REVIEW PAPER
UDK: 336.7:004
336.02
338.23:336.74
DOI: 10.5937/EKOPRE2302065V
Date of Receipt: January 24, 2023

Dušan Vujović
Metropolitan University
FEFA – Faculty of Economics, Finance and Administration
Belgrade

THE IMPACT OF DIGITAL MONEY ON MONETARY AND FISCAL POLICY

Uticaj digitalnog novca na monetarnu i fiskalnu politiku

Abstract

Digital money era is in full swing. It has already changed the structure of the global monetary system. Like industrial revolutions of the past few centuries, the digital money revolution is based on: (i) new IT and accounting technology (crypto algorithms, distributed ledger technology, internet, and deep penetration of smart phones), and (ii) demand for greater financial inclusion, and for more efficient financial services. The advent of unregulated private mobile money with more than 4 billion users and trillions of dollars in financial transaction has awakened fears of monetary system instability and dwindling traction of the old monetary and fiscal policy. The response has been a relentless effort by more than 100 central banks around the world to develop a public digital currency. Retail CBDCs issued by central banks will be available to everybody to provide stability and liquidity to the financial system in times of need. There will be uncertainties and challenges regarding the conduct of monetary and fiscal policy. Many expected improvements will come with inevitable tradeoffs in the speed and effectiveness of monetary policy transmission, and in achieving greater fiscal transparency without violating individual rights and privacy. Serbia will benefit greatly from improved fiscal transparency and reduced shadow economy associated with digital money revolution. At the same time it will be vulnerable to currency substitution pressures from future digital Euro and reduced traction of monetary policy in the presence of multiple e-money flows. Timely legal preparations for bank-led mobile money and central bank digital cash, and applied research of complex future policy risks is strongly advised.

Keywords: *crypto-assets, bitcoin, stablecoin, e-money, mobile money, CBDC, monetary policy, fiscal policy*

Sažetak

Era digitalnog novca je u punom zamahu. Već je promenila strukturu globalnog monetarnog sistema. Kao industrijske revolucije tokom prošlih nekoliko vekova, i ova digitalna revolucija novca zasnovana je na: (i) novim IT računovodstvenim tehnologijama (kripto algoritmima, decentralizovanom računovodstvu, internetu i dubokoj penetraciji pametnih mobilnih telefona) i (ii) očekivanjima veće finansijske inkluzije i tražnji za efikasnijim finansijskim uslugama. Pojavljivanje neregulisanog privatnog mobilnog novca koji danas već ima 4 milijarde korisnika i trilione dolara u finansijskim transakcijama probudilo je opravdani strah o mogućoj nestabilnosti monetarnog sistema pri opadajućoj efikasnosti stare monetarne i fiskalne politike. Odgovor je ogroman napor više od 100 centralnih banaka u svetu da razviju javni digitalni novac. Novac koji bi izdavale centralne banke, tzv. *retail* CBDC biće dostupan svima radi održanja stabilnosti i likvidnosti finansijskog sistema u slučaju potrebe. Sigurno će biti neizvesnosti i izazova u vođenju monetarne i fiskalne politike u novim uslovima. Mnoga očekivana poboljšanja doneće sa sobom i neizbežne teškoće u brzini i efektivnosti mehanizama transmisije monetarne politike, kao i izazove u dostizanju višeg stepena fiskalne transparentnosti bez narušavanja ličnih sloboda i privatnosti. Srbiji će digitalni novac doneti poboljšanu fiskalnu transparentnost i smanjenje sive ekonomije. Istovremeno, Srbija će biti izložena pritiscima eurizacije posle pojavljivanja digitalnog evra, kao i dejstvu smanjene efektivnosti monetarne politike u prisustvu višestrukih egzogenih tokova mobilnog novca. Zato se preporučuju blagovremene pravne reforme neophodne za uvođenje CBDC i dobro funkcionisanje mobilnog novca u saradnji sa bankarskim sistemom, kao i primenjena istraživanja budućih složenih rizika ekonomske politike.

Ključne reči: *kripto valute, bitkoin, stabilni koin, e-novac, mobilni novac, CBDC, monetarna politika, fiskalna politika*

Introduction

Digital money era is in full swing now. Decades long efforts to scale down or eliminate cash – the epitome of money and legal tender – relied on traditional cashless payment instruments: checks, payment cards, direct account debits, wire transfers and the like. This slow but persistent tide of cashless payments has recently been overpowered by a true digital money tsunami.

The first wave started with bitcoin and other private *sui generis* cryptocurrencies, and quickly expanded into crypto generated stablecoins backed by major currencies and/or low risk bonds to counter the excessive volatility of bitcoins. Privately and anonymously generated crypto protection in tandem with clearance and accounting mechanisms based on distributed ledger technology (DLT), challenged two quintessential properties of the regulated two-tier banking system. These were to print and distribute fiat money that is almost free of counterfeiting risks, and to provide an efficient clearing and accounting mechanism as a basis for payments and normal functioning of the economy.

Despite providing alternative safety features and decentralized payment clearance procedures, the impact of cryptocurrencies and stablecoins on the long held monopoly of the banking sector and stability of the financial sector remained relatively limited due to their small size, high volatility and lack of widespread acceptance.

The second wave brought on mobile money pioneered by fin-tech companies and internet trading giants relying on their dominant position in internet-based retail transactions and widespread penetration and use of smart phones by people with limited access to banking services. Instead of algorithm based *ex-ante* protection, mobile money provided security through client registration, prepayment of minimal balances and strict *ex-post* enforcement of payment discipline.

