



MONETARY REFORM, CENTRAL BANKS AND DIGITAL CURRENCIES

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Abstract

The modern debate about monetary reform has taken on a new twist with the development of distributed ledger payments technology employing private digital currencies. In order to consider the appropriate state response, we go back to first principles of money and finance and the case for financial regulation: to ensure provision of a safe money asset and a stable supply of credit within an inherently unstable financial system. We consider calls to privatise money or to restrict money issue to the state against the background of the increasing marketisation of the financial sector and money itself. Following an analysis of private digital currencies, we then consider proposals for state issue of digital currency. It is concluded that the focus of attention should instead be on updating of regulation, not only to encompass digital currencies, but also to address other innovations in the financial sector which generate credit and liquidity, in order to meet the needs of the real economy.

Keywords: digital currencies, central banks, financial instability, financial regulation

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Introduction

How does innovation in digital currencies affect the ability of the financial system to perform its socially-useful functions, and what should be the state's response?² The first of these functions is to provide a safe money asset as the basis for contracts as well as payments, and as store of value to hold when returns on alternative assets are uncertain. Second the system needs to generate credit to finance economic activity in advance of saving. Both functions require an adequate availability of relatively safe liquid assets to hold alongside money, and of relatively safe collateral to underpin the financial structure, in spite of instability in the financial system. The system has shown itself unable adequately to perform these functions, most spectacularly during the financial crisis.

Traditionally these functions have been performed by the banking system, which has thus provided the foundation for economic activity in a monetary production economy. In performing these functions the banking system has also provided the foundation for the rest of the financial sector, which in its turn has thus been enabled to provide an ever-increasing array of financial instruments (see e.g. Davidson 1994, chs 6, 7). At the same time, through its borrowing, the state has supplied the financial sector with a range of assets which are less liquid than money, but whose value is underpinned by the state.

Is this all under threat from unregulated financial innovation, or does this innovation enhance the ability of the financial sector to perform these functions? Shadow banking has overtaken the banks in the provision of credit, it has increasingly met demand for liquid assets other than bank deposits, and the collateral provided by sovereign debt has been spread ever-more thinly across multiple assets. Given these developments, can bank provision of liquidity in the form of deposits (supported by the lender-of-last-resort facility) and state provision of safe assets be enough to maintain financial stability? Now the development of digital currencies offers yet another alternative money asset and a payments system which bypasses the banks. What is the appropriate regulatory response?

Central banks have responded to the growth of private digital currencies by considering whether to issue their own digital currencies as a means of retaining some control over money and also of their seignorage earnings from the issue of money. This development feeds into a more general debate on the state's role in the financial sector in the wake of the crisis. In what follows we go back to first principles in order to consider the role of financial regulation from different perspectives, and the way in which regulation has evolved. We then review the development of private digital currencies and consider how far they satisfy the requirements for money assets,

¹ This paper has benefitted from comments from Merwan Engineer and from participants in the Rethinking Finance Conference, Oslo, April 2018, the YSI stream of the Trento Festival of Economics, and the YSI Financial Stability and Innovation Working Groups webinar, both June 2018, and from discussions with Rohan Grey.

² This echoes the stated mission of the Bank of England, 'to promote the good of the people'. This functional approach to the question includes, but is much more general than, Lerner's concept of functional finance.

before considering the relative merits of central banks issuing their own digital currencies, and considering the evolving role of central banks more generally.

Different approaches to financial regulation

The evident lack of financial stability during the crisis has added a sense of urgency to considering reform of financial regulation in light of the extent of innovations outside the regulatory net. This has included re-examining the relationship between commercial banks and the central bank, with many parallels between positions taken particularly in the 1930s and in the present day (Dow 2016). The question of monetary reform has been approached from different theoretical perspectives. One source of differentiation between them is the relative importance given to the macro level: how far money is a public good, and the scope for systemic developments in finance (see Dow and Smithin 1999, Aikman et al. 2018). Underpinning this theoretical issue is the relative importance ascribed by each perspective to general fundamental uncertainty in relation to market pricing, with implications for the desirability or otherwise of increased marketisation in finance.

At one extreme is the argument that central banks should have at most a minimal role, such as administering a reserve asset and/or a unit of account; financial institutions should then simply be subject to the regulation applied to any commercial company. Competitive markets would then ensure that the desired level and range of financial assets and liabilities were made available at the micro level, including privately-issued money assets. Discipline within competitive financial markets, through pricing based on the calculability of risk, would ensure prudent behaviour without the need for further regulation. The focus is thus on the micro level, and uncertainty is belied by the perceived ability of agents to correctly price risk.

This position is based on the argument that monetary instability has actually been caused by state interference in the supply of money, and financial instability has actually been caused by the erosion of market-imposed discipline by moral hazard: confidence that the lender-of-last-resort facility would rescue banks from any excesses (Dowd 2009). Hayek (1976a, 1976b) proposed the denationalisation of money and competition between alternative currencies; the latest version of this proposal involves the replacement of state money by digital currencies.

