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The Evolution of Currency: Cash to Cryptos to Sovereign Digital Currencies

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ARTICLE

THE EVOLUTION OF CURRENCY:

CASH TO CRYPTOS TO SOVEREIGN DIGITAL CURRENCIES

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ABSTRACT

In 2009, Bitcoin created a world-first decentralized alternative currency that has spawned over 1,700 imitations by private parties. In 2018, governments finally joined the race, as Venezuela issued a world-first sovereign digital currency. Major economies like Canada, China, Singapore and the United Kingdom are all developing their own versions. These new versions differ significantly from Bitcoin and among themselves, creating the potential to flood the global financial system with a myriad of new digital currencies. Existing taxonomies of currency struggle with the speed of change (frequently due to inadequate understanding of the underlying technology) and, as a result, remain incomplete and filled with confusing and conflicting vocabulary (with terms like "virtual currencies," "digital currencies," "cryptocurrencies" frequently being used to refer to the same thing). This Article resolves this problem. First, it analyzes existing forms of currency based on their functional characteristics and provides a comprehensive taxonomy. Second, it integrates the likely forms of upcoming sovereign digital currencies into this taxonomy and outlines the corresponding challenges. At the moment, no major economy seems keen to issue a sovereign digital currency, but if one does, others will,

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for good reasons, respond in kind and the ground will be laid for a sovereign digital currency battle royale.

I. INTRODUCTION

There are today over 2,000 new, privately held and controlled digital currencies across the globe and the rush to create them shows no sign of abating.[1] The first of its kind was Bitcoin, established in 2009.[2] This digital decentralized alternative to state-controlled currency offered new opportunities for end-users, by providing additional methods for transferring or storing value. In developing countries, mobile money, issued and used on mobile phones, provided another digital alternative, with the best known example being M-Pesa, launched by Safaricom in Kenya in 2007.[3]

These new products have created additional risks for national and international payment systems and triggered a regulatory response. Mobile money (also known as "electronic money" or "e-money") products have largely become regulated activities, although many issues remain unresolved.[4] In the case of Bitcoin and its spin-offs, regulation has proven distinctly problematic for technical reasons:

1. *All Cryptocurrencies*, COINMARKETCAP, https://coinmarketcap.com/all/views/all/ [https://perma.cc/WA4W-BJJT].

2. Bitcoin is the first digital currency issued without a single administrator or repository. Its operation was described in *SEC v. Shavers* as follows: "Bitcoins are held at, and sent to and from, bitcoin 'addresses.' A bitcoin 'wallet' is a software file that holds bitcoin addresses. Along with each bitcoin address, a bitcoin wallet stores the 'private key' for the address, essentially a password used by the holder to access the bitcoins held at the address, as well as the transaction history associated with the address. Whoever has the private key for a bitcoin address controls the bitcoins held at that address." SEC v. Shavers, No. 4:13-CV-416, 2014 U.S. Dist. LEXIS 130781, at *3 (E.D. Tex. Sept. 18, 2014).

3. *See* ALLIANCE FOR FINANCIAL INCLUSION, ENABLING MOBILE MONEY TRANSFER: THE CENTRAL BANK OF KENYA'S TREATMENT OF M-PESA 12 (2010). For additional detail concerning M-Pesa, see Nick Hughes & Susie Lonie, *M-Pesa: Mobile Money for the "Unbanked" Turning Cellphones into 24-Hour Tellers in Kenya*, 2(1-2) INNOVATIONS: TECH., GOVERNANCE, GLOBALIZATION 63 (2007); Benjamin Ngugi, Matthew Pelowski, & Javier G. Ogembo, *M-pesa: A Case Study of the Critical Early Adopters' Role in the Rapid Adoption of Mobile Money Banking in Kenya*, 43 ELECTRONIC J. INFO. SYS. DEVELOPING COUNTRIES 5 (2010); Mercy W. Buku & Michael W. Meredith, *Safaricom and M-Pesa in Kenya: Financial Inclusion and Financial Integrity*, 8 WASH. J. L., TECH. & ARTS 375, 399 (2013); Isaac Mbiti & David N. Weil, *Mobile Banking: The Impact of M-Pesa in Kenya* (National Bureau of Economic Research, Working Paper No. 17129, 2011), http://www.nber.org/papers/w17129.pdf.

4. *See*, *e.g.*, Louise Malady, Cheng-Yun Tsang & Ross P. Buckley, *Promoting Financial Inclusion by Encouraging the Payment of Interest on E-Money*, 40 U. NEW SOUTH WALES L. J. 1558 (2017); Katharine Kemp & Ross P. Buckley, *Resolution Powers Over E-Money Providers*, 40 U. NEW SOUTH WALES L. J. 1539, 1539-57 (2017); David Ramos, Javier Solana, Ross P. Buckley & Jonathan Greenacre, *Protecting Mobile Money Customer Funds in Civil Law Jurisdictions*, 65 INT'L & COMP. L. Q. 705 (2016).

without a central server or a single operator, it has been rather difficult to identify those to whom regulation should apply (after all, rules apply to people and businesses they create—not to technology, which lacks self-awareness, at least this day and age). Instead, the most popular regulatory measure has taken the form of warnings concerning potential risks and—ironically—lack of proper regulation.[5]

As the new privately issued digital currencies have kept multiplying, it was perhaps only a matter of time before regulators would devise new strategies where regulation had thus far proven ineffective. Governments and central banks around the globe have already started developing new sovereign digital currency models, inspired by the Bitcoin example.[6] These projects are all in different stages of development, and regulators are prone to hastening slowly and testing the technology before applying it in practice. However, the interest in creating an "official" alternative to Bitcoin and its numerous copycats is clear and cannot be ignored.

The many national initiatives to develop new sovereign digital currencies raise a whole range of issues. How will these new projects impact the financial system, both domestically and internationally? What are the opportunities and challenges faced by central banks and governments in developing the new currency types? But perhaps the first question should be different: how do these new currencies

5. *See*, *e.g.*, Perkins Coie, *Digital Currencies: International Actions and Regulations*, PERKINS COIE (June 2018), https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html [https://perma.cc/C677-GRR7].

6. *See* Morten Bech & Rodney Garratt, *Central Bank Cryptocurrencies*, BANK INT'L SETTLEMENTS Q. REV. 55, 57 (2017); John Barrdear & Michael Kumhof, *The Macroeconomics of Central Bank Issued Digital Currencies*, 3, 17 (Bank of England, Working Paper No. 605, 2016), https://www.bankofengland.co.uk/-/media/boe/files/working-paper/2016/the-macroeconomics-of-central-bank-issued-digital-currencies.pdf?la=en&hash=341B602838707E5D6FC26884588C912A721B1DC1 [https://perma.cc/4LFB-8HLX];; Walter Engert & Ben Fung, *Central Bank Digital Currency: Motivations and Implications*, 2, 26 (Bank of Canada, Staff Discussion Paper 2017-16, 2017), https://www.bankofcanada.ca/wp-content/uploads/2017/11/sdp2017-16.pdf [https://perma.cc/5VC9-BJU6]; *see also* Ruth Wandhöfer, *The Future of Digital Retail Payments in Europe: A Role for Central Bank Issued Crypto Cash?*, EUR. CENT. BANK (Oct. 2017), http://www.ecb.europa.eu/pub/conferences/shared/pdf/20171130_ECB_BdI_conference/payments_conference_2017_academic_paper_wandhoefer.pdf [https://perma.cc/NPA6-YMJ5]; JP Koning, *Fedcoin: A Central Bank-issued Cryptocurrency*, R3 REPORTS (Nov. 2016), https://www.r3.com/wp-content/uploads/2017/06/fedcoin_central-bank_R3.pdf [https://perma.cc/VJ4W-FQ4L]; *see generally* GEORGE DANEZIS & SARAH MEIKLEJOHN, CENTRALLY BANKED CRYPTOCURRENCIES (2016), https://eprint.iacr.org/2015/502.pdf [https://perma.cc/E2YT-Z48X].

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compare to their existing counterparts, most of which are already digital?[7]

This Article sets the foundation for a comprehensive analysis of existing initiatives to establish a new form of sovereign digital currency. Its objective is to put these new projects into perspective, taking a broader look at the existing payment systems and known currency types. One difficulty with achieving the above goal is the lack of a common taxonomy encompassing all existing forms of currencies. Absence of agreed terminology (discussed in greater detail in the next section) inhibits in-depth dialogue and analysis, leading some regulators to acknowledge that "[w]ith the exception of a few articles from respectable media sources or economics journals, it is almost impossible to find any comprehensive papers on this issue."[8]

The remainder of this Article is structured as follows: Part II outlines the key challenges resulting from the absence of a common taxonomy of various currencies and explains the rationale behind the proposed approach. Part III provides a brief historic outlook on the concept of currency. Parts IV and V analyze the concept of currency in the context of formal and alternative payment systems, respectively. Part VI examines the emerging new approaches to sovereign digital currency. Part VII summarizes the conclusions.

II. A QUAGMIRE OF CONFUSING VOCABULARY

There is no accepted vocabulary covering the entire array of different media of exchange, no agreed taxonomy. At first glance, this does not appear to raise major issues—after all, it is perfectly acceptable to disagree on terminology.[9] However, problems arise when

7. *See* Jeff Desjardins, *All of the World's Money and Markets in One Visualization*, VISUAL CAPITALIST (Oct. 26, 2017), http://www.visualcapitalist.com/worlds-money-markets-one-visualization-2017/ [https://perma.cc/KRK7-CHCV].

8. EUROPEAN CENTRAL BANK, VIRTUAL CURRENCY SCHEMES 33 (2012), https://www.ecb.europa.eu/pub/pdf/other/virtualcurrencyschemes201210en.pdf [https://perma.cc/VW8Z-57ZN] [hereinafter EUROPEAN CENTRAL BANK 2012] (providing a basis for discussion of various forms of virtual currencies).

