Department of Economics

Athens University of Economics and Business

WORKING PAPER no. 03-2023

Central bank digital currencies:
Foundational issues and prospects looking forward

George C. Bitros and Anastasios G. Malliaris

February 2023

Central bank digital currencies:
Foundational issues and prospects looking forward

George C. Bitros[1]
Emeritus Professor at the Athens University of Economics and Business
bitros@aueb.gr

Anastasios G. Malliaris
Walter F. Mullady Sr. Professor of Economics and Finance,
Quinlan School of Business, Loyola University Chicago
tmallia@luc.edu

Abstract

We identify the main pros and cons that drive the interest of central banks to issue a digital currency, we discuss certain fundamental issues that such a currency would raise for monetary policy, and we propose reforms that may be appropriate looking forward. While distant, it may not be farfetched to think of a future where, like in ancient Athens, money is produced privately and the "common" good, as reflected in democracy, free markets, and individual freedoms, is served by limiting the authority of the state in the domain of money to safeguarding competition and curbing illicit activities and tax evasion. However, until then, confronted with the challenges of cryptocurrencies, governments are likely to adopt hybrid systems consisting of two nodes: One that provides for a state-operated digital mint, supplying electronic money on a voluntary basis, and another rich in cryptocurrencies, all circulating parallel and in competition. In such a setup, let the government announce that all its transactions with the public will be reckoned and settled in its own electronic money, Bitcoins, and banknotes denominated thereof. As a result, government electronic money and Bitcoin will turn into reserve currencies. The demand for them will create strong incentives for financial institutions to issue notes denominated in them without government imposed convertibility obligations. And not the least, while the government would not issue a mandatory electronic currency, since such an initiative would undermine gravely democracy and citizen sovereignty, it would issue a voluntary one under conditions that would preserve its value.

Keywords: Central bank digital currency, cryptocurrencies, digital payments, monetary policies, banking system, financial Stability
JEL Classification: E42, E44, E51, E58, G21

---

[1] Corresponding author

1. Introduction

The last 30 years, digital technologies, such as the internet, artificial intelligence, machine learning, robotics, and virtual and augmented reality have revolutionized our ordinary lives. This technological upheaval started by replacing physical mailing by e-mails, moved to phones and texting, doing shopping on line, searching efficiently online with the brilliant Google search engines, using electronic forms, books, and then during the pandemic, doing most of our work from home. At the same time, while digital technologies were rapidly expanding, the US and many other economies experienced a major Global Financial Crisis, followed by an unusually slow recovery, and then a pandemic that lasted about 3 years.

During the pandemic, digital technologies like Zoom and Teams facilitated online teaching and teleconferencing and working from home, all reducing the spreading of Covid-19 and further encouraging the growth of digital economies. These changes were accompanied by equally radical structural shifts in the production and distribution of goods and services, the labor and goods markets, the financial sector domestically and internationally, and the institutions in charge of related laws and regulations, Thus, today, in addition to individuals, families, schools and churches, universities, firms, and local and state governments, who have experienced the impacts of these changes, we witness in many ways the interest of central banks to explore the implications of digital technologies in the fronts of money and the conduct of monetary policy.

In this context, the purpose of the present paper is to identify the confluence of forces that drive these changes, to discuss certain fundamental issues regarding the so-called Central Bank Digital Currency (CBDC) and the monetary system, and to propose reforms that may be appropriate looking forward. The currency in question raises many issues. They range, for example, from technological and economic to political and ethical, and even constitutional. Here we shall place the emphasis on those that have attracted most attention in the relevant economics literature. Moreover, to begin with, it is important to understand the roots of two key developments. The first has to do with the process through which digital Information and Communication Technologies (ICTs) enabled the transition from the old Distributed Ledger Technology (DLT) to the modern one of Blockchain (BC). In the traditional mode of DLT, or just DLT, clearing of the transactions among participants in a network like, for example, a corporation operating in many regionally dispersed locations, has been carried out by an administrator in the headquarters who performs all necessary tasks to maintain consistency among the master copy of the ledger and the

distributed ones. By contrast, in the modern mode of the DLT, represented by the BC, there is neither administrator nor master ledger, and the copies held by the network participants are updated and validated automatically in real time. The subtle difference is that, in the former case, coordination is achieved by command from the administrator to the subordinate network participants, whereas in the latter case coordination takes place through a process of interaction among the independent members of the network as in a perfectly competitive market. And it could be hardly more seminal. For, in a similar fashion, a digital currency managed by a central bank would function much like the present command-driven paper currency, in which trust springs from the commitment of the central bank to safeguard the purchasing power of the currency and act as lender of last resort, whereas a digital currency like the Bitcoin operates as a decentralized market-based exchange system, in which trust springs from the attributes of the *immutability* of records and the unconditioned *openness* to the general public.[2]

The second key development relates to the vast opportunities that digital technologies opened for the production and distribution of private currencies. In the past, as documented by Brunnermeier et al. (2019) and many others, with few exceptions, unbacked private paper currencies failed because they lacked the advantages of public currencies. But in the last fifteen years the national and international expansion of e-commerce has led, on the one hand, to a spectacular increase in the demand for electronic payments, and on the other, to a significant decline in the use of cash. In turn, these two trends have motivated technology- driven start- ups ("Fintech") and large e-commerce and social media platforms ("BigTech") to enter increasingly into the financial markets which have been dominated traditionally by banks and credit card companies. As a result, given that directly and indirectly they lose ground to issuers of private currencies and nothing precludes that their standing may be eroded further by the increasing appeal of cryptocurrencies, it is not surprising that central banks show a keen interest: first, in the implications that these developments may have for their ability to conduct effectively monetary policy and carry out their microprudential tasks, and secondly, in the advantages that a Central Bank Digital Currency (CBDC) may offer in preserving and even strengthening their status in the monetary system.