At another extreme is an enhanced role for the state, supported by the chartalist view of money as deriving its value from the authority of the state (Knapp 1924). It is proposed that the power to create money should be removed from the banks and given to the monetary authorities as a monopoly, even if administered for the state by the banks (Dyson, Hodgson and van Lerven 2016, Clarke 2018). This could be achieved by state issue and management of cash or its equivalent through accounts held by the public with the central bank (or with commercial banks but backed 100% by reserves with the central bank). The focus on the supply of money is macroeconomic. But the state taking control of the money supply away from the banks is seen as sufficient for ensuring financial stability without further particular regulation of the private financial sector. Again, the sector is presumed to be able to correctly price risk, i.e. uncertainty does not feature. Neither therefore does the scope feature for fluctuations in liquidity preference due to fluctuations

in the degree of confidence in expectations, in the face of a fixed money supply, i.e. the sovereign money approach is essentially monetarist.

This applies also to the approach which has in practice driven the regulatory reform agenda is New Keynesianism. While previous mainstream approaches have, like the neo-Austrians, argued that competitive financial markets at a micro level would ensure stability at the macro level, the New Keynesian approach argues that in practice markets do not work perfectly, so that regulation is needed to ensure financial stability. In particular, they challenge the view that individuals have perfect knowledge for making the best market decisions; opaque structured products and misinformation from credit-rating agencies, for example, concealed true risk in the run-up to the crisis. (Uncertainty plays no role in the sense that it is assumed that true risk can in principle be identified.) So one aim of regulation is to enhance information availability, addressing for example the factors leading credit-rating agencies to distort their ratings (see e.g. Heidhues, P, J Johnen and B Koszegi 2018).

A further aim of regulation, as with the neo-Austrian approach, is to remove incentives to take on undue risk, notably the promise of central bank liquidity support, and instead to introduce as much market discipline as possible. There has been a push, for example, for banks to issue contingent convertible ('coco') bonds which would in times of crisis convert debt into equity, reflecting the mainstream view that, because they are continually priced in competitive markets, equity is more efficient than debt. Further along these lines, were banks to fail, they should be bailed in rather than bailed out, i.e. the risk of failure should be priced in to their liabilities. Such elements are seen to be desirable features of the resolution mechanisms (or 'living wills') advocated for banks, enhancing in turn the knowledge of risk on the part of depositors.

There has been a macro focus in the growing awareness of network effects (whereby risks spread through contagion) as a form of externality with respect to decision-making by any one institution. This is a further form of market imperfection for which New Keynesians have advocated macroprudential and microprudential regulatory reforms following the crisis. But Calomiris (2017) argues that these reforms risk departing from New Keynesian principles, especially the 'core economic concepts of externalities and information costs' (Calomiris 2017: 61). The aim of regulation for New Keynesians is to promote market efficiency (with respect to profit maximisation and cost minimisation).

While Post Keynesians too have supported the attention to microprudential and macroprudential reforms, the reasoning is quite different, being grounded in the view that uncertainty is pervasive (rendering the idea of 'true risk' irrelevant) and financial stability is the norm rather than the exception (see further Dow 1996, Kregel 2016a, 2016b). Firms rely on the financial sector to provide financing for investment. But planning real investment is subject to considerable uncertainty, in the sense of an absence of known probability distributions; indeed uncertainty is higher for real investment than for other areas of decision-making, given the relevant time-scale and thus the scope for unknown developments in products, technology and markets. So a socially-useful financial sector needs to be ready to make credit available on stable terms for viable

projects³ which enhance wellbeing in some way and provide a stable environment for decision-making in order to facilitate new investment.

Uncertainty is fundamental also to the way in which the financial sector itself functions, and the extent to which it can therefore meet the credit needs of firms in the real sector. Just as borrowers form expectations as to the future prospects for their real investments, so do lenders; but lenders also form a view as to the short-term pricing of marketable assets. In chapter 12 of *The General Theory* Keynes (1936: 159) explained the damage done by financing being driven by short-term considerations in financial markets: '[w]hen the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done'. By implication, the greater the marketisation of credit, the greater the scope for damage. Since Keynes's day the proportion of direct financing of real investment has fallen relative to the financing of financial investment. Real assets provide the collateral for the financial sector, but increased leveraging, and hypothecation of collateral, in an increasingly financialised structure spreads it ever-thinner (Sawyer 2014).

The source of the problem for Post Keynesians is the absence of true prices for financial assets (Townshend 1937). Pricing is not uninformed, and may reflect expert analysis. But the prevalence of uncertainty as a result of evolutionary and creative developments in the economy prevents the establishment of the quantitative probability distributions required if value and risk are to be measured by the first two moments of such distributions. Markets therefore price according to evidence of the past, but also according to conventional judgements about that evidence and the judgements of gurus (Keynes 1937). But, since these conventional bases for pricing are vulnerable to discrete changes which then spread across markets, there is considerable scope for financial instability. This is fuelled in turn by the attempts to sell assets which is the natural reaction to an unexpected turnaround from a rising price trend, the resulting fall in prices, cash-flow problems of borrowers, and elements of interdependence within the financial sector.

This theoretical account of financial instability developed by Minsky (1986) explains why financial markets on their own are inherently unstable, and thus provide a poor environment for investors in the real sector. More generally, financial instability threatens wellbeing because of the risk of financial crisis with its fiscal, economic and social costs. Promoting wellbeing therefore means that the state needs to regulate the financial sector to curb its tendencies towards instability (Minsky 1994). The aim is to increase efficiency of markets *with respect to social goals*, even if it reduces profitability.

