



UDK: 654.034:338.2

DOI: 10.2478/jcbtp-2019-0003

*Journal of Central Banking Theory and Practice, 2019, 1, pp. 53-66*

*Received: 10 January 2018; accepted: 10 July 2018*

**Nikola Fabris\***

*\* Central Bank of Montenegro,  
Podgorica, Montenegro and  
Faculty of Economics, Belgrade  
University, Belgrade, Serbia*

*E-mail:  
nikola.fabris@cbcg.me*

## **Cashless Society – The Future of Money or a Utopia?**

**Abstract:** In recent years we have witnessed a growing trend in cashless transactions as well as products and services sold exclusively in this way. Also, after the onset of the global financial crisis, private crypto currencies appeared that have raised some concerns. All of these changes beg the question of whether modern societies are moving towards a cashless society. This also raises a number of other dilemmas such as whether cashless societies have negative implications, whether they have what should be the response of economic policymakers, who would be potential winners and losers, and the like.

The paper analyses the arguments both in favour and against cashless society, the future of crypto currencies, as well as potential responses of economic policymakers to the emergence of a cashless society. The paper concludes with the observation that it is not reasonable to expect the transition to a cashless society in the near future but the next step in the evolution of money might be the appearance of central bank digital currencies, at least in some countries.

**Key words:** cashless society, crypto currencies, economic policy, central bank digital currencies.

**Jel code:** E40, E50 and E52.

### **1. Introduction**

Over the past several decades, financial markets and institutions underwent radical transformation and a sudden expansion, induced by general trends in deregulation, liberalisation, globalisation, as well as computer technologies advances. International capital flows intensified; markets have developed new and sophisti-

cated instruments, with the drastic improvement in the speed of financial transactions execution significantly lowering financial transaction costs (Fabris, 2018). The degree of cross-border financial interdependence has increased dramatically, and financial sector development exceeded that of the real economy by far, resulting in financial assets in developed countries being multiple times higher than their GDP. These trends have also led to a better allocation of capital, reduction of costs, and other numerous positive effects, but also to easier crisis spillover and changes in economic policy pursuit that relies more on discretion than rules (Prašćević, 2013).

The manner of payment has changed in parallel with the aforesaid changes. Credit and debit cards have become widespread and started squeezing out cash, whereas the emergence of contactless technologies has further enhanced the use of these payment instruments. There have been a growing number of products and services paid without cash such as various applications, bus fares, airline tickets, internet stores, and the like. Smart phones also revolutionized payments. There have been less high-denomination banknotes and coins in circulation, the latter in particular due to high minting and handling costs. Banks have been reducing the number of their branches and employees and started encouraging cashless payments.

This has led to changes in numerous other areas such as education, innovations, change in consumer habits, commerce demand for new products and services, but also in product life cycles (Tomljanović and Grubišić, 2016). All these changes beg the questions of whether economic and social growth nowadays has two important features: first is sustainability, measured as durability, and the second is inclusiveness, measured as pro-poor growth (Jakšić and Jakšić, 2018).

The future of cash has become an ongoing debate, but mostly among economists. For the average person, it's a moot point—since we have access to a variety of forms of payment, there's no conflict (Mercadante, 2018). For some, cash is still something they use every day. For younger generations, cash is becoming more and more obsolete.

Today's money is based on a set of mutual beliefs. This means that money has value only because the society has assigned it certain value. Some are of the opinion that money is the most important abstraction human beings have ever devised (Zorpete, 2018).