The impact of mobile money on the financial sector is likely to continue to grow exponentially in line with the number of users in China, India and Africa, and expected growth trends in middle and higher income countries based on reputable providers (Apple Pay, Google Pay, Pay Pal, Samsung Pay, Venmo, Zelle, etc.). As discussed by Shirono et al. [32], large and growing shares of private unregulated and uninsured digital mobile money issued by mobile network operators (in so called non-Bank mobile money systems), may pose a stability and regulatory risk in difficult times if an adequate access to liquidity reserves is not secured.

Once these risks got recognized, the response of the monetary authorities worldwide was to explore the possibility of adapting and extending the concept of central bank money to the requirements of digital money revolution. In other words, to issue Central Bank Digital Currency (or CBDC), a digital form of physical currency which has been printed as legal tender during past centuries. Presently, almost 100 countries around the world (including the EU) are exploring the possibility of issuing CBDC that would best respond to the demands of providing liquidity and securing stability of the monetary system, while enabling the conduct of monetary policy in line with mandated objectives of price stability and employment.

This would complete digital transformation on the instrument side and pave the way to gradually eliminating cash and reaching cashless economy and cashless society in the not so distant future. Many challenges will have to be addressed along the way including the issues of financial inclusion and privacy. In many cases good solutions would depend on our ability to find and sustain the right balance between positive and negative effects. Positive developments rendered by digital revolution include better access to cheaper financial services, greater fiscal discipline, improved procurement and public financial management, tracking of payments enabling elimination of shadow economy and illegal activities, etc. Key negative effects include potential loss of privacy, further financial exclusion of certain social groups due to old age, limited access to ITC technology and skills, possible abuse of growing body of information on individual consumption, social political and other preferences.

This brings us to the conduct of monetary and fiscal policy in such a changed environment, the main theme of the paper addressed in section 4. Before that, in section 2, we briefly review the status of the global financial sector by looking at key lessons learned from the previous

Global Financial Crisis of 2008. In section 3 we define and discuss the characteristics of key digital financial instruments brought by the first wave (cryptocurrencies, and stablecoins), and second wave (mobile money), as well as the response of central banks through digital form of official legal tender money. We offer some concluding remarks on policy issues and themes for further policy research of relevance for Serbia in section 5.

Lessons learned from the Global Financial Crisis

In the wake of the 2008 crisis Stiglitz [33] and Rajan [29] assessed the crisis as a "financial market failure" caused by the absence of adequate regulatory framework and proper risk pricing, with contagion that led to the global financial crisis and previously unthinkable government bailout in trillions and trillions of Dollars and huge economic losses worldwide.

The belief in the efficiency of the financial markets held by the leading neoliberal economic school and adopted by key policymakers at the time (Greenspan, Summers, etc.) was so strong that it promulgated laws which legally prevented the US monetary and financial authorities from regulating the growing and increasingly complex derivatives. The usual assumptions of efficient markets (perfect competition, perfect information, no externalities) obviously did not hold in the US and the increasingly connected global financial sector.

Firstly, because the sector was dominated by large oligopolistic players not only by the size of their balance sheet (such as the13 US megabanks), but also by the overwhelming influence they had in the government and legislature through campaign financing and important policy positions held in the administration and academia.

Secondly, due to large and growing presence of overly complex multilayer financial instruments where true risk and performance information were not fully known to issuers themselves, let alone the clients and the policy makers. The situation became even more complex after the wholesale increase in the so called sub-prime lending instruments based on overly optimistic borrower income and real-estate price projections, as well as interest rate and credit risks.

Thirdly, in the absence of clear regulation and tight on-site and off-site supervision, megabanks started losing touch with reality. Glaring example is the stark contrast between the only one percent share of AAA corporate securities vis-à-vis 60 percent share of AAA "asset-backed securities". The first is a "real world rating number" earned by real corporations confirming their income and profits in the markets. The second is a fake number attached to packaged mortgage backed (or similar) securities "gold-plated" by the packaging company, in this case megabank. Interestingly enough Rajan shows [29, p.132] that this does not necessarily have to be a sham. Through the "magic of combining diversification with tranching" banks can create securities of different seniority and, thus, create average or even mediocre securities into "repackaged AAA-rated securities" since under normal circumstances:

(i) mortgage default probabilities tend to be low,
(ii) incidence of defaults is not correlated since people default for highly personal (health, family, job loss) reasons,
(iii) real estate prices do not fall substantially and across many locations at the same time, and
(iv) interest rates do not abruptly increase and refinancing conditions do not worsen across the board.

Rajan provides an example[1] which shows that if these assumptions hold, as they should in normal times, commercial and investment banks would not face significant risks. More specifically, the holder of senior securities would suffer losses only 1 percent of the time or less if more than two mortgages are packaged together.

But the assumptions did not hold. By 2007 defaults became more frequent than usual and highly correlated due to general layoffs. Real estate prices collapsed creating substantial negative net worth for many house owners. Programmed interest rates increase based on subprime clauses made things worse. The conditions in the financial

1 Rajan [29, p. 134] shows how packaging two or more low-quality loans can produce a AAA-rated security. If on the basis of two mortgages (assets) with face value of $1 and 10 percent chance of default, an investment bank structures a deal with one junior security with face value of $1 that bears the brunt of losses until they exceed $1, and one senior security that bears the losses after that.

market worsened, practically eliminating refinancing options due to market and liquidity risks.

In short, the financial market faced a perfect storm caused by regulatory failure, poor management (risk pricing practices) both at the micro-dealer and corporate level. The unregulated asset-backed securities and custom derivatives based thereon were a time bomb. And their share in the books of major banks in the US and around the world was way too high.