This account is in stark contrast to the other approaches discussed above, which analyse the financial sector in terms of competitive units. Portfolio weakness is presumed to be institution-specific; when the market (with certainty-equivalent knowledge) identifies such weakness, valuation of its assets falls, enforcing market discipline. The assets may be transferred to other institutions, helping to restore equilibrium. But if one institution's weakness reflects a systemic problem whereby excessive leveraging and associated vulnerability is a general phenomenon, the flight to liquidity causes fire-sales of securities, further decreasing confidence in the financial

³ What is 'viable' of course depends on the expectations of lenders as to the risk and return attached to that credit relative to alternative investments, all subject to uncertainty.

sector in general, aggravating the problem. By failing to take the macro view, market discipline cannot prevent financial instability.

The other key feature of the financial sector which forms part of this theoretical justification for regulation is that most modern money is supplied by the private financial sector. Much of the costs of crises arise from the state's need to support this crucial socio-economic function of the banking system. Money's role in the payment process is important, but the unit of account function is more critical not only to the denomination of trade in goods and services, but also to the denomination of the debt and labour contracts which are central to the functioning of a capitalist economy. Money (in whatever form) can perform these functions if it is also a store of value to hold in times of high uncertainty. A money asset must therefore have stable value relative to other assets and be highly liquid. This in turn underpins its unit of account and means of payment functions.

The relationship between the central bank and the private banks, according to this view, is a mutual one – a social contract. Banks benefit from the profit potential of credit creation; this is facilitated by the high redeposit ratio which follows from bank deposits being the predominant means of payment. In order to ensure the continuing supply of money, the central bank stands ready to supply liquidity to the banks, given the risks attached to illiquid credit. In return the banks accept closer, costlier regulation than the rest of the financial sector. The 'moneyness' which central bank support lends to bank deposits is a public good (Dow and Smithin 1999).

But the social contract began to break down in the 1970s with increasing deregulation of finance, as banks strained against the regulatory restrictions imposed on them while less constrained non-bank financial intermediaries encroached on their markets. The distinctions between banks and other financial institutions were eroded, freeing banks to enter new markets which in turn exposed them to new risks. Central banks kept up their side of the contract by continuing to supply liquidity support, but now to significantly larger institutions engaged in wider functions than traditional retail banking. As a result state support in the crisis was on a huge scale, providing a major impetus for regulatory reform. But until the crisis, contrary to the Post-Keynesian view, it was assumed that increasingly competitive efficient markets would ensure financial stability.

The explosion of credit, and consequent (monetarist) fears of inflation, which followed deregulation ushered in capital adequacy requirements, applied across the financial sector according to the risk profile of assets, as a way of central banks wresting back control. But the effects were to further enhance the marketisation of banking. By making banks dependent on capital markets for backing credit increases, central banks pushed the control over credit creation into capital markets. Further, since the cost of credit creation was now higher for banks, they were incentivised to securitise loans, engage in activities in derivatives markets and focus on providing financial management services as an alternative source of profits. The resulting massive exposure of the banks to new risks was a major cause of the banking crisis (Chick 2013).

Just as banks were engaging in non-traditional activities as a result of deregulation, other financial institutions were encroaching on the banks' traditional markets, notably the provision of credit. In particular, as governments responded to the crisis with ever-more reregulation of banks (see e.g. Aikman et al. 2018), other, lightly-regulated, institutions (shadow banks) increased in importance

as they filled the gap left by the banks: the provision of credit and of near-moneys. Financial stability increasingly required, not only central bank liquidity support for banks, but market-making in the instruments providing liquidity to the shadow banks. The high degree of leverage in the shadow banking sector, and the scope for mutually-reinforcing effects of downward valuation of collateral on the liquidity of repo claims, has posed a systemic threat to stability (Mehrling 2011, Gabor and Vestergaard 2016).

But now a particularly disruptive development is seen to be threatening the whole basis for modern money and banking: the rise of digital currencies. The issue arises, not just as to whether, and how, they should be regulated, but also whether central banks themselves need to seize the initiative and issue their own digital currencies. The next two sections are devoted to considering these issues.

The rise of digital currencies

Starting with bitcoin, there has been a remarkable proliferation of digital currencies, or cryptocurrencies, offering an alternative to the traditional, bank-based payments system which has underpinned the role of bank liabilities as money.⁴ Cryptographic technology allows value to be stored and peer-to-peer payments verified without reference to a central ledger operated by a bank/central-bank hierarchy.⁵ This central ledger would normally treat payments sequentially, ensuring that adequate balances are available for each. The technological facility to verify payments within ‘blockchains’ is viewed as less cumbersome, in that it can increase speed of verification and payment, reduce costs, and also be more reliable in preventing fraud. The risk of double payment is addressed by verification by competing specialist private sector ‘miners’. The incentive to verify transactions is the fee associated with the relevant transactions and a digital currency ‘reward’. Anonymity is assured by requiring a unique code identifier for each transactor.