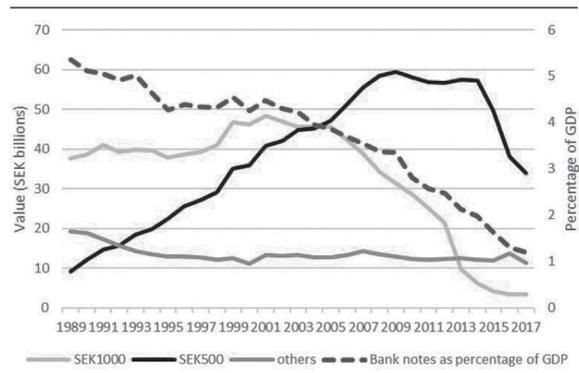
Cashless societies have existed from the time when human society came into existence, based on barter and other methods of exchange, but real cashless society

should be understood in the sense of a move towards, and the implications of, a society where cash is replaced by its digital equivalent - in other words, legal tender (money) exists, is recorded, and is exchanged only in electronic digital form.

Some governments encourage a shift toward digital services because they see it as a way to address money laundering, tax evasion and also to boost competition in financial services. Others argue that digital payments protect consumers from being robbed or losing money, as well as sparing them the hassle of constantly carrying a wallet (Cerulus and Contituglia, 2018). India is looking to step away from traditional cash transactions. The government withdrew some high denomination bank notes from circulation over a year ago. India's prime minister Narendra Modi created dozens of cashless townships where notes and coins are discouraged (Jenkins, 2018).

Sweden heads the vanguard. According to the Riksbank, the Swedish central bank (2018), at the last count only 13% of Sweden's payments were made using cash, compared with a European average of nearly 80%. Chart 1 clearly shows that the share of cash in GDP has been trending down since the early 1990s. The Riksbank is a little more cautious in timing but still believes a cashless society is imaginable in little more than a decade. "If you extrapolate current trends," says the deputy governor Cecilia Skingsley, "the last note will have been handed back to the Riksbank by 2030 (Jenkins, 2018)". In South Korea, the central bank has set a 2020 target to phase out coins. The ECB has decided that there will be no new issues of 500 euro notes.

**Chart 1: Banknotes in circulation in Sweden (1989-2017)**



Source: Engert, W., Fung, B. S. C. and Hendry, S. (2018) Is a Cashless Society Problematic?, Staff Discussion Paper 2018-12, Bank of Canada

When it comes to large value transactions, cash plays no role whatsoever. It is most common with households and retailers as well as for low-value payments because some merchants do not accept electronic payments due to high transaction fees.

Corporates are much less reliant on cash. However, cash could be very significant in case of financial instability or failure of some important financial institutions. That is why it is very important that central banks and governments take care of financial stability and the stability of their banking systems.

There are also data that clearly shows that the money in circulation is increasing globally. Today there are 500 billion banknotes and trillions of coins in circulation. According to a recent report from G4S, which manages cash distribution systems, physical money now accounts for 9.6 per cent of the global gross domestic product, up from 8.1 per cent in 2011 (Jenkins, 2018). It can be explained partly by some specific factors like very low interest rates, bank bankruptcy and measures of central bank in combating the global financial crisis. But, partly it is obviously a result of increasing world GDP which demands increasing cash.

Statements of some central bankers also support this view. “Cash is vital in supporting financial inclusion,” said Victoria Cleland, the Bank of England’s chief cashier, in a recent speech. In the UK, the number of those who rely almost entirely on cash has jumped by 500,000 to 2.7 million over the past two years, according to analysis by Payments UK and the Bank of England. The volume in the economy has also increased, with a record level of more than £73bn now in circulation, according to the BoE (Jenkins, 2018). Increasingly, central banks insist that cash will also play a role. We do not foresee a totally cashless society”, said Ewald Nowotny, the Governor of the Austrian National bank. If there is for instance an energy blackout, cash is the only surviving way of payment (Cerulus and Contituglia, 2018).

This paper consists of three parts. After the introduction, the second part discusses costs and benefits of cashless society. The third section analyses the future of private crypto currencies, and the fourth part examines policy response to cashless society and the emergence of central bank digital currencies.

## **2. Costs and benefits of cashless society**

It is obviously that there are arguments that support that we are moving towards a cashless society and those that argue against it, both being presented in Table 1.

