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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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De Nederlandsche Bank NV
P.O. Box 98
1000 AB AMSTERDAM
The Netherlands

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Wilko Bolt[a,b], Vera Lubbersen[a] and Peter Wierts[a, b]

[a] *De Nederlandsche Bank (DNB), Amsterdam, the Netherlands*
[b] *Vrije Universiteit (VU), Amsterdam, the Netherlands*

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Abstract

The rise of new forms of private money is reviving a long-standing debate on the appropriate balance between private and public interests in money and payments. The main aim of this paper is to explore an integrated policy analysis of various digital assets that may function as money: bank deposits, non-backed crypto's, stablecoins and Central Bank Digital Currency (CBDC). In our view, public and private money should coexist to get the best of both worlds: trust and innovation. Getting the balance right is however not an easy task. It requires a digital update of public money and effective regulation of crypto's and stablecoins. We argue that convertibility between public and private money should be a leading principle both for the design of CBDC and for the regulation of stablecoins that could potentially be widely adopted as a means of payment.

Keywords: digital payments, crypto's, stablecoins, CBDC, regulation.
JEL classifications: D4, E4, G2

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1. INTRODUCTION

Ongoing digitalization has not only changed the way we live and communicate but it has also affected the way we make payments. Rapid advancements in computer processing, electronic data storage and Internet connectivity have led to new technologies to transfer value that may disrupt 'traditional' money and payment systems. New type of assets that are exchanged using Distributed Ledger Technology (DLT) or similar technology, include crypto assets, without any financial or monetary backing, and so-called 'stablecoins', for which private issuers claim that they are backed by safe and liquid assets to stabilize their value.[1] At the same time, many central banks across the globe are currently working on a public alternative: Central Bank Digital Currency (CBDC), which would be a digital form of fiat money that may or may not use DLT. [2] These new types of assets add to the mix of existing means of payment, predominantly cash and bank deposits. As a result, these recent developments have revived a long-standing debate on the appropriate balance between public and private interests in payments, as regards confidence and trust supported by public money versus convenience and efficiency offered by private innovations.

The main aim of this paper is to explore how various digital means of payment may co-exist in the future: bank deposits, non-backed crypto's, stablecoins and Central Bank Digital Currency (CBDC). The scope of our paper is restricted to these assets, and we largely focus on their potential role as a means of payment (touching only briefly upon the other functions of money, as a store of value and unit of account). The actual payment instruments for the different forms of money, such as credit and debit cards, electronic wallets or transfers, are also left to future analysis. We address three key questions that relate to the evolving use of public and private forms of money:

1. Should there remain a role for generally accessible public money in increasingly digital payment systems?
2. Regarding the future of money and payments, which forms of money are likely to acquire mass adoption due to network and scale effects, and which forms are likely to become a niche product or even disappear?
3. What are the main opportunities and risks of new private forms of money, what are the main options for regulating them, and what are the main trade-offs?

In this paper, we argue that public and private money should coexist. Public money ensures trust, private money ensures innovation. However, as earlier 'payment episodes' illustrate, the

uncoordinated issuance of private money (and public money as well, if not properly governed) may lead to undesirable disruptions and increased financial risks. To mitigate these risks and safeguard the payment system, central banks and financial regulators have to step in. But getting the public-private balance right is not an easy task. It requires a digital update of public money and an effective mix of various regulatory options depending on future adoption of cryptocurrencies. As our main result we argue that convertibility between public and private money should be a leading principle both for the design of CBDC and for the regulation of stablecoins that could potentially be widely adopted as a means of payment.

The remainder of this paper is organised as follows. The next section sets the scene by looking at earlier episodes of uncoordinated money issuance that go back to minting coins, issuing banknotes and attracting bank deposits. It reviews the principle of convertibility between public and private money as a basis for balancing public and private interests. We then turn to a discussion of the current rise of non-backed crypto's and stablecoins, arguably the newest forms of private digital money. Our main analysis addresses the possible next steps in the rapidly evolving payment landscape: developing digital public money and regulating new private forms, with a focus on a newly emerging public-private balance in money and payments. We provide an overview of the main regulatory options and how they affect the trade-off between trust and innovation. The last section concludes.

2. SETTING THE SCENE IN MONEY AND PAYMENTS

In most modern economies, payments have largely been relying on cash and commercial bank deposits but this landscape is now changing.[3] The increase in the use of bank deposits as a means of payment relative to cash combined with the rise of cryptocurrencies is shifting the balance between public and private money. Interestingly, such balance shifts have happened before. Therefore, to get a better grip on the current developments, we start our analysis by looking at earlier payment episodes that featured uncoordinated money issuance.

