualnych jest nadal mała i nie stanowi zagrożenia dla państwowych systemów monetarnych, ale może mieć wpływ na popyt na pieniądź realny. Rosnąca popularność walut wirtualnych spowodowana ich cechami musi być brana pod uwagę przy ocenie przyszłego kształtu globalnego systemu monetarnego.

**Słowa kluczowe:** pieniądź cyfrowy, waluty wirtualne, systemy monetarne, kryptowaluty.

### 1. Introduction

The rapid growth of the Internet and ICT innovation has led to the development of alternative, digital currencies. These are generated on the Web. Online platforms, portals, exchange desks as well as communities are emerging, owing to which digital

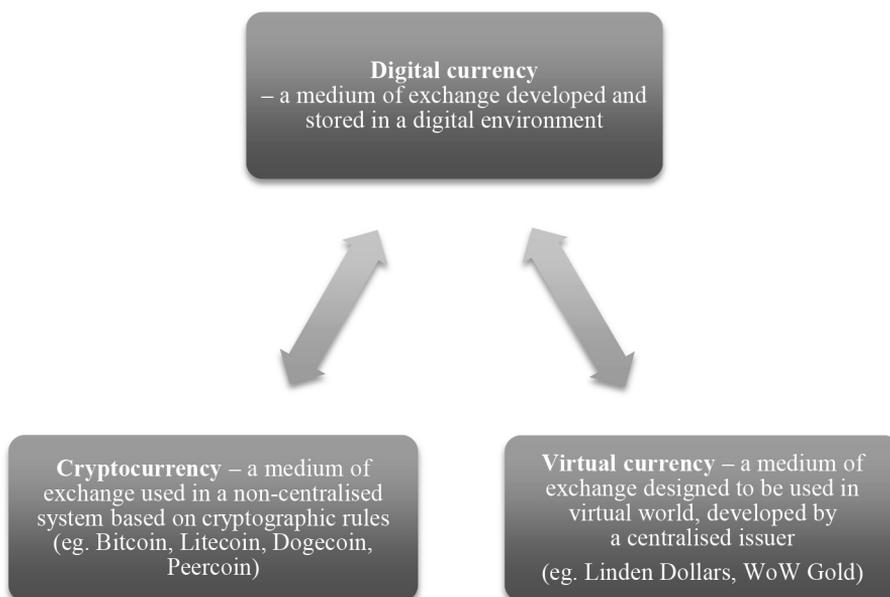
currency trading is not time or location confined. The most popular virtual currency in the world is Bitcoin (BTC), but other digital currencies are highly popular, too.

The purpose of this paper is to verify the following thesis: Digital money affects the global monetary system, has an impact on the demand for real money, may cause it to increase or decrease, leading to problems in forecasting the supply volume of real money. To this end, a survey of existing literature has been conducted.

## 2. What is digital currency?

Throughout the literature of the subject, names like cryptocurrencies, virtual currencies and digital currencies can be met. The use of the notion of “currency” in these terms “is a matter of convention, as it does not refer to an official monetary medium that is a legal tender in any country, but rather a currency in the broad sense of the word – a generally understood medium of exchange in current use. The notion may also be understood more broadly, as a system of trading in specific goods” [Bitcoin.pl].

Figure 1 illustrates the differences between cryptocurrency, virtual currency and digital currency. Both cryptocurrency and virtual currency are generated and stored on the Web – in the form of a digital record and may, therefore, be referred to as digital currencies. The differences between them concern the issuer and the functions for which they are used, but the notions may frequently interchange.



**Figure 1.** Digital currencies

Source: Prepared by the author, based on Bitcoin.pl.

## 2.1. Virtual currencies

The European Central Bank defines a virtual currency as unregulated, digital money, issued and usually controlled by its developers, used and accepted by the users of a virtual community [European Central Bank 2012].

FinCEN (Financial Crimes Enforcement Network<sup>1</sup>) – a network designed to combat financial crime – describes virtual currencies as “currencies having no centralized issuer or administrator, which can be acquired by providing computing capacity by computer users or thanks to their processing effort” [Szast 2013].

Virtual currencies do not have the status of legal tender in any jurisdiction, nor do they in Poland [Góra, Kyć 2013]. Their issue and use are not regulated by the legislation of most countries. No country issues a virtual currency, in fact it is issued by an IT system. In legal terms, a virtual currency is no more than data recorded on a disc, with no real, physically existing basis. Its value is founded on the agreement between the users of the system operating on the Internet and with confidence. A virtual currency, however, is convertible to nearly all the currencies of the world. Its application is primarily as a medium of exchange as well as for a quick transfer of financial assets.