**Table 1: Costs and benefits of cashless society**

Benefits of cashless society	Costs of cashless society
Decline in crime and money laundering	Elderly and uneducated people could be on the side of losers
Convenient means of payment	Low level of financial and IT literacy can prevent some part of population from using cashless means of payment
Reduced shadow economy	Cybercrime
Fast development of IT technologies, smart phones and electronic applications support e-payments	Threats to privacy
Personal safety	Tradition
Lower transaction costs	IT risk

So let us consider both arguments, starting with the arguments in favour of a cashless society:

1. First, the elimination of cash may seriously impair criminal activity, especially those connected with drugs and money laundering. These activities can be hardly carried out without cash. Also, cash cannot be tracked, which is very beneficial for criminals. Transitioning to cashless society will also make counterfeiting of money virtually impossible. A recent US study found that an increase in cashless transactions has led to a reduction in burglaries and the overall crime rate (Achord et al., 2017).
2. Not only there are credit and debit cards, but there are also bank transfers, direct deposit, and online payments. It's simply too convenient to make payments electronically, particularly with the Internet, as well as the fact that merchants and vendors can now be hundreds or thousands of miles away. The survey from FED showed that total noncash payments increased at an annual rate of 5.3 percent from 2012 to 2015 (Mercadante, 2018).
3. It will decrease shadow economy, which will result in increased public revenues, with the final outcome being the strengthening of fiscal stability. Most of shadow economy trading nowadays includes unreported transactions that would otherwise be taxed. With the transition to a cashless society these transactions would enter legal flows and be subject to taxation. This would increase public revenues, with the domino effect being lowered fiscal deficit and public debt. Tax savings are difficult to quantify, but a UK study pointed to potential savings in tax evasion of £6bn for UK.
4. Fast development of IT technology, smart phones, and electronic application support e-payment. Digital society development has brought about an increase in digital payments. Mobile phones are increasingly becoming a type of

digital wallets, and there are more and more applications and digital services that can be paid only electronically.

5. The issue of personal safety should not be ignored either. Individuals who have substantial amounts of cash on them or in their homes can become victims of robbery which could lead not only to material loss but also to jeopardized personal safety.
6. Then we have the cost saving argument - the elimination of cash would enable banks, credit unions, and other financial institutions to reduce staff. It will also decrease the costs associated with handling with money. Costs of handling cash in EU were estimated at 0.45% of GDP (Achord et al., 2017). This is a strong argument in favour of gradual withdrawal of cash. A large number of banks encourage e-banking, which has resulted in reduced number of bank branches, employees, and shortened working hours. It is, therefore, certain that financial institutions will be significant lobbyists for transition to a cashless society. On the other hand, it is also certain that there will be strong lobbyists against this transition like criminals, individuals involved in shadow economy, and similar. In addition, money printing, minting, transportation, storage, etc. can incur significant costs. However, one should not draw a wrong conclusion that digital money does not incur any expenses because it also raises the question of security and protection, settlement time, and associated costs and fees.

Though many believe a cashless society is inevitable, there are a few significant reasons why that may not be the case.

1. Poor and elderly population still remain disproportionately dependent on cash. Their knowledge of the use of digital money is limited and the question is how the majority of them would manage in a cashless society. Also, there is a significant part of the population in all countries that do not have access to bank accounts, mostly poor individuals and marginalized groups. Then a certain part of population does not have access to the Internet and are not IT literate. The data from the USA showed that 11% of the population do not use the Internet (Mercadante, 2018). However, the opposite effect in terms of financial inclusion should not be excluded. For example, in some rural areas or remote parts of the country with very limited financial infrastructure (banks, ATMs, etc.) digital money could lead to an increase in financial inclusion.
2. Low level of financial literacy can prevent some part of population from using cashless means of payment. With the emergence and development of the Internet, the globalisation of economic business and, in particular, electronic payments, finances have become different from what they once were. A large number of studies have shown that the level of financial literacy is very low,

and it is especially worrying that this is the case with the youngest and oldest members of our society. Also, the empirical link between financial education and poverty has been confirmed.<sup>1</sup> Therefore, the priority action must be the development of national financial education programs (Fabris and Luburić, 2016).