Coins and banknotes

Historical well-known examples of earlier episodes of rebalancing public and private interests in money and payments revolve around coins and banknotes. First, regarding coins, the history of the Bank of Amsterdam is generally regarded as the start of the central banking function in

promoting a smooth functioning of payment systems.[4] There was a period of 'confusion of coins' in Amsterdam in the early 1600s due to the large amount of national and international coins that were circulating at the same time. Issuers were trying to increase their revenue from coin issuance by slightly decreasing the amount of precious metal, slightly below the legal standard so that it could hardly be noticed in everyday payments.[5] This led to a loss of trust and confidence, which obstructed the payment function of money.

The response by the Bank of Amsterdam was to issue what may now be considered an early stablecoin: it checked the quality of gold and silver coins and provided notes stating the amount of gold put in custody. These notes could then be transferred from merchant tot merchant and when presented at the bank, the gold was shifted from one account to another. This restored trust in money. This money system continued to function well for more than 150 years. The 'Bank guilder' was reformed into an early form of fiat money in 1683, becoming the leading national and international currency.[6] Eventually, the Bank started to lend large amounts of money in response to external shocks, lost the backing of the government and ultimately failed.[7] This coin episode illustrated the need for a trustworthy institution that guaranteed the value of money issued.

Second, in the early 1800s, banknotes were often issued by private banks. In several instances, notably in the UK and US, commercial banknote issuance led to over-issuance and excessive inflation coupled with a high dose of financial distrust.[8] Different banknotes effectively traded at different values, depending on volatile collateral values and blurred trustworthiness of the underlying private issuing institution. As with the earlier episode of 'confusion of coins', money became suspicious and required effort to assess its real value. In this context, Gorton and Zhang discuss the so-called 'No Question Asked' property of money requiring that money is accepted in a transaction without due diligence on its value.[9] Confusion and suspicion triggered various bank runs and created financial instability. The general policy response at that time was to establish a system with government backed banknotes only, which eventually led to the creation of central banks with a monopoly on banknote issuance.[10] Interestingly, these 'run risks' were much more contained when private banknotes of commercial banks could be converted into public banknotes or private banknotes of other banks. This was the case in Sweden which had strict regulation regarding the redeemability and convertibility of private and public banknotes so as to gain the confidence and trust of the public. As a result, the Swedish system was 'unusually stable'.[11] Hence, this particular banknote episode showed that private money issuance could work, as long as convertibility with public money was safeguarded by the government.

Commercial bank deposits

During the 19th century, as a response to the banknote monopoly, commercial banks facilitated transfers between deposits to make payments through the use of cheques.[12] As these new payment methods were generally more convenient than the physical withdrawal and transfer of cash, an increasing number of payments was executed by transferring balances between depositors' accounts. However, in times of economic uncertainty and financial turbulence, similar problems arose as with private banknote issuance. As soon as people had real doubts about the value of this account money, they withdrew and changed their funds into cash, again leading to bank runs. Providing government deposit insurance restored trust, at different points of time in different countries (e.g. in the US in 1933 during the Great Depression). This reassured account holders that their holdings remain at value and convertible into public money. Moreover, this bank deposit episode also illustrated that private money issuance could spur innovation, as the use of bank deposits solved important frictions: ease of use, lower risk of theft and better record keeping.[13]

Balancing public and private interests

From these historical examples the overall picture emerges that private money issuance may not only bring innovation and convenience, but may also generate excessive risk due to profit-making incentives.[14] This led to a general response by the public authorities that focused on achieving monetary and financial stability. Such a conclusion is in line with the analysis carried out by the Bank of International Settlement (BIS) about the role of central bank money in the payment system.[15] It argues that trust and confidence in private money heavily relies on the ability of private money issuing entities to convert their liabilities into private money of another private entity or – ultimately – into public money. 'Corner' solutions with only public or private money are not seen as desirable given the need to balance trust, innovation and stability. Getting the balance right is however not an easy task due to the ongoing evolution in the use of different forms of money, often as a result of technological progress.

