Competing for legitimacy: A typology of virtual currencies

Beat Weber[1]

Preliminary draft prepared for the 2nd International Workshop on P2P Financial Systems 2016, London, 8-9 September, 2016.

Abstract:

Innovations in money and payments have to acquire legitimacy in order to have an impact. In this paper, we propose a typology of monetary governance which highlights the possible claims to legitimacy of different models of digital currencies, allowing their classification and preliminary discussion.

JEL Classification: E42, E 52, E 58

Keywords: Monetary reform, monetary policy, monetary systems, financialization

[1] Oesterreichische Nationalbank, European Affairs and International Financial Organizations Division. Author's E-Mail Address: beat.weber@oenb.at. The views expressed in this draft are those of the author and do not necessarily represent the views of Oesterreichische Nationalbank.

1. Introduction

The public debate surrounding the emerging world of digital currencies is often dominated by a technical focus, enriched at best with a business perspective. The promise of business models is argued on the basis of their employment of state-of-the-art technologies (e.g. the blockchain), claims on disruptiveness rely on analogies with other innovations in tech history (e.g. „blockchain will have the same effect as the internet“), digital currencies are categorized by their technical differences („distributed vs. centralized ledger“) etc.

What is less often observed is a discussion of this evolving phenomenon in the context of the political economy of money. Digital currencies are based on innovations in the governance of money and payment systems. Their future prospects depend on their acceptance by users. Ultimately, acceptance is an empirical question not pursued here. But we assume that innovations in money and payments have to acquire legitimacy in order to have an impact. In this paper, we propose a typology of monetary governance which highlights the possible claims to legitimacy of different models of digital currencies, allowing their classification and preliminary discussion.

The ECB (2015) has defined the term virtual currency as „a digital representation of value, not issued by a central bank, credit institution or e-money institution, which in some circumstances can be used as an alternative to money.“ The definition is intended to capture both in-game currencies issued by computer game developers and cryptocurrencies like Bitcoin which have no central issuer. It stresses the difference to electronic money in terms of the latter being a claim on an issuer which promises to keep par value to the official unit of account and is subject to regulation. In this paper, we employ the term „digital currency“ in order to capture both virtual currencies and e-money as defined above.

2. A framework derived from fundamental debates in monetary theory

On the topic of monetary governance, two major debates in monetary theory can be identified: First, what is the nature of money? Second, who is legitimized to issue money?

The first debate, concerning the nature of money, divides commodity and credit theories of money: Is money to be conceived as credit or as pure asset? This debate can be traced back to philosophical debates in ancient Greece. It divided the currency and banking school in the

19th century. And it separated neoclassic economics starting with Carl Menger (1892) from heterodox economists like Keynes (1930/2011) and Schumpeter in the 20th century.

To conceive of money as a pure asset goes back to the theory of money's emergence from barter. According to this theory, the commodity most in demand, if equipped with certain technical characteristics like homogeneity, portability and divisibility, will be used as means of exchange in order to overcome the inconveniences associated with barter. Starting with gold, the latter is replaced in the course of the history of money resulting from further efficiency improvements resulting in the introduction of paper money and bookkeeping entries. This conception of money tends to be associated with a view of the modern economy as just a perfected version of barter. With markets assumed to possess strong self-stabilizing tendencies, the governance of money becomes a potential source of destabilization as soon as commodity money is replaced by fiat money. In this view, rules or similar constraints are needed to govern money in order to promote stability.

This approach stands in contrast to credit theories of money, in which money is conceived as a liability of the issuer. While commodity theories of money focus on money as a means of exchange, credit theories highlight the unit of account function of money. Without it, no comparison of prices is possible and markets cannot function. In this view, even barter markets presuppose the establishment of money in the sense of a unit of account. Therefore, the emergence of money requires an entity that issues liabilities that users can use to settle debts with the issuer (resulting from imposition of taxes, fines etc.). In a further step, these liabilities might circulate to facilitate market transactions among users, resulting in prices denominated in a common unit of account.

In a monetary economy, money also serves as a store of value beyond being a means of payment. Using money as a store of value instead of spending it on consumption or investment is always an option for individual agents. This option will be exercised more intensively in times of increased uncertainty, which is considered an inherent feature of an economy based on decentralized interaction. In this conception, monetary developments follow from the operations of markets which are considered inherently unstable.