Attention in Section 2 is directed to the possible reasons why central banks may wish to ven-

[2] In addition to the unique attributes of *immutability* and *openness*, the BC strengthens "trust" through many more channels. For an excellent analysis and empirical documentation in this regard, see Marella et al. (2020). Also, for a more detailed analysis of the advantages of the numerous currencies that are based on this digital technology, otherwise known as cryptocurrencies or cryptos, see Bitros (2021).

ture into issuing their own digital currencies. From the burgeoning literature on the economics of CBDC it turns out that, aside of fending off competition from private currencies, central banks may have a wide set of motivations for doing so. Such would be, for example, the strengthening of their independence and the exercising of firmer control on the money supply by, say, adopting the ideas for "central bank electronic money for all" proposed by Berentsen, Schär (2018) .[3] Or, if research ascertained it, a significantly positive net balance of potential benefits over potential risks. In Section 3 we comment on a few political economy issues that may deter the adoption of CBDCs. Just to foreshadow our approach, assume that the CBDCs will indeed enhance the independence of central banks. In the light of the available literature, certainly this would be welcome. But since the CBDC would give the state an immense reach into private lives of individuals, the question that arises is whether this advance would be good or bad for citizens. Section 4 focuses on how the monetary system may evolve looking forward. In the light of the conclusions reached by Friedman, Schwartz (1986) at the dawn of the digital revolution, it is certainly heroic to assume that present day democratic governments will remain aloof and lose their monopoly power over unbacked paper currencies. But digital technologies appear to be strongly aligned with the preservation of citizen sovereignty and this time the production of private money locally and internationally may be exceedingly hard to control by authority. Lastly, the paper closes with the summary of our findings and certain concluding remarks.

2. Main drivers for a U. S. CBDC[4]

Monetary systems in Western type economies are based on state mandated currencies that operate on the fractional reserve system. What this means is that central banks advance to the associated private commercial banks a small quantity of so called "base" money, which is denominated in the national currency accounting unit, and in turn the latter create a large quantity of money in the same currency by extending loans to economic agents, but within certain limits set by the central banks for the sake of the currency's safety. As a result, while in these two-layer monetary systems the overwhelming quantity of money in circulation is created by the said commercial banks, money is not private. It is public, mandatory, and predominantly digi-

[3] These ideas were intensively discussed in the 1940s and 1950s. For an introduction to this literature, interested readers may start from Friedman's (1948) classic contribution.

[4] Unless specifically indicated otherwise, from now on all references will be addressed to the case of the United States as representative of the Western type economies and democracies. However, mutatis mutandis, the issues discussed hold more or less similarly in all these countries.

tal, since the currency used in the form of cash constitutes a very small and declining percentage of the total supply of money.

Hence, if the interest in the CDDCs that the literature attributes to central banks is serious, it is not clear why they may wish to replace the established and vastly digitized public currencies of today with digital currencies of their own. For now, perhaps they delay for the lack of hard evidence regarding the net balance of potential benefits and risks. We believe that central banks have strong economic incentives to issuing such currencies, but also to postpone doing so because of political economy considerations. The task in this section is to explain the possible drivers in favor of adopting this reform by central banks.

2.1 Advances in the stability of the financial system[5]

Drawing on the accumulated evidence regarding the causes of the financial crisis that erupted in the United States (US) in 2008 and spread quickly globally, Bitros (2015) concluded that the crisis was instigated by errors of omission and commission that the Federal Open Market Committee (henceforth, "the Fed" or the "U. S. central bank") and the federal fiscal authorities (Henceforth the "U. S. Government" or just "State") committed over the previous several years. Key to these errors was the Fed's failure to tame the risk-taking activities of commercial banks.[6]

This failure was not conjectural. It was not due to a one-time error in the Fed's micro-prudential regulatory policies. The fundamental reason was the moral hazard that Fed's standing as lender of last resort embeds in the decision making of the said commercial banks. To warn the latter about

---

[5] To convey its institutional structure, below is a brief account of the money and banking sector in the US:

When the Fed was created in 1913, there existed several private banks collecting deposits, issuing loans and managing their assets. The Fed's role was not to replace them but work with the banking system and promote financial stability. Today, there are about 5,000 and collectively have about 17 trillion in deposits. They keep about $4.6 trillion of them with the Fed and currently receive a 4.4% interest per year. There are some additional liabilities that the Fed has such as $2.0 trillion in Reverse Repurchase Agreements (Repos). Thus their approximate total liabilities from currency in circulation, bank deposits with the Fed, Repos, and accounts with the Treasury, amount to about $8.9 trillion. Assets purchased are primarily Treasury securities worth $5.8 trillion and mortgage-backed securities worth $2.7.

Commercial banks receive deposits, perform the important function of intermediation by collecting the surplus funds of savers and allocate them to investors who pursue worthy business pursuits. This function of intermediation is a skill developed by banks to allocate surplus short-term demand deposit to longer-term investments and benefit from the spread between short-term and longer term interests. The risks associated with the withdrawal of short-term deposits and the inability of banks to liquidate their loans was over time addressed with insuring up to a certain amount the safety of deposits and also by instituting risk management principles guiding the banks adequacy of own capital. In addition, overtime banks introduced credit cards to facilitate payments between buyers and sellers to supplement payments in cash and with checks. For major international payments banks have developed the SWIFT system.

[6] Some may argue that no banks failed and that it was shadow banks like Lehman Brothers and the American Insurance Group (AIG) that folded. The evidence presented by Calomiris (2009) to the contrary is overwhelming.

their risk-taking disposition, it is true that the Fed in cooperation with the fiscal authorities left the big bank of Lehman Brothers to go bankrupt. But shortly thereafter, they conceded that the structure of the banking sector is dominated by banks "too big to fail" and their warning was lost. For, as long as the managements of systemic banks are bent on maximizing profits for themselves and their shareholders, they will always find ways to thwart the limits set by regulatory controls. Hence, since in the established two-layers banking system the problem of moral hazard is inherent and a few commercial banks were left to grow so large that their risk of failure is inconsistent with the sustenance of the monetary system, the frequency and the severity of financial crises may be expected to increase.