3. NEW PRIVATE MONEY: RISE OF CRYPTOCURRENCIES

Although, over the past decennia, cash and paper-based payments have increasingly been replaced by electronic, online and mobile payments, most of these types of payments still rely on commercial bank deposits when funds are transferred from the payer to the payee. However, things may now be changing. With the arrival of Bitcoin on the payment scene back in 2009, this reliance on deposit accounts for making payments is no longer evident. Arguably, to the extent that cryptocurrencies are accepted by users as a medium of exchange, store of value and unit of account, they can be regarded as the newest form of private money that is around. In practice, the vast majority of Bitcoin transactions between real entities are however aimed at trading and speculation, and not as a means of payment.[16]

These crypto's only exist in 'cyberspace' and are stored as digital tokens on digital ledgers. They allow transactions to other nodes in the network, that rely on validation nodes that apply a consensus mechanism, and their issuance is not controlled by monetary authorities. Using advanced payment technology and cryptographic identification techniques, Bitcoin 'proved' that this new form of private money could be used for the transfer of value between unidentified network addresses while avoiding the possibility of 'double spending.' At the same time, market analysis now shows an increasing reliance on exchanges and wallet providers, which have emerged as central nodes in the network.[17] Broadly, these cryptocurrencies can be divided into two main categories: non-backed crypto's and stablecoins.

The first category – non-backed crypto's – refer to crypto assets that are not backed by any financial asset or government claim and have no inherent value. Since the arrival of Bitcoin in 2009, more than 10000 non-backed cryptocurrencies have been created with a total market capitalization of $2900 bln.[18] Grosso modo, non-backed crypto's derive their value from the self-fulfilling expectation that they will be used in the future. Although these 'unanchored' expectations may be (partly) based on future market adoption prospects, they seem to drive the extreme volatility of current crypto prices to a large extent.[19] Hence, it is often concluded that Bitcoin appears to behave more like a speculative investment and that market adoption is likely to remain limited.[20] The second category – stablecoins – covers crypto's that are (allegedly) backed by one or more fiat currencies that are legal tender, by one or several commodities, by one or several crypto-assets, or a combination of all such assets. It is suggested that consumers who buy stablecoins can redeem them for the underlying assets. In practice, this is not always the case, however, as practices differ with respect to the quality of the asset backing, limits and fees to

redemption, or redemption on the secondary market only, in line with profit-making motives of private issuers.

Thus far, stablecoins constitute a relatively small proportion of crypto assets, i.e. just over 5%.[21] But market capitalization of stablecoins is rising fast: for the largest stablecoin issuers, it has risen by nearly 500% in 2021.[22] As such, stablecoins have mainly been used for payments within crypto markets – for example, it has been estimated that half of all Bitcoin trades are executed using Tether.[23] Tether is currently the world's largest stablecoin and has recently been subject to controversy about its asset backing.[24] For the general public, the payment function of stablecoins is still in its infancy but could potentially grow rapidly due to the uptake by large, highly-advanced 'Bigtech' platforms. For consumers, it may be convenient to make payments using their social media apps. Moreover, fees could perhaps be lower than existing payment options, especially for cross-border payments and in countries with less developed payment systems.

4. REBALANCING PUBLIC AND PRIVATE INTERESTS

New digital monies have recently come to the fore, affecting the balance between public and private interests. The potential emergence of non-backed crypto's, stablecoins and CBDC as a means of payments may add new options to the existing set of monies. This is illustrated in Table 1, which contains public money, regulated forms of private money (i.e. bank deposits, e-money) and new private forms (i.e. non-backed crypto, stablecoins). The issue arises whether all forms of money can co-exist and if they do, how they should be regulated if at all. According to the International Monetary Fund (IMF), financial stability risks from the crypto ecosystem are not yet systemic, but risks should be closely monitored given the global implications and the inadequate operational and regulatory frameworks in most jurisdictions.[25]

Table 1: Current and potential future forms of money as a means of payment

	Central banks and government, public	**Regulated banks, private**	**E-money institutions, private**	**Cryptocurrency issuers, private**
means of payment	Cash: coins and banknotes	Bank deposits (regulated)	E-money (regulated)	
	Option: retail CBDC			***Option: crypto, stablecoins***

A digital update of public money

The public-private balance shifts that were observed in earlier episodes provide the underpinning of the key questions as posed in the introduction. First, the question comes up whether generally accessible public money should keep playing a role in an increasingly digitalized payment system? After all, private digital payments are already possible, so that the use case of a digital euro may not be immediately clear. Indeed, in our view, the value of providing CBDC would not directly derive from a technologically improved or more convenient payment instrument relative to those already supplied by the private sector. Rather, its main value added will be in balancing public and private interests. Due to the decline of cash usage and the potential absence of public digital money for the public at large, the payment system would gradually move in the direction of a 'corner' solution of private money only. The historical examples as well as current developments in crypto markets suggest that over time this could put the public interest at risk regarding trust and stability.

