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Digital Euro: An assessment of the first two progress reports

The case for unlimited holdings of digital euros

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Digital Euro: An assessment of the first two progress reports

The case for unlimited holdings of digital euros

Abstract

The study argues in favour of the introduction of a digital euro because of its benefits for the public's store of value and cashless payment options. It questions the assumption that caps on digital euro holdings would be necessary in the interest of financial stability and favours an approach that allows everyone unlimited access to digital euros.

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LIST OF ABBREVIATIONS

BIS	Bank for International Settlements
CBDC	Central Bank Digital Currency
CHF	Swiss framc
CS	Credit Suisse
ECB	European Central Bank
EFSF	European Financial Stability Facility
EFSM	European Financial Stabilisation Mechanism
ESM	European Stability Mechanism
Fed	United States Federal Reserve System
FINMA	Swiss Financial Market Supervisory Authority
PBOC	People's Bank of China
PBOC Act	People's Republic of China Law on People's Bank of China Act
SNB	Swiss National Bank
SVB	Silicon Valley Bank
UBS	Union Bank of Switzerland
USD	US dollar

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EXECUTIVE SUMMARY

The growing popularity of cryptocurrencies and stablecoins has alarmed central banks around the world and prompted them to accelerate the development of central bank digital currency (CBDC). Apart from its potential suitability to stifle the growth of cryptoassets, CBDC has been portrayed as a catalyst for greater financial inclusion, a means to ease the transition to cashless societies, a tool to increase the effectiveness of monetary policy implementation, and even an instrument to rival the dominance of the US dollar in international trade and financing. However, the actual benefits depend on the specifics of a relevant market and society. This paper argues that the paramount reason for introducing a digital euro should lie in the imperfections of the existing money landscape that offers the public suboptimal choices for store of value and payment transactions. In that respect, the introduction of a digital euro holds great promise for the public, and this paper focuses on one of the most essential design features of a digital euro. The European Central Bank (ECB) plans to introduce a limited version of a digital euro that would cap the maximum amounts of digital euros that individuals can hold, but this paper challenges the ECB's assumption that such caps are needed in the interest of financial stability. The concerns voiced by the ECB and other central banks about the risks from sudden outflows of liquidity from bank deposits to CBDC are realistic, but this paper argues that these risks are manageable and that a digital euro might even support financial stability in a banking crisis. Properly implemented, an unlimited digital euro would allow central banks and other authorities to wield control more effectively during bank run scenarios and improve their overall ability to manage crises situations.

1. INTRODUCTION

CBDC are one of the most pressing topics of interest to central banks. Practically all central banks are exploring the potential benefits of CBDC. Some of these central banks have started exploring the feasibility of implementing a digital version of their currency in their markets of jurisdiction. China's pilot is probably the most advanced pilot of its kind (see Box 1). It is therefore unsurprising that much has been written about CBDC, especially about the reasons for their introduction, the centralised or decentralised technology on which they could be based, the roles that private intermediaries could play in the distribution and handling of CBDC, their benefits for financial markets and societies and their potential disadvantages for parts of the financial industry.[1] Especially the CBDC collaboration of central banks coordinated by the Bank for International Settlements (BIS) addressed key questions and brought much needed clarity.[2] Depending on the specifics of the financial infrastructure in their markets of jurisdiction, central banks see the need for CBDC to foster financial inclusion of disadvantaged parts of society,[3] rival the dominance of private providers of cashless payment services,[4] or signal to the public that issuers and miners of crypto-tokens are not taking the lead in the global search for an optimal design of store of value and payment services.[5]

In view of this rich literature, there is no need to reiterate the reasons why central banks generally pursue the idea of introducing CBDC. Instead, this briefing focuses on a key yet unresolved aspect of CBDC. The potential impact of CBDC on the business model of banks has been mentioned in many works on CBDC, but mostly in very general terms and without regard to a specific market or jurisdiction.

The assumption that the public would profit from CBDC insofar as it would for the first time in the modern history of money have access to cashless central bank money and therefore be able to avoid the disadvantages that cash and bank money entail forms the starting point of our analysis (below at Section 2). This paper argues that the time has come to take these benefits for the public seriously. At the same time, it cannot be denied that CBDC would provide the public with an alternative to bank deposits and that this alternative might lead to loss of liquidity in the banking sector, especially in times

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1 For discussions of CBDC concepts, see Christian Barontini and Henry Holden, 'Proceeding with caution – a survey on central bank digital currency' (2019) BIS Papers No 101; Tommaso Mancini-Griffoli and others, 'Casting Light on Central Bank Digital Currencies' (2018) International Monetary Fund Staff Discussion Note 18/08; Cecilia Skingsley, 'Should the Riksbank issue e-krona?' (Fintech 2016 Conference, Stockholm, 16 November 2016); Javier Guzmán Calafell, 'Some considerations on central bank digital currencies' (2019) Federal Reserve Bank of St. Louis symposium 'The next decade of finance: assessing priorities and implications for society, politics and economics'; Michael Kumhof and Clare Noone, 'Central bank digital currencies – design principles and balance sheet implications' (2018) Bank of England Staff Working Paper No. 725; Aleksander Berentsen and Fabian Schär, 'The Case for Central Bank Electronic Money and the Non-case for Central Bank Cryptocurrencies' (2018) 100(2) Federal Reserve Bank of St. Louis Review 97; Tobias Adrian and Tommaso Mancini-Griffoli, 'The Rise of Digital Money' (International Monetary Fund 2019).

2 Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features', Report no 1 in a series of collaborations from a group of central banks (2020).

3 An example are the Bahamas where the population is widely dispersed across the archipelago and private providers of financial services are absent on far-off islands, prompting the central bank to fill the void with CBDC, see Jim Wyss, 'How the Tiny Bahamas Beat Global Giants in the E-Currency Race' (Financial Post, 20 May 2021).

4 Payments with Alipay and WeChat Pay account for more than 94% of all electronic payment transactions in China, see Bloomberg Business Week of 25 June 2021, 'China crushed Jack Ma, and his Fintech rivals are next'; Yao Qian, 'Central Bank Digital Currency: optimization of the currency system and its issuance design' (2019) 12(1) China Economic Journal 1, 3, prompting the central bank to advance its CBDC project (see Box 1).

5 For a summary of the manifold objectives, Gabriel Soderberg et al., 'Behind the Scenes of Central Bank Digital Currency Emerging Trends, Insights, and Policy Lessons', International Monetary Fund Note 2022/004, p. 4-7.

of crisis.[6] However, we argue that the indirect effects of liquidity outflows from the banking sector triggered by CBDC are unclear, and the questions whether these outflows would lead to difficulties in the loan sector ('credit crunches') and financial stability issues have so far remained unanswered.

Positive results for financial stability and access to financial services appear just as likely because the existence of CBDC makes liquidity movements more predictable which facilitates the crisis reactions of central banks and resolution authorities.

These issues are of relevance to the digital euro project. The ECB currently favours a cautious approach to CBDC that would limit access to a digital euro in the supposed interest of stability in the banking sector. Since a cap on the amounts of digital euros that individuals can hold would impair its greatest benefits for the public – its availability as a safe haven for store of value in crisis times – and ultimately defeat the purpose of its introduction because it could not be understood as a better choice of store of value than cryptocurrencies and stablecoins. As we argue here (Section 3) throughout this paper, the euro area needs a broad discussion about the need of such holding caps. The existing literature does not arrive at clear conclusions on how the indirect effects of unrestricted access to CBDC would look and can therefore not be understood as unequivocally supporting the ECB's restrictive stance[7]. This indicates that better insight is needed before central banks decide on this essential policy aspect. Finally, central banks' pursuit of monetary policy objectives could be facilitated by the existence of (unlimited) CBDC, and we explore this aspect for the Eurosystem (at Section 4).

Box 1: China's CBDC pilot

The People's Bank of China (PBOC) started a CBDC pilot in 2020 in select locations of China.[8] 50,000 individuals were selected for the initial testing phase and received a gift of 200 digital yuan (approximately €26) in their digital wallets provided by the participating banks. Purchases with digital yuan are in the initial phase only possible at selected points of sale in the pilot region and initiated with a phone app that reads and generates QR codes which are exchanged with corresponding apps installed on other users' phones and digital point of sale terminals. At the initial stage, the digital yuan is not issued as a central bank liability, but as a liability in the balance sheets of the participating banks backed by central bank reserve money. Ultimately, the PBOC plans to issue a digital yuan representing the PBOC's own liability in all of China and make use of help provided by private entities such as banks and electronic payment service providers such as Alipay and WeChat Pay as account and wallet services facilitators.[9] The PBOC's determination to launch a digital yuan

[6] See the discussions below at 2.1 and 3.1.

[7] Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022); Bank for International Settlements, ,'Central Bank Digital Currencies: financial stability implications - Report no 4 in a series of collaborations from a group of central banks ' (2021).

[8] For details on the pilot, see Gabriel Soderberg et al., 'Behind the Scenes of Central Bank Digital Currency Emerging Trends, Insights, and Policy Lessons', International Monetary Fund Note 2022/004, p. 22; Michelle Qi, 'What would be the impact of China's digital currency?' (Eastspring Investments, 2020), https://www.eastspring.com/insights/what-would-be-the-impact-of-china-s-digital-currency; Mian Xia, 'In Search of The Perfect Coin; China's Approach towards Cryptocurrency and Its Own Central Bank Digital Currency' (2021) 36(3) BFLR 419.