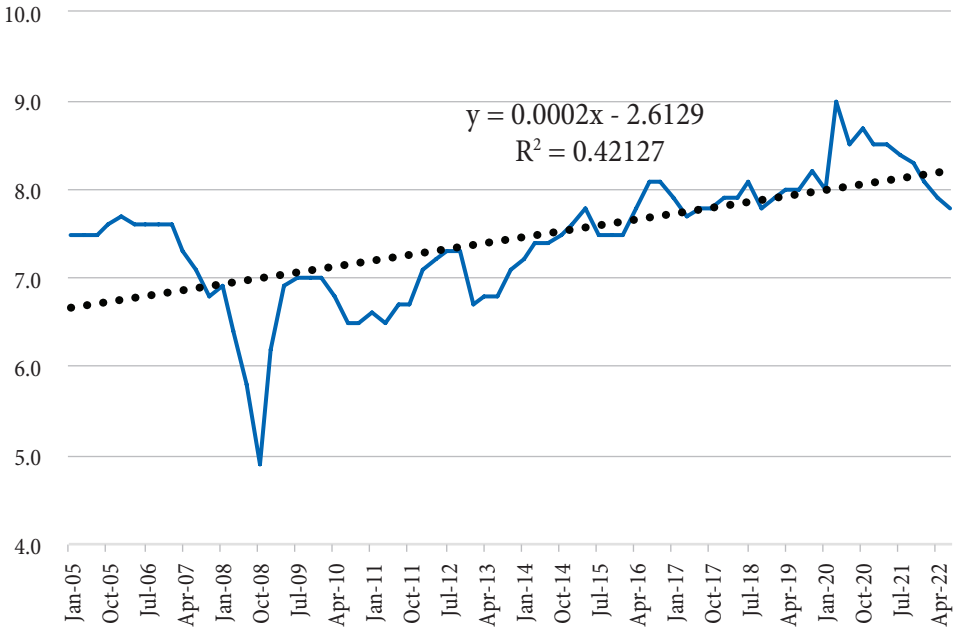
The questions are: Why did this happen? And how? The initial departure from the canonic features of the financial sector was neoliberal drive towards deregulation of the financial sector during the Reagan administration in the 1980s. Wages in the financial sector started to grow relative to other sectors in the economy based on the new set of wage, bonus and career incentives that favored performance without properly accounting for risks. Similar incentive changes happened at the higher management and corporate levels. Bank mergers in the 1990s created mega banks that became too influential and 'too big to fail'. This further increased appetite for excessive risk taking at all management and corporate levels as profits were allowed to be taken out through wages and bonuses, while losses were hidden in overpriced non-transparent complex instruments to be picked up by the government when the inevitable crises comes eventually.

As Rajan [29, p. 136] notes, it is not surprising that banks were tempted to create and promote risky mortgage-backed securities in the absence of strict regulatory rules and supervision practices. But it is truly a puzzle why so many banks with strong analytical and risk departments retained those senior securities as the crises broke out and the mirage of modeling probabilities crumbled in the face of reality.

The global financial crisis confirmed that complex financial markets are neither efficient nor stable without good nonbiased regulation. Active policies should moderate (or if needed prevent) the emergence of mega banks and other financial institutions with 'too big to fail' macroeconomic and social consequences. The regulators must carefully follow the relevant trends and hidden risks and timely intervene to prevent perfect storm situations that inevitably lead to massive market failure. Failure to do so creates huge fiscal cost at the national level and equally high economic costs and sufferings absorbed at the level of individuals and vulnerable social and income groups.

Figure 1 shows the cost of the 2008 crisis. During 2007-2008 the financial sector lost more than 1/3 of its value added. It took more than five years to recover that loss. Today, financial sector accounts for 8-9 percent of the US GDP, has the highest wages and excellent key performance indicators. Despite these successes, it is

Figure 1: US financial sector value added share (as percent of GDP)



Source: U.S. Bureau of Economic Analysis

important to remember some critical lessons from the regulatory and policy failures of the previous crises, most of all, the 2008 global financial crisis.

First, the design of financial sector regulatory framework and the conduct of monetary and financial policies are endogenous in their true nature and, hence, affect the behavior of banks and financial institutions.

Second, the incentive systems and signals may sometimes lead in the wrong direction or be conflicting, especially in the presence of risks which have to be properly factored in while pursuing higher performance in the presence of complex instruments.

Third, government preference for price stability, employment and growth, as well as targeted housing financing must not be interpreted as willingness to be drawn into expensive bailouts benefiting failed banks and financial institutions. This is especially relevant at this time as large fin-tech and other non-bank financial institutions embark on private digital money creation and domestic and international payment systems.

Fourth, financial sector reform is inevitable to truly and consistently implement all lessons learned from the previous crisis as well as prepare to secure stability of the new digital forms of money and complement the system with appropriately designed public digital currency (presently best known as CBDC or Central Bank Digital Currency). Aside from new instruments and payment innovations, the core part of the reformed financial sector will have to rest on a well-managed interface between private and public sector regarding both regulatory and policy issues.

Digital money instruments

Digital money revolution, also labeled "New Era of Digital Money" [1] and the "The Rise of Digital Money" [2], shared many common characteristics of many industrial revolutions we have seen in the past two centuries. Forces of change for private digital money included [18]:

A. Technology and infrastructure including but not limited to:
   - crypto algorithms to generate and protect privately (and anonymously) issued digital money;
   - distributed ledger technology (DLT) allowing decentralized clearance and accounting;
   - internet and powerful communication systems; and
   - deep penetration of smart phones, tablets and laptops at user level.