This may explain why central banks have accelerated the development of CBDC as a public alternative. Already before 2019, CBDC was analysed by a few countries where cash saw a steep decline (such as Canada or Sweden), and in some smaller countries (e.g. the Bahamas), and most importantly China, where platform payment providers have become dominant players. After 2019, it seemed that the sentiment has shifted to include the Euro and the dollar as well. Upon publication of its report on CBDC in 2020, the European Central Bank (ECB) intensified its work on a digital euro and Christine Lagarde said that "*we should be ready to issue a digital euro, should the need arise*". [26] Moreover, FED Board member Lael Brainard said that "*given the dollar's*

important role, it is essential that the Federal Reserve remains on the frontier of research and policy development regarding CBDC".[27] Looking forward, the next question is how to design CBDC. In October 2021, the Eurosystem has launched a project investigation phase that will last two years. After that, a new decision will be taken as to whether or not to continue with a realisation phase for a digital euro.

Adoption, scale and network effects

The second key question is concerned with future adoption of new forms of money. That is, In the decades to come, which forms of money are likely to acquire mass adoption and which forms are likely to become a 'niche' product or even disappear?

Not all possible future retail means of payment may achieve mass adoption. Economic research has shown that means of payment strongly benefit from network effects and standardisation.[28] Crucially, payment markets are 'two-sided', stressing the need that both payees and payers coordinate on using the same means of payment.[29] Rising adoption on one side of the market, increases participation of the other side, and vice versa. Moreover, on the demand side people tend to habitually stick to their preferred way of payment, often supported by high merchant acceptance, while on the supply side payment service providers and merchants benefit from economies of scale and scope which effectively limit the number of offered payment methods.[30] Therefore, two-sided market structures, network effects, consumer behaviour and economies of scale and scope may lead to 'winner-takes-most' type of dynamics. That is, some means of payment will be dominant while others co-exist as a 'niche' product.

Arguably, cash payments are likely to (further) develop into a niche product over time, as digitalization progresses, and the proportion of people that is used to digital payments increases. Does this imply that bank deposits will be the core form of money? It may be, but the payment landscape is changing rapidly. In particular, two-sided market theory may explain how heterogeneous private benefits and cross-group externalities among merchants and consumers affect the joint demand for cryptocurrencies to make payments. Privacy, data security and convenience may drive consumer usage of digital money on one side of the market, while avoiding high fees charged by traditional payment providers may drive merchant adoption on the other side. However, it is often argued that extreme price volatility, slow payment processing and risk of fraud are main factors that prohibit the widespread adoption of non-backed crypto's, leaving it as a niche payment product.

A different scenario would arise when private stablecoins become dominant players with global reach and wide adoption. The benefits of stablecoins for consumers include more convenient payment methods – in particular online and cross-border payments – and increased accessibility in countries without a well-developed payment system. Benefits for merchants may include lower fees. For example, Diem aims to offer lower fees for merchants both in store and online (i.e. e-commerce).[31] Therefore, Facebook's announcement of the Libra/Diem project in 2019 serves as a 'wake up call': stablecoins issued by large technology companies with 'deep pockets' and huge global consumer bases, have the potential to reach mass adoption.[32] At the same time, stablecoin issuers must convince their holders that at any point in time that its backing in assets is safe and reliable, so that 'no questions are asked'. If they can't, the risk to run is looming again.

Regulating new forms of private money

This brings us to the third key question: what are the main opportunities and risks of new private forms of money, what are the main options for regulating them, and what are the main trade-offs? We focus on stablecoins due to their potential to achieve mass adoption. To illustrate the risks, Table 2 shows a simple balance sheet of a stablecoin issuer with 100% coverage by safe and liquid assets (but not by central bank money).

Table 2: Stylised stablecoin balance sheet

Assets	**Liabilities**
"Safe and liquid" assets [Regulatory option: liquidity buffer]	**"Stablecoins"** [Regulatory option: capital buffer]

If the assets are assumed to be completely safe, as part of the framing, no capital would be needed to cover losses on the assets. Likewise, the story could also be that the assets are completely liquid, so that no additional liquidity buffers are needed. At first sight, the suggestion may therefore be that there are no balance sheet risks: there is no credit, maturity and liquidity transformation as would be the case for a bank. This would provide a stable value to the liabilities, and support the stablecoin as a means of payment. So the question comes up what type of risks could still arise, in particular for stablecoins with a potential global reach.