Allowing for this awful prospect, the Fed has various reform options. A moderate one is to leave the structure of the banking system as is and, as recommended in the literature [see, for example, Carstens (2021), Panetta (2022)], introduce a CBDC account for all citizens just for payment purposes. Berentsen, Schär (2018) have analyzed in good detail its properties and they find that the net gains in the stability of the banking system, the efficacy of monetary policy, the operational simplicity, and other key parameters are substantial. Another more radical reform is the Fed to push for the adoption in some version of the so-called "Chicago Plan" or the "100% reserve" proposals. This in turn would eliminate the moral hazard problem mentioned above, enhance Fed's control over the money supply, simplify micro-prudential policies, reduce the current fragility of the banking system, and in general increase the stability and the transparency of the financial system.[7] At the same time though, given that commercial banks stand to lose income and other advantages associated with the current fractional reserve system, any reform in the above directions will draw their strong opposition, and this perhaps explains why for the time being the Fed and the U.S. Congress remain aloof.

In short, while the lessons learned and the experiences gained from the 2008 financial crisis may stimulate Fed's interest in the CBDC , its introduction hinges more on the emergence of a

[7] The advantages of this particular reform have been emphasized by many renowned economists. For example, Fisher (1935, 1936) recommended it on the grounds that it would lead to: 1) much better control of a major source of business cycle fluctuations, that is, the sudden increases and contractions of bank credit; (2) complete elimination of bank runs; and (3) a dramatic reduction of net public and private debt. More recently, using a DSGE model of the U.S. economy, Benes, Kumhof (2012) found empirical evidence consistent with these claims and, furthermore, their results showed that output gains 10% whereas "steady state inflation can drop to zero without posing problems for the conduct of monetary policy." In sharp contrast to this evidence, Diamond, Dybvig (1986) have argued that this proposal is dangerous because it can result in scarcity of liquidity which would damage substantially the economy. But their argument is weak because it ignores that, after losing the ability to make loans based on demand deposits, commercial banks will be forced to change most likely along the lines suggested by Kotlikoff, Leamer (2009).

favorable political consensus. With the big banks most likely in opposition, is such a reform feasible in today's fragmented political system? We postpone consideration of this thorny question until the next section.

2.2 Protection of the Fed's power to conduct monetary policies

A national mandatory paper currency, whether backed or unbacked by convertibility into a precious metal, serves three functions. It is a unit of account, a means of payments in transactions, and a store of value. Before the advent of digital currencies, the Fed had strict monopoly power over all three attributes or services of the U. S. dollar. In the aftermath, a plethora of private digital currencies entered the market offering various bundles of these services to a more or less satisfactory extent, at least for the time being. In turn, this trend gave impetus to a growing body of literature arguing that these intrusions erode the monopoly power, independence, or even "sovereignty" of the Fed, thus undermining its ability to conduct monetary policy effectively.[8]

The beginning of the trend in question started in 2009 with Bitcoin. Since then the number of cryptocurrencies has grown into the thousands. However, for the time being, the challenge to the dominance of public money does not come from these currencies. It comes from the prospects that were created when in 2019 the giant corporation of Facebook Inc. announced their plans to introduce a digital currency called Libra. According to the provisions described in their First White Paper, this currency was designed to be:

- A simple global currency and financial infrastructure empowering billions of people;
- Based on a secure, scalable, and reliable blockchain;
- Backed by a reserve of assets designed to give it intrinsic value;
- Governed by an independent Libra Association tasked with evolving the ecosystem.

Unsurprisingly, this project is still pending, having been bogged down in the Byzantine deliberations of the U.S. Congress. And what is more is this. A year later, efforts were made by Facebook Inc.to launch the same currency in Switzerland under the name Diem. But again to no avail, their petition remains under review by the pertinent Swiss authorities.

From the way they have reacted to the imminent entrance of Facebook Inc. into the market of cryptocurrencies, it follows that, in contrast to the preceding heroic assumption, governments

---

[8] Indeed, there are now certain experts whose arguments transcend the concept of the central bank's "independence under the law" and go as far as to side with the shaky notion of central bank "sovereignty". For example, see Ahnert, et all (2022) and Quinn (2021). But we shall return to this issue later on.

will contest strenuously all attempts that may undermine the monopoly power of central banks over current national currencies. But now there are in the world many giant corporations with large ecosystem capable to grow their own currencies and they are learning fast from failures. For, if the ambitions of the Facebook Inc. were limited to introducing Libra or Diem only as a means of payments and not as a full fledge cryptocurrency, the U.S. and Swiss governments would have found it very difficult to resist granting the necessary authorizations. Actually, as analyzed in good detail by Brunnermeier et al. (2019), there are now indications that "BigTech" corporations have started slowly to "bundle" the traditional three functions of currencies, as well as "re-bundle" them by adding more services, thus challenging severely the monopoly power of central banks over national currencies.

Drawing on these trends, it is then most likely that the Fed is pressured into issuing its own digital currency, first, as a means to fend off potential competition from the private digital currencies that may emerge along the lines of the Libra project, and secondly, to preserve its monopoly over the conduct of monetary policies.[9]

2.3 Restoration of the trust in the public currency

From the establishment of the first few ones in the 17th century, central banks in Western type economies have been tasked by governments to manage paper currencies, whether backed or unbacked by convertibility in a precious metal, so as to achieve "stability" in the general price level. The overwhelming evidence is that they have not honored this obligation. For an example, consider the criticism that Ricardo (1809: III, 21–22) addressed to the Bank of England for the way it managed the quantity of banknotes:

> By lessening the value of the property of so many persons and that in any degree they pleased, it appeared to me that the Bank might involve many thousands in ruin. I wished, therefore, to call the attention of the public to the very dangerous power with which that body was entrusted; but I did not apprehend, any more than your correspondent, the signature of "A Friend to Bank Notes," that the issues of the Bank would involve us in the dangers of national bankruptcy.

If he lived in the US in the post 1971 period,[10] would he hold a better view of Fed's currency management? We believe that he would not, because in the 52 years since then, the U. S. dollar

---

[9] Pelagidis, Kostika (2022, 504) find empirical evidence that enables them to conclude that already "the increased popularity of cryptocurrencies can be seen as the main drivers behind the issuance of the digital euro."

[10] Recall that in 1971 the U.S. abandoned the convertibility of the U. S. dollar into gold. As a result, the currency turned into fiat, implying that ever since its value depends on the trust in the U. S. government.

has lost over 85% of its value.