B. Demand for efficient and reliable financial services and modern service providers including
   - payments and transfers (domestic and international, for small and large amounts),
   - investment

C. Responsiveness to consumer behavior and evolving expectations

D. Potential for higher level of financial inclusion for
   - SMEs (entrepreneurs),
   - previously un-bankable social and economic groups, and
   - general population and businesses in areas with poor bank penetration.

Cryptoassets – Bitcoin

Cryptocurrencies or Crypto-assets as ECB Task Force officially calls them are based on blockchain concept published in 2008 under the pseudonym Nakamoto, whose existence has never been confirmed. Bitcoin, first and best known crypto-asset out of some 2000 issued thus far accounts for about 2/3 of market capitalization of crypto-assets (based on [7]). In the absence of formal definition, bitcoin is crypto-asset with decentralized trading and clearing system. It is issued based on strict cryptographic rules regarding ownership of both existing and new units.

Crypto-assets are relatively small (about 2 percent of EU money aggregates), have limited acceptance and low penetration due to, among other factors, very high volatility.

As a result, bitcoin and crypto-assets in general have had a very limited impact on monetary aggregates and monetary policy thus far. Officially, crypto-assets are not considered part of broad money as they did not … "perform the basic functions of money as unit of account, a medium of exchange and a store of value … prices of goods and services are not quoted in any cryptocurrency anywhere … the number of transactions in Bitcoin is

modest. At the same time, the mining process is energy intensive …" [7, p. 4].

Stablecoin

By contrast, stablecoins also utilize crypto-algorithms and DLT but limit volatility by having a credible custodian and by being fully backed by a major currency (Dollar or Euro) or low risk securities.

As long as the share of national stablecoins remains small, and they are backed by stable major currencies, their impact on monetary policy and transmission channels is likely to be small and neutral. In the unlikely case of a strong global stablecoin, which may provide incentives or otherwise induce commodity exporters and/or energy importers to fix prices in such stablecoin, this could impose constraints on the conduct of domestic price stabilization policies.

e-Money or mobile money

Based on Shirono et al. [32], large fin-tech companies are leading the digital money revolution. Mobile money or e-money is their flagship instrument which can be acquired through a very simple registration procedure with one of local provider shops of Mobile Network Operators (MNO). Users must have a simple smart phone and some money to deposit on the mobile account. It does not require a banking account. Based on online database maintained by GSMA (Global Systems for Mobile Communications) and IMF held FAS (Financial Access Survey), mobile money presently offers more access points globally than traditional banking sector.

Based on GSMA data, the number of registered mobile money accounts in the world (excluding China) increased exponentially from 134 million in 2002 to 1.35 billion in 2021: a tenfold increase. During the same period, the number of active mobile accounts increased even faster, from 62 million to 864 million, almost 14 times.

The value of transactions reached one trillion USD in 2021, a 31% increase over 2020. By type of transaction, person-to-person (P2P) transactions were the highest with USD 387 million (37%), followed by Cash-In payments with USD 261 million (25%) and Cash-Out withdrawals of USD 178 million (17%). The fastest growing mobile money transactions were payments to merchants (94% increase over 2020) and international remittances (48%) indicating a diversification into areas that used to be dominated by payment cards and international wire transfers, respectively.

Additionally, mobile money is usually only one of the growing array of expanding digital financial services offered by Fin-Tech (also known as non-banking financial institutions), telecom, and other related companies. The number of mobile money users has been growing exponentially over the past decade. In addition to Africa known as the cradle of mobile money (M-Pesa), e-money has been expanding fast in Asia (China, India) providing services to billions of people seeking reliable, efficient (inexpensive) and widely accepted payment services for literally trillions of small value transactions daily.

Mobile money is a safe, simple and efficient (affordable) form of digital money that provides all functions of money: unit of account, stable store of value and medium of exchange. It provides easy access to most people, and guarantees simple and inexpensive payments and transfers, including remittances. From the monetary statistics point of view, mobile-money outstanding balances are a part of broad money, and thus affect the value and quality of monetary aggregates, as well as the characteristics of so-called transmission channels of monetary policy. The reporting of changes in mobile-money balances depends on the dominant business model and the applicable regulatory framework. Over the last 5-6 years mobile money balances have increased significantly in all African and Asian countries where e-money represents a significant portion of broad money.

It should be stressed that mobile banking is very different from mobile-money or e-money. In mobile banking, users access their bank account using custom application software installed on their smart phones. All transactions in mobile banking are performed on the client's bank account. Smart phones are just used to remotely access bank account and initiate those transactions. In mobile money, transactions are done directly peer-to-peer between registered and authenticated users based on previously deposited balances on the payee side and legitimate payments (for goods or services) and transfers.

Individual bank accounts are not needed to perform mobile-money transactions.

So far three major business models have emerged in the so-called Mobile Money Ecosystem. Shirono et. al. [32] identify two major models:

The original "MNO-led model" was created by major mobile network operators (MNO) such as M-Pesa launched by Safaricom in Kenya, Vodafone in Tanzania, and GlobeTelecom in Philippines. No bank accounts or prior credit history are needed to become mobile-money client.

"Bank-led model" is initiated by banks but relies on MNOs to manage the network and financial services based on mobile phones. Irrespective of bank involvement, no bank account is needed to become a client.

The third model is a "Fin-Tech-led model" where providers of financial/payment services initiate mobile-money operation. These include some of the presently largest mobile-money providers such as AliPay, WeChat Pay, Apple Pay, Google Pay, PayPal, etc.