The second debate concerns the question of the ideal issuer of money. Answers to this question are closely tied to views on which governance entity or operating principle is considered as socially legitimate. In modern society, coercion by brute force is the exception. In general, governance, defined as modes of coordination of interdependent activities (Jessop 1998, 29), requires legitimacy, understood as social credibility and acceptability. Legitimacy

has input and output dimensions (Scharpf 1997). Input legitimacy results from a connection to collective will formation. Output legitimacy refers to performance and effectivity in achieving goals. In monetary matters, output legitimacy as reflected in central bank mandates usually consists of goals like general acceptability, price and financial stability and contribution to other macroeconomic goals like output and employment.

The most important governance entities in modern societies are the state, markets and communities (Bowles 2006). The state claims input legitimacy based on democratic voting of representatives, and output legitimacy based on its ability to issue and enforce rules. Markets claim input legitimacy based on the meritocratic quality of competition, and output legitimacy based on their ability to achieve efficient allocations. Communities claim input legitimacy based on their participatory quality and output legitimacy in enforcement of rule compliant behaviour through mutual surveillance and peer pressure among members.

To a large extent, monetary theory in recent decades has converged on the idea that currencies are subject to strong network effects (Dowd/Greenaway 1993), ultimately favouring centralized issuance by the state. The utility of a network for each participant rises with the number of participants. With respect to money, this applies primarily to the unit of account. A larger number of prices denominated in a single unit of account enables greater competition which is commonly thought to result in greater efficiency. There is a considerable consensus that due to such network effects, the state is uniquely positioned to act as administrator of the unit of account and issuer of the final means of payment (and the most liquid store of value) denominated in that unit. It can claim input legitimacy in monetary governance even under delegation to an independent central banks through democratic parliaments issuing mandates establishing central bank goals and nominating the central bank's management. And, provided it successfully establishes effective taxation powers, the state can claim superior output legitimacy in monetary governance. By declaring its own currency the only acceptable means to discharge tax liabilities, the state establishes the single biggest payment community in an economy, comprising all taxable economic entities. Through the establishment of such critical mass, it can outperform any competing currency network in its domain. By having the longest lifetime of any entity in the economy and being publicly accountable, the state can also be regarded the most credible entity with regard to stability commitments and other goals of monetary governance.

A different view on that issue is held by approaches which favour competition and/or complementarity in currencies. In his later work, Friedrich A. Hayek advocated what he

called „denationalization of money“, replacing national currencies issued by the state with currency competition among private issuers (Hayek 1976). Those issuers are expected to compete by offering different forms of asset backing for their monetary liabilities. The market liberal principle to regard market competition as a superior governance mechanism in terms of input and output legitimacy is extended to the monetary sphere: Markets are considered the only acceptable governance form compatible with individual freedom and choice (input legitimacy), and competition is considered the only way to secure efficient outcomes (output legitimacy). According to this framework, hyperrational individuals are expected to overcome the informational and transaction costs associated with domestic currency competition and appreciate the increase of choice involved.

In concepts for complementary currencies (Blanc 2011), regional currencies are proposed. Issued by regional communities in addition to state-issued national currencies, such currencies are considered a means to secure input legitimacy within regional communities by being subject to local decisionmaking (input legitimacy). They are also expected to strengthen circulation within local economies on the sub-national level (output legitimacy).

3. Conceptualizing current monetary governance

How do these two debates relate to actual monetary governance? To a considerable extent, current arrangements for monetary governance in industrialized countries are hybrids (Mehrling 2012). They reflect both positions in both debates mentioned above. In this hybrid system, both state authorities and market participants issue means of payment. These entertain a hierarchical relationship in each currency area. On top of each national hierarchy, the central bank issues liabilities denominated in the national unit of account serving as ultimate means of payment (cash accessible to all users and non-cash accessible to banks). The issuing behaviour of central banks is regulated by mandates, most of them referring to macroeconomic outcomes like price and financial stability, growth and employment. Due to the transaction costs involved in using multiple currencies, users tend to converge on a single currency for domestic transactions in a currency area. The widespread acceptance of money issued in the official unit of account by market participants is supported by the state which requires payment of taxes in official currency. With the state being the biggest single trading partner of all taxable entities in the economy, the official currency gains a critical mass of

users which usually results in an advantage over every possible currency competitor in terms of network effects.