Perfectly aware that other criteria of categorization are possible, we may – from the point of view of the type of their relation with traditional money and the real economy – distinguish between three types of virtual currencies:

**1. Closed virtual currency systems:** primarily used in online games (e.g. WoW Gold), but also in real world, for instance in loyalty programs, in which rewards are generated as a digital record in a network. Rewards can only be obtained within a given network, like extra miles in frequent flyer programs, which can be converted to products and services of the partners of a program.

A large group of currencies in the closed systems are currencies generated by computer systems in a multilateral barter. The development of the Internet and ICT innovations has made it possible to develop barter platforms, also referred to as barter networks, systems or portals. Modern, multilateral barter is based on voluntary participation of entrepreneurs associated in a barter platform, on which goods and services can be traded. Each of the participants of a platform has a barter account, to which payment is effected for the goods and services sold to other users of a platform. The cooperation of parties to transactions is based on “their consent to accept an abstract form of payment, in the form of credits issued by other participants of the exchange as a confirmation of the receipt of the value” [Kruk 2007]. The funds in such an account are not money in the traditional sense of the word. They are units of barter trade, used only for the settlement of transactions. They have their traditio-

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<sup>1</sup> FinCEN is a US Administration agency (The Department of the Treasury) set up to prevent the abuse of the financial system, to counter money-laundering and to work for the national security by collecting, analyzing and disseminating information on financial transactions in order to ensure compliance. The agency also engages in wide-scale international cooperation in these areas.

nal currency equivalents, but in most cases, they are not convertible into traditional money.

The medium of exchange can be a virtual currency specially developed for a deal, but it can just as well be replaced by an accounting entry in an account. In such a case, entries will appear in the accounts of the participants of a system following transaction: on the credit side for the vendor and the debit side for the purchaser [Kruk 2007].

**2. One-way flow virtual currency systems:** (usually inflow), in which units of account of a currency can be acquired at a determined rate of exchange and used to buy specific virtual goods and services and, in exceptional cases, also real goods and services (e.g. Amazon Coins, formerly Facebook Credits).

**3. Two-way flow virtual currency systems:** in which a currency works like any other convertible currency, with a dual exchange rate (buying and selling rates), and which can be used to buy both virtual and real goods and services (e.g. Linden Dollars) [Bitcoin.pl].

Linden Dollars is an example of a local currency. Local, alternative currencies are becoming an increasingly popular means of payment. There are already about four thousand alternative currencies worldwide, compared with a mere one hundred in 1990. Several dozen new local currencies emerge each year. They are not issued by countries, but by municipalities, towns and even by individuals. In the USA, more than 400,000 businesses of various sizes generate more than 10 billion worth of trade in local currencies.<sup>2</sup>

Linden Dollars is a currency used by the Internet community called Second Life. It can be paid for with the national currency or with the goods and services provided to other members of the community. The currency enjoys a high level of trust and some members of the community collect their salaries/wages in Linden Dollars [*10 najbardziej znanych...* 2013].

## 2.2. Cryptocurrencies

The value of the cryptocurrency market is estimated at USD 1 billion. The most popular cryptocurrency is Bitcoin (BTC). Others, less popular, include Altcoin, Litecoin, Peercoin, Namecoin, etc.

Bitcoin was developed in 2009 by a programmer code-named Satoshi Nakamoto, as a sophisticated algorithm with which no one can interfere. One Bitcoin is one coin which has to be “mined.” The mining takes place upon connecting a computer to the network – the Internet mine (e.g. BTCguild.com, Deepbit.net, Polmine.pl, Mining.bitcoin.cz). A computer, using the capacity of its processor, generates digital coins. The process of coin minting and drawing will be completed some time around 2035, when 21 million Bitcoins will have been made. Every participant of the currency

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<sup>2</sup> The figures as of 2005.

system may also obtain Bitcoins – about every ten minutes, the algorithm randomly distributes some extra 50 BTC. Most virtual currency users buy Bitcoins with conventional money at Internet exchanges [Łukasiewicz-Kamińska 2014a].

As many as 13,784,474 [Bitcoin Charts] Bitcoins have been mined to date. -At their peak value so far of USD 1,242, their total value amounts to about USD 15 billion. For comparison, the monetary base of Poland, i.e. the total face value of the cash issued by the National Bank of Poland, is about PLN 155 billion (USD 50 billion) [Górzyński, Siemionczyk 2013].