The MNO and Fin-Tech led models share many common features and can be merged into a "non-bank-led model".

Five essential functions have been identified in each of the models:

- Network service provider role is usually carried out by one or more MNOs;
- Mobile money agents provide direct contact with present and future customers; The network of agents is supported by MNOs, and payment providers/Fin-Tech companies, as well as banks in the "bank-led model";
- Payment service provider is responsible for front end interface with agents and customers, back-end processing and, most importantly, for payment clearance and settlement; Payment services can be provided by MNOs, FinTech companies, as well as banks in the "bank-led model";
- Mobile money issuer who holds the liability for mobile money and guarantees the conversion of mobile money balances back to cash/legal tender when demanded; In the "non-bank led model" the issuer can be MNO or FinTech company, and in the "bank-led model" the issuer can only be the bank; and
- Deposit holder (usually a bank in all models) is responsible for funds deposited/pre-paid by mobile money customers.

A variant of "bank-led model" has been created in India labeled "narrow bank model". It allows a formation of so called "payment banks" under exiting banking laws and regulatory environment with limited set of financial services. Eligible MNOs or Fin-Techs can obtain a limited banking license which allows them to accept deposits, issue ATM and debit cards, offer payments and other financial services excluding lending. Restrictions also apply on the placement of deposits requiring that 3/4 of demand deposits be invested in low risk government securities or treasury bills with up to one year maturity, and 1/4 held with commercial banks as minimal operational liquidity.

Similar rules have evolved in other countries with significant share of mobile money in monetary aggregates to preserve financial stability and allow liquidity interventions in cases of a financial crisis due to external shocks or "runs". The remaining concerns that apply at times of severe liquidity and financial crisis have led to proposals for the introduction of CBDCs discussed in the next subsection.

RBI, the central bank of India, has also pioneered Universal Payment Interface as an enhancement to the mobile money system allowing some 400 million users in Rural areas with older telephones (without smart phone features) to join mobile money and access modern payment services. To further increase financial inclusion, RBI has also sponsored Unstructured Supplementary Service Data (USSD) as another cashless option for those who do not own or carry any phone or tablet, and do not have access to internet. On the higher end, RBI supported the development of Immediate Payment Service for users with mobile money accounts also registered for mobile banking.

Central bank digital money – CBDC

Unprecedented growth of mobile money in Africa, South and East Asia generated 1.35 billion users worldwide in 2021. This number is more than doubled when supplemented by the missing numbers for China (1.3 billion for Ali Pay and 900 million for WeChat Pay), and corrected for under-reported users in Europe and North America (as suggested

by data of major mobile money operators such as Apple Pay, Google pay, PayPal, Samsung Pay and Venmo). With fast increasing value of e-money transactions and growing balances, mobile money proved to be very convenient and a reliable unit of account for billions of users.

Adrian et. al. [1] ask a critical question: How stable is e-money compared to other competing forms of money (crypto-assets, stablecoins, commercial bank deposit money, cash or CBDC)?

First, e-money is exposed to liquidity risk which depends directly on the market liquidity of the asset mix held by the issuer of mobile money. In normal times this may not be an issue. In times of financial crisis, however, the issuer may not be able to convert less liquid assets to cash fast enough to prevent the "run" in the absence of central bank liquidity backstop.

Second, e-money is also subject to default risk of the issuing entity due to losses (bankruptcy) or inability to short-term obligations. In that case, pre-paid funds in mobile-money accounts could be frozen or seized by creditors which represents a serious risk with potential spillovers and damaged reputation.

Third, market risk can affect assets held by an e-money provider if his net worth becomes negative (i.e. if losses exceed equity).

Fourth, e-money can also be subject to foreign exchange risk if some claims are denominated in foreign currency or a basket of currencies.

With these risks and high potential for further growth of a widespread adoption, mobile money represents a major potential challenge for the stability of the monetary system in case of crisis unless adequate liquidity backstop solutions can be implemented seamlessly. These could either be based on limited inclusion of MNO and/or Fin-Tech companies into the banking system following the "narrow banking model" introduced in India, or the introduction of a public digital money issued by the central bank to which we devote the remainder of this section.

CBDC research and objectives

Central banks around the world are exploring the possibility of issuing retail central bank (public) digital money. Based on January 2023 online tracker data, out of 119 countries around the world, CBDCs have been Launched already in 11countries, and Piloted in 17. In addition, 39 countries are at Research stage and 33 at Development stage in 33. In 15 countries work on CBDCs is inactive at present, and in 2 countries CBDC work has been cancelled.[2]

A wide range of CBDC objectives is quoted in the ample literature on the subject. Panetta et al. [27] emphasize that the primary objective of issuing CBDCs is a necessity to secure access to public money in an economy increasingly dominated by private digital money.

In a survey of pragmatic CBDC issues, US Federal Reserve [1, pp. 1-2] states that policymakers and staff are guided by an understanding that CBDCs should:

- provide positive net benefits to the economy (adjusted for risks and time distribution of effects);
- be more efficient and effective in achieving desired objectives than alternative instruments;
- complement, rather than abruptly replace, existing forms of money and methods of financial services;
- protect consumer privacy;
- safeguard against criminal activity; and
- enjoy broad support from a broad range of key stakeholders.

As recognized early in the debate by Bordo and Levine [11] CBDCs can be either

- wholesale digital money instrument made available only to commercial banks, much like the present central bank reserves, or
- retail digital money instrument available to all economic agents in an economy, much like central bank FIAT money (cash or legal tender). Retail CBDCs can be
  - account based or
  - token based digital monies.