[9] People's Bank of China, 'Progress of Research & Development of E-CNY in China' (2021), para 2.1 (in English published by Peking University as 'Progress of Research & Development of E-CNY in China', http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/2021071614584691871.pdf

shows in the recent changes to the PBOC act by which the digital yuan has already been given legal tender status in China.[10]

2. BENEFITS TO THE PUBLIC RESULTING FROM A DIGITAL EURO

2.1. Public's need for cashless retail central bank money

The public currently only has access to cash, especially the banknotes issued by central banks, and book money in the deposit accounts of commercial banks (hereafter referred to as bank money). Both types of money display the three primary characteristics attributed to money: 1) store of value, 2) unit of account, and 3) medium of exchange. Cash and bank money retain their value for future usage and therefore serve as store of value; they also represent a unit of account since the value of commodities is measured against cash and bank money; and both are generally accepted as a medium of exchange for payment transactions.[11] Additionally, both are either issued by a state institution (cash) or issued and administered by a private entity (i.e. commercial banks) but indirectly under the control of state institutions due to the strict regulatory requirements imposed on banks and the interaction of central banks' monetary policies with the money creation powers of banks.[12] One might argue that the public's need for money is sufficiently covered by these two types of money, but this paper will argue that an additional form of money — a cashless type of central bank money — is in fact needed to prepare the public, including both natural and legal persons, for the challenges of the future.

To set the scene for the argument that a digital euro is needed, it is crucial to first understand the existing monetary landscape and its inadequacies. At the crux lies an interesting paradox: cash is the preferred means of payment in the euro area, but the preferred store of value is bank money (see Box 2). The public has valid reasons for this split in preferences. Cashless payment transactions are initiated by a payment instrument whose usage entails the risk of fraudulent transactions and consequently the loss of bank money. Cash is highly exposed to the risk of loss as well, but the quantum of loss is limited to the face value of the lost, stolen, or destroyed banknote. In contrast, payment instruments such as cards, mobile apps, and internet banking carry the potential for much larger losses. Fraudulent transactions might be initiated with the payment instrument and lead to losses that are only curtailed by the payment and transfer limits agreed between the holder of the payment instrument and its issuer.[13] It is even more concerning that there are substantial risks inherent in bank money. Bank money represents nothing more than a claim against a bank and is always subject to the bank's ability to

[10] People's Bank of China, 'PRC Law on People's Bank of China (Draft for Public Consultation)' (23 October 2020), art. 19.

[11] These three components constituting money are discussed in detail in Charles Proctor, Mann on the Legal Aspect of Money (7th ed. 2012) paras. 1.49-1.60; Antonio Sáinz de Vicuna (2010) An institutional theory of money, in Mario Giovanoli and Diego Devos (eds.), International monetary and financial law: the global crisis (2010), paras. 25.04-25.14; Thomas Cargill, The financial system, financial regulation and central bank policy (2017), pp 30-32.

[12] For definitions of money, the state theory of money and the money-creation powers of banks, see Michael McLeay, Amar Radia and Ryland Thomas, 'Money creation in the modern economy' (2014) Bank of England Quarterly Bulletin 2014 (Q1) 1; Michael McLeay, Amar Radia and Ryland Thomas, 'Money in the modern economy: an introduction' (2014) Bank of England Quarterly Bulletin 2014 (Q1) 4; Bank of England, 'Central Bank Digital Currency Opportunities, challenges and design', Bank of England Discussion Paper (2020), para. 1.1; Charles Proctor, Mann on the Legal Aspect of Money, para. 3.17; Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284, 285 and 317.

[13] Directive (EU) 2015/2366 on payment services in the internal market of 26 November 2015, OJ L 337/35, limits the risk of loss by reducing payment services users' liability to cases of gross negligence, see ibid, art. 74, but risks of loss remain nevertheless.

honour these claims.[14] Holders of bank money are therefore exposed to the solvency and liquidity risks inherent in the banking business,[15] and deposit insurance can only partially mitigate these risks because of caps on insured amounts[16] and factual limits as to what such insurance can achieve in a large-scale crisis affecting the entire banking sector.

The inherent riskiness of bank money is self-evident in times of crisis. Bank runs occur when depositors lose confidence in a specific bank or the banking sector as a whole, and typically manifest nowadays in the mass transfer of funds from a troubled bank to healthier banks.[17] If the entire banking sector is under stress, money might even be shifted away from banks altogether, to other (potentially less regulated) parts of the financial system or across borders to banks and other financial institutions abroad.[18] Even if the contagion from a banking crisis can be stymied through regulatory intervention, the consequences are still undesirable. Following a run event, unviable banks are often absorbed by other banks, which exacerbates the inexorable trend towards consolidation in the banking sector by increasing the scale and number of systemically important banks. This results in a vicious cycle: the stakes for future banking crises can only get higher after each round of consolidation, since the newly merged entities are even more systemically important than their pre-crisis predecessors. Seeing that these institutions are "too big to fail", governments are often willing to do whatever it takes to protect the integrity of the financial system whenever trouble arises, even if it creates moral hazard risks that may cost taxpayers dearly in the long-term. The March 2023 banking crisis involving the US Silicon Valley Bank (SVB) and Swiss bank Credit Suisse are recent examples of these typical developments (see Boxes 2 and 3).

At least from a depositor's perspective, CBDC provides a solution to the risks and deleterious consequences of bank failures.[19] For depositors, CBDC serves as an indisputably secure store of value option because it represents a liability of a central bank.[20] Central banks cannot default on their payment obligations since they have unlimited money-creation powers in their own currency.[21] When

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[14] For details on bank money, see Simon Gleeson, The Legal Concept of Money (2018), paras. 1.27-1.35; Bank of England, 'Central Bank Digital Currency Opportunities, challenges and design' (2020) Bank of England Discussion Paper, para 1.1; Charles Proctor, Mann on the Legal Aspect of Money, para 3.17; Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284, 285 and 317; Michael McLeay, Amar Radia and Ryland Thomas, 'Money in the modern economy: an introduction' (2014) Bank of England Quarterly Bulletin 2014 Q1 4, 7-11.

[15] On this process in general terms, see José Gabilondo, 'Bank Funding, Liquidity, and Capital Adequacy: A Law and Finance Approach' (2016) 11-22 and 27-37; John Armour and others, 'Principles of Financial Regulation' (OUP 2016) 290–293.

[16] The required minimum coverage level in the EU is EUR 100,000 according to Directive 2014/49/EU of 16 April 2014 on deposit guarantee schemes (recast), OJ EU (2014) L 173/149. In detail on the essential features of deposit insurance, see Financial Stability Board, Thematic Review on Deposit Insurance Systems – Peer Review Report (FSB 2012); Patrizia Baudino and others, Bank failure management—the role of deposit insurance (2019) Bank for International Settlement Financial Stability Institute FSI Insights No 17; Rosa Lastra, International Financial and Monetary Law (2nd ed. 2015) ch 10.

[17] Ted Temzelides, 'Are bank runs contagious?' (1997) Business Review, Federal Reserve Bank of Philadelphia (November issue), p. 3.

[18] Martin Brown, Stefan Trautmann and Razvan Vlahu., 'Understanding Bank-Run Contagion' (2014), ECB Working Paper No. 1711 l; Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022), p 27 seq.

[19] For potential positive effects on financial stability, below at 3.2 and Box 5.

[20] On this core legal element of CBDC, see European Central Bank, Report on a digital euro (2020) 6; Bank of England, 'Central Bank Digital Currency: Opportunities, challenges and design', p. 31 (Box 3); European Central Bank, 'Digital euro experimentation scope and key learnings' (2021), p. 7, 8 and 10; Wouter Bossu and others, 'Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations', (2020) IMF Working Paper WP/20/354, para 15ff. See also ECB, 'Progress on the investigation phase of a digital euro – second report (December 2022), p. 4 (at 1).

[21] Hanna Armelius, Carl A. Claussen and Hendry Scott, 'Is central bank currency fundamental to the monetary system?', Sveriges Riksbank Economic Review 2020:2, p. 19, 25; Hossein Nabilou, 'Testing the waters of the Rubicon: the European Central Bank and central bank

viewed in totality with the assurance of at-par convertibility of all types of money (the so-called principle of unity of money),[22] it is clear that central banks can always deliver on the promise underpinning their digital currency — they can always execute payments in digital currency, convert digital currency into cash, and convert digital currency into bank money.

For the public, this could herald new opportunities. Holdings in CBDC would become the baseline store of value option for everyone because it is a risk-free means of holding money, provides access to cashless payment transactions, and allows for conversions into cash. Any other store of value would be measured against the yardstick of a zero-risk CBDC. It can be expected that financial services such as the facilitation of investments will remain the primary domain of banks and that banks will remain the most important lenders and continue to credit the amounts lent to the bank accounts of their borrowing customers.[23] As a result, bank money would likely stay the primary choice for store of value (but see Box 5 for alternative scenarios).[24] However, depositors would likely demand adequate risk compensation since CBDC would serve as a risk-free alternative. If CBDC storage were available at zero cost, depositors would expect banks to offer interest rates that are commensurate with the risks inherent in bank money.