Some question the benefits of this distributed ledger technology. In particular, ‘mining’ bears significant environmental costs. The power requirements, even for the current limited coverage of digital currency payments, are already massive (the various systems allegedly requiring the same amount of electricity as a small country like Ireland), raising issues not only of efficiency but also of environmental sustainability, and thus more generally of social usefulness (Turner 2018).⁶ Efforts are however being made to develop less energy-intensive technology (Murphy 2018).

While the more obvious purpose, and potential societal benefit, of this kind of technological development had been to improve payment efficiency, the philosophy behind digital currencies is much broader, referring to the use of programmable information in society in general, not just payments (Swan and de Filippi 2017; Berg, Davidson and Potts 2018). When the leading digital currency, bitcoin, was launched, its initiator set out a detailed libertarian, neo-Austrian philosophy

⁴ These traditional payments systems were sometimes set up by the banks themselves, as in the case of the US banks before the establishment of the federal reserve system, and the Scottish banks in the eighteenth century.

⁵ There is a series of good detailed explanations of digital currency technology (Ali, Barrdear, Clews and Southgate 2014a and Weber 2016).

⁶ Offsetting the environmental impact of mining is possible if the heat generated by computer use is harnessed, see e.g. <http://www.cbc.ca/news/canada/manitoba/Bitcoin-mining-greenhouse-fish-farm-1.4470295>

which advocated the privatisation, not only of payments, but of money itself; bitcoin would compete with central bank liabilities as an alternative form of money (Nakamoto 2008).⁷ The argument was that the nature of the technology, and the incentivisation of verifying transactions, would ensure a higher level of trust in bitcoin than in fiat money.

This philosophy tapped into the long tradition of efforts to detach money creation from the state and from the facilitation of the banking system by the state (Weber 2016; see also Mehrling 2017). The philosophy is taken furthest by Berg, Davidson and Potts (2018), who explore the possibility of cryptographic technology developing in such a way as to make money itself obsolete, with exchange occurring instead through ‘high frequency barter’. The knowledge burden placed on traders is even higher than in a conventional neo-Austrian scenario, compounded by an absence of a safe money asset to hold. Indeed the democratic freely-competitive libertarian model is challenged further by the increasing dominance of the market by large-scale issuers of digital currency and large-scale holdings by ‘whales’ (Murphy 2018).

Kaminska (2018) questions the rationale that private distributed ledger systems are in any case safer than the conventional state-backed system of payments:

[B]lockchain ... is just a bundle of pre-existing technologies brought together in a cryptocurrency context to solve a problem most of the regulated financial system does not have: a lack of trusted intermediaries. Aside from solving that very specific issue — and doing so extremely expensively — blockchain achieves little beyond the novelty of broadcasting transactions publicly and pseudonymously in a way that achieves ledger immutability.

We have seen technological advance in payments systems before, including most recently the emergence of digital money within the conventional banking system. These advances have not been disruptive, simply allowing greater economising on bank balances and/or more efficient payments mechanisms. But the development of digital currencies built on blockchain technology is different. As Swan and de Filippi (2017: 7) put it, now programmable money rather than just digital money.

But how far can digital currencies be regarded as money? Any asset, to act as money, must have the characteristics to allow it to perform the three functions of means of payment, unit of account and store of value. As Yermack (2013) argues, bitcoin (the leading digital currency) fails on all three counts. First, empirically, digital money is used more for speculative transactions than for purchases of goods and services, and so does not seem to function well as a means of payment. This is not surprising since supply is limited, transactions are cumbersome (encouraging the emergence of break-away currencies like bitcoin cash), and, unlike payment by credit card, funds must be available in advance of purchase. Bitcoin also falls short as a unit of account because of its highly-variable value, the range of prices quoted in different sites, and its high denomination relative to many retail transactions.

⁷ It is telling that Hayek’s (1976a) book on denationalising money has been reprinted by the Satoshi Nakamoto Institute.

Third, bitcoin does not act as a store of value in the sense of having stable value. As long as bitcoin holders are confident its value will not fall, it *seems* to be an excellent store of value, but the volatility of its price makes it more suitable as a speculative investment than an asset to hold when expectations of returns on alternative assets are highly uncertain.⁸ Further, since maintenance of value is also a matter of security, the holder bears the risk of fraud or technological failure. Indeed the holder bears the cost of gathering information to inform assessment of these risks, a cost compounded by a lack of transparency and accountability (Chohan 2018). As Weber (2016: 27) puts it:

Because Bitcoin payments do not involve transfer of credit instruments and the system operates on a real-time gross basis, credit and liquidity risks are absent. But legal and operational risks are present, threatening reliability. Individual payments or the operation of the whole system can be challenged by authorities, privacy protection can be undermined by hackers and the network may face instability when increasing use reveals technical scalability limits.

Central banks as issuers of digital currencies

The philosophy behind bitcoin has been one strand of a series of arguments for monetary reform specifically aimed at curbing the credit-creating power of the banks (Nakamoto 2008, Mehrling 2017). Arguments along similar lines for full reserve banking in some form were prominent in the 1930s and have become prominent again in the wake of the 2008 financial crisis. According to these proposals, the role of the state would be confined *at most* to providing the core reserves of the financial system which would otherwise operate according to the principles of market competition (Dow and Smithin 1999).