Now transferring value through inflation from hard-working savers to huge borrowers like the U. S. government cannot be a legitimate policy objective of the Fed. Yet the data show that this is the outcome of the policies they conduct. Since in the first place they have redefined the "stability" of prices to apply at a longer-run target inflation rate of 2%, they condone creeping inflation by design.[11] If asked, they would explain that they have done so for the sake of combating unemployment due to "sticky" wages. This might sound as a well-intentioned convention for the common good. But it is not, because those who benefit are different from those who bear the costs, citizens lose trust in the stability of the purchasing power of public currency, and they look elsewhere for alternatives to protect the purchasing power of their assets. The data showing that in 2021 the number of cryptocurrencies had grown to over 6000 indicate how low the trust of citizens may have fallen and what a herculean task the Fed confronts to win back their loyalty in the public currency.[12]

Hence, if switching to a CBDC is viewed as an opportunity for a new beginning aimed at 0% longer-run inflation and no other distortive distributional effects, Fed's interest in this reform would be grounded on sound logic. Additionally, since a CBDC offered directly to citizens may enhance the transparency of the monetary system, the Fed has an extra incentive to adopt the reform as a way of repairing its credibility.

2.4 Catharsis of monetary policies from ethical lapses[13]

From economic analysis we know that inflation distorts the informational content of prices (see, e.g., (Friedman 1977)) thus leading to misallocation of resources; it biases the distribution of national income in favor of the younger and against the older; and not the least, as we said earlier, it transfers purchasing power from savers to borrowers. Aside of the mistrust for monetary policies to which they give rise, these effects raise also significant ethical issues. One example is the adverse impact of inflation on the most vulnerable part of society, that is, the people in retirement who

---

[11] Inflation targeting by central banks started in the early 1990. The Fed adopted explicitly the 2% target inflation rate in 2012. However, according to Bullard (2018), in practice the Fed conducted monetary policies implicitly on this particular convention from 1995. In earlier times, and in particular before the advent of the so-called "Phillips curve", "stability" of prices was construed by central bankers to take effect at 0% longer-run inflation.

[12] Besides, when economists of the professional status of Kotlikoff, Leamer (2009) call for a radical reform of the banking system to restore trust, it goes without saying that currently its structure is suspect in its core.

[13] Renowned libertarian economists have looked into the moral foundations of the fractional reserve system and they have found it wanting. However, as we document in Bitros, Economou, Kyriazis, (2021, 128-140), fractional reserve banking was practice already in classical Athens, where there was no central bank. For this reason, the ethical lapses discussed in this sub-section emerge because the fractional reserve system has been used by central banks in morally questionable ways.

have no working options and their resources are limited. As a result, the poverty and inequality that they fuel undermine democracy and the rule of law. Another example is the acquiescence of the Fed to the huge indebtedness of the U. S. Government. The accumulated debt is essentially future taxes, which are unethical because they will burden future generations that are not around to enjoy the any benefits from spending or protest by voting. Last is the example of the "large-to-fail" banks. The realization that the Fed allowed a few banks to become invincibly large and thus render tax payers ultimate insurers of their survival has detrimental moral implications.

Hence, if the Fed decides to issue a CBDC to replace the established two-layer monetary system and adopt the 100% reserve system, transparency and trust in the U.S. dollar will increase because of the elimination of the moral hazard that the risk-taking behavior of commercial banks entails. And the same will happen if, for the sake of wining the loyalty of citizens to the CBDC, the Fed renders borrowing on the part of the U. S. Government expressive enough so that politicians think twice before pushing democracy to unsustainable deficits and unethical burdens on future generations.

2.5 Sum-up

The money and banking system in the US is exceedingly digitized. Therefore, for the Fed to switch to a digital U. S. dollar it must be motivated by a firmly positive net balance of potential benefits from the new currency over potential costs from abandoning the current paper currency. In this section we cited and explained several sources of benefits that may result from adopting this reform. In particular, we found that the Fed may: a) deal with the moral hazard problem that besets the banking system of today, and thus enhance its degree of controllability of the money supply; b) defend its legal prerogative to the exclusive management of money and monetary policy in the face of the threats it confronts from privately produced currencies; c) encourage the support of the U. S. Congress by reassuring citizens that the reform will improve the stabilization of the economy, and thus help close the gaps in trust and ethics that accompanied its policies in the past; and d) accelerate research so that the potential risks that the reform carries for the banking sector are minimized.

However, the benefits from these sources may not be adequate to sway Fed's Board of Governors toward a U. S. CBDC. To some who believe that central banks have been late already in introducing digital currencies, this possibility is quite likely. But to others like us who look at this issue through a political economy magnifying glass, the hesitation shown in this regard by central banks is justified. The task in the next section is to explain why.

3. Main drivers against a U. S. CBDC

The Fed is not a public authority that designs and enforces monetary and micro-prudential policies in isolation from the U, S. Government and the Treasury. It is "free" and "independent" to act for the sake of the "common good". But it can do so only within the limits specifically set in the law by the U. S. Congress. By implication, since the right to decide on the introduction of a U. S. CDBC is not of the Fed, if the reform restraints in any way the authority of the U.S. Congress or if for political reasons the proposal for a U. S. CBDC cannot go through the legislative process, this would be a good reason for the Fed to procrastinate. However, while the above view has been settled, the literature, particularly in Europe, continues emphasizing central bank "independence" and lately even "sovereignty". This trend obscures the political nature of the difficulties that confront this reform and is in need of some clarification.

Quite related to the preceding is the example set by the U. S. Congress in the case of the Libra project. As it was noted earlier, the resolution of the issues regarding this initiative of Facebook Inc. is pending now for over three years. In view of this delay, one may surmise that in essence the U. S Congress is exercising a sort of veto over the project. This in turn may have signaled to the Fed that the state's legal monopoly power over the currency is protected, and hence, that it does not have to worry about the launching of a "BigTech" cryptocurrency anytime soon.

Lastly, the U. S Congress may be quite sensitive to questions about "privacy" that a U. S. CBDC may raise. The present section is devoted to a more detailed analysis of these crucial issues.