The era of zero-interest deposit funding for banks might therefore come to an end with the introduction of CBDC.[25] Concerns about increased costs of deposit funding due to CBDC have prompted the ECB to propose limited access to a digital euro, such that holdings of digital euros would not exceed "cash-like" volumes.[26] Both ECB Progress Reports reiterate these plans and adopt the working assumption that holdings of digital euros would be capped.[27] This proposed cap is problematic on several counts. Firstly, it suggests that the digital euro is meant as a cash replacement which is not, and should not be the case (as discussed at 2.2). Secondly, it would defeat the purpose of CBDC to serve as a risk-free store of value option for the public although compelling reasons that would require such restrictions are not evident (as argued at 3.1 and 3.2) and render the digital euro ineffective as a response to growing usage of cryptocurrencies (as assessed at 3.3). Thirdly, a restricted access to a

digital currencies' (2020) 21 Journal of Banking Regulation 299, 306; Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284, 295-297.

22 For this principle and plans of central banks to adhere to it with the introduction of CBDC, Bank of England, 'Central Bank Digital Currency : Opportunities, challenges and design' Bank of England Discussion Paper (2020), p. 7-9 ; European Central Bank, 'Digital euro experimentation scope and key learnings' (2021), p. 7; Yves Mersch, 'Digital Base Money: an assessment from the ECB's perspective' (Speech at the Farewell ceremony for Pentii Hakkarainen, Deputy Governor of Suomen Pankki – Finlands Bank, Helsinki, 16 January 2017); Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features, Report no 1 in a series of collaborations from a group of central banks' (2020), p. 11 (Table 1).

23 For the process of bank lending and the inherent creation of money in customers' accounts, see Michael McLeay, Amar Radia and Ryland Thomas, 'Money creation in the modern economy' (2014) Bank of England Quarterly Bulletin 2014 (Q1) 1.

24 Although the ultimate effects of a digital euro are difficult to predict, see Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022), p 27.

25 Except, maybe, during times of extreme monetary loosening that see the Eurosystem charging negative interest on digital euros (especially for holdings exceeding certain thresholds), thereby boosting the attractiveness of zero interest bank money. For the concept of tiered interest paid on digital euros, see Ulrich Bindseil, 'Tiered CBDC and the financial system' (2020) European Central Bank Working Paper Series No 2351/January 2020 (as also discussed below at 4). However, we would caution against such deterrents against (large) holdings of digital euros because they could damage the public's trust in digital euros and thereby defeat their stabilising effects (as argued at Section 3.2).

26 ECB, Report on a digital euro (2020) p. 17 for the potential risks of an unlimited digital euro and p. 28 seq. (at para 5.1.3) ; Ulrich Bindseil, 'Issuing a digital euro - ESCB Legal Conference 2020 (February 2021), 172, 175 (at para 3.3).

27 ECB, 'Progress on the investigation phase of a digital euro' (September 2022), p. 9 seq. (at 2.3); ECB, 'Progress on the investigation phase of a digital euro – second report' (December 2022), p. 8 seq. (at 1.3).

digital euro would also impede benefits which could otherwise result for central banks' monetary policy transactions (as explained at 4).

Box 2: Cash and bank money volumes

The following numbers highlight the store of value and payment preferences in the euro area:

- On the one hand, numbers reveal that cash is the preferred means of payment for day-to-day transactions in the euro area. A 2020 study authorised by the ECB revealed *that "73% of the volume of POS and P2P transactions was carried out using cash as a payment instrument and 27% using non-cash payment instruments"*.[28] Even in terms of payment values, cash outcompeted cashless transactions: "*in value terms, cash transactions accounted for 48% of all transactions, versus 41% for card transactions*".[29]

- On the other hand, cash volumes are overall small in comparison with holdings of bank money.[30] The public stores money conveniently as mere data in bank accounts because it trusts the banks' promise to convert this book data into banknotes if the customers so wish. Cash serves as an "anchor" for bank money on which the public relies.[31]

Box 3: Measures in response to the Silicon Valley Bank collapse

Silicon Valley Bank (SVB) had a large depositor base of Californian start-ups and experienced high inflows of deposits during the Covid-19 years when the tech-industry was doing well. The gloomier business environment for start-ups in 2022-23 led to outflows of liquidity from its depositors. To counter-finance these outflows, SVB sold its liquid assets consisting predominantly of low-yielding sovereign bonds whose market value had come under pressure due to rising bond yields resulting from central banks' interest rates hikes in 2022-23. SVB's disclosure of substantial losses from its asset sales prompted a panic run of depositors in March 2023 that turned SVB's business unviable within 48 hours. Although SVB's balance sheet size was marginal compared with global systemically important banks (G-SIBs)[32], financial stability concerns prompted the Federal Reserve System to

[28] European Central Bank, Study on the payment attitudes of consumers in the euro area (SPACE) (2020), p. 5 (Executive Summary). See also Laure Lalouette and Henk Esselink, Trends and developments in the use of euro cash over the past ten years, 6 Economic Bulletin Issue (2018). For 2023 numbers that show that the trend continues, see Deutsche Bundesbank, Cash: Fact and Figures, at 1, https://www.bundesbank.de/en/bundesbank/history/20-years-euro/cash-facts-and-figures-772080

[29] European Central Bank, ibid.

[30] Based on numbers from 2023, cash in circulation amounts to €1.56 trillion compared with M3 amounting to €16.1 trillion. For the categorisations of M1, M2 and M3 see ECB, Manual on MFI balance sheet statistics (January 2021), at https://www.ecb.europa.eu/pub/pdf/other/ecb.manualmfibalancesheetstatistics201901~d2ebf72987.en.pdf. This corresponds with the situation in the UK, see McLeay, 'Money in the modern economy' (n 16) p. 5 and 10.

[31] For the anchor function of cash, see Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284, 302, 306 and 298. This anchor role of central bank money is also emphasised in the First Progress Report as an important role that a digital euro would serve in the money landscape, see ECB, 'Progress on the Investigation phase of a digital euro' (September 2022), p. 3 (at 1).

[32] For the annually upated list of G-SIBs see Financial Stability Board, 2022 List of Global Systemically Important Banks (G-SIBs), https://www.fsb.org/2022/11/2022-list-of-global-systemically-important-banks-g-sibs/ (based on the November 2022 update).

open a new lending facility for American banks (backed by a USD 25 billion credit protection guarantee by the US Department of the Treasury),[33] and the US government guaranteed the deposits with the failing banks beyond the deposit insurance cap of USD 250,000.[34] SVB's collapse also precipitated a broader shift of deposits from smaller (and potentially weaker) banks to the biggest banks in the country (e.g., JPMorgan Chase).[35] This occurred because depositors who have fears about the soundness of their holdings of bank money tend to move those funds to banks that they perceive to be the strongest and most resilient. This results in the further entrenchment of the competitive advantages of big banks over smaller banks during times of crises. Regulatory responses, especially by resolution authorities and finance ministries, that favour large banks ultimately limit the public's choices for store of value and can even lead to economic inefficiencies in areas such as lending markets, because big banks tend to be less active on regional SME lending markets than smaller banks.[36]

Box 4: Measures in response to the Credit Suisse collapse

The Credit Suisse (CS) acquisition by its national rival, the Union Bank of Switzerland (UBS), in March 2023 was the result of depositors and other creditors withdrawing liquidity from CS *en masse*. This run was prompted by substantial losses on CS's assets coupled with its largest shareholder publicly refraining from further investments in CS. The Swiss authorities, recognising the need for prompt action to prevent uncontrollable repercussions for the Swiss financial market, orchestrated an impromptu takeover of CS by UBS. The Swiss Financial Market Supervisory Authority (FINMA), in its role as Switzerland's bank resolution authority, took actions that led to the transfer of all shares in CS to UBS, the wipe out of all CHF 16 billion of Additional Tier 1 (AT1) instruments issued by CS, and the heavily diluted compensation of former CS shareholders with shares in UBS.[37] To meet demands from UBS, the Swiss Federal Department of Finance provided a loss absorption guarantee of CHF 9 million for already defined losses and an additional further loss absorption guarantee of up to CHF 9 billion for currently still unassessed risks hidden in the assets of CS. Alongside these taxpayer-financed measures, the Swiss National Bank (SNB) created a CHF 100 billion liquidity support programme for the newly created megabank.[38] The imperfections of this takeover deal raise grave concerns. FINMA could face legal challenges because CS creditors accuse it of having overstepped

[33] Board of Governors of the Federal Reserve System, '*Federal Reserve Board announces it will make available additional funding to eligible depository institutions to help assure banks have the ability to meet the needs of all their depositors*' (Press Release of 12 March 2023), https://www.federalreserve.gov/newsevents/pressreleases/monetary20230312a.htm

[34] See the media report by Jeff Cox, '*U.S. government steps in and says people with funds deposited at SVB will be able to access their money*' (CNBS online article of 12 March 2023), https://www.cnbc.com/2023/03/12/regulators-unveil-plan-to-stem-damage-from-svb-collapse.html

[35] Hugh Son, '*Deposit drain from smaller banks into financial giants like JPMorgan Chase has slowed, sources say*' (CNBS online article of 25 March 2023), https://www.cnbc.com/2023/03/25/banking-crisis-deposit-drain-from-small-banks-into-jpm-wfc-c-slowed.html

[36] Jith Jayaratne, John Wolken, 'How important are small banks to small business lending?: New evidence from a survey of small firms' (1999) Volume 23, Issues 2–4 Journal of Banking & Finance 429.