Both wholesale and retail CBDCs can be interest bearing as deposit money or no interest bearing. This is presently a heavy debated issue with possible significance in the conduct of monetary policy, currency substitution, crowding out commercial bank deposits with possible far reaching consequences on the volume and cost of lending.

2 CBDC Stage of Research and Development, by Country as of January 2023 can be accessed at Central Bank Digital Currency (CBDC) Tracker (cbdctracker.org) as well as specialized site sponsored by Atlantic Council. Central Bank Digital Currency Tracker - Atlantic Council.

Recent research suggests that these effects could be managed through the design of CBDCs and targeted policy measures that could limit the size of CBDC holdings, provide multi-tier remuneration (interest payments) depending on share of CBDCs in bank portfolios, use of CBDC caps etc.

CBDCs have a positive impact on the stability of the financial system based on sovereign digital money, faster and more efficient (cheaper) payments and financial transactions in general.

One issue that attracted a lot of attention is the potential impact of CBDC during times of financial crisis and a potential loss of confidence in commercial banks. The fact that retail CBDCs can be held with zero financial and handling cost (unlike cash) may exacerbate run on banks if no restrictions are put in place before hand. Paneta et al. [27] quote recent research results which indicate that increased risks of bank runs in the presence of CBDC can be effectively contained by design features of the instrument itself, as well as through properly calibrated safeguards and information of deposit flows enabled by tracking properties of digital instruments.

It should be noted that design features and safeguards also help in sustaining the monetary policy transmission channels. More research is needed to resolve the dilemma of CBDC remuneration and constraints on CBDC holdings in the realistic context of real-life policy choices. Zero lower bound on interest rates is one such issue. The attractiveness of CBDC as an efficient payment instrument, form of investment in times of crisis, and an anchor of price and financial stability. As Schiling et al. [31] put it: the objectives of payment efficiency, financial system stability and price stability cannot be all achieved at the same time.

Impact on monetary and fiscal policy

Without repeating policy issues already discussed in the introduction, the section devoted to policy lessons from the Global financial crisis, and in the context of individual digital money instruments, this section aims to highlight some of the key remaining policy issues with high impact on the effectiveness of monetary and fiscal policy.

The effect of crypto assets on money aggregates is small primarily because bitcoin and similar crypto assets do not satisfy the definition of money and are normally not recorded as addition to broad money. Stablecoins backed by major currencies may add to the value of monetary aggregates, but their size remains marginal at present. Mobile money is officially considered as money which adds to the size of broad money. The reporting depends on the business model followed: In "bank-based e-money models" outstanding balances should automatically be reported as additions to M2. In "non-bank-based models" the reporting depends on the specific legal and regulatory arrangements. The responsibility for reporting can be placed on banks holding e-money deposits, or MNOs or Fin-Tech companies issuing e-money. CBDCs are part of CB money issued in digital form and thus gets reported in a standard way.

As discussed above, private digital money is a convenient and efficient way to provide payment and transfer services. In all aspects they are equal or more efficient than the traditional payment instruments. The effect on the stability of the monetary system and transmission channels depends on the inherent financial characteristics of mobile money issuers. As discussed in the previous section, both mobile money and CBDCs bring some stability and policy effectiveness issues. Current research has already identified a number of design features and safeguards that can help address main risks in normal times, as well as prevent "runs" and widespread costs during crisis.

The ongoing research of the impact on transmission channels is limited by the lack of both adequate models and empirical evidence. Much of modern monetary policy wisdom is based on empirical relations as a basis of evaluating and calibrating the policy interest rate channel and other instruments at central bank disposal.

Much of the policy discussion surrounding the development of CBDC instrument is focused on the challenges that could potentially be caused by currency substitution. The advent of strong major digital central bank currencies, such as digital US Dollar or digital Euro may create incentives for currency substitution in countries with weaker currencies and macroeconomic fundamentals. This could trigger a process of digital dollarization or digital euroization that is faster and deeper than similar processes observed in the past, based on traditional major

currencies. Excessive currency substitution may adversely affect domestic monetary policy due to limited control over domestic liquidity and, hence, less efficient impact on price stability and real performance.

Currency substitution in the presence of digital CBDC is not very different from present dual currency situations faced by many small economies with large remittances and share of shadow economy. Methods of dealing with the currency substitution problem may have to be adapted to much faster financial flows associated with the dominance of digital currencies. The fact that most digital moneys would leave a trace which could help fight shadow economy and illegal economic activity may actually diminish one the main drivers of dual currency.

Digital revolution is expected to have a profound impact on the ease and transaction cost of cross border payments. This will create considerable savings for workers' remittances, SME transactions, trade flows and international transfers. At the same time, digitalization of international payments will remove most barriers to capital flows and make standard policies of "capital account restrictions" more difficult if not impossible without stark violations of the spirit of public and private digital monies. Furthermore, the presence of public CB digital currency with practically unlimited capital mobility will require adequate choices regarding foreign exchange rate regime, and the independence of monetary policy.

On the fiscal side, digital money revolution will bring a possibility of a major reduction in the shadow economy based on digital tracking left behind every transaction (payment or transfer) and much higher level of transparency of accounting and fiscal/tax reporting. Carefully drafted laws should increase fiscal transparency and revenues without violating privacy and personal information. Challenges in protecting privacy and data integrity are very serious and merit utmost attention of the government, the legislature and the broad public.

Digital transactions would also help improve the efficiency of public spending through transparent and truly competitive procurement procedures, and monitoring of public spending effects on the achievement of stated budget objectives in health, education, social assistance, and infrastructure investment.

As a result, there will be an improved base for better public expenditure management based on multi-year expenditure framework and program based budgeting aligned with development objectives.