Most means of payments in modern economies are issued by commercial banks. Both central bank and commercial bank means of payment are denominated in the official unit of account. The issuing behaviour of banks is regulated by market governance and government regulation and supervision. Under proper functioning of these mechanisms, means of payment of all issuers covered are rendered homogeneous with respect to liquidity and their denomination in the official unit of account. As a result, money is a hybrid in terms of being governed by elements of both state and market mechanisms.

With respect to the nature of money, money currently results from a balance sheet operation: The central bank issues money by temporarily or permanently swapping securities from the private sector against its own liabilities.

Generally, the economic term „financial liability“ denotes a promise to pay a specific quantity of an asset which the debtor cannot produce on its own (i.e. money issued by someone else than the debtor). Under the gold standard, in currency board and fixed exchange rate systems, domestic currency is a promise to pay a specific sum of gold or foreign currency, which is quite within the traditional definition of a claim. But in modern flexible exchange rate systems, money’s character changes. While in accounting terms, central bank issued money is a liability of the issuer, it is a very specific form of debt which in economic respect resembles a pure asset. For domestic purposes, the central bank‘s promise to pay entails a mere promise to redeem any of its banknotes for another of its banknotes of the same value, a self-referential provision. For international purposes, national currency might be exchanged against foreign currency according to the current market value at private FX dealers. Again, no specific commitment from the central bank. As a result, the central bank cannot be defaulted by users handing in national currency. Finally, money is useful for its acceptance for payments within the national economy. We accept it in expecting that money gives us access to goods and services in the market. In that respect, money could be conceptualized as a very general claim on goods and services. But such a wide notion of claim entails substantial diffrences to the narrow conception of a liability. No particular supplier in the market economy owes a particular amount of goods or services to the holder of money (with the possible, and important, exception of the state in accepting currency in discharge of tax obligations). To conclude, central bank issued money not tied to another currency or asset is a hybrid of a credit and a pure asset.

On a hierarchical level below the central bank, banks issue means of payment by extending short-term liabilities to their customers promising redeemability for cash at par value on demand. Bank's demand liabilities are used as the main means of payment in modern economies. They are credit money, representing claims on central bank money which serve as substitutes to the latter as long as banks can uphold public trust in their ability to fulfill the underlying promise. As a result, money is a hybrid featuring a hierarchy which contains both credit and pure asset elements.

In sum, the current monetary system is a hybrid, uniting features of both sides in both debates in monetary theory introduced above: The resulting hierarchy features state and market governance mechanisms, and involves means of payment with varying degrees of credit/asset nature.

Before the Global Financial Crisis, this hybrid could be regarded as reflecting the coexistence of heterogeneous preferences or perceptions among users of money with respect to legitimate governance arrangements, as also reflected in the mixed economy character of economic governance in general. This compromise or balance among views on proper governance has been shaken by the crisis. Public perceptions of legitimacy of monetary and financial governing institutions have received severe blows in the wake of the financial crisis, government assistance to banks and stabilization efforts by unconventional monetary policies. It is in this context that the rise of digital currency projects has to be understood (Weber 2016). Both self-promotion of these proposals and perception by users are shaped by the claim to improve on where existing institutions have failed in monetary governance. The next section will investigate some of these claims, with a focus on monetary governance.

4. Digital currencies: A heterogeneous family emerging

The vision of a cashless society has been around since at least the 1950s. Attracted by the promise of various technical innovations and their cost saving potential, generations of pilot projects have been launched only to fail to live up to their initial promise (Batiz-Lazo et al. 2014). Recently, the hype around the blockchain technology in the wake of the crisis-induced legitimacy erosion of the monetary and financial system has revived such scenarios. Various schemes are proposed that embody the promotion of a digital future of money.

The analytical framework derived from the two debates introduced above can be used to compare and discuss such different conceptions of virtual currencies with the current monetary system.

Table 1: A matrix of digital currency variants

	Money as pure asset	**Money as credit**
Decentralized governance	Bitcoin	Classic Ripple Pay
Centralized governance	Central bank-issued digital currency monopoly	Central bank reserves with a distributed ledger

Virtual currencies Bitcoin, Classic Ripple Pay, and state issued digital currencies either substituting or complementing privately issued means of payment can be considered examples of different combinations of positions within the two debates. We discuss each of the four in the following.