3. Then, the next problem can be cybercrime. There are many studies that have showed that this type of crime has been on an uptrend. One study identified that this is the fastest growing crime in the USA. The size of this potential problem can be best confirmed by data of the Anti-Phishing Working group indicating that of 14,000 phishing websites and no less than 86% of them are falsely represented as financial institutions (Fabris and Luburić, 2014). Cyber-criminals show a high degree of inventiveness and every year they “promote” new techniques and tactics designed to deceive potential victims. The biggest mistake is made by individuals who expect banks to protect them from these types of fraud, and while some banks have really high levels of protection and react immediately, there are those with poor protection systems.
4. Privacy - some persons want privacy in their financial transactions. Electronic payments provide possibilities for tracking all financial transactions. This will be a burning issue in the future because it is not difficult to imagine the future where an individual will have a chip in their body that will replace their ID card, a health insurance card, a driver’s license, a key to open an apartment and a car, and this will also be a digital wallet. The key issue will be the risk of a complete loss of privacy, as well as the dilemma of who will have access to the supervision of individuals. Although literature often finds arguments that privacy is only required by individuals who have something to hide, this does not have to be the case. For example, this information can enable customer profiling, commercial use of personal data, creation of psychological profiles of individuals, the creation of databases about their consumer habits, insight into their assets which increases the risk of robbery, and so on. Basically, this is a kind of trade-off between convenience and privacy.
5. Tradition - Paying with cash is a traditional means of payment. Abolishing cash would certainly be a revolutionary change and behavioural theories suggest that individuals tend to behave conservatively, that is, often they strongly resist major changes when they are uncertain how those will affect their position. Thus, cash is much more used in Germany and Austria than in Sweden or Belgium. There are also studies suggesting that a greater share of cash use in these countries is not related to a higher level of shadow economy. (Achord et al., 2017).

---

<sup>1</sup> For more detail see Fabris, N. and Luburić, R. (2017) *Finansijsko obrazovanje dece i omladine*, Heraedu, Beograd.

6. IT risk – If we fully transit to a digital society and our IT systems fail, what shall we do then? An outage of visa services in June - caused by a system failure - gave a small taste of the risk. Customers across the EU were left unable to pay for goods and services. The only people who could eat were those with cash (Cerulus and Contituglia, 2018). Also, the recent hurricanes in the USA led to power outages in a great number of areas and electronic money was virtually useless. What if there is a failure of the platform through which cashless transactions are performed or if it were to be infected by virus? One should not neglect the risks of cell phone loss or data hacking. These are all issues that have to be addressed before considering a transition to a cashless society.

### 3. Crypto currencies

Appearance of crypto currencies opens a new chapter in this discussion. Digital private currencies have become a reality and they are currently estimated at 1,000. Their use is unregulated in the majority of countries and this leaves room for a lot of dilemmas, but I believe that there are no true forms of money. Unlike with fiat money, the cost of producing many cryptocurrencies is high, reflecting the large amount of energy needed to power the computers that solve the cryptographic puzzles (Bouveret and Haksar, 2018).

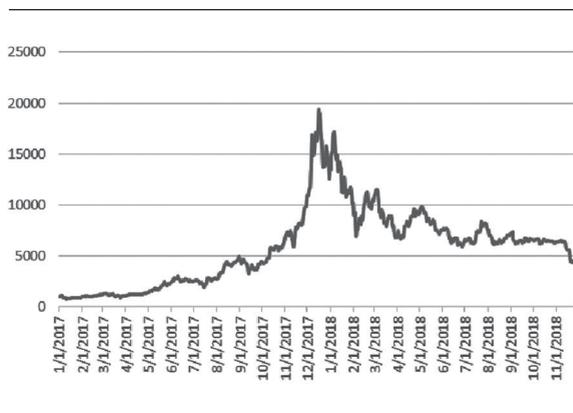
Central banks have taken rather different positions on this matter. Private digital currencies are prohibited in some countries (India, China, Russia), some central banks are in the process of considering the introduction of their own, while most central banks warn of risks associated with their use. I would like to point to the warning made by the Governor of the Banque de France, Mr. Francois Villeroy de Galhau, in June last year: “who advise great caution with respect to bitcoin because there is no public institution behind it to provide confidence. In history, all examples of private currencies ended badly” (Lam, 2017).