3.1 The Fed's presumed lack of independence

By Article 1, Section 8, of the U.S. Constitution, the authority "to coin Money" and to "regulate the Value thereof" is assigned to the U. S, Congress. Drawing on this authorization, in the *Federal Reserve Reform Act of 1977*, the latter mandated that:

> The Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain long run growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates.…Nothing in this Act shall be interpreted to require that such ranges of growth or diminution be achieved if the Board of Governors and the Federal Open Market Committee determine that they cannot or should not be achieved because of changing conditions.

One year later, in Section 108 of the *1978 Full Employment and Balanced Growth Act*, the U.S. Congress repeated the same wording, albeit with an important qualification, by declaring that:

> Nothing in this Act shall be interpreted to require that the objectives and plans … be achieved if the Board of Governors and the Federal Open Market Committee determine that they cannot or should not be achieved because of changing conditions: Provided, that in the subsequent consultations with, and reports to, the aforesaid Committees of the Congress pursuant to this section, the Board of Governors shall include an explanation of the reasons for any revisions to or deviations from such objectives and plans."

From these constitutional arrangements it follows that the Fed *reports* to the U.S Congress, that it is accountable for explanations whenever the set objectives are not achieved, and that the lack of "independence" to which some experts attribute Fed's hesitation to introduce a CBDC is a charge alien to the separation of state powers that prevails.

This assessment can be ascertained also by reference to the report on "Rethinking Central Banking" that 16 world-renowned economists in the *Committee on International Economic Policy and Reform* submitted back in 2011. In the page 28 of this report, they state:

> Central Bank independence ultimately rests on political consensus—on the convergence of views among leading political interests that society's broader economic goals are best served by this independence.

That is, the Fed may become "independent" only through "political consensus." Does this proposal have any real value? It does not, for at least two fundamental reasons: a) representative party democracies are beset by moral hazard problems that make political consensus extremely unlikely, and b) democracy stands on the principle of not granting "independence" to any person, collective entity, or institution—even if it were certain that this would serve society's broader goals. And no doubt, analyses and proposals in this regard become much more uncertain and shadowy when based on thinking about central bank "sovereignty", since in democracies all powers springs from the people.

In short then, if the Fed decides to proceed with the reform, irrespective of the degree of its "independence", it will have to refer the matter for authorization to the U. S, Congress. And there, depending on the political circumstances, the outcome may be uncertain. Perhaps it is this uncertainty that deters the Fed from pushing on with this reform.

3.2 The constitutional prerogative of the U. S. Congress

In the early 1970s, the Federal Communications Commission (FCC) opened long-distance calls to limited competition. A few years later, the company MCI and other providers of such services filed an antitrust lawsuit against AT&T. Then in the early 1980s, the U. S. Government decided that the monopoly status of AT&T was unnecessary, and opened the market to full competition. Can the U.

S. Congress do the same by allowing private currency providers to compete with the Fed? The answer is yes because it draws this authority directly from the U. S. Constitution. Moreover, given that it was the U. S. Congress that established the Federal Reserve System in 1913 and authorized it to manage the currency on an exclusive basis, now it is the same that must decide on whether or not to open the market of digital currencies to competition.

Drawing on this understanding, the stance of the U. S. Congress in the case of the Libra project sends mixed signals. For one, the three year delay may signal a de facto veto. If so, the Fed might take all the time it needs to adopt a digital currency or even remain with the status quo. On the other hand, if the delay is due to the lack of a majority in favor or against the project then, the decision on the part of the U. S. Congress is clouded in the uncertainty of the political process, which may be liable for the observed operational stalemate. The Fed shows no interest in adopting the reform; Facebook Inc. tries to find a solution outside the US; and other BigTech corporations stay aloof waiting to see the reaction of the U. S. Congress to which the U. S. Constitution has bestowed the monopoly rights on the U. S. currency.

3.3 The case against a U S. CBDC based on "privacy" risks

Berentsen, Schär (2018, 99-103) argue in favor of mandatory central bank digital currency on two grounds. The first is the negative view they take on the future of cash. For them, while cash provides many advantages, its end might be near. The second ground is their claims that a CBDC offered directly to all citizens by the central bank: (a) increases the stability of the financial system; b) simplifies monetary policy and makes it more transparent; and c) requires low administrative effort. Provided that these advantages are ascertained by further empirical research, no-doubt they may translate into contributions of significant social and economic value-added. But, for a more balanced appraisal of the proposed reform, one should take also into account the possibility of serious adverse effects from the introduction of a CBDC.

Relevant in this regard are the troubling insights that the authorities may gain into the private lives of citizens. For example, since, say, the US is in reality a virtual community, it should be obvious that the Fed may turn the U.S. dollar into a virtual currency transferred via permissioned ledgers or pseudo-blockchains. This in turn would facilitate real-time tracking of transactions; all those with bad credit records might be excluded; tax authorities might have access to private records, etc. In short, the U. S.CBDC would endow the government and the regulators with sophisticated forensics tools, and hence with unprecedented and tempting opportunities to gain information

on the spending habits and social behaviors of citizens. It could become all the way eponymous.

If the prospect of a U.S. CBDC is dreadful for individual freedoms, only its introduction on a voluntary basis and secure institutional guarantees for citizens' privacy might render it palatable. But even then, depending on the circumstances, the lack of trust may lead central bank digital currency to failure. To corroborate this possibility, it suffices to mention the debacle that the central bank of Ecuador suffered when in 2014 it introduced electronic money and enabled citizens to undertake transactions through their mobile phones directly from their accounts with the central bank. As explained in greater detail by White (2018), despite its apparent convenience, the citizens refused to embrace the central bank electronic money so much so that the government of Ecuador was forced in 2017 to decommission it.

Based on the above, some people think that a CBDC, voluntary or mandatory, is a bad idea. But money is too important for the "common" good and the question of the state's involvement in market economies where money is produced privately remains open. For this reason, the objective in the sequel is to explain why the centuries old success of the monetary arrangements in classical Athens may serve as a model of choice after which to pattern the necessary reforms to accommodate the challenges of digital currencies in Western type democracies.