It may be said that a new monetary system is emerging around Bitcoin, functioning on the Web. It is international, open, decentralized, accessible at any time (24/7), anywhere in the world where Internet access is provided. The cryptocurrency payment system is all the businesses and individuals involved in the generation, circulation and exchange of the cryptocurrency. Unlike traditional payment systems, it is neither state-controlled nor regulated in the traditional sense of the word (the only quantitative regulation is the algorithm). Currency desks and exchanges are developing around BTC (e.g. converting it to PLN) as well as companies converting the cryptocurrency to the local currency and transferring it to vendors (like BitPay) [Deptuła 2014]. There are ATMs selling Bitcoins (in Vancouver, for example), ones in which traditional currencies can be converted to Bitcoins and *vice-versa* (the first such ATM in Europe was in Finland), as well as cashpoints uploading Bitcoins on mobile phones (like ATMs in New York) [Deptuła 2014]. There are online shops that accept BTC as a means of payment, in which real goods can be bought with a virtual currency. Bitcoin is already accepted in more than 82,000 retail outlets worldwide. *The New York Post* estimates that about a thousand companies a week in New York join the Bitcoin payment system, deciding to accept the digital currency as a form of payment for their products and services. Although many companies now accept Bitcoin (the latest and largest to join the system is Microsoft), the average use of digital currency globally amounted to USD 50 million a day in 2014, compared to the daily amount of USD 32 billion in the operations of Visa and MasterCard [*Wall Street Journal*... 2015].

ICT innovations fuel the growing interest in the currency, which translates into rising exchange rate of BTC. Bitcoin is highly popular because:

1. it is convertible to traditional currencies like the dollar or the złoty through a network of special exchange desks and ATMs;
2. it does not depend on a state, a bank, a company or an organization;
3. it is not subject to control by governmental bodies;
4. it cannot be interfered with;
5. its exchange rate is not affected by crises, wars, politics or inflation;
6. its price is only influenced by the market – earnings can be derived from the growing interest in the currency;
7. it may be a safety buffer against inflation;
8. the system ensures equal treatment to everyone – anybody can join it and no one is privileged;

9. no costs are involved in the possession and circulation of the currency. “If we keep our zlotys in the bank, we are charged for the running of the account. Even if no fee is charged, the bank will benefit anyway, when we make a card payment. The retailer will pay a commission on every transaction, which will be sunk in the price of the product or the service. Money is simply costly” [Ogórek 2011];

10. its service is quick – transfers are effected in a matter of seconds, while the transaction software is very easy to use;

11. the network of exchange desks and portals as well as of ATMs is growing rapidly;

12. it can be used in more and more online portals and shops;

13. it can be converted into a real currency, in which withdrawals can be made [Łukasiewicz-Kamińska 2014b].

### 3. Money creation by the bank system

The monetary system “is the whole of legal standards, rules and organizational principles concerning the issue and creation of money, regulation and control of its circulation” [*System pieniężny*]. Modern, bank-issued money, regulated by the law, is token money, i.e. paper money based on legal sanctions and trust (fiat money). The state guarantees such money to have economic back-up. The central bank is a state body, responsible for money and its efficient performance of economic functions as legal tender, medium of exchange, standard of value, accumulation of savings (hoarding), release from liabilities and international legal tender.

Unlimited possibilities for money creation occurred in relation to demonetization of gold, i.e. breaking the relation between money and bullion. Commercial banks are profit-oriented; therefore, they may attempt to regulate the volume of money creation in order to generate maximum profits. The operations of a central bank are motivated by neither profit nor by pecuniary revenues, but by economic security of the issue of money and protection of its value by maintaining a low and stable level of consumer prices [Zieliński 2014, p. 19].

Motives illustrating the impact of various factors on shaping the demand for bank-issued money can be:

1. Transaction driven: holding pecuniary resources to pay expenses, a need to possess money for sale and purchase transactions.

With the dynamic development of virtual currencies, a slump in demand for money is possible because there will be more sale and purchase transactions where payments are made with virtual currencies rather than bank-issued money.

An increase in demand for bank-issued money may occur when it is to be used to purchase virtual currencies – the conversion of money to virtual currencies.

2. Prudence driven: holding cash for unforeseen expenditures. This refers both to households and business entities. “Apart from the fact that they need money for sale and purchase transactions, business entities must have contingency reserves for

expenditures related to price increases, illness, accidents, natural disasters or, political turmoil” [Zieliński 2014].