The idea of private money is not new and it dates back some 40 years ago when Hayek wrote that the governments' exclusive right to issue money and regulate monetary flows did not give us better money than that would otherwise existed if the governments did not perform the said functions (Lukić, 2017 ). The first digital currencies appeared after the global financial crisis with the idea to be money independent of governments and not subject to inflation. The most famous digital currency is the bitcoin with no institution standing behind it. It is issued by using the specific programming code and no financial institution is needed for everyday payments because they are recorded using blockchain technology.

However, the main function of money is to be the means of payment. Have digital currencies taken over this function? As the Governor of the Bank of Japan, Mr. Haruhiko Kuroda, once said: “Bitcoin is being traded for investing or for speculation”. Similar opinion was also expressed by the vice president of the European Central Bank (ECB), Mr. Vitor Constancio, who said that “bitcoin is not a currency but sort of a tulip”, alluding to the price bubble of the Dutch tulip mania in the 17th century. Jens Weidmann, the President of the Deutsche Bundesbank, highlighted that the development of bitcoin has a noticeably speculative character. Australia’s RBA Governor, Philip Lowe, was certainly the harshest in expressing negative position on bitcoin arguing that the asset is more likely to appeal to criminals than consumers (Lam, 2017).

Considering that bitcoin has come a long way in a very short period of time in terms of its value, from 1,000\$ to 20,000\$ and with large fluctuations along the way, it is clear that its value is subject to speculative factors. This indicates that it can bring big speculative profit, yet big losses as well. This also begs the question of whether we are the witnesses of another Ponzi scheme. Chart 2 shows the movement of bitcoin value from its emergence until mid-November 2018.

Chart 2: Bitcoin movement



Source: <https://finance.yahoo.com/quote/BTC-USD/history/>

The facts that suggest great caution are that there is no monetary authority or government that stands behind bitcoin or any other crypto currency, there is no protection in case of the relevant technological platform malfunction, payments in these currencies are still minor, and there is no real backing for them.

Is it possible for the value of some electronic record or some other asset to increase dramatically? The answer is: yes, it is possible and we have seen many such examples throughout history. Those were classical price bubbles which burst sooner or later and their effects usually involved few individuals (who would withdraw on time) earning enormous profits, while a vast number of people would suffer huge losses. If we all mined and traded in digital currencies and ignored real

production, it is clear that such a society would be doomed to failure. This was also one of the lessons from the global financial crisis as not all of us can engage in financial services and neglect real production.

Moreover, digital currencies do not have the second important function of money and that is to be the measure of value as we do not have any product nowadays whose value is solely expressed in digital currencies (the number of those with digital currency price tag is negligible). These currencies also lack the third function of money, the store of value, because when you have money you expect its value to be nearly the same in the future whereas the value of digital currencies in the future cannot be estimated by anyone. All this provides for a clear conclusion that, in fact, digital currencies are not real money.

I do not believe that private digital currencies will become important payment instruments, but one should not neglect the fact that their benefit for a user is that it ensures anonymity. On the other hand, distributed-ledger technology can be promising in making the financial system more efficient. It can be a step towards cashless society. Also, it is probable that some central banks will start issuing their own cryptocurrencies and even the IMF Managing Director Christine Lagarde recommended central banks to consider issuing digital currencies at the Singapore FinTech Festival held in November 2018.