[37] Credit Suisse, 'Credit Suisse and UBS to Merge' (press release of 19 March 2023), https://www.credit-suisse.com/about-us-news/en/articles/media-releases/credit-suisse-and-ubs-to-merge-202303.html.

[38] For these details, see John Revill, Noele Illien, John O'Donnell, Oliver Hirt and Tom Sims, 'UBS to take over Credit Suisse, assume up to 5 billion Swiss francs in losses' (Reuters online of 21 March 2023), https://www.reuters.com/business/finance/ubs-take-over-credit-suisse-central-bank-2023-03-19/#:~:text=BERN%2C%20March%2019%20(Reuters),market%2Dshaking%20turmoil%20in%20global.

its legal authority by allowing shareholders to recover some of their investments while completely wiping out holders of AT1 bonds, although AT1 holders rank above Common Equity Tier 1 (CET1) holders in the resolution and insolvency hierarchy.[39] Taxpayers might have to pay for the guarantees provided to UBS, which remains the only large private bank in Switzerland and consequently wields greater dominance in the Swiss market than ever before as a result of this deal.[40]

Box 5: Potential effects of a digital euro on the financial industry

The Eurosystem has declared in unison with other central banks that it intends to rely on the support of regulated and supervised private intermediaries for the supply of CBDC accounts and wallets instead of handling hundreds of millions of CBDC accounts itself.[41] These intermediaries could be existing financial institutions, especially banks, and new types of entities operating under a licence specifically created for CBDC handling services. A depositor's shift from bank money to digital euros would therefore not necessarily require a shift from a bank to a different institution, but the shift from bank money to digital euros would fundamentally change the legal relationship of a bank and its customer. Money that is transferred into deposit accounts becomes the banks' own money; banks may then utilise this money for their business activities with payment owed to the depositors upon demand or maturity.[42] By contrast, if banks provide accounts in which their customers store CBDC, the customers retain all rights inherent in the CBDC. Whereas deposits provide banks with liquidity needed for their own business transactions such as lending, proprietary trading, etc., CBDC account services would make them custodians of their customers' rights inherent in CBDC, similar to the custodianship that custodian banks provide for securities owners.

Depending on whether depositors consider their banks safe and the conditions they offer for deposits attractive, the banks' businesses will remain mostly unaffected or change because of massive moves from deposits to digital euros. In the latter case, it appears possible that a new financial industry catering to holders of digital euros could develop and offer financial services such as lending, credit intermediation and investments in financial products directly in exchange for digital euros without any need for prior conversions into bank money. Banks would have to compete with this new financial industry, especially for custodian and investment services for digital euros.[43] The results could be less risk concentration in a few systemically important banks and consequential

[39] Nikou Asgari, Harriet Agnew, Owen Walker and Sam Jones, 'Swiss under fire for shotgun marriage of Credit Suisse and UBS' (Financial Times online of 21 March 2023), https://www.ft.com/content/9058bfec-85a5-4983-8f8c-2ded77e101d7. For this hierarchy in general terms, Financial Stability Board, Key Attributes of Effective Resolution Regimes for Financial Institutions (15 October 2014), Key Attribute 5.1.

[40] Hanna Ziady, 'Too big for Switzerland? Credit Suisse rescue creates bank twice the size of the economy' (CNN Buiness online of 24 March 2023), https://www.cnn.com/2023/03/23/investing/credit-suisse-ubs-impact-switzerland/index.html#:~:text=UBS%20now%20has%20%E2%80%9Cquasi%2Dmonopoly,an%20even%20more%20dominant%20play

[41] ECB, 'Progress on the investigation phase of a digital euro – second report' (December 2022), p. 5 seq. (at 1.1); European Central Bank, 'Digital euro experimentation scope and key learnings' (2021), p. 8; ECB, Report on a digital euro (2020), p. 25; Ulrich Bindseil, 'Tiered CBDC and the financial system' (2020) European Central Bank Working Paper Series No 2351/January 2020, p. 4.

[42] On these principles in general terms, Simon Gleeson, 'The Legal Concept of Money' (2018), at 6.2.7 (lending for consumption versus custodianship); José Gabilondo, 'Bank Funding, Liquidity, and Capital Adequacy: A Law and Finance Approach' (2016) p. 11-22 and 27-37; John Armour et al., 'Principles of Financial Regulation' (2016) p. 290–293.

[43] Bank of England, 'Central Bank Digital Currency: Opportunities, challenges and design', Bank of England Discussion Paper (2020, p. 22-24.

rollbacks on regulation targeted at risks related to systemic importance (such as loss absorbing capacity, liquidity requirements and complex resolution regimes).[44]

2.2. Digital euro as an additional type of central bank money, not a cash replacement

A digital euro only benefits the public if it is introduced as an additional type of money available to everyone, and not if it replaces cash. The only commonality between euro banknotes and a digital euro would be their issuer. Both would be issued by the Eurosystem as two types of central bank money. In their practical usage, however, euro banknotes and digital euros would be entirely different. A digital euro would be a form of intangible money that is free of any default risk and can be stored and transferred electronically and therefore should be seen as the central bank-issued equivalent of bank money.

Cash, on the other hand, comes with the aforementioned advantages: simplicity of usage and finality of payment once tangible banknotes have been transferred. These remain compelling selling points which explain the continued existence of cash. By contrast, any form of intangible money depends on electronic platforms and is therefore prone to technology risks, such as the potential failure of a payment device or network. In addition, cash will always remain the only truly anonymous form of money. If a payer wishes to keep her tobacco, alcohol, or junk food habits secret so as to avoid any potential impact on her social standing, she could easily protect her confidentiality via cash transactions but would find it substantially more difficult to keep her transactions unknown to anyone if she were to use cashless methods of payment.

Therefore, a digital euro could be marketed as an innovative development that offers genuine social utility if it is introduced as a new means of store of value and payment that complements cash and bank money. Concerns about privacy issues mentioned in the First Progress Report[45] were likely the result of questionable depictions of CBDC in mass media and misinterpretations of central banks' messaging by the general public.[46] CBDC is often discussed against the backdrop of a supposed decline in cash usage,[47] and that view is not only questionable in the euro area context as ECB data has shown (see at Box 1), but central banks have also made clear that they do not plan to phase out cash via the introduction of CBDC.[48] To assuage the public's concerns and correct the misperception that a digital

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[44] In detail on such developments see Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 11 North Carolina Journal of International Law 1-77 (with further references).

[45] ECB, 'Progress on the investigation phase of a digital euro' (September 2022), p. 6-8 (at 2.2).

[46] Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features, Report no 1 in a series of collaborations from a group of central banks' (2020), para. 2.1.1; Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284, 285-288.

[47] Bank of England, 'Central Bank Digital Currency: Opportunities, challenges and design', Bank of England Discussion Paper (2020), p. 7-9 ; European Central Bank, 'Digital euro experimentation scope and key learnings' (2021) p. 7; Yves Mersch, 'Digital Base Money: an assessment from the ECB's perspective' (Speech at the Farewell ceremony for Pentii Hakkarainen, Deputy Governor of Suomen Pankki – Finlands Bank, Helsinki, 16 January 2017); Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features, Report no 1 in a series of collaborations from a group of central banks' (2020), p. 11 (Table 1).

[48] Bank of England, 'Central Bank Digital Currency : Opportunities, challenges and design', Bank of England Discussion Paper (2020) p. 7-9 ; Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features, Report no 1 in a series of collaborations from a group of central banks' (2020), p. 10.

euro would erode cash usage and diminish traditional payment options, all EU institutions should emphasise that the public in fact stands to gain from the introduction of a digital euro. Official statements from EU institutions should not portray a digital euro as a cash alternative or a policy vehicle for phasing out cash. Additionally, as long as the public understands that a digital euro is a safe alternative to existing forms of intangible money, above all bank money, data protection concerns are likely to disappear. It would be fair to assume that the public will eventually understand that private entities facilitating the storage of digital euros and their transfers as discussed in the Second Progress Report[49] (see also Box 5) are subject to the same standards that apply to existing providers of cashless storage and transfer services and that central banks would not have knowledge of spending habits. As both Reports emphasise, central banks would use all data related to digital euro transactions only for statistical purposes.[50]

3. BENEFITS OF A DIGITAL EURO FOR FINANCIAL STABILITY

The discussion about the value of a CBDC available to everyone could not have come at a more opportune time. In March 2023, banks in the US and Switzerland faced such grave difficulties that massive interventions by the resolution authorities, central banks, and finance ministries were necessary to mitigate the spread of contagion to other banks and the rest of the financial sector (see Boxes 2 and 3). It appears likely that many of these problematic developments could be avoided or their impact mitigated with the introduction of a CBDC as explained in the following sections.