4.a Bitcoin

Bitcoin is conceptualized as pure asset representing a separate unit of account unrelated to official currency. Intended to embody a digital equivalent to gold, Bitcoin has no issuer and is noone's liability (Nakamoto 2009). Its limited supply, provided by an open source software administered by volunteers attracted to the project, is just "out there", waiting to be recovered by profit-hunting competing miners expecting to be able to sell the units received against official currency for a profit. Market competition is the currency's main governance mechanism: Miners compete for receiving new bitcoins, thereby administering the payments network. And third party providers run exchange platforms, where bitcoins can be exchanged for other currencies at exchange rates determined by supply and demand.

Bitcoin is often portrayed as a promising tool for establishing currency competition as advocated by Hayek: It introduces market competition in currency matters and conceives of money as an asset.

But even Hayek expected private currency issuers to compete on stability of their currencies (Hayek 1976, 20). In contrast, Bitcoin cannot offer stability of purchasing power. The fixed supply of bitcoins is designed to attract users with the promise of market value appreciation in the face of growing demand. Whereas official currency is managed with a view to serving as a stable store of value over the short and medium term, Bitcoin builds on the promise of long-term value appreciation, not stability. In the short term, it even exhibits extraordinary volatility in comparison with most other financial assets (Yermack 2013). There is no market maker willing or able to ensure the stability usually expected from a currency by users. Rather than a store of value, Bitcoin can be better characterized as a speculative asset. In light of this, economic incentives for hoarding are far greater than incentives for spending bitcoins. Exceptions are transactions where using official currency is not applicable or disadvantageous (e.g. illicit transactions and small-denomination cross-border online payments) (Beer/Weber 2014).

In contrast to gold, which is customarily used for various products (e.g. electronics, industry, dental fillings or jewelry) and has a commodity value, Bitcoin has no use value other than serving its role in the Bitcoin system. Therefore its value is determined only by the subjective valuation of users, exhibiting substantial volatility in terms of official currency.

Even if Bitcoin were perceived as an attractive alternative unit of account, it would hardly be able to compete with official currency. A newly introduced rival private unit of account is at a huge disadvantage against an established unit, all the more if it has an unstable exchange rate against the official unit of account. A unit of account is subject to significant network effects, which entails switching costs for users (Dowd/Greenaway, 1993). If a merchant were to start to price goods and services in bitcoin, she would incur substantial exchange rate and conversion risks. With inputs and taxes being priced in official currency, bitcoin income from sales would have to be at least partially converted into official currency. But their value would fluctuate in terms of the official currency according to the daily exchange rate, and conversion costs would accrue. As a result, while there are a number of online merchants accepting bitcoins in payment, none of them is known to use Bitcoin as a unit of account. Instead, prices are fixed in official currency and Bitcoin prices are adjusted according to the currency's fluctuating exchange rate, possibly including additional costs for the conversion spread.

Conceptualized as a pure asset subject to market governance only, a digital currency like Bitcoin is unable to rival functioning official currencies beyond use as a means of payment for a limited number of purposes, even in the absence of first mover advantages of official

currencies. Its input legitimacy claims may appeal to users which favour market mechanisms over state involvement in monetary affairs, but its inability to deliver output legitimacy with respect to established monetary qualities like general acceptability and stability make it an inferior competitor to official currencies.

4.b Ripple

Today, Ripple is a commercial project that offers services for the interbank payment market. It also has its own digital currency, XRP, which in contrast to Bitcoin is pre-mined by the owners to be used for incentive payments among participants.

About a decade ago, Ripple started out as something different (Ripple n.d). Our discussion will focus on this initial conception. It was a platform that invited groups of friends to join and grant each other credit lines. By exploiting overlaps between friendship networks, Classic Ripple Pay offered a platform where payments could be made among peers. The platform‘s algorithm identifies connections between payer and payee by finding overlaps among both participants‘ personal networks, resulting in swaps of bilateral IOUs. Payments among participants is made possible by Ripple arranging various swaps of IOUs among people who know each other over a chain of networks. Offering its own currency, tradeable among participants against official currency on a platform administered by Ripple, the operator introduces an optional separate unit of account for these IOUs.

By making every participant an issuer of money denominated in a common unit of account and leveraging existing trust relationships among friends, Classic Ripple Pay promised a scaled-up version of Local Exchange Trading Systems and other monetary initiatives traditionally restricted to regional communities, often subsumed under the term „complementary currency“. Today, Classic Ripple Pay still exists. But it has failed to attract significant user activity, and the Ripple company has turned to other activities, while the scheme‘s founder left the company.