Finally, the digital monetary revolution will accelerate all flows and processes, and pose new challenges in the areas of monetary and fiscal policy coordination.

Serbia will benefit greatly from improved fiscal transparency and reduced shadow economy associated with digital money revolution. Despite significant variation in the estimates, the shadow economy remains a serious concern strongly linked to the share of cash transactions (in both local currency and Euros). All other factors being equal, declining share of cash and growing use of digital monies with tracking capabilities are likely to bring many shadow activities in the open, reduce or eliminate under-reporting of taxable income and transactions in otherwise registered businesses, and increase fiscal transparency on both the revenue and expenditure side of the budget. To internalize these benefits, Serbia will have to revisit its tax, budget and procurement laws, and modernize tax administration to target likely pockets of tax evasion among large tax payers, and in unregistered and illegal activities, instead of putting undue pressure on small and medium size businesses with poorly disguised urge to collect revenues ignoring social and long-term growth consequences.

At the same time Serbia will be vulnerable to currency substitution pressures from future digital Euro due to high dependence on remittances coming mostly from Euro area, and the possibly large stock of dual currency in the country. Furthermore, reduced effectiveness and traction of monetary policy caused by currency substitution will be stressed further by: (a) the presence of likely multiple exogenous e-money flows spreading like wild fire in many EU and other countries with significant trade and remittance flows, and (b) inability to fine tune capital flows.

To effectively respond to these challenges Serbia is best advised to engage in timely legal preparations for the anticipated needs of a possible (or likely) increase in "bank-led mobile money" and central bank digital currency. In parallel, mirroring the initiatives of ECB, BIS and u Fed, Serbia should initiate applied research of

complex future policy risks and seek effective institutional and policy responses.

Conclusion

Era of digital money has started slowly, at the outskirts of privately generated crypto-security associated with extreme volatility. In slightly over a decade digital money has spread like a wildfire to now include more than 4 billion users of mobile money and force a quantum change in the central bank money. Paper money, bank notes, legal tender are on the way out. CBDC will be a digital reincarnation of central bank money, available retail for all banks, companies and individuals to provide liquidity and public sector backbone to the monetary system.

We will soon live in a brave new world of digital money. Phrases like "Show me the money" from Jerry Maguire, "Cash is the king" and "Money makes the world go round" will no longer make sense. Our life will be easier. Transactions will be faster and cheaper.

There will be uncertainties and challenges regarding the conduct of monetary and fiscal policy. Many improvements will come with necessary tradeoffs in the speed and effectiveness of monetary policy transmission, and the challenges of achieving greater fiscal transparency without violating individual rights and privacy.

Serbia will benefit greatly from improved fiscal transparency and reduced shadow economy associated with digital money revolution. At the same time it will be vulnerable to currency substitution pressures from future digital Euro and reduced traction of monetary policy in the presence of multiple e-money flows. Timely legal preparations for bank-led mobile money and central bank digital cash, and applied research of complex future policy risks is strongly advised.

References

1. Adrian, T., & Mancini-Griffoli, T. (2021). *A New Era of Digital Money*. FD Finance and Development. Retrieved from https://www.imf.org/external/pubs/ft/fandd/2021/06/online/digital-money-new-era-adrian-mancini-griffoli.htm
2. Adrian, T., & Mancini-Griffoli, T. (2019). *The Rise of Digital Money*. IMF Fintech Notes. Washington, D.C.: IMF.
3. Ahnert, T., Hoffmann, P., & Monnet, M. (2022). *The digital economy, privacy, and CBDC, ECB* (ECB Working Paper, No. 2662) ISBN 978-92-899-5111-1.
4. Aggarwal, K., Malik, S., Mishra, D. K., & Paul, D. (2021). Moving from Cash to Cashless Economy: Toward Digital India. *Journal of Asian Finance, Economics and Business, 8*(4), 43-54.
5. Armas, A., & Singh, M. (2022). *Digital Money and Central Banks Balance Sheet* (IMF Working Paper, 2022. WP/22/206). Washington, D.C.: IMF.
6. Arvidsson, N. (2019). *Building a Cashless Society: The Swedish Route to the Future of Cash Payments* (Kindle Edition). Springer International Publishing.
7. Assenmacher, K. (2020, May). *Monetary policy implications of digital currencies* (SUERF Policy Note, Issue No.165).
8. Barrdear, J., & Kumhof, M. (2022). The macroeconomics of central bank digital currencies. *Journal of Economic Dynamics and Control*, *142*, 104148.
9. Bank for International Settlements (2021). *CBDCs: An opportunity for the monetary system* (BIS Annual Economic Report 2021).
10. Board of Governors of the Federal Reserve System. (2022). *Money and Payments: The U.S. Dollar in the Age of Digital Transformation*. Retrieved from https://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf
11. Bordo, M. D, & Levin, A. T. (2017). *Central Bank Digital Currency and the Future of Monetary Policy* (NBER Working Paper 23711). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w23711
12. Brunnermeier, M. K., & Niepelt, D. (2019). On the equivalence of private and public money. *Journal of Monetary Economics*, *106*, 27-41.
13. Carapella, F., & Flemming, J. (2020, November 9). *Central Bank Digital Currency: A Literature Review* (FEDS Notes). Washington: Board of Governors of the Federal Reserve System. https://doi.org/10.17016/2380-7172.2790
14. Carstens, A. (2021). *Digital currencies and the future of the monetary system*. Remarks by General Manager, Bank for International Settlements. Hoover Institution policy seminar Basel 27 January 2021.
15. Chiu, J., & Keister, T. (2022). The economics of digital currencies: Progress and open questions. *Journal of Economic Dynamics and Control*, *142*, 104496.
16. Davoodalhosseini, S. M. (2022). Central bank digital currency and monetary policy. *Journal of Economic Dynamics and Control*, *142*, 104150.
17. Ikeda, D. (2022). *Digital Money as a Medium of Exchange and Monetary Policy in Open Economies* (Discussion Paper No. 2022-E-10). Institute for Monetary and Economic Studies Bank of Japan.
18. IMF. (2020). *The Rise of Public and Private Digital Money: A Strategy to Continue Delivering on the IMF's Mandate* (IMF Board Paper). Washington, D.C.: IMF.
19. Johnson, S., & Kwak, J. (2011). *13 Bankers: The Wall Street Takeover and the Next Financial Meltdown*. New York: Vintage books, Random House.
20. Kahn, C., Singh, M., & Alwazir, J. (2022). Digital Money and Central Bank Operations (IMF Working Paper, 2022. WP/22/85). Washington, D.C.: IMF.