3.1 Depositor protection less of a regulatory concern

CBDC would provide a permanent and last resort store of value facility for depositors. A digital euro, introduced with no limitations on how much of them individuals are allowed to hold, would allow the public to decide at any time how much of their money to store in secure digital euros, how much in bank money secured by deposit insurance, and how much in unsecured deposits or unsecured investments. Such optimal freedom of choice among different levels of riskiness would justify holding everyone to their financial decisions and therefore eliminate the need for governments to use taxpayers' money to pay for defaults on deposits exceeding the amounts guaranteed by deposit insurance and make restructurings of unviable banks easier since depositor protection would no longer be a primary concern of resolution authorities.[51]

3.2 Improved control over bank runs

The ECB's plans to cap individual holdings of a digital euro depict the easy convertibility of bank money into CBDC as a threat to the funding model of banks and therefore a potential financial stability risk.[52] This paper does not dispute the ECB's starting point that banks would experience large outflows of liquidity in a banking crisis, the reason being that bank runs are an unsurprising occurrence during

[49] ECB, 'Progress on the investigation phase of a digital euro – second report' (December 2022), p. 5 seq. (at 1.1).

[50] ECB, 'Progress on the investigation phase of a digital euro' (September 2022), p. 8 (last paragraph); ECB, 'Progress on the investigation phase of a digital euro – second report' (December 2022), p. 6 seq. (at 1.2).

[51] In detail on the simplification of such restructurings, Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 11 North Carolina Journal of International Law, 1, 49-55.

[52] For a more neutral assessment of the effect of a digital euro on depositor runs, Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022), p. 27 seq. The authors do not expect the introduction of a digital euro to make a big difference for bank runs and overall take a "benign" view on the matter, but ultimately recommend that central banks rely on caps as a possible run mitigation solution, ibid. Box 5.

times of crises. The existence of CBDC would not change that fact. On the contrary, prima facie, a run with a digital euro in place would look more threatening in terms of financial stability.

First, the magnitude of the run would likely increase with a digital euro.[53] A move into CBDC would eliminate all exposure to the risk of default for depositors that convert their bank money into CBDC, whereas a run from one bank to another in a banking crisis does not resolve the issue for retail depositors. Past crises have shown that large numbers of poorly informed depositors decided to stay with their banks,[54] although it is not clear whether that happened because they resigned to the fact that they saw no better alternative or relied on deposit insurance and protective interventions by the authorities. That would change with the presence of a digital euro. Smaller banks especially would likely experience higher outflows of liquidity in bank run scenarios than without the availability of such an easy and safe conversion option.

Second, runs would likely start much faster with a CBDC in place. Instead of losing time searching for information about the financial situation of specific banks, and instead of multiple transfers from one bank to another depending on news updates and rumours in one or the other direction, depositors could be expected to convert their bank money swiftly into CBDC and hold on to them until they consider the crisis resolved.

However, we argue that neither the magnitude nor the swiftness of depositors' moves into CBDC necessarily means that financial stability risks increase. For the Eurosystem, rapid mass moves into digital euros would come with the advantage of equally rapid clarity about the magnitude of banks' liquidity needs. It could be expected that within a few days, the central banks would know which banks would need how much liquidity support, allowing them to swiftly decide on the volumes of their impromptu liquidity programmes. Similarly, the competent supervisory and resolution authorities would likely have the relevant data forming the basis for their viability assessments sooner than in current run scenarios, in which liquidity shifts among financial institutions are likely to continue until depositors believe that the crisis is resolved. That would allow them to take resolution actions sooner than currently. Unviable banks could promptly be restructured, and viable banks robustly supported with central bank liquidity.

This liquidity support from central banks would still be needed. In that respect, CBDC would make no difference. To prevent a bank collapse resulting from the liquidity drainage experienced during a bank run, central banks customarily provide liquidity support to the banking sector or individual banks, as was the case following the March 2023 collapses of SVB and Signature Bank.[55] In situations of sudden and drastic liquidity shortages in the banking sector, central banks react with special lending programmes that provide solvent banks with extra liquidity in exchange for adequate collateral, oftentimes in the form of repo transactions. In addition, Lending of Last Resort (also called Emergency Liquidity Assistance in the euro area) enables central banks to support one or several individual banks that are particularly badly affected by liquidity shortages and cut off from all conventional liquidity sources, but have remained solvent.[56] Such liquidity support for the banking sector substantially

[53] In general terms on this issue, Brunnermeier, 'The Digital Euro: Policy Implications and Perspectives' (n 68) Box 7.

[54] Emilios Avgouleas & Charles Goodhart, *Critical Reflections on Bank Bail-ins*, 1:1 Journal of Financial Regulation 1, 16 (2015).

[55] See above Box 2 for the Federal Reserve System's lending facility.

[56] For the principles governing the provision of Lending of Last Resort by central banks, see Gertrude Tumpel-Gugerell ,Lender of Last Resort – Which Institution Could Best Fulfil this Function', in Dombret A, Lucius O (eds.), Stability and the Financial System: Illusion or Feasible Concept? (2013), p. 513-525; Rosa Lastra, International Financial and Monetary Law (2nd ed 2015); Christian Hofmann, 'Reconsidering Lending of Last Resort', (2018) 19:4 European Business Organization Law Review 883, 898-916.

increases the central banks' balance sheets.[57] However, balance sheet expansions are common during a financial crisis and generally accepted for as long as these expansions promise to help resolving the underlying issues of the crisis and are reversible once the financial sector recovers from the shock. Due to the vastness and speed of conversions predicted here, a digital euro would likely require the Eurosystem central banks to intervene more forcefully in liquidity markets, at least for as long as systemically important banks exist and are affected by liquidity shortages.

However, it appears likely that these liquidity support programmes could end sooner with than without a digital euro in place because runs would become more easily reversible with a digital euro. The presence of a digital euro in run scenarios should mean that liquidity would remain in the euro area. Cross-border runs are particularly easy in the euro area owing to the single currency and fast, secure, and cheap transfer options resulting from the rules and technologies of the Single Euro Payments Area (SEPA).[58] However, with all Eurosystem central banks providing the unlimited option to convert bank money into digital euros, transfers across borders and especially flights into other currencies (as witnessed during the Global Financial Crisis (see Box 6) would not only become unnecessary but even counterintuitive, because a digital euro would be a heavyweight among global currencies and therefore one of the safest options for store of value worldwide. With money safely stored in digital euro accounts held with the local financial industry in depositors' home jurisdictions, runs could be reversed as fast and easily as they would likely start and escalate. At the same pace by which depositors would reconvert their digital euros into bank money once confidence in the banking system is restored, central banks could roll back their liquidity support.

In summary, it appears likely that with the introduction of a digital euro, the euro area authorities (especially the bank supervisors, resolution authorities, finance ministries and central banks) would have more control during periods of market turmoil. If one accepts the theory mooted here that freedom of choice of how to store one's financial means securely and adequately justifies lower levels of depositor protection, it follows that the focus of these authorities' rescue actions would no longer need to be on retail depositor protection. The fact that depositors would have unrestricted access to CBDC (and therefore an infallible alternative to bank money in terms of store of value and access to cashless payments) would justify holding them to their prior financial decisions that they took on an informed and independent basis. Depositors' protection would therefore be limited to the coverage provided by deposit insurance schemes (i.e., a payout of up to euro 100,000 in the euro area). Freed from depositor protection concerns due to the presence of a digital euro as a risk-free store of value option, resolution authorities and central banks could focus all their attention on the issue of how to est proceed in the interest of financial stability.[59]

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[57] Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022), p 31.

[58] For information on SEPA, see at https://www.ecb.europa.eu/paym/integration/retail/sepa/html/index.en.html

[59] Ultimately, many regulatory mechanisms could be due for review because of the much-reduced need for retail depositor protection. For a detailed analysis of the effect that a digital euro could have on bank regulation in the euro-area, see Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 48:1 North Carolina Journal of International Law 1-77.