9. Bitcoin is known as many things. It has been characterized as "cryptocurrency." *See* ARVIND NARAYANAN, JOSEPH BONNEAU, EDWARD FELTEN, ANDREW MILLER & STEVEN GOLDFEDER, BITCOIN AND CRYPTOCURRENCY TECHNOLOGIES 20 (Princeton Univ. Press, eds., 1st ed. 2016). It has been characterized as "virtual currency." *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 6. It has also been characterized as "digital currency." *See* Financial Systems Inquiry, *Clearer graduated payments regulation*, FSI (Oct. 2015), http://fsi.gov.au/publications/final-report/chapter-3/graduated-payments/ [https://perma.cc/ZN85-YBEW].

functionally similar concepts need to be joined together to create a common classification or when a new technology or its application that disrupts the existing payment system needs to be integrated into it. The lack of a common approach creates complications not only for academics, but also for regulators.[10] Even experts in the field are presently confused—and scholarship and regulation exist to serve the interests of far more than the select few:

> So, the unsettled vocabulary is relevant to how financial regulators understand, discuss, and ultimately regulate (or not) the technology or its uses, as well as how courts will interpret any regulation or regulatory guidance in the future. However, the vocabulary problems are also more broadly applicable to any regulators evaluating the technology, including those outside the financial sector, as well as to groups considering implementing the technology in whatever domain.[11]

The existing issues with terminology can be summarized as follows.

First, the concepts of "money" and "currency" are frequently used interchangeably or inconsistently.[12] From an economic perspective, this may reflect a failure to appreciate the three separate functions of the former (unit of account, medium of exchange, store of value) and the singular defining function of the latter (medium of exchange). In a legal sense, the problem is even more complex, since the word "money" is frequently used "as a generic term" without a corresponding definition and clear meaning.[13]

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10. *See* Ross P. Buckley, Jonathan Greenacre & Louise Malady, *The Regulation of Mobile Money in Malawi*, 14 WASH. U. GLOB. STUD. L. REV. 435, 467-68, 493-94 (2015).

11. Angela Walch, *The Path of the Blockchain Lexicon (and the Law)*, 36 REV. BANKING & FIN. L. 718 (2017).

12. *See*, *e.g.*, EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 13 (defining "virtual currency" as "a type of unregulated, *digital money*, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community'" (emphasis added)). Three years later, the ECB published a new report that adopted a different view and defined "virtual currency" as "a digital representation of value, not issued by a central bank, credit institution or e-money institution, which, in some circumstances, can be used as an *alternative to money*." *See* EUROPEAN CENTRAL BANK, VIRTUAL CURRENCY SCHEMES – A FURTHER ANALYSIS 25 (2015), https://www.ecb.europa.eu/pub/pdf/other/virtualcurrency schemesen.pdf [https://perma.cc/TX8K-QMU5] [hereinafter EUROPEAN CENTRAL BANK 2015].

13. *See* Benjamin Geva, *Is Cryptocurrency Money and Why Does It Matter?*, TORYS (June 6, 2018), https://www.torys.com/insights/publications/2018/06/is-cryptocurrency-money-and-why-does-it-matter (last visited Mar. 17, 2019).

Second, different terms are used as synonyms. Frequently, it is practically impossible to distinguish one term from another without a corresponding explanation, and, against this background, the emergence of new types of sovereign digital currency complicate things even further. Differences between "electronic", "digital" and "virtual" currencies are often contrived, and although the parties to the dialogue concerning current monetary issues seem to understand each other, it is frequently acknowledged that the existing taxonomy is confusing.[14]

Third, difficulties arise when one term becomes part of another, without corresponding adjustment or when the same term is used to describe different issues.[15]

Fourth, some of the more recent developments in technology have become very closely associated with colloquial terms that fail to convey their defining features or focus on aspects that are not material. As a result, the emergence of a different, but related technology or product may make such terms meaningless. Take, for instance, the word "cryptocurrency." In existing literature, cryptocurrencies are classified as decentralized bi-directional (i.e., fully convertible) virtual currencies (i.e., alternative currencies).[16] However, introduction of centrally issued digital currencies[17] would render this classification redundant.[18] Furthermore, some of the newer technologies, like

14. In its research on "virtual currencies" the European Central Bank concludes that "virtual currencies should not be bundled into the generic words of money or currency, even though their technical appearance takes a form which has some similarities to scriptural money and/or electronic money" and eventually adopts a different definition that no longer refers to "money." *See* EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 25. The research of the Bank of England concludes that "the phrase 'digital currency' is, perhaps, a regrettable one, as it may invite a number of misunderstandings among casual readers" and "there is no innovation in the provision of an electronic form of money, as the vast majority of money in a modern economy is already electronic and has been for some time." *See* Barrdear & Kumhof, *supra* note 6, at 4.

15. In its Guidance on the Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies, the US Department of Treasury defines "virtual currency" as "a medium of exchange that operates *like a currency* in some environments, but does not have all the attributes of *real currency*." *See* US Department of Treasury Financial Crimes Enforcement Network, *Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies*, FINCEN (Mar. 2013) 1, https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf [https://perma.cc/2JPH-XQ2B].

16. *See* EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 6; FINANCIAL ACTION TASK FORCE, VIRTUAL CURRENCIES: KEY DEFINITIONS AND POTENTIAL AML/CFT RISKS 5 (2014).

17. For a discussion on centrally issued digital currencies, see *infra* Section IV.B.3.

18. In its report on digital currencies, the Bank for International Settlements ("BIS") stresses that these alternative currencies are "not a liability of any individual or institution." *See*

Bitcoin, are often subject to regulatory scrutiny in the form of warnings, prohibitions, or express prescriptive rules. The effectiveness of these measures hinges on clear and unambiguous definitions of their subject matter—yet regulators frequently reuse the existing terminology and, by doing so, fail to achieve the clarity required.

Fifth, occasionally new technologies end up being so deeply associated with their applications, that absurdity results. Blockchain[19] is one such example. On the one hand, blockchain and its first application—Bitcoin—are sometimes used interchangeably. A publication of the UK government, no less, states:

> However, when people talk about the block chain [sic], they tend to mean the *collection of technologies and techniques that underpin the Bitcoin system*, which other projects have used as inspiration because they solve unrelated problems in finance and elsewhere.[20]

Yet, blockchain is but one of many technologies that, operating together, give Bitcoin its functionality. To equate blockchain with Bitcoin is plain silly. On the other hand, the perceived strength and resilience of Bitcoin has generated the popular, but ridiculous, view that all blockchains are inherently strong and resilient.[21] This

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BANK FOR INTERNATIONAL SETTLEMENTS, DIGITAL CURRENCIES 4 (2015). The emergence of an "official" cryptocurrency would change this as well.

19. Blockchain is a special database structure first utilized in Bitcoin to link together data arranged in individual blocks in append-only chronological order. Bitcoin's blockchain uses cryptographic hashing to uniquely identify each block and uses this identification as a reference to connect different blocks into a single "chain." Although the basic features of Bitcoin were explained in a whitepaper by an author named Satoshi Nakamoto, *see* Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System*, BITCOIN (Oct. 2008) https://bitcoin.org/bitcoin.pdf [https://perma.cc/7W3N-NZMM], the term "blockchain" was not introduced in the whitepaper and became widespread only subsequently. For some of the earliest mentions of the term, *see*, *e.g.*, richbodo, *Usage of the Word "Blockchain,"* MEDIUM (Aug. 8, 2018), https://medium.com/@richbodo/common-use-of-the-word-blockchain-5b916cecef29 [https://perma.cc/UA8H-FK4R].

20. UK Government Chief Scientific Adviser, *Distributed Ledger Technology: Beyond Block Chain*, GOV'T OFF. SCI. (Jan. 2016) 34, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf [https://perma.cc/XB4V-JE84] (emphasis added).

21. *See*, *e.g.*, MARC PILKINGTON, RES. HANDBOOK DIGITAL TRANSFORMATION 15 (F. Xavier Olleros & Majlinda Zhegu eds., 2016); Chamber of Digital Commerce, Digital Currency Group & Center for Financial Markets and Policy at Georgetown University McDonough School of Business, *Blockchain and Financial Inclusion* (White Paper Mar. 2017) 8, http://finpolicy.georgetown.edu/sites/finpolicy.georgetown.edu/files/Blockchain%20and%20Financial%20Inclusion%20120417.pdf [https://perma.cc/E43B-NH7M]; Andrea Tinianow & Caitlin Long, *Transforming the Foundational Infrastructure of Corporate Finance*, HARV. L.

association has proven so strong that lawmakers in Arizona included in recent legislation that data on a blockchain "is *immutable* and auditable and provides an *uncensored truth*."[22] This surprisingly maximalist approach has been subject to thorough critique in the academic literature but remains in the legislation.[23]

In the light of the above issues, this Article proposes a new taxonomy that accommodates existing currencies and the new and upcoming variations. This taxonomy possesses five key features.

First, it applies a functional—not a legal—test as the main criterion.[24] This means that regulatory status does not affect classification, instead applying the logic "that what walks like a duck, quacks like a duck, and looks like a duck, is a duck." One of the benefits of the suggested classification is that it disregards the objectives for which currencies may be used, because these features determine their end-use, rather than functionality, and can lead to endless categorization into types and sub-types. For example, so-called community currencies are not classified separately: depending on their characteristics, they may fall into different categories.

Second, it is regulation-neutral for several reasons. On the one hand, the law does not always provide a sufficient basis for classification, omitting some currencies altogether or using inconsistent terminology. Little would be gained by confirming that currencies not issued by the state are not considered a lawful currency and legal tender in that state.[25] On the other hand, regulation frequently creates exceptions and exclusions from definitions based not on the underlying features of a certain currency, but instead on its potential to cause trouble when things go wrong.