In our view, the main risk relates to the profit-making motive and incentive of over-issuance, as discussed in the second section, with implications for monetary and financial stability.[33] A main incentive to issue a stablecoin is to receive 'deposits' in trade for a stablecoin and then earn revenues on those deposits, perhaps by placing them in government securities or fully depositing them in a bank to earn some interest (and be protected by deposit insurance). Once adoption and trust have been established, a private entity may have a motive to increase the return on its assets, e.g. by moving to higher yielding, more risky assets (or even loans), decreasing coverage, and restricting access (e.g. imposing redemption fees or limiting – 'not at par' - convertibility). This calls for safeguards on the composition of the asset backing. Moreover, network and scale effects may lead to a globally dominant stablecoin, potentially increasing fees and risk even further and issuing more stablecoins than would otherwise be socially desirable. This could introduce credit, maturity and liquidity transformation and therefore bank-like risks, which may require adequate capital and liquidity buffers, as indicated in Table 2.

Table 3 summarises the main risks of stablecoins which allows a 'tailoring' of regulatory options based on the underlying risks. This underscores a 'same risks, same principles' approach to ensure a level playing field across different market participants. On the one hand, as long as stablecoins are used for niche payments and not adopted as a regular means of payment, risks are mostly related to AML/CFT concerns, consumer/investment protection, sound governance, safety of systems, legal certainty, and market integrity (the right side of Table 3). In this case, regulation could be framed in a relatively light regime. On the other hand, as soon as stablecoins have the potential for mass adoption as a means of payment at a global scale, risks related to dominance and stability effects come to the fore (the left side of Table 3).

Based on these risks, substantial reforms to regulation were announced since 2019. The Financial Stability Board FSB (FSB, 2020) issued recommendations for regulating stablecoins, the European Commission (EC, 2020) published its proposal for a Market in Crypto Assets Regulation (MiCAR), the BIS (2021) applied its standards for systemically important infrastructures to stablecoins and the President's Working Group on Financial Markets (2021) published its report on stablecoins.[34]

Table 3: Risks of stablecoins

Stablecoins that may reach global scale	**Stablecoins, regardless of size**
<u>Risks related to:</u> • Monetary policy • Financial stability • Settlement finality, credit and liquidity risk in wholesale settlement • Fair competition	<u>Risks related to:</u> • Legal certainty • Sound governance, including the investment rules of the stability mechanism • Safety, efficiency and integrity of payments systems • Cyber security and operational resilience • Market integrity • Data privacy, protection and portability • Consumer/investor protection • Tax compliance

Table 4 provides a stylised overview of main policy options. The options indicate different trade-offs between freely allowing private money innovations at one extreme ('option 1') and implementing the toughest regulation to fully mitigate monetary and financial risk at the other ('option 5'). It is important to note however that the choice of these options need not remain fixed over time. In fact, as different forms of private money become more widely accepted, policymakers may decide they need more stringent regulation. An important question is how easily one could move from one regime to the next regime.

Option 1 represents how crypto's are currently regulated. Regulation is aimed at preventing money laundering and terrorist financing. This option allows most room for innovation and could be acceptable as long as crypto's are used as a niche product.

Table 4: Policy options to regulate stablecoins

1	No regulation except **anti-money laundering**/countering terrorism financing
2	Regulate as **investment fund/Money Market Fund**: transparency & governance. Transparency on asset backing (not necessarily 100%)
3	Regulate as **e-money**: redeemability at par and backed by 100% private assets and capital buffer
4	Regulate as **synthetic CBDC**: redeemability at par and backed by 100% central bank reserves (or 100% commercial bank deposits as a 'lighter' option)
5	**Prohibit** significant private stablecoins and only allow **bank deposits**

Policy option 2 tightens the rules to better protect holders of crypto assets. This option resembles so-called 'asset-referenced tokens' from the EU regulatory proposals for a Regulation on Markets in Crypto Assets.[35] This option is more or less based on a similar framework applied to investment funds, largely focusing on transparency requirements regarding asset backing and conflicts of interest. This option leaves responsibility to the buyer of the crypto-asset, who should understand the nature of the backing, or the lack of it. However, in the case of stablecoins, the option of less than 100% backing with a promise to maintain a stable value would create a risky debt-like claim. This could lead to run risk, i.e. why all financial panics involve debt, in line with our discussion in section 2.[36]