4. Prospects looking forward

Money in ancient Athens was produced and traded like any other commodity. But due to its strategic importance for keeping Persians at bay, holding the sea lanes open for securing the necessary imports of cereals, strengthening social bonding, and other reasons, with the acquiescence and support of the *Assembly*, the state had been empowered with several mandates over the currency. The enforcement of these mandates resulted in an economic environment in which money functioned as in a free banking system. In this system, the state: a) determined the unit of account called drachma and linked it to silver; b) retained the exclusive right to cutting silver drachma coins of various denominations; c) operated a mint, which was open to cutting drachma coins on demand for anybody who brought in silver bullion; d) enforced legal and administrative mechanisms to defend the currency's integrity in the domestic and international markets; and e) carried out all its transactions in this currency, thus turning the drachma into the dominant currency in the Eastern Mediterranean and beyond. Moreover, in addition to the evidence that drachma coins circulated in Athens in parallel and in competition to foreign currencies, which rendered the state's drachma cutting monopoly contestable, the government was in the hands of citizens

themselves, who had all the interests to maintain the currency's integrity. As for the deposit and loans markets, they were regulated as all other non-foodstuff related activities.

Many centuries later, countries adopted monetary systems based on gold and/or silver, which operated in the presence or absence of a central bank. From the study of their experiences we have come to know fairly well how changes in the quantity of money might be expected to affect key macroeconomic variables like the general price level, the exchange rate, the interest rate, the rate of economic growth, the stability of the economic system, and even what a central bank can and cannot do. By revisiting the data from the period 1880-1914, when many countries applied the gold standard, and drawing on the gold-like properties of Bitcoin, Weber (2016) conjectures how the said macroeconomic variables might be influenced, if countries switched to a bitcoin standard.

The view taken here is that it is distant but not farfetched to think of a future where, like in ancient Athens, money is produced privately and the "common" good, as reflected in the fundamental principles of democracy, free markets, and individual freedoms, is served by limiting the authority of the state in the domain of money to the above-mentioned administrative tasks.[14] However, until then, confronted with the challenges of cryptocurrencies, governments in contemporary democracies are likely to adopt hybrid systems consisting of two nodes: One that provides for a state-operated digital mint, supplying electronic money on a voluntary basis, and another rich in cryptocurrencies, all circulating parallel and in competition. In such a setup, let the government announce that all its transactions with the public will be reckoned and settled in its own electronic money, Bitcoins, and banknotes denominated thereof. As a result: a) the government electronic money and the Bitcoin will turn into reserve currencies; b) the demand for them will create strong incentives for financial institutions to supply them in price stability preserving quantities; c) financial institutions will be free to issue notes in these as well as in any other currency, without government imposed convertibility obligations; d) in the absence of a lender of last resort, citizens and financial institutions will assume in common the responsibility for the

[14] Nothing precludes of course that the situation may worsen under the challenges posed by cryptocurrencies. For, given that the stakes of governments in today's *representative party democracies* do not coincide systematically with the interests of citizens, there is a grave risk. This has to do with the possibility that governments may react by undertaking initiatives to introduce some sort of compulsory digital currency. Such a development is unlikely to succeed and it should be avoided, because digital currency is not cash, which functions as a safety valve. Instead, since the decentralized nature of cryptocurrencies is absolutely consistent with democracy and free markets, governments should adopt schemes of accommodation of cryptocurrencies along the lines suggested above in the case of classical Athens.

maintenance of political and economic freedoms; and e) while the government would not issue an obligatory electronic currency, since such an initiative would undermine gravely democracy and citizen sovereignty, it would issue a voluntary one under conditions that would preserve its value and retain all prerogatives to enact and enforce rules and regulations for keeping all markets open to competition, and to combat tax evasion and illicit activities.

5. Concluding remarks

Irrespective of what we say and write about the pros and cons of a CBDC looking from outside, whether the Fed or any other central bank decides to issue one depends on the balance of benefits and risks as assessed by its own decision-making centers and the supervising state authorities. So it is of great interest to know the intellectual climate that prevails on this subject within central banks. One accessible channel from outside is the official and unofficial discussion papers that are published by central banks all over the world. For the Fed we have the publication of the Board of Governors of the Federal Reserve System (2022). Reading through the two pages of potential benefits and risks, one is impressed with the tentativeness of the prevailing views and assessments on both sides of the balance. Assuming that there are no detailed plans rendering the prospects of potential benefits way firmer and brighter than the risks, in our view, the gestation period of a U. S. CBDC may be expected to be long, unless developments in the front of "BigTech" cryptocurrencies precipitate some reaction from the Fed or the U. S. Congress.

Over three decades ago, while assessing the models of free banking found in the literature, Friedman, Schwartz (1986, 43) concluded that:

> Historically, a single unit of account linked to a single dominant outside money has tended to emerge, initially via a market process of transactors settling on a particular commodity, followed almost invariably by government's exercising control over one or more aspects of the issuance of outside money-typically with the ostensible purpose of standardizing the coinage and certifying its quality (purity, fineness, etc.).

At the time they were writing, not enough was known from which to piece together a model of money and banking in classical Athens. Hence, they were justified in invoking the lack of a historical precedent as a condition for the possibility of "privately produced viable money without government" to ever emerge. In the meantime, circumstances changed as new research has expanded vastly our knowledge about the Athenian society and economy in that period. As a result, it has become possible to revisit the issue in search also for insights regarding the current challenges that emanate from the advent of digital currencies. The main finding is that the application

of the silver standard in classical Athens offers a solid historical precedent after which to pattern the foundation of a modern hybrid monetary system consisting of a government operated voluntary digital currency and private currencies based on the bona fide Blockchain technology.

Until such a modern monetary system emerges, a framework of institutional and policy arrangements was sketched for setting up a hybrid monetary system in which a CBDC and privately produced digital currencies circulate in parallel and in competition. While in the context of this framework governments in Western type democracies are envisioned to abstain from issuing their own cryptocurrencies to protect the anonymity of citizens, and hence their civil liberties, governments retain and should exercise all prerogatives under the law to control abuses of competition in private markets, and combat tax evasion and other illicit activities.