21. Khiaonarong, T., & Humphrey, D. (2022). Falling Use of Cash and Demand for Retail Central Bank Digital Currency (IMF Working Paper WP/22/27). Washington, D.C.: IMF.
22. Kumhof, M., & Jakab, Z. (2016, March). The Truth about Banks. Finance & Development, 53(1). Retrieved from https://www.imf.org/external/pubs/ft/fandd/2016/03/pdf/kumhof.pdf
23. McLeay, M., Radia, A., & Thomas, R. (2014). Money creation in the modern economy. *Bank of England Quarterly Bulletin*, *54*(1), 14-27.
24. Monnet, E, Riva, A., & Ungaro, S. (2021). *Bank runs and central bank digital currency*. VoxEU. Retrieved from https://cepr.org/voxeu/columns/bank-runs-and-central-bank-digital-currency
25. Niepelt, D. (2021, November 24). *Central bank digital currency: Considerations, projects, outlook*. VoxEU. Retrieved from https://cepr.org/voxeu/columns/central-bank-digital-currency-considerations-projects-outlook
26. OECD. (2002). *The Future of Money*. Paris: OECD.
27. Panetta, F., Mehl, A., Neumann, M. M., & Jamet, J-F. (2022, April 13). *Monetary policy and financial stability implications of central bank digital currencies*. VoxEU. Retrieved from https://cepr.org/voxeu/columns/monetary-policy-and-financial-stability-implications-central-bank-digital-currencies
28. Prasad, E. S. (2021). *The future of money: how the digital revolution is transforming currencies and finance* (Kindle Edition). The Belknap Press of Harvard University Press.
29. Rajan, R. G. (2010). *Fault Lines: How Hidden Fractures Still Threaten the World Economy*, Princeton University Press, Princeton.
30. Sanches, D., & Keister, T. (2021). *Should Central Banks Issue Digital Currency?* (Federal Reserve Bank of Philadelphia Working Paper 21-37).
31. Schilling, L., Fernández-Villaverde, J., & Uhlig, H. (2020). *Central Bank Digital Currency: When Price and Bank Stability Collide* (BFI Working Papers, No 2020-180). Becker Friedman Institute for Economics at the University of Chicago.
32. Shirono, K., Das, B., Fan, Y., Chhabra, E., & Carcel, H. (2021). *Is Mobile Money Part of Money? Understanding the Trends and Measurement* (IMF Working Paper WP/21/177). Washington, D.C.: IMF.
33. Stiglitz, J. E. (2010). Lessons from the Global Financial Crisis of 2008. *Seoul Journal of Economics*. *23*(3), 321-339.
34. Turrin, R. (2021). *China's Digital Currency Revolution*. Gold River: ⁋Authority Publishing.
35. van Oordt, M. R.C. (2022). Discussion of "Central bank digital currency: Stability and information". *Journal of Economic Dynamics and Control*, *142*, 104503.
36. Williamson, S. D. (2022). Central bank digital currency and flight to safety. *Journal of Economic Dynamics and Control*, *142*, 104146.
37. World Bank. (2014). *Global Financial Development Report 2014: Financial Inclusion*. Washington, DC: World Bank.
38. World Payments Report, Capgemini. (2022). World Payments Report 2022. Retrieved from https://worldpaymentsreport.com/index.html

Dušan Vujović

is a Professor of Economics at FEFA (Faculty of Economics, Finance and Administration), Belgrade, and a World Bank consultant in the areas of macroeconomic policy, fiscal and governance reform, and innovation for growth. Dr Vujović is a member of WAAS (World Academy of Arts and Sciences). He chairs NALED (National Alliance for Local Economic Development) Research Council and provides consulting services to various Serbian and international research and policy institutes. From April 27, 2014 – May 16, 2018 Dr. Vujović held three ministerial positions in the Government of Serbia: Economy April 2014 - September 2014, Finance August 2014 - May 2018, and Defence February - March 2016. He received the best Minister of Finance in Eastern and Central Europe award for 2017. He was a USAID consultant on budget and fiscal reform issues, and a research fellow at CASE Institute, Warsaw. Dr Vujovic past career includes various positions at the World Bank, such as Country Manager for Ukraine, and Co-Director of the Joint Vienna Comprehensive program for government officials from the transition economies, Lead Economist in the World Bank ECA region and in the Independent Evaluation Group. He authored and co-authored a number of publications on macroeconomic policy, development, and institutional reform and transition issues published as papers in domestic and international journals, and chapters in books published by The World Bank, Oxford University Press, North Holland, Edward Elgar, etc.