But, while for Hayek (1976a) money itself would be privatised, for others the banks' power would be curbed instead by money being under the complete control of the state. The financial structure would consist of central bank money 100% backed by reserves (e.g. of gold) at the core of an array of assets and liabilities of an array of financial institutions, as determined by market forces. Dyson, Hodgson and van Lerven (2016) have argued instead that the issue of reserves be sidestepped by central banks themselves issuing the means of payment to be administered by the banks in place of money in the form of bank deposits. This approach, supporting the proposal for central banks to have a monopoly over the issue of money, is now being widely considered by central banks themselves – in particular that they might issue money in the form of digital currencies (see e.g. Ali, Barrdear, Clews and Southgate 2014b; Haldane 2015; Dyson and Hodgson 2016; Engert and Fung 2017; Coeuré and Loh 2018; Clarke 2018). Such a proposal was put in general terms to a (failed) Swiss referendum on 10 June 2018.

There is of course no necessity for the state's monopoly on money to take the form of digital currency within a blockchain system of payments. Further, there is a range of possibilities for

⁸ Murphy (2018) documents the shift over time from long-term investment holdings to short-term speculative holdings.

central bank digital currencies: whether or not to pay interest, whether to have a quantitative limit on supply, whether to restrict its use to financial institutions or make it general purpose, whether or not to retain users' anonymity, and so on (see further Coeuré and Loh 2018, Kumhof and Noone 2018).

A range of potential advantages of central bank digital currencies has been identified: the potential for curbing illegal transactions, protection of seignorage, enhanced scope for effective monetary policy and efficiency gains.

Anonymity is a particular issue, given that it is a major attraction for users of digital currencies but a major concern for governments concerned about illegal activity. The attraction of anonymous digital currency transactions is not just philosophical, but also the opportunity it provides to conceal illegal activity in a more convenient way than cash. Centralising payments within a central-bank-run system would provide the opportunity better to track payments, even if they are apparently anonymous (no system being completely impregnable). But it would be impossible in any case for the central bank to sustain anonymity if there were to be interest payments (or charges) on holdings, where the holder would need to be identified for income tax purposes. If, as is more likely, a central bank would opt for identified accounts, then illegal activity would be more transparent, with benefits for the rule of law, as well as fiscal benefits. But this would of course create a huge incentive for the perpetuation of private digital currency peer-to-peer payments alongside the state digital system. Given the difficulty (indeed impossibility) in eliminating private digital currencies as a way of concealing illegal activity, the goal of tracking as many transactions as possible might be more easily served by requiring all transactions to be conducted digitally within the existing system with debit or credit cards.⁹

Second, there would be further fiscal advantages to issuing a central bank digital currency relating to *seignorage*. To the extent that the state was successful in supplanting private digital currencies, or indeed any other cash-substitute, seignorage earnings would be protected. These earnings are currently under threat from the reduced use of cash, particularly high in some countries, such as Sweden. Partly this is demand-led, due to increased use of debit and credit cards, for which digital currency is not a substitute. But also there have been supply issues; commercial banks have been economising on cash machines, making it difficult for people in ill-served areas to access cash, contributing to social deprivation (Clarke 2018). Developing countries similarly experience a leap-frogging over bank money to digital payments, given the poor coverage of banking facilities (Grey and Dharmapalan 2017). But all proposals employing digital technology fail to address the real challenge they pose either for the unbanked or for the unconnected (through choice, lack of knowledge or unavailability of suitable broadband width).

Third it is judged that digital currency would enhance the operation of *monetary policy*, specifically allowing central banks to impose charges on their digital currency, thus evading the limitations of the Zero Lower Bound (ZLB). It is perceived that the monetary authorities were

⁹ I am grateful to Merwan Engineer for this point.

unable to encourage spending further with the quantitative easing programme once interest rates had reached zero. Again the argument is independent of the form the new state money takes.

But the ZLB problem has arguably been overstated in three respects. First, it was confused with Keynes's (1936: 207) concept of the liquidity trap, which occurs when expectations are so widely held that interest rates can only rise that wealth holders hold off on buying bonds. But this can happen at any interest rate.

Second, central banks did introduce negative interest rates on reserves; had this been sufficiently negative then the increase in banks' costs would have fed through to bank accounts. Banks in any case can effectively ensure negative interest rates through fees and charges, but a negative nominal interest rate on chequing accounts would no doubt have caused a public outcry and diversion to cash and digital currencies.

The third issue relates to the fact that the monetary authorities were the sole source of stimulus as economies struggled in the wake of the crisis; indeed they were having to counter the deflationary effects of fiscal austerity. It is no wonder that there was so little feed-through into financing productive investment when demand was so weak. Instead the main effect of quantitative easing was to encourage borrowing instead for financing investment in financial markets, stoking up the prospects of a return to crisis and aggravating the worsening distribution of income and wealth.

Keynes (1936: 353-8) had already addressed the possibility of a negative rate of interest as a means of encouraging an increase in demand, as advocated by Gesell (1916). While in principle attracted to the idea, Keynes argued that it was unworkable. Keynes pointed out that liquidity preference is very high in times of particular uncertainty, belying any attempt to discourage money holdings in favour of expenditure. This capacity for the demand for money to increase discretely and unpredictably with a surge in uncertainty poses particular challenges for a central bank considering exogenously controlling the supply of money.