One such example abides in EU law, where an electronic store of value convertible by the issuer into official currency at the 1:1 ratio and otherwise compliant with the definition of "electronic money," is not

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SCH. FORUM. CORP. GOVERNANCE FIN. REG. (Mar. 16, 2017), https://corpgov.law.harvard.edu/2017/03/16/delaware-blockchain-initiative-transforming-the-foundational-infrastructure-of-corporate-finance/ [https://perma.cc/PYJ4-ZMTN].

22. *See* An Act Amending Section 44-7003, Arizona Revised Statutes; Amending Title 44, Chapter 26, Arizona Revised Statutes, By Adding Article 5; Relating To Electronic Transactions § 2 AZ HB2417 (2017) (emphasis added).

23. Walch, *supra* note 11, at 743-45.

24. Although currencies are analyzed by reference to their functional characteristics, legal implications still need to be considered—particularly for separating formal and alternative payment systems, as discussed below.

25. *See*, *e.g.*, EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 24.

treated as such. This follows from Article 1(4) of the E-Money Directive[26] and Article 3(k) of the Payment Services Directive,[27] which exclude from the scope of the E-Money Directive services "based on instruments that can be used to acquire goods or services only in the premises used by the issuer or under a commercial agreement with the issuer either within a limited network of service providers or for a limited range of goods or services."[28]

In a similar fashion, Section 9(3) of Australia's Payment Systems (Regulation) Act 1998 ("the Act") permits the Reserve Bank of Australia ("RBA") to exempt from the Act certain facilities with limited impact, having regard to "any restrictions that limit the number or types of people who may purchase the facility" or "any restrictions that limit the number or types of people to whom payments may be made using the facility."[29] Facilities covered by such exception do not qualify as "purchased payment facilities" ("PPF").[30] The RBA has exercised this authority on a number of occasions, thus excluding, among other things, (i) gift card facilities,[31] (ii) loyalty schemes,[32] (iii) electronic road toll services,[33] (iv) prepaid mobile phone accounts,[34] (v) facilities limited to AUD$10 million (in total)[35] and (vi) facilities whereby payments can be made to no more than fifty persons.[36]

The above exceptions from EU and Australian law are based on the assumption that the limited scope of certain facilities removes the

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26. Directive 2009/110, 2009 O.J. (L 267) (amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC).

27. Directive 2007/64/EC, 2007 O.J. (L 319) (amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC), *replaced by* Directive 2015/2366, 2015 O.J. (L 337) (amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No. 1093/2010 and repealing Directive 2007/64/EC).

28. *See* Directive 2007/64/EC, art. 3(k), 2007 O.J. (L 319) (amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC), *replaced by* Directive 2015/2366, 2015 O.J. (L 337) (amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No. 1093/2010, and repealing Directive 2007/64/EC).

29. *Payment Systems (Regulation) Act 1998* (Cth) § 9(3) (Austl.).

30. *Payment Systems (Regulation) Act 1998* (Cth) § 9(1) (Austl.).

31. Reserve Bank of Australia, *Declaration No 1 of 2006*, RBA, https://www.rba.gov.au/media-releases/2006/pdf/mr-06-02-purchased-payment-facilities-dec-1.pdf [https://perma.cc/ZDG4-BZDQ].

32. *Id.*

33. *Id.*

34. *Id.*

35. Reserve Bank of Australia, *Declaration No 2 of 2006*, RBA, https://www.rba.gov.au/media-releases/2006/pdf/mr-06-02-purchased-payment-facilities-dec-2.pdf [https://perma.cc/CLF6-2L2U].

36. *Id*.

need to regulate them. Also, these exceptions apply to the scope of the regulatory instruments, rather than the definitions themselves (which remain largely functional). Although the result is the same (excepted facilities are not regulated), functionally the exceptions fully satisfy the relevant definitions of electronic money and purchased payment facilities, respectively.

Third, the proposed taxonomy is technology-neutral. The problem with taxonomy based on technology is that technology changes and – as is demonstrated by the blockchain example above[37] – can be readily misunderstood.

Fourth, it focuses on the concept of "currency,"[38] rather than "money" (although certain references to basic theories and technical concepts are, of course, unavoidable). For the purposes of suggested functional analysis, the term "money" that is often used in literature is too abstract: with enough qualifications (such as the limited ability to perform one or more functions of money),[39] almost anything of value can be classified as such;[40] conversely, if interpreted more broadly, many national currencies will not qualify as money either.[41] As a result, references to the term "money" are often used without further explanation as if its meaning is obvious, which creates taxonomy issues. For example, in its taxonomy of money and exchange mechanisms the Bank for International Settlements ("BIS") refers to "money in traditional sense," clarifying that this means money "denominated in a sovereign currency."[42] Overall, a discussion about the "moneyness" of various assets is outside the scope of this Article.

37. *See* UK Government Chief Scientific Adviser, *supra* note 20.

38. Merriam Webster dictionary defines "currency" as "something . . . that is in circulation as a medium of exchange." In this Article, currency is thus understood broadly, by reference only to the medium of exchange function, disregarding other functions of money (such as store of value and unit of account). *Currency*, MERRIAM-WEBSTER, https://www.merriam-webster.com/dictionary/currency [https://perma.cc/RAF5-HMZE].

39. *See* LOCKE, *infra* note 66; LOCKE, *infra* note 67; TOBIN, *infra* note 68.

40. *See*, *e.g.*, Aleksander Berentsen & Fabian Schar, *The Case for Central Bank Electronic Money and the Non-case for Central Bank Cryptocurrencies*, 100 FED. RESERVE BANK ST. LOUIS 97, 97-98 (2018). (taking a broad view on the concept of money and classifying assets used as a store of value (e.g. gold) as "commodity money").

41. From the economics perspective, this would be true for highly volatile currencies that fail to fulfil the store of value function. For further detail, see Garrick Hileman, *Alternative Currencies: A Historical Survey and Taxonomy* 4-8 (2016), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2747975 (last visited Mar. 18, 2019).

42. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 18, at 6.

Fifth, the different currencies are examined through the lens of two payment systems: (i) formal and (ii) alternative. The distinction is based on their regulatory status, the latter (alternative) being the residual category. Such breadth of scope is important for a number of reasons. Unlike regulation, where failure to meet any of the legal definitions can be an expected outcome (meaning that the facility is not regulated at all), a taxonomy should be complete. For example, in the European Union certain community currencies can be classified neither as "electronic money" (due to Article 1(4) of the E-Money Directive and Article 3(k) of the Payment Services Directive), nor as "virtual currencies" (pursuant to section 11 of the Preamble to the Fifth Anti-Money Laundering Directive).[43] Furthermore, the classification needs to be broad enough to encompass the most recent developments, such as the emergence of new digital currencies issued by sovereign states. Finally, a residual approach is already used in the regulation of certain currencies. As discussed in Section V.B.2,[44] it is possible that the same facility could qualify as both "electronic money" under the E-Money Directive and as a "virtual currency" under the Fifth Anti-Money Laundering Directive – if not for the condition that anything having a "legal" status of currency or money under the law is not a virtual currency.

III. USEFUL BUT WORTHLESS: CURRENCY AS THE BACKBONE OF MODERN PAYMENT SYSTEMS

Early historic forms of money, such as metallic coins that can be traced back to as early as 2200 BC,[45] possessed inherent value based on the quality and quantity of materials from which they were made. This contrasts with modern payment systems that are largely based on electronic records and ever decreasing use of physical money.

For lawyers, the legal characteristics of money historically remained secondary to the more pragmatic questions underpinning commercial turnover – their functionality. The Roman jurist Paul engaged in a discussion on the legal nature of money only insofar as

43. Directive 2018/843, 2018 O.J. (L 156) (amending Directives 2015/849, 2009/138/EC and 2013/36/EU).

44. *See infra* Section V.B.2.

45. For a more detailed discussion of the earlier primitive forms of money, see GLYN DAVIES, A HISTORY OF MONEY: FROM ANCIENT TIMES TO THE PRESENT DAY 34-48 (3d ed. 2002).

was necessary to differentiate between contracts of sale and barter.[46] Medieval lawyers explained the distinction between the actual value of coins and their declared value established by the state not to answer an abstract legal question about the nature of money, but to comply with the legal requirements of loan repayments.[47] Even Charles Dumoulin's claim that "the form and substance of money, as money, is not its matter of physical appearance" was simply an argument to support his views on proper contractual discharge.[48]

As a result, the term "money" could have completely different legal meanings (depending on the circumstances) when interpreted by lawyers. In a testator's will, its broad construction was justified, to encompass various assets in one's estate. For the purposes of loan repayment, however, a narrower interpretation was utilized, permitting only certain coins to be used to discharge an obligation and thus recognizing that not all coined money was the same. For example, foreign coins were historically viewed as legally distinct from their domestic counterparts, as a matter of customary or positive law.[49] In English law, the concept of "legal tender money" developed from the legal rules on the performance of debts, which only permitted good discharge by tendering coins issued or adopted by the Crown.[50] In the famous 1899 judgment *Moss v. Hancock*, Justice Darling cited Francis Walker in "Money, Trade, and Industry" as the author of the best (legal) definition of money "as currency, and not as medals":

> [T]hat which passes freely from hand to hand throughout the community in final discharge of debts and full payment for commodities, being accepted equally without reference to the character or credit of the person who offers it and without the intention of the person who receives it to consume it or apply it to any other use than in turn to tender it to others in discharge of debts or payment for commodities.[51]

The evolution of money eventually proceeded towards monetary nominalism, by separating the legally recognized value of money from

46. DAVID FOX & WOLFGANG ERNST, MONEY IN THE WESTERN LEGAL TRADITION: MIDDLE AGES TO BRETTON WOODS 7 (1st ed. 2016).

47. *Id*.

48. *Id.* at 8.

49. *Id.* at 9.