Policy option 3 tightens the rules on asset backing, i.e. 100% backing and a small capital buffer. It resembles so-called 'e-money tokens' from the EU regulatory proposals for a Regulation on Markets in Crypto Assets.[37] In this case, the specifics of the asset backing still matter, e.g. which types of securities are allowed. This would then determine the possible existence of credit and liquidity risk, for which additional buffers are added. Moreover, it would still fall outside the monetary framework. This may explain why the ECB has stated to have serious concerns about issuing of e-money by non-credit institutions.[38] The ECB has argued that in- and outflows of bank

deposits to and from e-money have impact on banks' liquidity, and that the implementation of monetary policy in the Euro area would become increasingly difficult and the desired policy outcomes more uncertain.

This brings us to option 4, i.e. creating more certainty and stability by requiring full backing in commercial or central bank money. Essentially, this goes in the same direction of the option as described in the BIS report on stablecoins that regards systemically important transfers of value as a financial market infrastructure.[39] This report states that these should carry "*little or no credit or liquidity risk*" and be "*an acceptable alternative to the use of central bank money.*" In case systemically important stablecoins would be given access to the central bank balance sheet, they could then be called 'synthetic CBDC'.[40] In this case, the word 'synthetic' illustrates that the claim would still be on a private institution and not on the central bank, but nevertheless covered by 100% central bank reserves.

Finally, policy option 5 would prohibit significant private stablecoins altogether and only allow bank deposits. This resembles the proposal by the US President's Working Group to "*limit stablecoin issuance, and related activities of redemption and maintenance of reserve assets, to entities that are insured depository institutions.*"[41] Such a solution would maintain the current two-tier banking system, including its monetary arrangements and prudential constraints. It would not rely on the notion of 100% safe and liquid assets, but rather demand capital and liquidity buffers to cover the risks, as indicated in Table 2. At the same time, this may not be the most appropriate solution for entities that only want to provide payment services, but not issue loans (not being a bank). Policy option 5 would still allow some degree of innovation related to digital money, but only when it is issued by regulated banks and in line with the applicable regulatory framework.

Overall, the risks and corresponding policy options suggest stronger forms of regulation as adoption of crypto assets would increase. The overview of risks shows that these risks largely depend on their uptake, i.e. whether they become widely used as a means of payment or not. As soon as that point is reached, the principle of convertibility at par requires certainty on the backing. The precise format of such backing is still 'under construction', i.e., whether 100% commercial bank deposits would be good enough, whether it should be central bank money, or whether it would be desirable not to allow this option at all, and instead demand full compliance with banking regulation.

5. CONCLUSION

The money and payment landscape is rapidly changing. New technologies, new players, and new monies come to the fore. Clearly, in our view, public and private money should coexist. Public money ensures trust, private money drives innovation. However, as earlier payment episodes illustrate, the uncoordinated issuance of private money may lead to undesirable disruptions and increased financial risks. To mitigate these risks and safeguard the payment system, central banks and financial regulators have to step in.

Getting the public-private balance right is of key importance but easier said than done. The appropriate balance will largely depend on future adoption of new forms of private money. If adoption remains limited a light regulatory regime will do, but if adoption increases so will the stringency of the regulation. Assuming that cash usage will keep declining and non-backed crypto's remain a niche product, a great deal will depend on how stablecoins will develop globally. Mass adoption could be within reach when they are issued by large technology platforms benefitting from 'deep pockets' and large worldwide consumer networks. If stablecoins become widely used as money, the stability of the payment system may be at risk without adequate regulation and convertibility at par with public money.

Finally, to shift the balance in the right direction, public money needs to first undergo a digital update. Just like cash, issuing CBDC will support the convertibility between private and public forms of money. At the same time, CBDC should be designed such that it will not fundamentally change the role of bank deposits. Hence, the key issue is one of technological adaptation. Central banks may have to adjust again, just like they did in the past by restoring the balance with respect to coins, private banknotes and bank deposits. Without a doubt, there are exciting times in money and payments ahead of us.

REFERENCES

[1] Crypto assets can be defined as a digital represent of value or rights which may be transferred and stored electronically, using distributed ledger technology or similar technology. See European Commission (2020), Proposal for a regulation on markets in crypto-assets, and amending Directive (EU) 2019/1937, COM(2020)-593, Report. Stablecoins are a type of crypto assets that purports to maintain a stable value by referring to the value of one or more fiat currencies that are legal tender, one or several commodities, one or several crypto-assets, or a combination of such assets. European Commission (2020) provides a further breakdown into electronic money tokens, which are supported by a fiat currency that is legal tender, and asset-referenced tokens, which are supported by a broader range of assets.