Box 6: Cross-border bank runs

During the peak years of the euro area sovereign debt crisis, cross-border runs of depositors became a huge issue for highly indebted countries such as Greece, Ireland and Portugal. Concerted action from the IMF, EU and euro area funding mechanisms (such as the EFSM, EFSF, ESM) became necessary to replace dried-up market debt financing for these states. The Eurosystem initiated large-scale lending and asset-purchase programmes from which all banks in the euro area profited, but which was most needed by banks that had lost much of their liquidity in countries worst affected by the sovereign debt crisis.[60] Data shows that much of the lost liquidity remained in the euro area as it was transferred to Germany and other euro area member states that were at that time perceived as financially more robust. Outflows into other currencies took place as well. Especially the Swiss financial industry experienced large increases in CHF-denominated liquidity during these years.[61] These cross-border liquidity transfers were problematic for all affected economies. Economies that experienced the highest outflows were evidently worst affected because the outflows destabilised their banking sector, led to credit crunches and overall loss of living standards. However, they were problematic for the recipient economies as well. Mass inflows of liquidity that are not the result of pareto optimality, but motivated by fear of loss due to defaults of the financial industry can lead to price distortions, such as asset price inflation and debt financing cost deflation. Real estate prices increased drastically in Germany,[62] yields on sovereign debt decreased starkly,[63] and retail depositors had to pay more for basic store of value facilities with banks than their counterparts in most other euro area countries.[64] These developments show that even in a monetary union, cross-border runs are problematic. It helps that the Eurosystem can enact measures for all parts of the monetary union and thereby take the situation and interests of all affected member states into account, but it cannot simply redirect the lost liquidity from the recipient markets back into the dried-up economies. Simply put, the excess liquidity remained in the recipient markets, and the Eurosystem provided its liquidity support for the entire euro area banking sector which increased the excess liquidity in countries like Germany further.[65]

[60] For these developments and the liquidity programmes of the Eurosystem, see Markus Brunnermeier and Ricardo Reis, A crash course on the euro crisis (august 2019); René Smith, The Crisis Response in Europe's Economic and Monetary Union: Overview of Legal Developments, 38 Fordham Int'l L.J. 1135 (2015); Deborah Zandstra, *The European Sovereign Debt Crisis and Its Evolving Resolution*, 6 CAPITAL MARKETS L.J., 285 (2011); Sideek Seyad, A Legal Analysis of the European Financial Stability Mechanism, 26 J. INT'L BANKING L. & REG. 421 (2011); Jean Victor Louis, Guest Editorial: The No-Bailout Clause and Rescue Packages, 47 CML Rev. 971 (2010); Phoebus Athanassiou, Of Past Measures and Future Plans for Europe's Exit from the Sovereign Debt Crisis: What is Legally Possible (and What is Not), 36 European Law Review 558 (2011); Christian Hofmann, 'Greek debt Relief', 37:1 Oxford Journal of Legal Studies 1 (2017).

[61] Raphael Auer, 'A safe haven: international demand for Swiss francs during the euro area debt crisis', Swiss National Bank Quarterly Bulletin 2/2015, p. 40-53.

[62] From 2010 (100%) to 2021 (160%), see Economic Research, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/QDER628BIS

[63] From 3% in 2010 to around 0% from 2015 to 2022 for 10-year sovereign bonds (Bundesanleihen), see Economic Research, Federal Reserve Bank of St. Louis, https://fred.stlouisfed.org/series/IRLTLT01DEM156N.

[64] Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 48:1 North Carolina Journal of International Law.

[65] In detail, Luca Baldo et al., 'The distribution of excess liquidity in the euro area', ECB Occasional Paper Series No 200 (November 2017); Grégory Claeys, *What are the Effects of the ECB's Negative Interest Rate Policy?* (European Parliament Monetary Dialogue Paper June 2021) Panel B.

3.3 Rivalling cryptocurrencies and stablecoins

A digital euro would also be an effective response to the rising attraction stemming from cryptocurrencies and stablecoins. It has long been discussed whether digital tokens based on crypto technology might be perceived by depositors as an alternative to bank money, especially during banking crises.[66] The temporary surge in Bitcoin's price in reaction to the collapse of SVB[67] indicates that a run from bank deposits into digital tokens is not beyond the realm of possibility for depositors that are dissatisfied with the existing monetary landscape that only offers them the option of moving money from one bank to another, not knowing whether this means going from bad to worse. However, these tokens are questionable havens for store of value. Their dangers lie in the complexity and high risk of substantial losses which are often misunderstood and underestimated by retail investors and make them highly unsuitable as "money-alternatives".[68] The existence of a digital euro would provide security-focused depositors a perfect alternative to bank money and reduce (if not eliminate) the attraction of cryptocurrencies and stablecoins as supposedly safer store of value options in bank crisis scenarios, but only if the ECB drops its plans to cap the holdings of digital euros at cash-like volumes.[69]

4. DIGITAL EURO AS A FACILITATOR OF MONETARY POLICY

In addition to its benefits for financial stability, CBDC could support central banks' monetary policy operations.

During times of expansionary monetary policy operations when central banks lower interest rates to (close to) zero, banks stop paying interest for demand and term deposits, and depositors have no choice but to fund commercial banks for free. Without the existence of CBDC, depositors lack any alternative to zero-interest bank money unless they accept the risks inherent in investments (e.g., in money market funds, mutual funds, and shares).

If central bank interest rates turn negative (as was the case in the euro area from 2014 to 2022),[70] the situation of depositors worsens. Negative interest rates mean that central banks charge banks punitive rates on their excess reserves, and banks pass on these costs to depositors who have little choice but to pay these penalties on their deposits (as was the case in Germany and some other euro area countries from 2014 to 2022). Depositors are forced to stay with their banks if no better safe store of value option and no better access to cashless payment systems exists,[71] but with the introduction of a

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66 Dan Awrey and Kristin van Zwieten, 'The Shadow Payment System' (2018) 43(3) Journal of Corporation Law 775, 779; Seraina Grunewald, Corinne Zellweger-Gutknecht and Benjamin Geva, 'Digital Euro and ECB Powers' (2021) 58(4) Common Market Law Review 1029; Hossein Nabilou and André Prüm, 'Central Banks and Regulation of Cryptocurrencies' (2019) University of Luxembourg Law Working Paper No. 2019-014, 12-15; Markus Brunnermeier and Jean-Pierre Landau, 'The Digital Euro: Policy Implications and Perspectives' (ECON Committee, European Parliament, 2022), Box 7.

67 Arjun Kharpal, 'Bitcoin jumps as much as 10% with crypto market topping $1 trillion as U.S. creates backstop for SVB depositors' (CNBC online of 13 March 2023), https://www.cnbc.com/2023/03/13/bitcoin-btc-crypto-prices-surge-as-svb-depositors-protected.html

68 The 22nterest of the algorithmic stablecoin TerraUSD bears witness of the complexity and risks, see Bank for International Settlements, 'BIS Annual Economic Report' (2022), p. 78-79 and 82 (Box A). In general terms on the risks, see Douglas Arner, Raphael Auer and Jon Frost, Stablecoins: risks, potential and regulation (Bank for International Settlements Working Papers No 905, November 2020).

69 In more detail on this argument that caps on CBDC holdings defeat their purpose as weapons against the rise of cryptocurrencies and stablecoins, Christian Hofmann, 'Central Bank Digital Currencies: why some markets need them more than others', (2013) 18:3 Capital Markets Law Journal (forthcoming).

70 See the tables showing current and past interest rates of the Eurosystem at ECB, 'Key ECB Interest Rates', https://www.ecb.europa.eu/stats/policy_and_exchange_rates/key_ecb_interest_rates/html/index.en.html

71 For the implications of negative interest rates in general, Gregory Claeys, 'What are the effects of the ECB's negative interest rate policy ?' (European Parliament Monetary Dialogue Papers June 2021), p. 15-22. In detail on the punitive interest rates charged by German and

digital euro, depositors could move their savings from bank accounts to digital euro accounts, thereby avoiding negative interest and simultaneously freeing banks of excess liquidity in their reserve accounts for which they are required to pay punitive interest to central bank. Central banks could steer such movements out of deposits and into CBDC (and vice versa) with (negative or positive) interest rates paid on CDBC holdings. If these flights into CBDC contravened central banks' monetary policy objectives, e.g., defeated their expansionary policy goals, central banks could introduce tiered interest rates for CBDC holdings similar to the tiered interest rates applicable to banks' reserve accounts.[72] Above certain thresholds, CBDC holdings could be penalised with negative interest rates to incentivise wealthier CBDC holders to spend or invest more. However, such penalising interest rates should only be applied in the interest of monetary policy objectives, not in crisis times to prevent runs into CBDC.[73] As we have explained here, we see benefits in the safe haven role that CBDC can play in crisis times which could be defeated by central banks imposing financial deterrents for conversions of bank money into CBDC.

During times when central banks engage in contractionary monetary policy operations and typically raise interest rates, undesirable effects may arise for depositors as well. If a longer phase of expansionary policy operations with low funding costs for banks precedes a phase of higher central bank interest rates, banks will not instantly be hit by higher financing costs. Their large amounts of excess reserves accumulated during times of monetary easing make it unnecessary for them to raise new and more expensive liquidity. Once again, depositors bear the negative consequences. With no alternative at hand, depositors remain with their banks, although these banks continue to offer zero or very low interest rates. This can currently be observed in the euro area. Although German banks earn 3% on their excess reserves with central banks,[74] they still pay depositors no or very low interest and continue to charge fees for account services. For instance, a 2023 study (based on previous interest rates for overnight bank deposits standing at 2.5%) found that *"(w)hile eurozone lenders can now earn 2.5 per cent by depositing liquidity overnight at the European Central Bank, German retail banks on average pay only 0.07 per cent in interest to retail depositors"*.[75]

For the Eurosystem, the reluctance of banks to extend their interest earnings to creditors might be undesirable from a policy perspective. It is plausible that German depositors see no incentive for saving if interest rates remain that low, meaning that the Eurosystem's contractionary policy stance is not effectively translated into reduced consumer spending. With a digital euro in place, the Eurosystem could target depositors directly by offering better deals than banks. This would force banks to either raise interest rates on deposits if they were interested in keeping depositors as one of their most important sources of liquidity supply, or face being effectively stripped of their excess reserves by

other euro-area banks until 2022, Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 48:1 North Carolina Journal of International Law 1, 18-23.