50. *Id.*

51. *Moss v Hancock* [1899] 2 Q.B. 116 (Eng.).

the substance of which it is made.[52] Just like today, technological innovation was generally outpacing legal change: specialized financial institutions (i.e., banks) were established to pool money from their clients, but the law was struggling to adequately explain the nature of the bank-client relationship, including clients' rights to balances in their accounts.[53] At the same time, the sovereign prerogative over money initially only covered coinage, leaving coin substitutes, such as bankers' notes and transferable ledger balances, in the hands of private parties and outside "formal" financial law.[54] Acceptance of such substitutes, at least initially, depended on the degree of confidence and public trust existing among their users, and the substitutes themselves can be seen as "privately created currencies" operating outside the sovereign's monopoly.[55]

With time, the sovereign's monopoly covered even coin substitutes that were assigned the status of official (i.e., national, regional or international) currency.[56] In the words of Adam Smith, "[a] prince who should enact that a certain proportion of his taxes should be paid in a paper money of a certain kind might thereby give a certain value to this paper money, even though the term of its final discharge and redemption should depend altogether upon the will of the prince."[57] This approach was later developed by Georg Knapp, who argued that the medium which carried the monetary units was not more than a token ("charta") with no intrinsic value as a physical substance.[58]

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52. The 18th century saw the emergence of "commodity-backed" money in the form of certificates exchangeable for a fixed amount of certain commodity. Unlike the underlying commodity, this form of money had no intrinsic value: its demand resulted from (i) acceptance by state and (ii) redeemability into precious metals. This brought greater portability of money and made possible large-scale transactions. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 9.

53. FOX & ERNST, *supra* note 46, at 12.

54. FOX & ERNST, *supra* note 46, at 14.

55. FOX & ERNST, *supra* note 46, at 14.

56. In this Article, the term "legal tender" is not used because it may be interpreted more narrowly, due to restrictions imposed in different countries on the use of certain forms of official currency. For example, in Australia, Australian cents are not considered legal tender if used in payments exceeding the maximum limits for coin payments (e.g., coins of the denomination of five, ten, twenty or fifty cents are considered legal tender only for payments not exceeding AUD$5 in total. *See Currency Act 1965* (Cth) s 16.1(a) (Austl.).

57. ADAM SMITH, *On Money considered as a particular Branch of the general Stock of the Society, or of the Expense of maintaining the National Capital, in* AN INQUIRY INTO THE NATURE AND CAUSES OF THE WEALTH OF NATIONS (1776).

58. GEORG FRIEDRICH KNAPP, THE STATE THEORY OF MONEY 32 (1st ed. 1924).

The state (or chartalist) theory of money[59] can be used to explain the operation of modern payment systems, including dematerialized money that exists only as account records.[60] But the fundamentals of money circulation have not really changed: what serves as currency must generate sufficient public trust and demand among the end-users of the payment system. For commercial banks, such public trust and demand are based on the creditworthiness, liquidity and reputation of the relevant financial institution. The state, however, has a larger arsenal at its disposal. First, it has the instruments to generate artificial demand for its own liabilities (in the form of "official" currency), including the right to set restrictions on the types of currency it accepts in payments to itself (e.g., in tax collection)[61] and the right to impose limitations on the circulation of other currencies (e.g., prohibition of foreign currency payments among residents[62]). Second, it sits atop the national currency pyramid and cannot be driven into involuntary default (as long as it only promises to redeem its own liabilities by payments in its own currency or to itself).[63]

The emergence of new types of digital currencies is inextricably tied to the revisions of the international monetary system in the twentieth century. Following the 1944 Bretton Woods and 1976 Jamaica reforms, chartalist currency (also commonly referred to as "fiat" currency) stopped being freely convertible into gold.[64] In a world where official currencies—possessing neither inherent, nor fixed redemption value—form the core of the payment system, a search for

59. It can be generally summarized by reference to Abba Lerner: "[W]hatever may have been the history of gold, at the present time, in a normally well-working economy, money is a creature of the state. Its general acceptability, which is its all-important attribute, stands or falls by its acceptability by the state." Abba P. Lerner, *Money as a Creature of the State*, 37 AM. ECON. REV. 312, 313 (1947).

60. For a more detailed discussion and variations of the state theory, *see*, *e.g.*, JOHN MAYNARD KEYNES, A TREATISE ON MONEY [1930] 2 (1976); Lerner, *supra* note 59, at 312.

61. FOX & ERNST, *supra* note 46, at 639.

62. *See, e.g.*, The Russian Federal Law On Currency Regulation and Currency Control, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 173-FZ, § 9(1) (prohibiting foreign currency operations among residents with certain exemptions).

63. FOX & ERNST, *supra* note 46, at 652.

64. Individual states abandoned the precious metal standard at different time. For example, the Bank of England was relieved of its obligation to pay its own notes and Treasury notes in gold under the Gold Standard Act 1925. In Australia, the Commonwealth Bank Act 1929 gave the Treasurer authority to require mandatory exchange of precious metal coins or bullion into Australian notes.

alternative currencies was inevitable. The global financial crisis of 2007-2008 merely intensified this search.

Technological development, including the emergence of multiple public and private telecommunications networks, has resulted in proliferation of alternative privately issued payment instruments, including so-called "electronic money" and "virtual currencies." Some have not been recognized as part of national payment systems[65] (which comprise authorized institutions, infrastructure and regulated processes and are here called "formal" payment systems for short), thus creating what can be referred to as alternative (and unregulated) payment systems. In the following Parts IV and V, this Article examines the concept of currency through the lens of each type of payment system, starting with the formal one.

IV. THE CONCEPT OF "CURRENCY" IN FORMAL PAYMENT SYSTEMS

Of the three textbook functions of money (store of value,[66] medium of exchange,[67] unit of account),[68] the third one is definitive for a "formal" payment system: private parties may invest in different types of assets, from land to securities, to store value and individuals routinely engage in barter transactions, avoiding the use of any currency altogether. National and international payment systems, however, are unthinkable without a commonly accepted material or immaterial "referent" associated with each unit of account—a shared standard of value that is acceptable to all within a state or group of states. The necessary degree of acceptance is attributed by virtue of the law, which stipulates which instruments function as accepted media of exchange—the official currency.[69]

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65. In this Article, the term "payment systems" is interpreted broadly, as a defined set of institutions, instruments, procedures, and rules for the transfer of money. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 17.

66. *See*, *e.g.*, JOHN LOCKE, SECOND TREATISE OF GOVERNMENT ch. V, § 47 (1691).

67. *See, e.g.,* JOHN LOCKE, *Further Considerations Concerning Raising the Value of Money [1696]*, *in* LOCKE ON MONEY 410 (P.H. Kelly ed. 1991).

68. For the standard definition of money as a unit of account, store of value, and medium of exchange, *see*, *e.g.*, JAMES TOBIN, MONEY, CREDIT AND CAPITAL 4 (1998). On the payment function of money, see Stephanie Bell, *The Role of the State and the Hierarchy of Money*, 25 CAMBRIDGE J. ECON. 149 (2001). For a more detailed discussion on the various functions of money, see DAVIES, *supra* note 45, at 27-28.

69. Regarding the United States, *see*, *e.g.*, 31 U.S.C § 5103 (1965). Regarding the United Kingdom, *see*, *e.g.*, Coinage Act 1971 c. 24, § 2 (Gr. Brit.). Regarding Australia, *see*, *e.g.*,

Formal payment systems may differ from country to country both in terms of structure sophistication[70] and underlying regulation. Despite existing differences, the common features can be summarized as follows. First, they utilize or are based upon official state currency, regardless of whether payments are made in cash (subject to any applicable upper limit of payment allowed for such transactions) or non-cash form.[71] Second, a designated authority (usually a central bank) plays the key role in the design and operation of infrastructure within which its currency is used.[72] Third, non-cash payments are predominantly performed via intermediaries, such as commercial banks (acting as account holders for clients and correspondents for other financial institutions) and specialized non-bank payment institutions.[73] Fourth, non-bank actors are increasingly becoming part of the formal payment system, offering additional services and increasing the level of competition.[74]

Over time, cash payments have been to a large extent replaced with non-cash alternatives (such as, credit transfers, direct debits, payment cards, checks, money orders, drafts, bills of exchange, letters of credit, etc.), which themselves are increasingly switching from physical to electronic platforms.[75] Nonetheless, despite ongoing changes, the fundamentals of formal payment systems have remained

Reserve Bank Act 1959 § 36(1) (Austl.). Regarding Israel, *see*, *e.g.*, Bank of Israel Law 5714-1954 § 30 (Isr.).

70. In terms of structure, a formal payment system includes key processes (*e.g.*, payment instruments, processing and settlement), institutions providing deposit and payment services to clients (*e.g.*, banks) and facilitating clearing and settlement (*e.g.*, interbank funds transfer systems), binding domestic and international rules, as well as soft law instruments, such as domestic industry self-regulation and international guidance and practices. *See* TOM KOKKOLA, THE PAYMENT SYSTEM, PAYMENTS, SECURITIES AND DERIVATIVES, AND THE ROLE OF THE EUROSYSTEM 25-26 (2010).

71. BANK FOR INTERNATIONAL SETTLEMENTS, THE ROLE OF CENTRAL BANK MONEY IN PAYMENT SYSTEMS 1 (2003).

72. KOKKOLA, *supra* note 70, at 19.

73. *See generally* James Bullard & Bruce D. Smith, *Intermediaries and Payment Instruments*, 109 J. ECON. THEORY. 172 (2003).

74. *See generally* Monzur Hossain & MD. Shahiduzzaman, Development of Non Bank Financial Institutions to Strengthen the Financial System of Bangladesh, 28 Q. J. BANGLADESH. INST. BANK. MGMT. 1 (2002).