[2] Fiat money is any money that is backed by the order ('fiat') of the government to act as money.

[3] In this paper we mainly focus on retail payments. Large-value payments and wholesale settlement have traditionally relied on central bank reserves, although this picture may now be changing as well.

[4] Schnabel, I. and Shin, H.S. (2018) 'Money and trust: Lessons from the 1620s for money in the digital age', BIS Working Paper No. 698.

[5] Quinn, S. and Roberds, W. (2012) 'The Bank of Amsterdam through the lens of monetary competition', Federal Reserve Bank of Atlanta Working Paper No. 14.

[6] Quinn, S. and Roberds, W. (2014) 'How Amsterdam got fiat money', *Journal of Monetary Economics*, Vol. 66(C), pp. 1–12.

[7] Quinn, S. and Roberds, W. (2016) 'Death of a reserve currency', International Journal of Central Banking, Vol. 12, No. 4, pp. 63-103. Frost, J., Shin, H.S. and Wierts, P. (2020) 'An early stablecoin? The Bank of Amsterdam and the governance of money', BIS Working Paper No. 902.

[8] Knafo, S. (2006) 'The Gold Standard and the Origins of the Modern International Monetary System', *Review of International Political Economy*, Vol. 13, No. 1, pp. 78-102. Söderberg, G. (2018) 'Why did the Riksbank get a monopoly on banknotes?' Sveriges Riksbank Economic Review 2018:3.

[9] Gorton, G. and Zhang, J. (2021) 'Taming wildcat stablecoins', Mimeo.

[10] Söderberg, G. (2018) 'Why did the Riksbank get a monopoly on banknotes?', Sveriges Riksbank Economic Review 2018:3.

[11] Ibid.

[12] Knafo, S. (2006) 'The Gold Standard and the Origins of the Modern International Monetary System', *Review of International Political Economy*, Vol. 13, No. 1, pp. 78-102.

[13] See Chakravorti, S. (2016) 'New payment technologies: Back to basics', Mimeo.

[14] See Milton Friedman: "*So long as the fiduciary currency has a market value greater than its cost of production—which under favourable conditions can be compressed close to the cost of paper on which itis printed—any individual issuer has an incentive to issue additional amounts. A fiduciary currency would thus probably tend through increased issue to degenerate into a commodity standard—there being no stable equilibrium price short of that at which the money value of currency is no greater than that of the paper it contains. And in view of the negligible cost of adding zeros, it is not clear that there is any finite price level for which this is the case*". Quoted in Bordo, M. (2021) 'Central bank digital currency in historical perspective: Another crossroads in monetary history', Working Paper prepared for the Bank of England's chief economists workshop.

[15] BIS (2003) 'The role of central bank money in payment systems', Committee on Payment and Settlement Systems, Report.

[16] Makarov, I. and Schoar, A. (2021) 'Blockchain analysis of the bitcoin market', NBER Working Paper No. 29396.

[17] Ibid.

[18] See www.coingecko.com, data as last accessed on November 7, 2021.

[19] See Bolt, W. and van Oordt, M. (2020) 'On the value of virtual currencies', *Journal of Money, Credit and Banking*, Vol. 52, No. 4, pp. 835-862. The determinants of crypto prices and its volatility are the focus of many

papers, see also e.g. Biais, B., Bisière, C., Bouvard, M., Casamatta, C. and Menkveld, A. (2018) 'Equilibrium bitcoin pricing', Mimeo, available at SSRN; Garratt, R. and Wallace N. (2018) 'Bitcoin 1, Bitcoin 2,…: An experiment on privately issued outside monies', *Economic Inquiry*, Vol. 56, pp. 1887–97; and Yermack, D. (2015) 'Is bitcoin a real currency? An economic appraisal', in *Handbook of Digital Currency*, pp. 31-43. Springer.

[20] Halaburda, H., Haeringer, G., Gans, J. and Gandal, N. (2021) 'The microeconomics of cryptocurrencies', forthcoming in *Journal of Economic Literature*.

[21] Cunliffe, J. (2021) 'Is 'crypto' a financial stability risk?', Speech given at SIBOS, Bank of England, 13 October 2021.

[22] President's Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency (2021) 'Report on Stablecoins', Report.

[23] Kaiko research (2021) 'Half of all Bitcoin trades are executed using Tether', https://blog.kaiko.com/half-of-all-bitcoin-trades-are-executed-using-tether-9d7595304ca2, last accessed in November 2021.