6. References

1. Ahnert, T., Assenmacher, K. Hoffmann, P., Leonello, A., Monnet, Porcellacchia, D., (2022), "The economics of central bank digital currency," European Central Bank, Working paper Series, 2713.
2. Benes, J., Kumhof, M. (2012), "The Chicago plan revisited," International Monetary Fund, WP/12/202.
3. Berentsen, A., Schär, F., (2018), "The case for central bank electronic money and the non-case for central bank cryptocurrencies," *Reserve Bank of St. Louis Review*, 100, 97-106.
4. Bitros, C. G., (2021), "From the Athenian silver to the bitcoin standard: private money in a state-enforced free banking model," https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3836037.
5. ----------, (2021b), "Destabilizing asymmetries in central banking: With some enlightenment from money in classical Athens," *The Journal of Economic Asymmetries*, 23, e00199.
6. ----------, (2015), "Thinking ahead of the next big crash," *Cato Journal*, 35, 67-93.
7. Bitros, C. G., Economou, E. M. L., Kyriazis, N. C., (2021), *Democracy and money: Lessons for Today from Athens in Classical Times*, London and New York: Rutledge, Taylor and Francis Group.
8. Brunnermeier, M. K., Harold, J., Landau, J-P., (2019), "The digitalization of money," National Bureau of Economic Research, http://www.nber.org/papers/w26300.
9. Bullard, J., (2018), "What is the best strategy for extending the U.S. Economy's expansion?" Federal Reserve Bank of St Louis, Presentation (pdf) (stlouisfed.org).
10. Calomiris, C. W. (2009) "Financial Innovation, Regulation, and Reform." *Cato Journal*, 29, 65–91.
11. Carstens, A., (2021), "Digital currencies and the future of the monetary system," Bank for International Settlements, https://www.bis.org/speeches/sp210127.htm.
12. Committee on International Economic Policy and Reform, (2011), "Rethinking central Banking," https://www.bruegel.org/report/rethinking-central-banking.
13. Diamond, D. W., Dybvig, P. H., (1986), "Banking Theory, Deposit Insurance, and Bank Regulation," *The Journal of Business*, 59, 55-68.

14. Fisher, I. (1935), "100% Money: Designed to keep checking banks 100% liquid; to prevent inflation and deflation; largely to cure or prevent depressions; and to wipeout much of the National Debt", New York: The Adelphi Company.
15. Fisher, I. (1936), "100% Money and the Public Debt", Economic Forum, Spring Number, April-June 1936, 406-420.
16. Friedman, M., (1977), "Nobel Lecture: Inflation and Unemployment." *Journal of Political Economy*, 85, 451–72.
17. ----------. (1948), A Monetary and Fiscal Framework for Economic Stability, *American Economic Review*, 38, 245-264.
18. Friedman, M., Schwartz, A. J., (1986), "Has Government any Role in Money?" *Journal of Monetary Economics*, 17, 37-62.
19. Kotlikoff, L., Leamer, W., (2009), "A banking system we can trust," Forbes.com, April 23, 2009.
20. Marella, V., Upreti, B., Merikivi, J., Tuunainen, K. V., (2020), "Understanding the creation of trust in cryptocurrencies: The case of Bitcoin," *Electronic Markets* 30, 259–271.
21. Panetta, F., (2022), "More than an intellectual game: exploring the monetary policy and financial stability implications of central bank digital currencies," f_e2bbb6c289a1f6fc299b4c365e04ea7c_45505_suerf.pdf.
22. Pelagidis, T., Kostika, E., (2022), "Investigating the role of central banks in the interconnection between financial markets and cryptoassets," *Journal of Industrial and Business Economics*, 49, 481–507.
23. Quinn, D., (2021), "The Law and norms of the European Central Bank as sovereign Lender of Last Resort: Crystallising endogenous authority," *European Constitutional Law Review* , 17, 78 – 106.
24. Ricardo, D. ([1809] 1951) "The Price of Gold: Three Contributions to the Morning Chronicle," in P. Sraffa (ed.), *The Works and Correspondence of David Ricardo*, vol. 3, 15–46. Cambridge: Cambridge University Press.
25. U. S. Board of Governors of the Federal Reserve System, (2022), "Money and payments: the U. S. dollar in the age of digital transformation," https://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf.

26. Weber, W. E., (2015), "A bitcoin standard: Lessons from the gold standard," Bank of Canada, Staff Working Papers, 2016-14.
27. White, L., (2018), "The world's first central bank electronic money has come-and gone: Ecuador, 2014-2018," https://www.cato.org/blog/worlds-first-central-bank-electronic-money-has-come-gone-ecuador-2014-2018.

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ

ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS

ΣΧΟΛΗ ΟΙΚΟΝΟΜΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
SCHOOL OF ECONOMIC SCIENCES

ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ
DEPARTMENT OF ECONOMICS

Department of Economics
Athens University of Economics and Business

List of Recent Working Papers

2021

01-21 **Historical Cycles of the Economy of Modern Greece From 1821 to the Present, George Alogoskoufis**

02-21 **Greece Before and After the Euro: Macroeconomics, Politics and the Quest for Reforms, George Alogoskoufis**

03-21 **Commodity money and the price level, George C. Bitros. Published in: *Quarterly Journal of Austrian Economics*, 2022**

04-21 **Destabilizing asymmetries in central banking: With some enlightenment from money in classical Athens, George C. Bitros. Published in: *Journal of Economic Asymmetries*, 2021**

05-21 **Exploring the Long-Term Impact of Maximum Markup Deregulation, Athanasios Dimas and Christos Genakos**

06-21 **A regularization approach for estimation and variable selection in high dimensional regression models, Y. Dendramis, L. Giraitis, G. Kapetanios**

07-21 **Tax Competition in the Presence of Environmental Spillovers, Fabio Antoniou, Panos Hatzipanayotou, Michael S. Michael, Nikos Tsakiris**

08-21 **Firm Dynamics by Age and Size Classes and the Choice of Size Measure, Stelios Giannoulakis and Plutarchos Sakellaris**

09-21 **Measuring the Systemic Importance of Banks, Georgios Moratis, Plutarchos Sakellaris**

10-21 **Firms' Financing Dynamics Around Lumpy Capacity Adjustments, Christoph Görtz, Plutarchos Sakellaris, John D. Tsoukalas**