[72] Ulrich Bindseil, 'Tiered CBDC and the financial system' (2020) European Central Bank Working Paper Series No 2351/January 2020, p. 22-26.

[73] However, explicitly in favour of such bank run-disincentivising tiering, Bindseil, ibid, p. 24: "The central bank would need to communicate clearly at an early stage that the remuneration of tier-two CBDC is not meant to be attractive, and may be made particularly unattractive in a crisis, as needed".

[74] See the current rates for the Eurosystem's standin facilities at https://www.ecb.europa.eu/mopo/implement/sf/html/index.en.html

[75] Olaf Storbeck, "German banks accused of short-changing savers with low rates - Europe's largest retail deposit broker says country's lenders will make €40bn in 'unfair' profits this year", Financial Times of 6 March 2023, https://www.ft.com/content/0b185970-c99d-4a5a-9e84-9dfa98c9bea9. It should be noted that German banks do not hold reserves with the ECB, but with the Bundesbank as the competent national central bank of the Eurosystem.

depositors moving from bank money to digital euros due to enticingly better conditions on holdings of the latter. store of value

5. CONCLUSIONS

In summary, we strongly support the introduction of a digital euro that complements instead of replaces cash in the euro area. We reason that the key role of a digital euro consists of the important role it can play as a store of value option for the public. We argue that it can only fill this role if it truly represents an alternative to bank money, especially in times when financial markets are in turmoil, and if it eclipses the attraction of cryptocurrencies and stablecoins as supposed safe havens of store of value. We further advance the idea that all of this requires that the public's access to a digital euro is unlimited. We thereby argue against the ECB's assumption that an unlimited access to a digital euro would destabilise the financial system by suggesting that such unlimited access would in fact protect depositors, enhance central banks' control over the liquidity provision for banks, and support competent authorities' resolution efforts. We also advance the idea that some monetary policy operations could become more efficient with unlimited access to digital euros. A digital euro could in its first phase be capped to allow for its gradual introduction in phases which would help banks prepare for this new world of diversified and unrestricted store of value choices for everyone. However, after this initial phase (of two or three years), the cap should end.

It follows from the above that a digital euro should either be introduced without any holding caps or further research projects analyse whether holding restrictions are justified. Only a detailed analysis of all expected negative consequences of unrestricted access to a digital euro for everyone and convincing arguments why they outweigh the benefits that only an unlimited version of a digital euro promises would provide such justification. In case that such justification ultimately argues in favour of holding caps, we recommend that the ECB explains in concrete terms what objectives the Eurosystem would pursue with a digital euro that limits the holdings of digital euros to small amounts (e.g., to a few thousand euros at any time). Since the Eurosystem does not intend to replace cash with a digital euro, the benefits that would result from such limited access to digital euros are far from evident. Its store of value component would be negligible since it would not offer a safer alternative to bank money for amounts exceeding the cap. As a result, it would be unsuitable to rival the allure of cryptocurrencies and stablecoins. It could be understood as an alternative to existing cashless payment systems, but nothing in the research on CBDC published so far suggests that there are issues with the existing private payment services landscape in all or parts of the euro area.

We therefore conclude that, from today's perspective, a digital euro can only be considered a project worth pursuing if the Eurosystem (ideally cumulatively, but at least alternatively) 1) feels ready to design it as a safe store of value option for the public, 2) sees value in it for the resolution of a banking crisis, and/or 3) embraces it as a monetary policy instrument.

REFERENCES

Tobias Adrian and Tommaso Mancini-Griffoli, 'The Rise of Digital Money' (International Monetary Fund 2019), https://www.imf.org/en/Publications/fintech-notes/Issues/2019/07/12/The-Rise-of-Digital-Money-47097.

John Armour et al., 'Principles of Financial Regulation' (Oxford University Press 2016).

Hanna Armelius, Carl Claussen and Hendry Scott, 'Is central bank currency fundamental to the monetary system?', Sveriges Riksbank Economic Review 2020:2, 19, https://www.riksbank.se/globalassets/media/rapporter/pov/artiklar/engelska/2020/200618/2020_2-is-central-bank-currency-fundamental-to-the-monetary-system.pdf.

Douglas Arner, Raphael Auer and Jon Frost, Stablecoins: risks, potential and regulation (Bank for International Settlements Working Papers No 905, November 2020), https://www.bis.org/publ/work905.pdf.

Nikou Asgari, Harriet Agnew, Owen Walker and Sam Jones, 'Swiss under fire for shotgun marriage of Credit Suisse and UBS' (Financial Times online of 21 March 2023), https://www.ft.com/content/9058bfec-85a5-4983-8f8c-2ded77e101d7.

Raphael Auer, 'A safe haven: international demand for Swiss francs during the euro area debt crisis', Swiss National Bank Quarterly Bulletin 2/2015, 40. https://www.snb.ch/en/mmr/reference/quartbul_2015_2/source/quartbul_2015_2.en.pdf.

Dan Awrey and Kristin van Zwieten, 'The Shadow Payment System' (2018) 43(3) Journal of Corporation Law 775.

Luca Baldo et al., 'The distribution of excess liquidity in the euro area', ECB Occasional Paper Series No 200 (November 2017), https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op200.en.pdf.

Bank for International Settlements, 'BIS Annual Economic Report' (June 2022), https://www.bis.org/publ/arpdf/ar2022e.htm.

Bank for International Settlements, 'Central bank digital currencies: foundational principles and core features, Report no 1 in a series of collaborations from a group of central banks' (2020), https://www.bis.org/publ/othp33.pdf.

Bank for International Settlements, 'Central Bank Digital Currencies: financial stability implications, Report no 4 in a series of collaborations from a group of central banks' (2021), https://www.bis.org/publ/othp42_fin_stab.pdf.

Bank of England, 'Central Bank Digital Currency: Opportunities, challenges and design', Bank of England Discussion Paper (2020), https://www.bankofengland.co.uk/-/media/boe/files/paper/2020/central-bank-digital-currency-opportunities-challenges-and-design.pdf.

Christian Barontini and Henry Holden, 'Proceeding with caution – a survey on central bank digital currency', BIS Papers No 101 (2019), https://www.bis.org/publ/bppdf/bispap101.pdf.

Patrizia Baudino and others, Bank failure management—the role of deposit insurance', Bank for International Settlement - Financial Stability Institute - FSI Insights No 17 (2019), https://www.bis.org/fsi/publ/insights17.pdf.

Aleksander Berentsen and Fabian Schär, 'The Case for Central Bank Electronic Money and the Non-case for Central Bank Cryptocurrencies', (2018) 100:2 Federal Reserve Bank of St. Louis Review 97, https://research.stlouisfed.org/publications/review/2018/02/13/the-case-for-central-bank-electronic-money-and-the-non-case-for-central-bank-cryptocurrencies

David Bholat and Robin Darbyshire, 'Accounting in Central Banks', Bank of England Working Paper No. 604 (May 2016), https://ssrn.com/abstract=2783744.

Ulrich Bindseil, 'Issuing a digital euro', ESCB Legal Conference 2020 (February 2021), https://www.ecb.europa.eu/pub/pdf/other/ecb.escblegalconferenceproceedings2020~4c11842967.en.pdf.

Bloomberg Business Week of 25 June 2021, 'China crushed Jack Ma, and his Fintech rivals are next', https://www.bloomberg.com/news/articles/2021-06-24/how-xi-and-the-ccp-turned-on-jack-ma-ant-and-china-s-fintech-companies#xj4y7vzkg.

Board of Governors of the Federal Reserve System, 'Federal Reserve Board announces it will make available additional funding to eligible depository institutions to help assure banks have the ability to meet the needs of all their depositors' (Press Release of 12 March 2023), https://www.federalreserve.gov/newsevents/pressreleases/monetary20230312a.htm.

Wouter Bossu and others, 'Legal Aspects of Central Bank Digital Currency: Central Bank and Monetary Law Considerations' (2020) IMF Working Paper WP/20/354, https://www.imf.org/en/Publications/WP/Issues/2020/11/20/Legal-Aspects-of-Central-Bank-Digital-Currency-Central-Bank-and-Monetary-Law-Considerations-49827.

Martin Brown, Stefan Trautmann and Razvan Vlahu. 'Understanding Bank-Run Contagion' (2014), ECB Working Paper No. 1711, https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1711.pdf.

Thomas Cargill, 'The Financial System, Financial Regulation and Central Bank Policy' (Cambridge University Press 2017).

Javier Guzmán Calafell, 'Some considerations on central bank digital currencies' (2019) Federal Reserve Bank of St. Louis symposium 'The next decade of finance: assessing priorities and implications for society, politics and economics', https://www.bis.org/review/r190711i.pdf.

Iris Chiu and Christian Hofmann, 'Unlimited Central Bank Digital Currency: The Case for a Public Good in the Euro Area and its Regulatory (and Deregulatory) Implications for Modern Finance', (2023) 48:1 North Carolina Journal of International Law 1-77, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4371897.

Grégory Claeys, 'What are the Effects of the ECB's Negative Interest Rate Policy?' (European Parliament Monetary Dialogue Paper June 2021).