Combining community and market governance, the project attempts to establish a payment system and a digital currency based on decentralized governance.

By replacing commercial bank’s loan decision making and the resulting demand liabilities with judgements of creditworthiness based on existing personal relations among friends, the operators of Classic Ripple Pay expect the creation and allocation of means of payment to

better reflect people's personal values as opposed to anonymous economic rationality. By encouraging loan creation and collection based on existing knowledge and trust relations among friends, the information and enforcement costs of commercial banks‘ credit business are hoped to be avoided, resulting in lower cost.

Instead of making economic relationships more humane, such an endeavour might introduce a strong dose of economic rationality to personal relationships. Replacing commercial intermediaries with credit relationships among peers may force conflicts of interest on individuals, struggling with the choice among keeping up a friendship or collecting debts overdue from a friend when both participants are in financial difficulty. As Michel Aglietta and André Orléan (1982) have noted in their speculative theory of money's emergence from ancient rites, the introduction of money administered by an authority external to private economic relationships is also a way to pacify interpersonal rivalry and conflict, and redirect it towards an external object.

In comparison to traditional payment services, the project involves unique access hurdles: Users can only join in groups of friends, requiring a collective action effort by potential users. By joining, each individual is required to extend credit within the network of friends, thereby assuming credit and liquidity risk. Established credit lines can be drawn at short notice, putting individuals in the position of small-scale banks. Also, privacy issues are involved with credit relations revelatory of a person‘s financial situation.

Using Ripple currency as a separate unit of account introduces exchange rate risk to payment transactions. As long as liquidity in Ripple currency trading remains modest, also spreads will be high.

All of these aspects mean opportunity costs for users which might serve to reduce the alleged fee advantage of Ripple over commercial payment services. In addition, costs for the operation of traditional commercial payment systems are not always reflected in fees for customers. In many cases, payment services are offered free of charge to customers, with costs recovered from other sources of revenue (which might not necessarily involve the same customers proportionally).

As opposed to the pure asset quality of Bitcoin, Classic Ripple Pay builds on a credit conception of money. Where Bitcoin has no currency issuer at all, Classic Ripple Pay makes individual users issuers of means of payment analogous to commercial banks in official currency systems. Like Bitcoin, Classic Ripple Pay relies on decentralized governance, asking

individual users to shoulder a number of risks that result from the absence of a centralized authority and commercial intermediaries. Users with a preference for community governance may be attracted by the input legitimacy claims of Ripple, although the commercial character and governance of the platform where users interact may give them a pause. With respect to output legitimacy, a number of risks for users can be considered likely causes for a failure of the platform to achieve significant scale.

4.c Central bank-issued digital currency monopoly

The emergence of blockchain-based digital currencies like Bitcoin and talk about a market-driven „end of cash“ have inspired speculation about the possibility of central banks issuing digital currency. Possible reasons for such an invention include catering to consumer demand for an equivalent to cash in terms of security and pricing in online transactions, an increase in monetary policy control, the promise of greater financial stability, safeguarding standardization and interoperability in a market dominated by privately issued digital currencies, and possibly also the safeguarding of seignorage income.

There are a number of possible variants of a central bank issued digital currency with different implications for their share and effect in the market for means of payment. The maximum version would be a complete substitution of privately issued means of payment, either through market forces or regulation.

In this version, the central bank would widen digital access to its balance sheet to the general public by offering electronic money denominated in the official unit of account to all potential customers. Currently, such access is restricted to commercial banks. Digital means of payment issued by the central bank could be recognized as being more secure than banks‘ demand liabilities, which represent mere promises to pay central bank money on demand that can be disappointed. Even the presence of deposit insurance does not make the two completely equal, as individual account holdings may surpass insurance limits, payouts from deposit insurance funds will involve delays resulting in limited liquidity of personal funds, and deposit holdings may involve costs (typically account management fees). If full payment services would be offered by the central bank free of charge or at lower cost than those of competitors, customers motivated by cost and economic security concerns could be attracted to the point of a complete migration of an economy’s payment community to the central

bank's retail payment system. In this scenario of equal service quality combined with cost and security advantages, the main limit to full substitution would be legitimacy concerns by users. If a central bank-administered retail payment system is perceived as being subject to abuse or excessive control in the service of state authority, some users might hesitate to switch and even take into account possible higher costs and risks of private systems.[i] Supporting the central banks payment system by blockchain technology with distributing verification among a number of outside stakeholders and adding cryptographic features for access to personal accounts could be possible ways to counter such concerns. If successful, the reform could ultimately provide a substitute for both commercial bank deposits and cash. An alternative would be to enforce a public monopoly by banning private provision of means of payment.