75. A 1994 article in Wired cites Microsoft's former CTO Nathan Myhrvold: "Today we have a zillion different ways of doing financial transactions. There's cash, checks, credit cards, debit cards, wiring money, traveler's checks . . . each of these has a particular point. We're going to see that much diversity in digital money." *See* Steven Levy, *E-Money (That's What I Want)*, WIRED (Jan. 1, 1994), https://www.wired.com/1994/12/emoney/ [https://perma.cc/RS38-TKPD]. *See also* KOKKOLA, *supra* note 70, at 31-33.

largely the same: in most cases, new technologies merely add variety or enhance the efficiency of payment initiation or processing methods (e.g., e-invoicing or e-reconciliation). At their core, existing formal payment systems are still predominantly based on two types of money: official (national or regional) currency[76] and its surrogates. These are discussed in Sections IV.A and IV.B, respectively.[77]

A. Official currency: cash and bank accounts

Even within the same country not all official national currency is created equal. Central banks sit atop the national currency pyramid, controlling the circulation of cash and the opening of central bank accounts.[78] Liabilities of central banks involve no credit or liquidity risks, as the overall volume of currency issued by a central bank can be increased as necessary.[79] For this reason, according to the international standards, payment obligations within systemically important payment systems should be settled using central bank accounts.[80] By issuing cash, opening accounts and ensuring convertibility of other authorized forms of payment into their own liabilities, central banks preserve the uniform value of national currency, without which national currency cannot perform its key role in payments—as a unit of account.[81]

In practice, the great majority of domestic payment systems settle using central bank accounts.[82] In an international context involving settlement in multiple currencies, the settlement processes are invariably more complex—yet central bank accounts retain their importance, although to a lesser extent. For example, the Continuous Linked Settlement ("CLS") system, which utilizes a dedicated third party—the CLS Bank—to perform settlement, relies on central banks

76. A related term "legal tender" is not used in this Article. *See supra* note 56 and accompanying text.

77. *See infra* Section IV.A and IV.B.

78. Currency issued by a central bank means, essentially, such central bank's liabilities which have the function of a medium of exchange. These liabilities come in two forms (physical—cash, and digital—central bank accounts) and have five key characteristics: safety, availability, efficiency, neutrality and finality. *See* TOMMASO PADOA-SCHIOPPA, THE EURO AND ITS CENTRAL BANK: GETTING UNITED AFTER THE UNION 123 (1st ed. 2004); *see also* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 2.

79. KOKKOLA, *supra* note 70, at 44.

80. Committee on Payment and Settlement Systems, *Core Principles for Systemically Important Payment Systems*, BIS (Jan 2001) 8, https://www.bis.org/cpmi/publ/d43.pdf.

81. KOKKOLA, *supra* note 70, at 45.

82. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at Annex 3 Table C.

to make all payments to and from the CLS.[83] This is in contrast to other multicurrency settlement systems that perform settlement using commercial bank accounts.[84]

While it can be said that commercial banks[85] also "create" official currency by issuing loans,[86] they are limited in performing this function by several factors: the law generally precludes uncontrolled lending by establishing mandatory ratios (e.g., capital adequacy ratios) and by otherwise restricting leverage (not to mention economic factors, such as central banks' interest rate policies).[87] Similarly to central bank money balances, a client account with a commercial bank is essentially a liability of the latter.[88] This liability, however, is of a lower quality than a central bank liability, as its originator can mismatch its liquidity and obligations or otherwise default. For this reason, countries develop additional instruments to increase public trust in commercial banks, by establishing deposit insurance and oversight mechanisms, by reserving resolution powers in the event of financial distress and by adopting other regulatory measures.

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83. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 3.

84. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 3.

85. In some jurisdictions, loans can be issued by other financial institutions that may not have the status of a "bank." For example, in Russia, microloans can be provided by "microfinance organisations." *See* The Russian Federal Law On Microfinance Activity and Microfinance Organisations, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2010, No 151-FZ, § 2. As these institutions are generally subject to similar, but often more relaxed (due to their smaller size and impact), regulatory requirements, in this Article the term "commercial banks" is interpreted broadly to include all financial institutions authorized to issue loans and make deposits in official currency by making records in their own, rather than third party accounts nominated in official currency.

86. While various theories provide different views on this issue (e.g., the financial intermediation theory, the fractional reserve theory and the credit creation theory), in his recent study, Werner empirically demonstrates that "each individual bank creates credit and money out of nothing." *See* Richard Werner, *Can Banks Individually Create Money Out of Nothing – The Theories and the Empirical Evidence*, 36 INT'L REV. FIN. ANALYSIS, 1, 16 (2014); *see also* DEUTSCHE BUNDESBANK, THE ROLE OF BANKS, NON-BANKS AND THE CENTRAL BANK IN THE MONEY CREATION PROCESS (2017).

87. *See*, *e.g.*, Basel Committee on Banking Supervision, *Basel III: international regulatory framework for banks,* BIS, https://www.bis.org/bcbs/basel3.htm [https://perma.cc/8XZ8-UJCS].

88. This is settled both in legal theory and practice. *See*, *e.g.*, *Libyan Arab Foreign Bank v Bankers Trust Co* [1989] QB 728, 21 (treating the fact that a customer "does not own any money in a bank" and has merely "a personal right" (i.e., a claim) against the bank as "hornbook law") (citing Foley v. Hill (1848) 2 H.L.Cas. 28, 36 ("Money, when paid into a bank, ceases altogether to be the money of the principal . . . it is then the money of the banker, who is bound to return an equivalent by paying a similar sum to that deposited with him when he is asked for it . . . The money placed in the custody of a banker is, to all intents and purposes, the money of the banker, to do with as he pleases.")).

A combination of cash and accounts opened by central and commercial banks is the *sine qua non* of modern formal payment systems recognized by most central banks.[89] In this layered system, non-financial institutions hold their liquidity with commercial banks, and commercial banks hold their own liquidity with their central banks.[90] Except for cash, which serves as the only freely available type of currency issued by central banks, the only other way for most organizations and individuals[91] to own official currency is through intermediaries, namely commercial banks—the same institutions that can create new money out of "thin air."[92]

Despite the advantages of official currency issued directly by a central bank, its use remains limited. First, transactions in its physical form (cash) are generally restricted in terms of size (e.g., up to a certain limit)[93] and of transacting parties (e.g., cash transactions among legal entities can be prohibited). Second, in most cases its digital form is only accessible to certain (usually the largest) banks[94] and non-bank financial institutions (e.g., clearing houses), as well as selected non-commercial entities (e.g., the government, foreign central banks and international organizations).[95] Third, commercial bank accounts offer advantages that could overshadow the underlying risks (e.g., multicurrency and cross-border payments, increased competition, diversification of payment systems, access to credit, etc.), not to

89. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 1.

90. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 2. This description is overly simplified, since developed financial systems with multiple banks of different sizes routinely use a combination of central bank money and commercial bank money for payments in domestic and foreign currency. It is common for smaller financial institutions with correspondent accounts at the same top-tier bank to settle without using central bank money at all. *See* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 3.

91. While individuals are commonly precluded from opening accounts directly with a central bank, certain exceptions exist (but remain quite rare). One such exception has recently been eliminated in the UK, where employees at the Bank of England used to have the privilege of having direct accounts with the central bank. *See* Gwyn Topham, *Bank of England to Close Personal Banking Service for Employees*, THE GUARDIAN (July 18, 2016), https://www.theguardian.com/business/2016/jul/17/bank-of-england-closing-personal-banking-service-employees [https://perma.cc/3CGL-6CBW].

92. Werner, *supra* note 86; DEUTSCHE BUNDESBANK, *supra* note 86.

93. *See supra* note 56 and accompanying text.

94. Relevant policies differ from country to country. For example, the Hong Kong Monetary Authority strongly encourages all banks to have a settlement account with it. *See* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 4.

95. *See* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 3-4.

mention deposit insurance that provides sufficient security for a large portion of account holders.[96]

B. Surrogates of Official Currency

The level of competition within payment systems has increased over time. Where banks were unable to offer sufficient territorial coverage or competitive prices for their services, other businesses stepped in to close the gap. Of course, these businesses could not issue official currency, which remained the prerogative of banks. Instead, non-banks started offering their own liabilities, trying to make them more attractive to clients by allowing convertibility of such liabilities into official currency. Thus privately issued surrogates of official currency ("SOC") came into being.[97] Where they were more accessible than bank accounts and more efficient than cash, these surrogates had a very positive effect on financial inclusion.[98]

SOC have different names in different jurisdictions: "mobile money" or "e-money" in Kenya,[99] "electronic money" in the European Union,[100] "purchased payment facility"[101] in Australia, "electronic monetary funds" in Russia.[102] All these concepts have two things in common: (i) they represent a promise by a recipient of official currency (the issuer) to follow the payment instructions of the person which has provided that official currency (the client) and (ii) payment instructions from the client do not have to be submitted alongside the official

96. *See* EUROPEAN REPO COUNCIL, THE INTERCONNECTIVITY OF CENTRAL AND COMMERCIAL BANK MONEY IN THE CLEARING AND SETTLEMENT OF THE EUROPEAN REPO MARKET 9-11 (2011).

97. Characterisation of units of value as "surrogates" can be found in paragraph 13 of the Preamble to the EU Directive 2009/110/EC. *See* Directive 2009/110/EC, 2009 O.J. (L 267), Preamble ¶ 13.

98. A prominent example is Kenya and its dominant SOC platform M-Pesa. *See* Anton Didenko, *Regulating FinTech: Lessons from Africa*, 19 SAN DIEGO INT'L L.J. 311, 362 (2018).

99. *See*, *e.g.*, COMMUNICATIONS AUTHORITY OF KENYA, FIRST QUARTER SECTOR STATISTICS REPORT FOR THE FINANCIAL YEAR 2017/2018 13 (2017); CENTRAL BANK OF KENYA, E-MONEY REGULATION (2013). FATF also uses the term 'e-money' and defines it as "a digital representation of fiat currency used to electronically transfer value denominated in fiat currency." *See* FINANCIAL ACTION TASK FORCE, *supra* note 16, at 4.