Jeff Cox, 'U.S. government steps in and says people with funds deposited at SVB will be able to access their money' (CNBS online article of 12 March 2023), https://www.cnbc.com/2023/03/12/regulators-unveil-plan-to-stem-damage-from-svb-collapse.html.

Credit Suisse, 'Credit Suisse and UBS to Merge' (press release of 19 March 2023), https://www.credit-suisse.com/about-us-news/en/articles/media-releases/credit-suisse-and-ubs-to-merge-202303.html.

Telis Demos, What Happened With Silicon Valley Bank? (The Wall Street Journal online of 14 March 2023), https://www.wsj.com/articles/silicon-valley-bank-svb-financial-what-is-happening-299e9b65

Deutsche Bundesbank, 'Cash: Fact and Figures', https://www.bundesbank.de/en/bundesbank/history/20-years-euro/cash-facts-and-figures-772080.

European Central Bank, 'Manual on MFI balance sheet statistics' (January 2021), at https://www.ecb.europa.eu/pub/pdf/other/ecb.manualmfibalancesheetstatistics201901~d2ebf72987.en.pdf.

European Central Bank, 'Progress on the investigation phase of a digital euro' (September 2022), https://www.ecb.europa.eu/paym/digital_euro/investigation/governance/shared/files/ecb.degov220929.en.pdf.

European Central Bank, 'Progress on the investigation phase of a digital euro – second report' (December 2022),

https://www.ecb.europa.eu/paym/digital_euro/investigation/governance/shared/files/ecb.degov221221_Progress.en.pdf?f91e0b8ff8cbd6654d7e6b071a8f7071.

European Central Bank, 'Digital euro experimentation scope and key learnings' (2021), https://www.ecb.europa.eu/pub/pdf/other/ecb.digitaleuroscopekeylearnings202107~564d89045e.en.pdf.

European Central Bank, 'Report on a digital euro' (2020), https://www.ecb.europa.eu/pub/pdf/other/Report_on_a_digital_euro~4d7268b458.en.pdf.

European Central Bank, 'Study on the payment attitudes of consumers in the euro area (SPACE)` (2020), European Central Bank, 'Study on the payment attitudes of consumers in the euro area (SPACE)` (2020).

José Gabilondo, 'Bank Funding, Liquidity, and Capital Adequacy: A Law and Finance Approach' (Edward Elgar Publishing 2016).

Simon Gleeson, The Legal Concept of Money (Oxford University Press 2018).

Tommaso Mancini-Griffoli and others, 'Casting Light on Central Bank Digital Currencies' (2018) International Monetary Fund Staff Discussion Note 18/08, https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2018/11/13/Casting-Light-on-Central-Bank-Digital-Currencies-46233.

Seraina Grunewald, Corinne Zellweger-Gutknecht and Benjamin Geva, 'Digital Euro and ECB Powers' (2021) 58:4 Common Market Law Review 1029.

Gertrude Tumpel-Gugerell 'Lender of Last Resort – Which Institution Could Best Fulfil this Function', in Dombret A, Lucius O (eds), Stability and the Financial System: Illusion or Feasible Concept? (Edward Elgar Publishing 2013), 513, https://ideas.repec.org/h/elg/eechap/15454_24.html.

Corinne Zellweger-Gutknecht, Bemjamin Geva and Seraina Grünewald, 'Digital Euro, Monetary Objects and Price Stability—A Legal Analysis' (2021) 7(2) Journal of Financial Regulation 284.

Christian Hofmann, 'Reconsidering Lending of Last Resort', (2018) 19:4 European Business Organization Law Review 883.

Christian Hofmann, 'Central Bank Digital Currencies: why some markets need them more than others', (2023) 18:3 Capital Markets Law Journal (forthcoming).

Erica Jiang, Gregor Matvos, Tomasz Piskorski, and Amit Seru, 'Monetary Tightening and U.S. Bank Fragility in 2023: Mark-to-Market Losses and Uninsured Depositor Runs?', (DDRN working paper of 13 March 2023), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4387676.

Arjun Kharpal, 'Bitcoin jumps as much as 10% with crypto market topping $1 trillion as U.S. creates backstop for SVB depositors' (CNBC online of 13 March 2023), https://www.cnbc.com/2023/03/13/bitcoin-btc-crypto-prices-surge-as-svb-depositors-protected.html.

Michael Kumhof and Clare Noone, 'Central bank digital currencies – design principles and balance sheet implications' (2018) Bank of England Staff Working Paper No. 725, https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2018/central-bank-digital-currencies-design-principles-and-balance-sheet-implications.

Laure Lalouette and Henk Esselink, Trends and developments in the use of euro cash over the past ten years, 6 Economic Bulletin Issue (2018), https://www.ecb.europa.eu/pub/economic-bulletin/articles/2018/html/ecb.ebart201806_03.en.html.

Rosa Lastra 'International Financial and Monetary Law' (Oxford University Press, 2nd ed 2015).

Michael McLeay, Amar Radia and Ryland Thomas, 'Money in the modern economy: an introduction' (2014) Bank of England Quarterly Bulletin 2014 (Q1), https://www.bankofengland.co.uk/-/media/boe/files/quarterly-bulletin/2014/money-creation-in-the-modern-economy.pdf.

Yves Mersch, 'Digital Base Money: an assessment from the ECB's perspective' (Speech at the Farewell ceremony for Pentii Hakkarainen, Deputy Governor of Suomen Pankki – Finlands Bank, Helsinki, 16 January 2017), https://www.ecb.europa.eu/press/key/date/2017/html/sp170116.en.html.

Hossein Nabilou and André Prüm, 'Central Banks and Regulation of Cryptocurrencies' (2019) University of Luxembourg Law Working Paper No. 2019-014, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3421417.

Hossein Nabilou, 'Testing the waters of the Rubicon: the European Central Bank and central bank digital currencies' (2020) 21 Journal of Banking Regulation 299.

Charles Proctor, Mann on the Legal Aspect of Money (Oxford University Press, 7th ed. 2012).

John Revill, Noele Illien, John O'Donnell, Oliver Hirt and Tom Sims, 'UBS to take over Credit Suisse, assume up to 5 billion Swiss francs in losses' (Reuters online of 21 March 2023), https://www.reuters.com/business/finance/ubs-take-over-credit-suisse-central-bank-2023-03-19/#:~:text=BERN%2C%20March%2019%20(Reuters),market%2Dshaking%20turmoil%20in%20global.

Antonio Sáinz de Vicuna, 'An institutional theory of money', in Mario Giovanoli and Diego Devos (eds), International monetary and financial law: the global crisis (Oxford University Press 2010).

Cecilia Skingsley, 'Should the Riksbank issue e-krona?' (Fintech 2016 Conference, Stockholm, 16 November 2016), https://www.bis.org/review/r161128a.pdf.

Gabriel Soderberg et al., 'Behind the Scenes of Central Bank Digital Currency Emerging Trends, Insights, and Policy Lessons', International Monetary Fund Note 2022/004, https://www.imf.org/en/Publications/fintech-notes/Issues/2022/02/07/Behind-the-Scenes-of-Central-Bank-Digital-Currency-512174.

Hugh Son, 'Deposit drain from smaller banks into financial giants like JPMorgan Chase has slowed, sources say' (CNBS online article of 25 March 2023), https://www.cnbc.com/2023/03/25/banking-crisis-deposit-drain-from-small-banks-into-jpm-wfc-c-slowed.html.

Olaf Storbeck, "German banks accused of short-changing savers with low rates - Europe's largest retail deposit broker says country's lenders will make €40bn in 'unfair' profits this year", Financial Times of 6 March 2023, https://www.ft.com/content/0b185970-c99d-4a5a-9e84-9dfa98c9bea9.

Ted Temzelides, 'Are bank runs contagious?' (1997) Business Review, Federal Reserve Bank of Philadelphia (November issue), https://www.philadelphiafed.org/-/media/frbp/assets/economy/articles/business-review/1997/november-december/brnd97tt.pdf.

Martin Wolff, 'Four ways to fix the bank problem', Financial Times of 21 March 2023, https://www.ft.com/content/70ce4b8a-1310-4e3c-a891-3c34cd313841.

Qian Yao, 'Central Bank Digital Currency: optimization of the currency system and its issuance design' (2019) 12(1) China Economic Journal 1.

Hanna Ziady, 'Why Silicon Valley Bank collapsed and what it could mean' (CNN Business online of 13 March 2023), https://www.cnn.com/2023/03/13/investing/silicon-valley-bank-collapse-explained/index.html.

Hanna Ziady, Too big for Switzerland? Credit Suisse rescue creates bank twice the size of the economy (CNN Buiness online of 24 March 2023), https://www.cnn.com/2023/03/23/investing/credit-suisse-ubs-impact-switzerland/index.html#:~:text=UBS%20now%20has%20%E2%80%9Cquasi%2Dmonopoly,an%20even%20more%20dominant%20player.

The study argues in favour of the introduction of a digital euro because of its benefits for the public's store of value and cashless payment options. It questions the assumption that caps on digital euro holdings would be necessary in the interest of financial stability and favours an approach that allows everyone unlimited access to digital euros.

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