The result would be an institutional setting envisaged by some proponents of banking and monetary reform, known inter alia as the „Chicago Plan", „100 Percent Reserve Banking" and „Sovereign Money" (Benes/Kumhof 2012, Jackson/Dyson 2013, Andresen 2013). In these conceptions, the issuance of credit-based private money substitutes like banks' demand liabilities would be outlawed. The central bank would become a monopoly issuer of means of payments, transforming money into a pure asset. Money would enter the economy via central bank-financed government spending and/or credit issued by the central bank to banks. Banks would need to refinance with longer-term savings, with savers bearing more risk, as deposit insurance would be abolished. The main focus of the reform is on safeguarding the payment system from crisis, transforming the latter into a safe infrastructure run by either the central banks or piggy bank-like private institutions restricted to storing and transfering central bank issued money. In addition, increased public control of monetary policy is envisaged, inter alia in the service of public finance.

With respect to the debates in monetary theory discussed above, the system would be one of centralized governance of pure asset money.

Such a reform faces a number of problems. By depriving commercial banks of a cheap and relatively stable means of refinancing, their ability to perform liquidity transformation is terminated and their ability to perform maturity transformation is restricted, with adverse results for the availability and pricing of credit to be expected (Broadbent 2016).

Reformers' expectations on improved financial stability in terms of reduced risks of bank runs rely on the idea that mass withdrawals of retail customer deposits are the main threat to banks and the main reason for costly government and central bank support to the financial system in a systemic crisis. In reality, customer deposits are a relatively stable entity, and of diminished

importance in the transition to a more market-based credit system in recent decades, where wholesale market funding of banks has become more important.

With respect to monetary governance, the model assumes the central bank to possess an extremely extensive degree of legitimacy required for assuming a monopoly position. In connection with the idea of issuing new digital central bank currency exclusively against government debt (Barrdear/Kumhof 2016, 9), a significant shift in current legitimacy distributions towards state authorities would be required. Otherwise, public expectations for the stability of monetary value and even the general acceptance of the currency concerned could deteriorate.

4.d Central bank reserves with a distributed ledger

The minimum variant of a central bank issued digital currency would be to retain the current exclusive access of banks to central bank balance sheets, but switch its administration to a distributed ledger system. Instead of substituting for bank deposits like the maximum variant discussed above, access to the central banks‘ balance sheet would remain unchanged, and the governance of the digital equivalent to cash used by commercial banks to settle payments among each other and hold reserves would just be subject to a reformed way of recording. Money would retain its current hybrid status of pure asset and claim, administered by a hierarchy with central banks on top and market governance, regulation and supervision of banks as issuers of digital means of payment for retail purposes.

Implementing a blockchain-like administration for the electronic payment system where central bank-issued e-money circulates among the central banks counterparties could be a way for monetary governance to claim increased input legitimacy, if public perceptions of legitimacy gravitate towards a stronger preference for market governance. If such a solution were attached with reduced cost for either the central bank (by shifting costs to counterparties) or the system overall, and increased system resilience due to decentralization, the central bank could claim improved output legitimacy with respect to efficiency.

5. Conclusion

In this paper, we have examined the claims to legitimacy associated with four types of virtual currencies, each combining one particular position in the two debates in monetary theory which underly all monetary governance regimes: Commodity vs. credit theories of money, centralized vs. decentralized governance of money.

Given the prevailing plurality of views in society on legitimate forms of governance, monetary systems based on mono-governance (state-only, market-only, community-only) can be expected to suffer from lack of legitimacy, as illustrated by the three case studies (Bitcoin, Ripple and Government Digital Currency Monopoly) examined above. They will also be economically deficient: Whereas state monopolies suffer from legitimacy risks due to potential conflicts of interest, decentralized governance resulting in currency pluralism entails an increase in transaction costs and failure to secure key output legitimacy requirements like stability.