In any case, Keynes argued, imposing a charge on one money asset would simply encourage innovation in more attractive alternative money assets, including digital currencies outside the banking system and more generally the capacity of banks to create near-money. The temptation for asset holders to seek new forms of near-money are great, especially where the demand for money to hold exceeds the current limits on bank deposit insurance. But the *caveat emptor* approach promoted by the pro-market views on regulation proved to be disastrous during the crisis, so that attention needs to turn to greater regulatory oversight of near-monies.

State money attracts a premium which reflects the authority of the state which backs it (Knapp 1924). But the scope for innovation to meet the demand for money applies to any attempts to control the money supply as part of the central bank digital currency project; this was evident with efforts at monetary control in the 1980s. As Fung, Hendry and Weber (2017) point out, based on a historical study of parallel public-private provision of bank notes, the state cannot prevent an innovative private sector from generating alternative money assets. Issue of a digital currency by the state would not prevent additional private issue of digital currencies and private payments systems.

Innovation in payments systems and digital currency assets is just part of an ongoing process of financial innovation outside the current boundaries of regulation. Digital currencies simply offer new opportunities for unregulated credit provision (shadow banking). The system involves credit in two ways. First credit may be provided to finance purchase of digital currencies, exposing the lender to the risk of price collapse (not unlikely given the volatile nature of digital currency values). Second, credit may itself be provided in digital currencies. Initial Coin Offerings (ICOs) are a mechanism for firms to borrow digital currencies (normally then converted into regular currency) in exchange for tokens. The discussion of regulation of these tokens focuses on their different characteristics. To the extent that their value varies with the value of assets available to the borrower, they act like securities and should therefore be subject to securities regulation (Hacker and Thomale 2017).

But tokens may be treated as money, even though they perform money functions poorly, in particular if their value is less safe than holders think. The issue is whether they should be subject to any regulation beyond anti-fraud regulation. Jabotinsky (2018) suggests that the criterion should be whether the use of these tokens systemically threatens financial stability. This would be the case if banks, for example, were to hold significant amounts of ICO tokens, or securities based on these tokens, in their portfolios. But some banks have specifically taken a stance against any exposure to such assets.

The main monetary policy motivation for the state having a monopoly of the means of payment (and administration of the payments system) was to remove from banks the power to create credit and money and thereby to threaten the stability of the financial system. If banks no longer enjoyed a high redeposit ratio, as deposits circulated in the payments system, then they would lose the power to create credit. Dyson, Hodgson and van Lerven (2016) argue that the state would adapt the supply of this means of payment to the needs of fiscal policy and, by means of distributions to the banks, the need for credit.

A central bank digital currency payments system need not conform to a narrow banking model, where banks lose their ability to create credit. Considerable work is now underway on a variety of models for central bank digital currencies. For example Kumhof and Noone (2018) set out a range of possibilities with variable interest rates on the currency and issue against eligible assets, but crucially without guaranteed convertibility of the currency into bank reserves or bank deposits. The main focus is on preventing destabilising bank runs, while aiming to address concerns over other proposals with the implications for the availability of credit and liquidity. But the lack of convertibility and the resulting parallel existence of the digital currency, bank reserves and bank deposits introduces new problems, while the benefits relative to the conventional banking system are not clear.

The challenge is to harness the benefits of conventional banking in responding to the need for credit and liquidity while reaping the efficiency and seignorage benefits of a central bank digital-currency-based payments system. Grey and Dharmapalan (2017) accordingly propose a ‘digital fiat currency’ (DFC) system where the supply is determined endogenously by the banks rather than the state, thus retaining the socially-useful practise of retail bank lending. The payments system, operating in DFC issued by the state, would be detached from commercial banks. Banks

would lend in the normal way, but borrow DFC from the central bank against these loans such that the supply of money would grow endogenously along with credit. Credit growth would thus lead to DFC growth if the banks borrow DFC from the central bank against their loan book.

Improved bank monitoring and supervision would similarly require much more in-depth knowledge on the part of the central bank of banks' loan books. These knowledge demands on the central bank would be heavy, particularly in the case of a DFC system where central banks accepted bank loans as collateral. These demands are akin to the knowledge demands placed on market participants by approaches which presume market efficiency. Indeed it would not be a long step from the central bank acquiring this knowledge to actually nationalising banks, with a view to protecting the central bank's risk exposure and promoting social goals.

The other possibility would of course simply be to return to the social contract with retail banks (segmented from investment banks), making sure they are properly regulated such that bank deposits are safe as the basis for the payments system (Kroll 2015). While less dramatic than introducing a central bank digital currency payments system, this possibility takes on board the question of whether it is feasible for the central bank to control money, given the innovative capacity of the financial sector.