[24] Financial Times (2021) 'Short-seller Hindenburg sets €1m 'bounty' for details on Tether's reserves', 20 October 2021.

[25] IMF (2021) 'The crypto ecosystem and financial stability challenges', Global Financial Stability Report, October 2021.

[26] ECB (2020) 'Report on a digital euro', Report, October 2020.

[27] Brainard, L. (2020) 'An update on digital currencies', Speech 13 August.

[28] Brunnermeier, M., H. James and Landau, J-P. (2021) 'The digitalization of money'. BIS Working Paper No. 941. See also Den Butter, F. and Mallekoote, P. (2018) 'The payment system as a public good?', *Journal of Payments Strategy & Systems*, Vol. 12, No. 4, pp. 304-313.

[29] Armstrong, M. (2006) 'Competition in two-sided markets', *RAND Journal of Economics*, Vol. 37, pp. 668–91. See also Rochet, J-C. and Tirole, J. (2006) 'Two-sided markets: A progress report'. *RAND Journal of Economics*, Vol. 37, pp. 645–67.

[30] See Van der Cruijsen, C., Hernandez, L. and Jonker, N. (2017) 'In love with debit card, but still married to cash', *Applied Economics*, Vol. 49, No. 30, pp. 2989-3004; and Bolt, W. (2013) 'Pricing, competition and innovation in retail payment systems: A brief overview', *Journal of Financial Market Infrastructures*, Vol. 1, No. 3, pp. 73-90.

[31] See website Novi (Facebook-owned digital wallet created for Diem): https://www.novi.com, last accessed on 15 November 2021.

[32] Libra Association (2019) 'An introduction to Libra', White Paper, June 2019.

[33] The profit-making motive may lead to an underlying conflict of interest between the stablecoin issuer, who manages the assets and receives the return, and the stablecoin owner, who relies on full backing. See Frost, J., Shin, H.S. and Wierts, P. (2020) 'An early stablecoin? The Bank of Amsterdam and the governance of money', BIS Working Paper No. 902.

[34] FSB (2020) 'Regulation, supervision and oversight of 'global stablecoin' arrangements', Final Report and High-Level Recommendations, Basel; European Commission (2020) 'Proposal for a regulation on markets in crypto-assets, and amending Directive (EU) 2019/1937', COM(2020)-593; BIS (2021) 'Application of the principles for financial market infrastructures to stablecoin arrangements', Consultative Report, CPMI and IOSCO, October 2021; President's Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency (2021) 'Report on Stablecoins', Report, November 2021. See also G7 (2019) 'Investigating the impact of global stablecoins', Working Group on Stablecoins, Report, October 2019.

[35] Ibid.

[36] Holmstrom, B. (2015) 'Understanding the role of debt in the financial system', BIS Working Paper No. 479.

[37] In the EC (2020) MiCAR proposal, significant stablecoins are supposed to be regulated as 'e-money', the third official category of money, which exists already, but has attracted very limited use so that it has largely remained off radar. The main requirement for such 'e-money tokens' in MiCAR is that it has a one-to-one backing of safe and liquid assets with fiat money. However, many questions remain open. For example, it is

unclear when a stablecoin becomes 'significant' and in case it becomes significant, how to change from an 'asset referenced token' to an 'e-money token'.

[38] ECB (1998) 'Report on electronic money', Report; ECB (2008) 'Opinion of the European Central Bank of 5 December 2008 on a proposal for a Directive on the taking up, pursuit and prudential supervision of the business of electronic money institutions (CON/2008/84)', *Official Journal of the European Union*, 6 February 2009, pp. 1–9; ECB (2021) 'Opinion of the European Central Bank of 19 February 2021 on a proposal for a regulation on Markets in Crypto-assets, and amending Directive (EU) 2019/1937 (CON/2021/4)', *Official Journal of the European Union*, 29 April 2021, pp. 1–9.

[39] BIS (2021) 'Application of the principles for financial market infrastructures to stablecoin arrangements'. Consultative Report, CPMI and IOSCO, October 2021.

[40] Adrian, T. and Mancini-Griffoli, T. (2019) 'The rise of digital money', IMF Fintech Notes, 19/01.

[41] See President's Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency (2021), Report on Stablecoins, p. 16.

DeNederlandscheBank
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De Nederlandsche Bank N.V.
Postbus 98, 1000 AB Amsterdam
020 524 91 11
dnb.nl