As a result, we are unlikely to see lasting major shifts in monetary governance resulting from the shattering of its legitimacy resulting from the Global Financial Crisis and the promise of a digital currency future. Adopting a distributed ledger to administer the payment system for electronic central bank reserves could be a source of claiming increased legitimacy for central banks, but such a move is unlikely to yield effects beyond a very narrow constituency of financial market participants. Beyond the corner solutions discussed in this paper, other variants of digital currencies issued by central banks may be examined in future research.

References

Aglietta, Michel/André Orlèan (1982): La Violence de la Monnaie, Paris: UFP

Andolfatto, David (2015): Fedcoin: On the Desirability of a Government Cryptocurrency, http:/adolfatto.blogspot.co.at/2015/02/fedcoin-on-desirability-of-government.html, accessed on May 17, 2015

Andresen, Trond (2013): Improved Macroeconomic Control with Electronic Money and Modern Monetary Theory, in: Real-World Economics Review 63, 135-142

Barrdear, John/Michael Kumhof (2016): The Macroeconomics of Central Bank Issued Digital Currencies, BoE Staff Working Paper 605, July

Batiz-Lazo, Bernardo/Thomas Haigh/David L. Stearns (2014): How the Future Shaped the Past: The Case of the Cashless Society, in: Enterprise & Society 15/1, 103-131

Beer, Christian/Beat Weber (2014): Bitcoin – The Promise and Limits of Private Innovation in Monetary and Payment Systems, in: Monetary Policy and the Economy 4/2014, 53-66

Benes, Jaromil/Michael Kumhof (2012): The Chicago Plan Revisited, IMF Working Paper WP/12/202

Blanc, Jérôme (2011): Classifying "CCs": Community, Complementary and Local Currencies' Types and Generations, in: International Journal of Community Currency Research 15, D 4-10, https://ijccr.files.wordpress.com/2012/05/ijccr-2011-special-issue-02-blanc.pdf, accessed on 18 August 2016

Bowles, Samuel (2006): Microeconomics. Behavior, Institutions and Evolutions, Princeton/Oxford: Princeton University Press

Broadbent, Ben (2016): Central Banks and Digital Currencies, Speech given at the LSE, 2 March, http://www.bankofengland.co.uk/publications/Pages/speeches/2016/886.aspx, accessed on 18 August 2016

Dowd, Keith/David Greenaway (1993): Currency Competition, Network Externalities and Switching Costs: Towards an Alternative View of Optimum Currency Areas, in: The Economic Journal 103/420, 1180-1189

ECB (2015): Virtual Currency Schemes – a further Analysis, https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemesen.pdf, accessed on 17 August 2016

Hayek, Friedrich A. (1976): Choice in Currency. A Way to Stop Inflation, London: Institute of Economic Affairs

Ingham, Geoffrey (2004): The Nature of Money, Cambridge: Polity Press

Jackson, Andrew/Ben Dyson (2013): Modernising Money. Why our Monetary System is broken and how it can be fixed, London: Positive Money

Jessop, Bob (1998): The Rise of Governance and the Risks of Failure: the Case of Economic Development, in: International Social Science Journal 155, 29-45

Keynes, John M. (1930/2011): A Treatise on Money, Eastford: Martino

Mehrling, Perry (2012): The Inherent Hierarchy of Money, in: Taylor, L./Rezai, A./Michl, T. (eds.), Social Fairness and Economics: Economic Essays in the Spirit of Duncan Foley, Oxon/New York: Routledge, 394-404

Menger, Carl (1892): On the Origins of Money, in: The Economic Journal, Vol.2, 239-55

Nakamoto, Satoshi (2009): Bitcoin: A Peer-to-Peer Electronic Cash System, http://bitcoin.org/bitcoin.pdf, accessed on 9 July 2013

Ripple (n.d.): Why Ripple?, https://classic.ripplepay.com/essay/, accessed on 17 August 2016

Scharpf, Fritz W. (1997): Games Real Actors Play: Actor-centered Institutionalism in Policy Research, Boulder: Westview Press

Weber, Beat (2016): Bitcoin and the Legitimacy Crisis of Money, in: Cambridge Journal of Economics 40/1, 17-41

Yermack, David (2013): Is Bitcoin a real currency, NBER Working Paper No. 19747

[i] This is certainly especially relevant for heavy users of cryptocurrencies as means of payment. In view of competition with the latter, Andolfatto (2015) stresses that giving access to everybody to the central bank's payment system would require identification and screening of customers by the central bank, which would make such a digital currency different from cash or private cryptocurrencies like Bitcoin.