Thus Fontana and Sawyer (2016, 2017) and Mehrling (2017), for example, have critiqued the sovereign money proposal on the grounds that the financial sector would not be passive in the face of central bank control over money and credit. Rather, the need for additional liquidity and credit would be met by other means. While citizens and companies would hold balances with the central bank for making payments, the incentive would be strong to hold liquid accounts (say at a few days' notice) with banks, or near moneys outside the banking system to satisfy liquidity preference. Only in times of severe banking crisis would liquidity preference be directed primarily to accounts with the central bank as the safest location. Even then the authorities would need to be able to respond nimbly to discrete shifts in liquidity preference, for precautionary rather than transactions purposes. Keynes's arguments from the 1930s about the capacity of fluctuating liquidity preference and the capacity for financial innovation to subvert efforts at monetary reform still hold good when we consider a state monopoly of the means of payment.

Similarly the capacity for innovation in the private sector to meet (some) credit needs (particularly the need to finance speculation) could also threaten financial stability, which would in turn undermine the provision of liquidity while increasing liquidity preference (see Gabor and Vestergaard 2016). This capacity has been evident in the last decade, through the growth of shadow banking, and now through the issue of ICOs.¹⁰ Efforts to transfer money creation from the banks to the state would accelerate the marketisation of finance. The financial instability which marketised credit creation can promote if unregulated would in fact undermine the provision of credit, particularly for business investment, and particularly for small and medium-sized enterprises.

The traditional retail banking business model allowed smaller businesses in particular to engage in a debt relationship with a known institution with the relevant expertise to assess risk (under

¹⁰ See Kregel and Tonveronachi (2014) for a thorough account of this line of argument.

uncertainty) and the intention to hold onto the debt rather than distribute it (Bhidé 2017). More generally, different financial institutions can meet the needs of different segments of the market, e.g. cooperative banks. Rather than setting them all up to compete in a homogeneous market, financial stability would be better served by reintroducing the segmentation of banking which prevailed before the process of deregulation. Different regulation would be designed for each segment, including regulation of digital currencies. This approach to regulation seeks to promote efficiency by impeding forces for instability rather than the New Keynesian sense of market efficiency as being served by freeing up market forces.

But finally can central bank digital currencies still be justified on *efficiency* grounds? Central banks could contract out payment verification, incentivised appropriately, or else set up systems in-house with the prospect of greater efficiency than the current energy-intensive competitive process. In particular a centralised system could be safer than a diversified range of unregulated private systems (contrary to assertions of private digital currency promoters), having greater capacity to counter hacking, and fraud more generally.

But, while the Bank of Canada has pursued the possibility of a central bank digital currency assiduously, conducting experiments in blockchain payments ('Project Jasper'), they have concluded that the superior efficiency of blockchain technology is not proven (Engert and Fung 2017). Seretakis (2017: 13) argues that:

Despite the promise of distributed ledger technology in terms of cost reduction, speed and efficiency, central bank officials have determined that distributed ledger technology is not yet ready for mass adoption and is not capable of meeting central banks' safety and efficiency standards.

Indeed Kaminska (2017) reports that use of blockchain technology is already on the wane in the private sector, although some banks have been cooperating in setting up their own blockchain systems, bypassing central banks (Arnold and McLannahan 2018, Kaminska 2018). She later concludes: 'To all other extents and purposes, blockchain in its original bundle is not cheaper to run, not more efficient to operate and certainly not faster than the conventional settlement system. Proof of this comes in bitcoin's own payment dysfunctionality' (Kaminska 2018). This may well change, but the efficiency case remains to be made.

Concluding reflections on the evolving role of central banks

So where does this leave central banks and their relationship with the private financial sector? The principles discussed above suggest that unregulated financial markets will be unstable, and so, in the absence of private sector institutions taking a macro view, it is the responsibility of the state to regulate them. The need to prevent another financial crisis is a recurring theme.

But it is important to understand that central banking functions should not be regarded as exogenous constraints on the private sector. From an institutionalist perspective, the public-private distinction disregards the way in which private companies can only function by relying on the institutional structure of the state – at the most basic level as the enforcer of property rights.

Similarly the state relies on the private sector, for take-up of sovereign debt and as a conduit for monetary policy, for example. The state and the private sector are intrinsically interconnected.¹¹

History shows that, under favourable circumstances, the private financial sector itself can generate central banking where it is not provided by the state, as happened in Scotland. The Scottish banks emerged sequentially after 1695 in the absence of a Scottish-state-sponsored bank, issuing their own notes, and only came under Bank of England control in 1844. While the first two banks initially competed fiercely, they soon learned the mutual benefit (in maintaining confidence in their notes) from some degree of cooperation. This cooperation was enhanced as newer banks emerged, and it became apparent that system-wide cooperation and, where necessary, discipline was required so that the excesses of one bank would not bring down the whole system. The old banks therefore took on the role of central bank, for example managing the exchanges and operating a clearing system; discipline would take the form of banning deviant banks from clearing (see Dow and Smithin 1992). The particular circumstances of Scotland allowed central banking to form endogenously; a less propitious environment might not have done so but, by implication, at the cost of the confidence in the banking system.

Now there are instances of attempts within the digital currency system to address systemic risk. Thus for example bitFlyer sets limits to leverage buying in order to prevent defaults should market price fall:

BitFlyer automatically closes client positions when they lose half their initial margin. For example, a customer who used ¥10,000 to buy ¥150,000 of Bitcoin would be forced to sell if its value fell to ¥145,000, a drop of slightly more than 3 per cent (Harding 2017).