3. Portfolio driven: tendency to hold pecuniary resources resulting from the desire to save up.

4. Speculation driven [Zieliński 2014].

With the quantitative data given earlier on the share of digital currencies in the market, it cannot be said that now they have a significant impact on the state-issued money as far as prudence, portfolio and speculation driven motives are concerned. This does not mean, however, that the phenomenon should be ignored: the observation of how “the new economy” develops reveals a high dynamic of the whole service branches being transferred to the virtual zone, which may also affect the demand for digital currencies and make them more important.

#### **4. Factors shaping the impact of digital currencies on bank-issued money**

As already mentioned, the digital currency market is in its early stage of development, and, compared with traditional currencies, its range and size do not exceed a monetary base of a small country. As the share of digital currencies in the monetary system grows, they will have an impact on bank-issued money. However, in assessing a potential impact of these currencies on bank-issued money, we can identify factors determining the supply and the demand, as well as the interrelations between digital currencies and traditional money.

An increase in the demand for bank-issued money can be related to the readiness to convert such money into digital currencies, caused by:

1. a trend to possess and pay with digital currencies;
2. a rapid growth of digital currencies and their service tools (ATMs, portals, exchange desks);
3. rising exchange rates of these currencies;
4. equal treatment of all players in the system;
5. money laundering and other criminal activities;
6. lower trust in national currencies;
7. lack of attractive saving and investment offers on the national financial market;
8. a need to possess money that is independent of states, crises, wars or inflation;
9. a comfort of effecting transactions in virtual currencies;
10. low transaction costs.

A drop in the demand for a national currency may result from the reluctance to purchase digital currencies caused by:

1. loss of confidence in digital currencies, e.g. due to falling or fluctuating exchange rates and lack of security within the system;

2. introduction of a currency regulation by the state;
3. introduction of supervision by public authorities.

A drop in the demand for national money can be also related to “the driving out effect.” Digital money, especially barter money or local virtual currencies, will drive out national money from circulation due to:

1. a rapid growth of digital currencies and payment and exchange systems;
2. a growing amount of virtual currencies in circulation;
3. a growing tendency to pay, settle transactions in digital currencies caused by e.g. an easy-to-use, fast and cheap transaction settlement system, a growing number of e-shops where virtual currency is accepted, exchange desks, ATMs;
4. a vogue for payments in virtual currencies;
5. an economic situation of a region: local money will develop as a tool to fight crises, unemployment and poverty.

Bank system – its range – may be decreased *inter alia* because of further development of a parallel, independent system of virtual currencies circulation. Globalization, communication and technology innovations may contribute to the growth of demand for independent money (or money equivalent) for micro-payment or payment for internet services. Bitcoin is a currency independent from any banking system, and is controlled by a community of enthusiasts. This independence can make it become a means of storing value. A stable exchange rate of that currency will be of great importance. While other currencies lose value, Bitcoin can be protection against inflation.

Therefore, for a growth of the significance of alternative currencies, it is important to guarantee safety of transactions and stable exchange rate to strengthen certainty of trading and protection of its participants. The usefulness of virtual currencies demonstrated by competitive prices (lack of costs or very low costs) in relation to transactions done with traditional money, range (acceptance in more and more internet-based companies but also in traditional economy) and infrastructure (platforms of exchange, exchange offices, ATMs, internet payment (settlement) systems) is also essential. Dynamic growth of these systems and platforms will make competitive pressure on banks, which will have to adapt themselves, their prices and quality of services to requirements of a changing financial market.

A question arises: What consequences will the development of a virtual currency have on issuing money by banks? Are methods of money creation going to change? Are national currencies going to be replaced step by step by new, seemingly totally free, independent, democratic means of payment?

Hitherto rules of “issuing” of the most important cryptocurrency – Bitcoin – contradict such a thesis. It is presupposed that there will be precisely assumed amount money in circulation, which for sure does not guarantee gaining an advantage over national currencies. Admittedly this shows a possibility of functioning of cryptocurrencies as a means of trade, measure of value, or a means of savings accumulation, but rather of minor importance.

## 5. Conclusions

Digital money is a relatively new product, developing rapidly thanks to ICT innovations. Constantly emerging new forms and tools of digital money will make it easily accessible and user friendly. It is likely to become more and more popular. Digital money has some influence on the global monetary system; it has a bearing on the demand for real money, causing it to either grow or decline. This may lead to problems with forecasting the volume of the supply of real money. The extent of digital money is still too small to pose a threat to national monetary systems. The existence of digital currencies has been already noted by international institutions, such as the European Central Bank and FinCEN (Financial Crimes Enforcement Network).

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