11-21 **On the provision of excludable public goods General taxes or user prices? George Economides and Apostolis Philippopoulos**

12-21 **Asymmetries of Financial Openness in an Optimal Growth Model, George Alogoskoufis**

13-21 **Evaluating the impact of labour market reforms in Greece during 2010-2018 , Georgios Gatopoulos, Alexandros Louka, Ioannis Polycarpou, Nikolaos Vettas**

14-21 **From the Athenian silver to the bitcoin standard: Private money in a state-enforced free banking model, George C. Bitros**

15-21 **Ordering Arbitrage Portfolios and Finding Arbitrage Opportunities. Stelios Arvanitis and Thierry Post**

16-21 **Inconsistency for the Gaussian QMLE in GARCH-type models with infinite variance, Stelios Arvanitis and Alexandros Louka**

17-21 **Competition and Pass-Through: Evidence from Isolated Markets, Christos Genakos and Mario Pagliero**

18-21 **Exploring Okun's Law Asymmetry: An Endogenous Threshold LSTR Approach, Dimitris Christopoulos, Peter McAdam and Elias Tzavalis**

19-21 **Limit Theory for Martingale Transforms with Heavy-Tailed Multiplicative Noise, Stelios Arvanitis and Alexandros Louka**

20-21 Optimal taxation with positional considerations, Ourania Karakosta and Eleftherios Zacharias
21-21 The ECB's policy, the Recovery Fund and the importance of trust: The case of Greece, Vasiliki Dimakopoulou, George Economides and Apostolis Philippopoulos

2022

01-22 Is Ireland the most intangible intensive economy in Europe? A growth accounting perspective, Ilias Kostarakos, KieranMcQuinn and Petros Varthalitis
02-22 Common bank supervision and profitability convergence in the EU, Ioanna Avgeri, Yiannis Dendramis and Helen Louri
03-22 Missing Values in Panel Data Unit Root Tests, Yiannis Karavias, Elias Tzavalis and Haotian Zhang
04-22 Ordering Arbitrage Portfolios and Finding Arbitrage Opportunities, Stelios Arvanitis and Thierry Post
05-22 Concentration Inequalities for Kernel Density Estimators under Uniform Mixing, Stelios Arvanitis
06-22 Public Sector Corruption and the Valuation of Systemically Important Banks, Georgios Bertsatos, Spyros Pagratis, Plutarchos Sakellaris
07-22 Finance or Demand: What drives the Responses of Young and Small Firms to Financial Crises? Stelios Giannoulakis and Plutarchos Sakellaris
08-22 Production function estimation controlling for endogenous productivity disruptions, Plutarchos Sakellaris and Dimitris Zaverdas
09-22 A panel bounds testing procedure, Georgios Bertsatos, Plutarchos Sakellaris, Mike G. Tsionas
10-22 Social policy gone bad educationally: Unintended peer effects from transferred students, Christos Genakos and Eleni Kyrkopoulou
11-22 Inconsistency for the Gaussian QMLE in GARCH-type models with infinite variance, Stelios Arvanitis and Alexandros Louka
12-22 Time to question the wisdom of active monetary policies, George C. Bitros
13-22 Investors' Behavior in Cryptocurrency Market, Stelios Arvanitis, Nikolas Topaloglou and Georgios Tsomidis
14-22 On the asking price for selling Chelsea FC, Georgios Bertsatos and Gerassimos Sapountzoglou
15-22 Hysteresis, Financial Frictions and Monetary Policy, Konstantinos Giakas
16-22 Delay in Childbearing and the Evolution of Fertility Rates, Evangelos Dioikitopoulos and Dimitrios Varvarigos
17-22 Human capital threshold effects in economic development: A panel data approach with endogenous threshold, Dimitris Christopoulos, Dimitris Smyrnakis and Elias Tzavalis
18-22 Distributional aspects of rent seeking activities in a Real Business Cycle model, Tryfonas Christou, Apostolis Philippopoulos and Vanghelis Vassilatos

2023

01-23 Real interest rate and monetary policy in the post Bretton Woods United States, George C. Bitros and Mara Vidali
02-23 Debt targets and fiscal consolidation in a two-country HANK model: the case of Euro Area, Xiaoshan Chen, Spyridon Lazarakis and Petros Varthalitis

ΟΙΚΟΝΟΜΙΚΟ ΠΑΝΕΠΙΣΤΗΜΙΟ ΑΘΗΝΩΝ
ATHENS UNIVERSITY OF ECONOMICS AND BUSINESS
ΣΧΟΛΗ ΟΙΚΟΝΟΜΙΚΩΝ ΕΠΙΣΤΗΜΩΝ
SCHOOL OF ECONOMIC SCIENCES
ΤΜΗΜΑ ΟΙΚΟΝΟΜΙΚΗΣ ΕΠΙΣΤΗΜΗΣ
DEPARTMENT OF ECONOMICS

Department of Economics
Athens University of Economics and Business

The Department is the oldest Department of Economics in Greece with a pioneering role in organising postgraduate studies in Economics since 1978. Its priority has always been to bring together highly qualified academics and top quality students. Faculty members specialize in a wide range of topics in economics, with teaching and research experience in world-class universities and publications in top academic journals.

The Department constantly strives to maintain its high level of research and teaching standards. It covers a wide range of economic studies in micro-and macroeconomic analysis, banking and finance, public and monetary economics, international and rural economics, labour economics, industrial organization and strategy, economics of the environment and natural resources, economic history and relevant quantitative tools of mathematics, statistics and econometrics.

Its undergraduate program attracts high quality students who, after successful completion of their studies, have excellent prospects for employment in the private and public sector, including areas such as business, banking, finance and advisory services. Also, graduates of the program have solid foundations in economics and related tools and are regularly admitted to top graduate programs internationally. Three specializations are offered:1. Economic Theory and Policy, 2. Business Economics and Finance and 3. International and European Economics. The postgraduate programs of the Department (M.Sc and Ph.D) are highly regarded and attract a large number of quality candidates every year.

For more information:

https://www.dept.aueb.gr/en/econ/