The philosophy behind digital currencies is that market incentives are a more effective substitute for state regulation: '[t]he Bitcoin system attempts to mimic the anonymity and payment finality aspects of cash in the digital domain. Bitcoin's main metagovernance element is in effect to provide incentives for market governance to run the system' (Weber 2016: 26). The difficulty, as the old Scottish banks discovered, was that, the more successful the system, the more new entrants are encouraged who will exercise less caution. BitFlyer is a case in point (Harding 2017); a large derivatives market has grown in the form of side-bets on the bitFlyer price. This does not directly challenge the bitFlyer market itself, but exposes derivatives traders to additional risks, posing a systemic risk of defaults spreading through the system. The solution, short of state regulation, is for first movers like bitcoin, or other large players, to discipline other players, i.e. to act as a central bank. Indeed, as larger institutions form around digital currencies the chances increase of central banking evolving within the private sector. But this is not the atomistic market discipline of the Free Bankers; it is a matter of institutions evolving in the private sector to take the macro view, i.e. to meet a need unmet by the state. Indeed this is a useful way of understanding how the state evolves more generally.

So the issue is not so much why regulation, but how. The challenge is enormous given the extent to which deregulation occurred from the 1970s, and to which new developments (such as shadow banking) have been allowed to proceed unchecked alongside attempts at reregulation which have

¹¹ See Berg, Davidson and Potts (2017) for a discussion of the role of the state with respect to blockchain.

reduced bank competitiveness. This process has been fuelled by the low interest rate environment (and the scale of quantitative easing) on which governments relied for economic stability and financial stability; the full onus for macroeconomic policy was placed on monetary policy. Fiscal policy was restricted to attempts to reduce budgetary deficits and the size of the state, to clear the way for monetary policy. From a Post-Keynesian perspective central banks cannot alone boost aggregate demand, as has been evident by the extent of feed-through of quantitative easing into financial markets rather than loans to finance real investment.

Ironically, since fiscal austerity policies held down aggregate demand and elevated expectations of risk attached to real projects (relative to financial investment), increases in the money supply were accompanied by low inflation, ensuring monetary stability. So monopoly control of the money supply in order to promote monetary stability seems to be beside the point. In any case, it is now widely held that the almost exclusive focus of central banks in recent decades on inflation targeting, at the expense of promoting financial stability and economic stability, was an aberration in historical terms (Dow 2017).

Rather the focus needs to be on how the financial sector might be regulated in such a way as to generate credit for useful projects and liquidity as a refuge from uncertainty. According to this view, monetary stability would follow from economic and financial stability, which are the more feasible goals for central banks. It may be that further technological advance would make a digital central bank money feasible on efficiency grounds. Indeed for small developing countries, central bank digital currencies may have particular benefits. But to consider such a possibility as the core of a generalised policy to avert future crises is to look in the wrong place.

Rather than thinking in terms of a public/private duality (with a corresponding official-money/non-money duality), and focusing on strict control in the public sector (letting the chips fall where they may in a marketised private sector), the issue is rather how to promote a public/private relationship which promotes wellbeing. Placing some controls on private digital currencies being used as a means of payment, to provide consumer protection from loss of value, would be a start. This requires identifying digital currencies which have money-like characteristics and imposing regulations to ensure that their value is stable. ICO tokens are more like securities, held as investments rather than for liquidity. Then it is more appropriate to apply securities regulation (Hacker and Thomale 2017, Jabotinsky 2018), and indeed jurisdictions have already taken action against cases of fraud in ICOs.

More generally it is important to design regulation to address the inherent tendencies towards financial fragility which undermine the private sector's capacity to provide liquidity and credit in a stable way. Further, from a Post-Keynesian perspective, such regulation should encourage segmentation within the financial sector to limit the transmission of instability, with macroprudential controls specifically designed for shadow banks for example (see further Aikman et al. 2018). Indeed some of these institutions are coming in from the shadows anyway, as banks have begun to reassert their market position; some peer-to-peer lenders, such as Zopa, are applying for banking licences (Jenkins 2018). Of course further innovations would occur, designed to evade regulation, but it has always been the task of the monetary authorities to keep abreast of such developments and update regulation accordingly; regulation needs to be dynamic in the face of

evolving threats to financial stability (Kregel 2014). Given the international arena within which such innovations apply, efforts at establishing international regulatory cooperation are called for.

Such proposals pose massive challenges of various sorts. It has been argued here that central bank digital currencies are not able adequately to meet these challenges, and could even make them worse by diverting attention from the sources of economic and financial instability in the private sector, encouraging new forces for instability to be unleashed. In particular, trying to separate off money and payments within a state monopoly would not address the financial stability problems of leaving the private sector otherwise to develop as it pleases, and indeed to be spurred on to develop alternative means of payment and opportunities for creating and holding liquidity. It may well be that technological advance and new systems designs will usher in some form of centralised payments system based on a central bank digital currency. But the argument here has been that such a development cannot alone deliver a more functional financial system and indeed to focus on such a development is to distract from much more important measures which could more robustly address socio-economic goals.

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