100. *See* Directive 2009/110/EC, 2009 O.J. (L 267), art. 2.2.

101. *Payment Systems (Regulation) Act 1998* (Cth) s 9 (Austl.).

102. *See* The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ, § 3.18.

currency.[103] Although the resemblance with bank deposits is striking, the key difference is that the issuer's liability is not recorded in a bank account. This remains true regardless of whether the issuer is a bank or not.[104]

At the same time, the type of account alone cannot be determinative. After all, many organizations (e.g., brokers, clearing organizations, fund managers) can intermediate their customer funds and for this purpose also maintain internal accounting systems. Unlike other forms of intermediation, however, SOC issuers open client accounts for the sole purpose of facilitating *payments*, by offering units in their own accounts – and not in the accounts of banks – as a *medium of exchange*.[105]

1. Differences from Official Currency

This use of separate units of account instead of official currency is a defining feature of a SOC, which helps to differentiate SOC from a range of other payment mechanisms that do not involve the creation of, and payment in, non-official currency units. This would be the situation when a payment service provider acts as agent on behalf of clients to store official currency on their (rather than the agent's) behalf and fulfil client payment orders.[106] Similarly, if a payment facility, however called, operates by providing remote access to a bank account, it also does not establish a different medium of exchange and, as a result, a different currency. This distinction becomes especially important in the context of SOCs offered by banks that can – but should

103. The time lag implies that, in addition to making payments, a SOC issuer also performs a form of intermediation by storing the value overtime. This is in contrast to money transfer service providers which do not perform the storage function.

104. This is clear from the Russian Federal Law "On the National Payment System," which requires all corporate clients of issuers of electronic means of payment either to open a separate bank account with the issuer (provided that such issuer is a bank, otherwise it would have no authority to open one), or to provide to the issuer the details of its third party bank account. *See* The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ, § 7.23.

105. *Id.* at §12.3.

106. In the past, PayPal operated in the United States as an agent for its clients, offering its clients two different services: (i) custody of funds in PayPal's accounts, and (ii) transferring funds from those accounts in accordance with the clients' instructions. *See* Paypal, *User Agreement for Paypal Service*, SEC (Nov. 2004), https://www.sec.gov/Archives/edgar/data/1314052/000131405205000004/ex105a.htm [https://perma.cc/7FB3-52DY].

not be – confused with currency in bank accounts. Let us consider evidence found in the law applicable to SOC.

First, deposit insurance protections do not apply to non-bank accounts and, consequently, do not safeguard holders of SOC balances, at least directly.[107] The only potential exception known to us might be the recently announced pass-through of deposit insurance by PayPal for select users of its new services.[108] A number of jurisdictions have implemented creative workarounds to promote customer trust in SOC, such as a duty of the SOC issuer (or its counterparty) to hold liquid assets (e.g., in the form of official currency) in a bank (commonly referred to as "float").[109] In some jurisdictions the float must be held on trust for the benefit of the SOC issuer's account holders.[110] However, these measures do not change the key mechanics, whereby deposit insurance does not apply to non-bank accounts. Furthermore, such protection is fundamentally different from deposit insurance. The latter kicks in regardless of the status of the asset structure of an insolvent bank: for all intents and purposes, there could be zero assets to repay any depositors, but deposit insurance will compensate each of them, depending on its terms (e.g., subject to the maximum amount established by the law).[111] If an SOC issuer goes into bankruptcy and the float held on trust for the clients remains untouched, the clients will recover up to their respective proportion of the float.[112] Assuming no restrictions on the number of units of SOC held by each customer, this could potentially[113] mean recovery of sums exceeding a deposit insurance cap. But so long as control of the account remains in the

107. *See* The Russian Federal Law On the Insurance Deposits of Individuals in Banks of the Russian Federation, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2003, No. 177-FZ, § 5.2.5.

108. At the time of writing, this project was still in a testing ("beta") phase. *See* Bill Ready, *Taking Further Steps to Help the Unbanked*, PAYPAL (April 2018), https://www.paypal.com/stories/us/taking-further-steps-to-help-the-unbanked [https://perma.cc/7RF6-EH3Z]. It is unclear how the pass-through of FDIC insurance will be implemented in practice.

109. *See*, *e.g.*, CENTRAL BANK OF KENYA, *supra* note 99, cl. 8.

110. *See* Jonathan Greenacre & Ross P. Buckley, *Using Trusts to Protect Mobile Money Customers*, SINGAPORE J. LEGAL STUD. 59, 59-78 (2014).

111. This does not mean, however, that an SOC issuer will necessarily be deemed less reliable compared to a commercial bank. In countries where banking is deemed inefficient or too expensive, an SOC offered by a leading and well-respected mobile operator is likely to be widely favoured by the population. This was the situation with M-Pesa when it was launched by Safaricom in Kenya in 2007.

112. *See* Greenacre & Buckley, *supra* note 110, at 67-69.

113. This is unlikely in practice, given that generally SOC balances are lower than commercial bank deposits.

hands of the SOC issuer,[114] the trust's effectiveness is limited to situations when such issuer has not already misappropriated the float. This is somewhat similar to the requirement that brokers hold client funds separately from their own – practice shows that, in financially difficult times, the temptation to use segregated funds may be too strong.[115] Other protective measures, such as contractual arrangements between an SOC issuer and the bank holding the float, are even less effective than a trust structure – and for this reason their comparison to deposit insurance is less germane.[116]

Second, issuers of SOC are commonly prevented from engaging in lending activities.[117] Lending in this context clearly refers to the

114. In theory, it is possible to implement a range of protections to put some distance between an SOC issuer and the float. Some regulators even offer a differentiated approach based on the nature of this connection. For example, the liquidity requirements listed in Australia's Prudential Standard APS 610 'Prudential Requirements for Providers of Purchased Payment Facilities' do not apply to PPFs that do not hold 'stored value at risk', which is the case, inter alia, when: (i) the funds received in exchange for PPF balances are deposited in an account with an authorised deposit taking institution (ADI), (ii) the PPF provider has no operational control over such account and (iii) no creditors aside from beneficiaries of the stored value can have legal recourse to the asset in that account in the event of insolvency or winding up of activities of the PPF provider. See Prudential Standard APS 610 § 7. Despite clear policy reasons behind such differentiated approach, it is very difficult to imagine a situation when all of these requirements will be met. In fact, back in 2005 Australian Prudential Regulation Authority (APRA) attempted to provide a corresponding example, which involved two companies splitting different functions among themselves (Company A acting as the provider of the PPF facility, and Company B controlling the relevant deposit account with an ADI to make payments out of it). *See* Australian Prudential Regulation Authority, *Authorisation and Prudential Supervision of Providers of Purchased Payment Facilities* (Discussion Paper May 2005) 4, http://www.gtm.apra.gov.au/adi/Documents/ADI-Supervision-of-PPFs-May-2005.pdf [https://perma.cc/S8VC-CUSL]. Unfortunately, even in this hypothetical scenario with split functions and responsibility, Company A would almost certainly have a contractual arrangement with Company B whereby the latter should honor all of Company A's instructions relating to the use of the deposit account with an ADI—in which case Company A remains in control of the account, albeit indirectly.

115. A prominent example is the case of bankruptcy of MF Global Inc, which—in the face of financial difficulties—"unlawfully used nearly one billion dollars of customer segregated funds to support its own proprietary operations and the operations of its affiliates." *See* U.S. Commodity Futures Trading Commission v. MF Global Holdings Ltd., No. 11-cv-7866 (S.D.N.Y. Oct. 3, 2016) (order granting consent order for preliminary injunction, civil monetary penalty and other equitable relief against defendant).

116. *See* Ramos, Solana, Buckley & Greenacre, *supra* note 4, at 724-25.

117. *See* CENTRAL BANK OF KENYA, *supra* note 99, at cl. 7.6. In a similar fashion, but using different terminology, Russian law does not allow operators of electronic monetary funds 'to provide to the client monetary funds for the purposes of increasing the client's balance of electronic monetary funds, on the basis of consumer credit agreement'. *See* The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ, § 7.5.

increase of SOC balances not backed by a commensurate contribution of official currency by the client,[118] rather than creation of *new* official currency.[119] After all, non-banks cannot create official currency *directly*, and so there is no good policy reason to allow them to create it *indirectly*, by issuing surrogates freely exchangeable into official currency. With banks, however, the situation is more complicated, since even a prohibition on lending strictly in the context of issuing SOC, even if carefully worded, will be extremely difficult to observe. The problem is that the fungibility of value stored in bank accounts makes it extremely difficult to track individual units of official currency underlying a payment transaction to their source. With cash, such tracking is outright impossible for bank notes and coins, provided that individual note numbers are not recorded and tracked. With bank accounts, which merely represent electronic records, the tracking can be only circumstantial.

Despite these difficulties, however, it appears to be technically possible to track a breach of the lending prohibition in respect of SOC in a situation when (i) a bank ("Bank") credits official currency to a bank account ("Account") of its client ("Client") as a loan ("Loan"), (ii) the Client requests the Bank to issue SOC in exchange for some or all of the balance of the Account, and at the same time (iii) the following equation is satisfied:

$X > A + B$, if $W = 0$ or

$X > A + B$, if $L > W > 0$,

where

X – the amount of official currency in the Account exchanged by the Client for SOC;

A – the amount of official currency in the Account prior to the issuance of the Loan;

B – the amount of official currency credited to the Account after the issuance of the Loan but before the reduction of the Client's balance by the Bank for the purpose of issuing SOC (assuming that neither A, nor B includes loans issued by the Bank);

118. Clearly, a lending prohibition cannot relate to bank accounts, as it would make no sense for banks issuing SOC.

119. Since SOC balances are redeemable in official currency, then the creation of SOC balances on loan would indirectly lead to the increase in the volume of official currency in operation.