#### 4. Policy Response

The appearance of a cashless society raises a number of dilemmas for economic policymakers and all open questions are still left without final answers. Certainly the key dilemmas refer to whether a cashless society implies welfare growth or not; what implications would it have for monetary policy, and would the attainment of key objectives be facilitated or made more difficult? What are the risks? Would a cashless society be better in meeting user demand for money? What is certain is that a lot of research is needed that would shed light on all potential implications and they must always start with country specific circumstances.

However, considering all the above, it is not reasonable to expect the emergence of a cashless society in the near future, same as expecting that it could be based on private money. Nonetheless, what cannot be excluded and what may be likely in the near future is the emergence of central bank digital currencies, at least in some countries and as an alternative to cash. This is also supported by the fact that a number of central banks are very actively investigating the costs and benefits of introducing this money.

The first question that arises is how would digital money affect financial stability? A part of individuals could withdraw their money from banks, which would have a negative impact on liquidity. In such circumstances, a rational reaction of banks would be to increase interest rates and thereby attract new depositors, but this would also mean increasing lending interest rates that would further negatively impact employment, investment, and economic growth. In particular, banks that have a greater share of retail deposits can be at risk. The option suggested by the IMF is that banks could try to replace deposits with other forms of funding such as commercial paper, bonds, and equity (Mancini-Griffoli et al., 2018). Also, the other two possible options should be taken into account in the given circumstances, namely central bank could compensate banks for the loss of deposits through credit lines and allow the depositing of digital currencies in banks which would also bear interest.

The next question is how would digital currencies affect monetary policy transmission? The IMF considers that the basic interest rate channel may be the most affected, and the exchange rate channel is unlikely to be affected much (Mancini-Griffoli et al., 2018). A potentially bigger impact could be felt by countries in the inflation targeting regime because under inflation targeting, the effectiveness of monetary policy is a function of the transmission channels of monetary policy (Aguir, 2018). Nevertheless, further research is necessary before making any final conclusion.

Certainly the key measures of economic policymakers should be related to the adoption of a new set of regulations that would guarantee payment security and regulate all aspects of these transactions. A particular emphasis must be on protecting personal information because much more personal data becomes available in such a system. This issue could be resolved if user identification is not done through personal data but via a crypto key that would be available to a limited number of institutions such as the money issuer (central bank), tax authorities, and the like. Special attention and regulation should be on avoiding the situation of creating large card payment companies and other providers.

Another set of measures must involve increasing financial inclusion as there are still a large number of individuals who, for example, do not have bank accounts. Also, a potential risk may be the fact that with an increase in the share of digital money, banks could reduce the number of their ATMs, branches, etc., which could lead to even greater exclusion of vulnerable groups. This should also add to the importance of increasing financial and IT literacy because new payment techniques require new knowledge, and those that could be particularly vulnerable are representatives of elderly population and marginalized groups.

It is very important to develop adequate infrastructure that would provide a higher degree of security than the current one because all information indicate that cybercrime is on the rise. Also, the new infrastructure should be able to resolve the issue of back up of data and the system resilience to external shocks such as power outages, malfunctions, viruses, and the like. Very important in this context is increasing the share of fast payments.

In the event of transitioning to a cashless society we should already have prepared answers for a number of other critical issues such as what to do with cash ATMs, who will bear transaction costs, the organisation of training programs for new payment methods, what to do with small payments (such as pocket money given to children), how to exchange cash for their digital equivalents, and so on.

## 5. Conclusion

If we look at the history of money, we will notice that it went through evolutionary changes starting from the barter system, precious metals used as the means of payment, money made from precious metals and gold backed money to money whose value is completely separate from the material from which it was made. Central bank digital currency is a completely logical next step in this process of money evolution.

Divergent processes are at play today as at the same time we have an increase in the share of cashless transactions but also growth of cash. The paper clearly shows potential benefits as well as risks that cashless society would bring about. Unfortunately, there are not enough arguments at this moment to assume an unambiguous view of the impact of a cashless society on welfare. However, the analysis provides two unequivocal conclusions:

- cashless society is not something that can be expected in the near future, and
- private crypto currencies are not the backbone on which a cashless society could be based.