L – amount of the Loan; and

W – amount of official currency withdrawn from the Account after the issuance of the Loan but before the reduction of the Client's balance by the Bank for the purpose of issuing SOC.

As is seen from the equation, the amount of the loan in question is irrelevant – what matters is whether the *same* currency was used to issue SOC. Due to inherent fungibility, currency can only be tracked in this manner using the bank account indirectly, by comparing the loan amount with the sums received from other sources.

Third, payments with SOC require dedicated know-your-customer ("KYC") procedures that are similar to, but remain separate from, bank account checks.[120]

Fourth, payments with SOC are made using accounts of the SOC issuer, rather than the accounts of any third party, such as the bank that holds the float.[121] This remains true even when the SOC issuer engages a third party.[122]

Fifth, even in jurisdictions with dedicated SOC regulation where units of SOC can be used to fulfil payment obligations,[123] the law neither recognizes SOC as legal tender[124] (the latter remains the prerogative of official currency), nor permits payments to the state to be made in units of SOC.[125]

It is clear from the discussion above that SOC indeed form a separate medium of exchange. This said, SOC do not compete with official currency as such. Instead, they only compete with other *payment mechanisms*.[126] In EU law, SOC units have been expressly recognized as a standalone media of exchange distinct from other forms of currency: in 2012 Regulation (EC) No. 924/2009 was amended by clarifying that "electronic money" forms a standalone sub-category of

120. *See*, *e.g.*, The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ, § 10.

121. *Id.* at § 7.10.

122. *Id*. at § 13.4.

123. *Id.* at §§ 7.17 – 7.18.

124. *See* Grazhdanskii Kodeks Rossiiskoi Federatsii [GK RF] [Civil Code] § 140 (Russ.).

125. *See* Nalogovyi Kodeks Rossiiskoi Federatsii [NK RF] [Tax Code] § 45.3 (Russ.).

126. *See* CENTRAL BANK OF KENYA, *supra* note 99, cl. 4 (stating that "currency" includes "e-money" for the purposes of the definition of "payment instrument").

"funds," alongside banknotes, coins and "scriptural money."[127] At the same time, "payment transactions transferring electronic money" were expressly carved out from the regulation of other payment transactions using credit and direct debit, due to the specific legal nature of SOC units: the carve-out applies where payment transactions are settled only using "electronic money" and is not applied when "such transactions result in a credit transfer or direct debit to and from a payment account identified by BBAN or IBAN."[128] Equally important is the very definition of "electronic money" in Article 2(2) of the EU Directive 2009/110/EC as "electronically . . . stored monetary value," which shows that units of "electronic money" themselves possess a monetary value of their own. This value is based on the convertibility into official currency but is clearly separate from the value of units of official currency.

Legal differences, in turn, lead to differences in utility and usage models. On the one hand, the SOC business model is built around the medium of exchange function of SOC units. According to the Australian Prudential Regulation Authority ("APRA"), "PPF providers primarily earn fees from services linked to facilitating the function of money as a medium of exchange, not through making advances of money."[129] On the other hand, SOC offer only rudimentary functionality as a store of value, due to existing restrictions on balances held as SOC and prohibitions on the payment of interest.[130]

2. Connection to Official Currency

Let us now consider the close connection of SOC to official currency—a factor that categorizes this medium of exchange as a *surrogate*, rather than as a standalone alternative currency.[131]

First, existing SOC schemes do not alter the supply of official currency. SOC do not alter the fundamental mechanics of the payment

127. *See* Regulation 260/2012, art. 17(1), 2012 O.J. (L 94) 33-34 (establishing technical and business requirements for credit transfers and direct debits in euro and amending Regulation 924/2009, 2012 O.J. (L 94)).

128. *Id*. at art. 1(2)(f).

129. Australian Prudential Regulation Authority, *supra* note 114, at 5. APRA further explains that, consequently, stored value is "largely a residue of the services provided," rather than a source of funding for other operations. *See Id*.

130. In a number of jurisdictions payments of interest on SOC balances have been permitted. For more detail, see Malady, Tsang & Buckley, *supra* note 4.

131. For a discussion on alternative currencies and their classification, see *infra* Section V.

system built around official currencies. Although SOC represent a *separate* medium of exchange, units of SOC can only be obtained in *exchange* for official currency (they cannot be lent).[132] Similarly, these units can exit the internal accounting system of the SOC issuer by *exchange* into official currency. These exchanges are done at par or at least at par.[133]

Second, SOC regulations frequently mirror regulations governing bank deposits.[134]

Third, SOC are becoming increasingly associated with the formal financial system. A prominent example is the World Bank's Findex database which counts as financially excluded, people "without an account at a financial institution or through a mobile money provider."[135] Another example is the newly adopted Fifth AML Directive, which treats "electronic money" as a type of fiat currency, alongside "coins and banknotes that are designated as legal tender."[136]

3. SOC as Part of the Formal Payment System

Over time, SOC systems have matured and are now exhibiting even more similarities with regular bank accounts. Some SOC projects have evolved to provide greater credibility in the eyes of prospective users (e.g., by establishing trust facilities to safeguard customers against the insolvency of the SOC issuer).[137] Although historically SOC products were not interest-bearing, the situation is beginning to change, further reducing the gap between bank accounts and SOC accounts.[138] As the gap is reducing, so are SOC products becoming part

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132. *See supra* note 117 and accompanying text.

133. *See* Directive 2009/110/EC, 2009 O.J. (L 267), art. 11.

134. *See* The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ, § 10.11 (providing that interruption of payments using electronic monetary funds is permitted in cases and in the manner that are analogous to those applicable to bank accounts).

135. ASLI DEMIRGÜÇ-KUNT, ET AL., THE GLOBAL FINDEX DATABASE 2017: MEASURING FINANCIAL INCLUSION AND THE FINTECH REVOLUTION 4 (2018).

136. *See* Directive 2018/843, 2018 O.J. (L 156) (amending Directive 2015/849, 2015 O.J. (L 141)); Directive 2009/138/EC, 2009 O.J. (L 335); Directive 2013/36/EU, 2013 O.J. (L 176), Preamble ¶ 8. This is done to contrast SOC with so-called "virtual currencies."

137. *See* Greenacre & Buckley, *supra* note 110. For a discussion on alternative protection mechanisms in the context of Civil Law jurisdictions, which do not recognize the concept of trust, see Ramos, Solana, Buckley & Greenacre, *supra* note 4.

138. Tanzania's Tigo Pesa is arguably the first interest-earning e-money product. See Tsang, Malady & Buckley, supra note 4. Although the same is not true for the United Kingdom and the United States, payment of interest is a defining feature of a bank deposit in certain

of existing formal payments systems. After all, both (bank and SOC accounts) are pursuing the common goal of ensuring greater inclusion of domestic actors in the formal payment system based on official currency to minimize the risks associated with cash-based payments and give the regulators a better grasp or financial flows in the economy (among other underlying factors).

The notion of public trust remains just as important for SOC as for bank currency (i.e., deposits) but is generated through different channels. In the case of a bank account, client security is achieved through licensing requirements, deposit insurance schemes, and resolution powers over banks in case of financial distress. The same protections do not always apply to SOC providers. First, in most jurisdictions regulators do not have special resolution powers in the event of financial difficulties of SOC issuers (as opposed to distressed commercial banks, which can be subject to a variety of recovery procedures, from management replacement, to the transfer of toxic assets to a third party).[139] Second, since deposit insurance rules do not always apply to SOC issuers,[140] the latter are often forced to adopt other measures to ensure that their own insolvency does not adversely affect their client's money.[141]

This functional similarity to bank deposits can also help to explain why—despite a variety of attempts—SOC systems have been largely unsuccessful (with some notable exceptions). The two business models (SOC and electronic banking) are commonly engaged in direct competition, which often precludes the development of SOC in countries with established banking systems (this is generally due to high costs of implementation and also competition from incumbent financial institutions).[142] A prime example is Australia, where after almost ten years only PayPal is the only PPF provider to have been registered. Notable exceptions can be found in countries with large numbers of unbanked people, where SOC can become a viable alternative to a bank account: in Kenya, the mobile money platform M-Pesa became an instrument of financial inclusion for the majority of the

jurisdictions. For an example in Russia, see The Civil Code of the Russian Federation, GRAZHDANSKII KODEKS ROSSIISKOI FEDERATSII [GK RF] § 834, ¶ 1.

139. Kenya is a notable exception. *See* Kemp & Buckley, *supra* note 4, at 1551-52.

140. *See*, *e.g.*, Juan Carlos Izaguirre, Claire McGuire & Dave Grace, *Deposit Insurance for Digital Financial Products: 3 Approaches*, CGAP, http://www.cgap.org/blog/deposit-insurance-digital-financial-products-3-approaches [https://perma.cc/83SD-XAWX].

141. *See supra* note 137 and accompanying text.

142. KOKKOLA, *supra* note 70, at 33-34.

population at a time when formal banking was perceived as expensive, time-consuming and generally inaccessible.[143] Similarly high levels of impact from SOCs has been seen in Tanzania, Uganda, the Philippines, and other countries.[144]

C. Development trends in formal payment systems

Formal payment systems are continuously evolving. Recent trends include the following.

- Technological advancement and increasing complexity. Developments in technology have made possible the establishment and widespread adoption of real-time gross settlement (RTGS) systems where each payment is settled intra-day in real-time (as opposed to settlement of net positions at the end of a specified period).[145] Wholesale settlement requires a substantially larger money pool to operate efficiently, and thus generally utilizes central bank money (in terms of accounts used for settling payment obligations and intra-day loans provided by central banks).[146] At the same time, the speed of technological development tends to reduce the payment system's lifecycle: many existing wholesale payment systems are programmed in obsolete languages or use outdated database designs.[147] The process of modernisation of existing payment systems and development of new ones[148] creates a fertile ground for the adoption of new technologies, such as distributed ledger technology (DLT): a

143. For an overview of the challenges associated with Kenya's banking sector, see EMCompass, *How Fintech is Reaching the Poor in Africa and Asia: A Start-Up Perspective*, IFC (Mar. 2017), https://www.ifc.org/wps/wcm/connect/f745fd31-a9aa-4736-b0ba-4ac2956f96dc/EmCompass+Note+34+DFS+and+FinTech+Mar+28+FINAL.pdf?MOD=AJPERES [https://perma.cc/85AN-UHYN].