However, it is reasonable to expect that central bank digital currencies would emerge in some countries but this step, as well as the transition to a cashless society, would require a set of policy responses. The paper points out that the key reactions of economic policymakers must address the influence of digital currencies on financial stability and the efficiency of monetary policy. It is also necessary to adopt a set of new regulations, then deepen our knowledge about them, improve security of IT technology, increase IT literacy, and so on.

## References

1. Achord, S., et al. (2017). *A Cashless Society - Benefits, Risks and Issues*. London: Institute and Faculty of Actuaries.
2. Aguir, A. (2018). Central Bank Credibility, Independence, and Monetary Policy. *Journal of Central Banking Theory and Practice*, 7 (3), 91-110.
3. Bouveret, A. and Haksar, V. (2018). What Are Cryptocurrencies? *Finance and Development*, 55 (2), 26 – 29
4. Cerulus, R. and Contituglia, C. (2018). Central Bankers Warn of Chaos in a Cashless society. Retrieved from <https://www.politico.eu/article/central-bankers-fear-cybersecurity-chaos-in-a-cashless-society/>
5. Engert, W., Fung, B. S. C. and Hendry, S. (2018). Is a Cashless Society Problematic? Bank of Canada, Staff Discussion Paper 2018-12.
6. Fabris, N. and Luburić, R. (2016). Financial Education of Children and Youth, *Journal of Central Banking Theory and Practice*, 5 (2), 65-79.
7. Fabris, N. (2018). Challenges for Modern Monetary Policy. *Journal of Central Banking Theory and Practice*, 7( 2), 5-24.
8. Fabris, N. and Luburić, R. (2017). *Finansijsko obrazovanje dece i omladine*. Beograd: Heraedu.
9. Jakšić, M. and Jakšić, M. (2018). Inclusive Institutions for Sustainable Economic Development, *Journal of Central Banking Theory and Practice*, 7(1), 5-16.
10. Jenkins, P. (2018). We don't Take a Cash: is This Future of the Money? Retrieved from <https://www.ft.com/content/9fc55dda-5316-11e8-b24e-cad6aa67e23e>
11. Lam, E. (2017). What the World's Central Banks are Saying About Bitcoin. Retrieved from <https://www.bloomberg.com/news/articles/2017-12-15/what-the-world-s-central-banks-are-saying-about-cryptocurrencies>
12. Luburić, R. and Fabris, N. (2014). *Umijeće upravljanja novcem*. Podgorica: Medeon.
13. Lukić, V. (2017). Potentials and limits of private digital currencies. Seminar katedre za ekonomsku politiku, Ekonomski fakultet, Beograd.
14. Mancini-Griffoli, T., et al. (2018). Casting Light on Central Bank Digital Currency. IMF, Staff Discussion Note, November.
15. Mercadante, K. (2018). The Future of Cash - Will It Disappear Or Become Obsolete? Retrieved from <https://www.moneyunder30.com/what-is-the-future-of-cash>
16. Prašćević, A. (2013). Dometi ekonomske politike u prevazilaženju efekata globalne ekonomske krize na ekonomiju Srbije. *Ekonomski horizonti*, 15 (1), 17-30.

17. Riksbank (2018). Payment statistics. Retrieved from <https://www.riksbank.se/en-gb/statistics/payments-notes-and-coins/payment-statistics/>
18. Tomljanović, M. and Grubišić, Z. (2016). Investment in Research and Development: a Factor of Adjustment of Montenegro to the EU economy. *Journal of Central Banking Theory and Practice*, 5(3), 139-164.
19. Zorpete, G. (2018). The Beginning of the end of Cash. Retrieved from <https://spectrum.ieee.org/at-work/innovation/the-beginning-of-the-end-of-cash>