144. Tavneet Suri, *Mobile Money*, 9 ANN. REV. ECON, 497, 506-08 (2017).

145. See, for example, CHAPS in the UK, RITS in Australia.

146. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 4.

147. Bech & Garratt, *supra* note 6, at 66.

148. For an example of a recent initiative to modernize the national payment system, *see*, *e.g.*, News Release, Bank of England, A Blueprint for a New RTGS Service for the United Kingdom (May 9, 2017), https://www.bankofengland.co.uk/-/media/boe/files/news/2017/may/a-blueprint-for-a-new-rtgs-service-for-the-united-kingdom.pdf?la=en&hash=C3C5EFE19203BBEDF725BEFB6D45CFDC0504D6FE [https://perma.cc/P7D9-FV7R]. Another example comes from Australia, which launched a New Payments Platform in February 2018 "to provide a platform for innovation and competition in the provision of payment services." *See* Reserve Bank of Australia, *Launch of the New Payments Platform*, (Feb. 13, 2018), https://www.rba.gov.au/media-releases/2018/mr-18-02.html [https://perma.cc/HFJ2-8V87].

number of central banks have already completed proofs of concept for DLT applications.[149]

- Concentration of payment system risks. For various reasons (e.g. business specialization or bank consolidation) individual financial institutions end up concentrating significant volumes of payment activities, sometimes equalling in scope the size of entire payment systems of certain countries. This prompts central banks to react and to revise their approach to payment systems, e.g. by creating more competitive settlement mechanisms or enhancing oversight of systemically important institutions.[150] In the long term, in such cases, central banks might consider taking over the payment settlement process to prevent further consolidation of risks.

- Increasing demand for central bank accounts and services. Increased cross-border flows of money resulting from financial globalisation and the establishment of settlement facilities operating with multiple currencies imposes additional pressure on central banks, such as the need for greater access to intraday credit. In addition, non-bank financial institutions (and some non-financial institutions) are requesting broader access to central bank accounts and operations in central bank money, as well as to improve the services utilising central bank money (by allowing longer operating hours, multicurrency functionality or otherwise).[151]

Overall, formal payment systems are predominantly operating as multi-level domestic and cross-border payment systems dominated by intermediaries (both nationally and internationally). These intermediaries are typically commercial banks but also include front-end, back-end, and end-to-end providers, as well as operators of retail payment infrastructure.[152] These systems are given official status by dedicated laws and regulations.[153] High volumes of foreign exchange

149. Bech & Garratt, *supra* note 6, at 66.

150. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 4-5.

151. *See* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 5, 43; *see also* ITU-T FOCUS GROUP ON DIGITAL FINANCIAL SERVICES, ACCESS TO PAYMENT INFRASTRUCTURES (2016), https://www.itu.int/en/ITU-T/focusgroups/dfs/Documents/09_2016/Access%20to%20Payment%20Infrastructures.pdf [https://perma.cc/KT64-WNAX].

152. *See* BANK FOR INTERNATIONAL SETTLEMENTS, NON-BANKS IN RETAIL PAYMENTS 9 (2014).

153. *See*, *e.g.*, The Russian Federal Law On the National Payment System, SOBRANIE ZAKONODATEL'STVA ROSSIISKOI FEDERATSII [SZ RF] [Russian Federation Collection of Legislation] 2011, No 161-FZ.

operations and the emergence of major financial institutions engaged in cross-border transactions[154] drive financial internationalization, which, nonetheless, remains largely decentralized and based on correspondent accounts with commercial banks.[155] New technologies, like DLT, offer alluring prospects of resolving some of the existing issues (such as high infrastructure costs relating to cross-border payments, securities trading and regulatory compliance)[156] and attract significant attention, but so far appear a somewhat distant opportunity.[157]

V. THE CONCEPT OF "CURRENCY" IN ALTERNATIVE PAYMENT SYSTEMS

The unit of account function of currency used in a formal payment system is maintained through guaranteed conversion of recognized forms of currency into central bank liabilities.[158] This ensures the overall stability of the system and public trust in formal fiat currency, which is, of course, intrinsically worthless. By necessity, such a system functions in a closed loop, covering only those types of currency which are accepted by the law. In contrast, "alternative payment systems" operate outside such a loop and cover those processes, institutions, and practices, which are not based on cash, central bank, or commercial bank accounts and are thus conceived as standalone systems. As a result, these systems can be expressly prohibited by law or, to take another extreme, be subject to no specific rules at all.

Alternative payment systems operate within dedicated user groups (e.g., virtual communities[159] or users of a particular electronic protocol) and utilize alternative currency units instead of official state currency for settlement purposes.[160] Payment systems established by

154. KOKKOLA, *supra* note 70, at 61.

155. KOKKOLA, *supra* note 70, at 62.

156. A recent report by Santander InnoVentures, Oliver Wyman, and Anthemis Group projects the pertinent savings from the application of distributed ledger technology in the region of US$15-20 billion per annum by 2022. *See* MARIANO BELINKY, EMMET RENNICK & ANDREW VEITCH, THE FINTECH 2.0 PAPER: REBOOTING FINANCIAL SERVICES 15 (2015).

157. *See*, *e.g.*, Chris Skinner, *Applying Blockchain to Clearing and Settlement*, BANKNXT (Aug. 16, 2016), https://banknxt.com/57632/blockchain-clearing-and-settlement/ [https://perma.cc/7PLN-Z3WR].

158. *See supra* note 81 and accompanying text.

159. A virtual community can be defined as 'a place within cyberspace where individuals interact and follow mutual interests or goals'. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 11.

160. There is no uniform classification of these units. *See infra* Section V.A.

such user groups often resemble their "formal" counterparts: they can be subject to the same kinds of risks,[161] and the level of acceptance of settlement units used in these systems depends on the level of public trust attributable to them by end-users. The special characteristics of alternative currency units utilized as a medium of exchange, however, make alternative payment systems quite distinct. First, since the settlement unit is the alternative currency itself (as opposed to official currency),[162] finality and irrevocability of payments cannot be guaranteed as a matter of law. Second, while some methods of achieving end users' demand for virtual currencies can be quite similar to those applied in a formal payment system (e.g., the developers of a computer game may require all payments among players to be performed in a single, specially created virtual currency),[163] others focus on the perceived advantages of such currencies, such as anonymity or pseudonymity (compared with bank accounts), settlement speed (compared with foreign exchange retail banking transactions), or lack of regulatory oversight.[164]

A. Taxonomy of Alternative Currencies

In this Article, the words "alternative currency" are used with a broad meaning, to cover the whole array of currencies operating outside the formal payment system. This is in contrast to the existing literature, which largely focuses on specific currencies or even currency groups, but does not provide a comprehensive picture. For example, in recent years, a lot of attention has been dedicated to the terms "virtual

161. EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 40.

162. *See supra* Section IV.A.

163. Compare the official state currency authorized by law to be used for the settlement of debts. This said, even computer game economies find their way into the formal payment system, albeit often in violation of terms of use, which prohibit transactions with "real" money. *See*, *e.g.*, Blizzard Entertainment, *Blizzard Termination of Service Agreement*, BLIZZARD ENT., https://www.blizzard.com/en-sg/legal/b8a1574a-8137-44ad-acf0-11c92e90b26f/blizzard-termination-of-service-agreement [https://perma.cc/PAW3-F2BE]; s*ee also infra* note 182.

164. *See*, *e.g.*, EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 18-19. Some of these perceived advantages have already caused serious concern among regulators across the globe. *See* EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 30-32.

currency"[165] and "digital currency"[166] (and their classification). Both terms are rather unfortunate, however. The former accurately reflects the fact that many alternative currencies operate within virtual communities (like computer games or social networks) but does not sit well with the fact that units like Bitcoin are commonly used in real-life economy transactions. The latter term, digital currency, addresses this inconsistency but creates another: currency used in "formal" payment systems is also predominantly digital[167] and exists in the form of account records, so the distinction appears somewhat contrived. Needless to say, occasionally one term is replaced with the other, with the only increase being in terms of obfuscation.[168] In other cases, one of the terms is simply not used to avoid confusion with the other.[169] In addition, existing classifications are frequently incomplete, as they do not include so-called "complementary" (or "community") currencies or focus on non-physical currencies, particularly in the light of the recent explosion of so-called "cryptocurrencies" (a misnomer discussed in Section V.A.4 below).[170] Any taxonomy excluding these latter categories is incomplete.

There are many ways to classify alternative currencies. This Article will consider three key universal criteria in Sections V.A.1 to V.A.3 and will then discuss the special characteristics of the new group of alternative currencies inspired by Bitcoin (in Section V.A.4).[171]

1. Physical or Digital?

The vast majority of alternative currency types are digital. However, exceptions still exist. First, in a number of regions across the

165. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8; EUROPEAN CENTRAL BANK 2015, *supra* note 12. European Banking Authority, *EBA Opinion on "Virtual Currencies*," EBA (July 4, 2014), https://www.eba.europa.eu/documents/10180/657547/EBA-Op-2014-08+Opinion+on+Virtual+Currencies.pdf [https://perma.cc/T8FJ-LT2G]; INTERNATIONAL MONETARY FUND, VIRTUAL CURRENCIES AND BEYOND: INITIAL CONSIDERATIONS (2016); US Department of Treasury Financial Crimes Enforcement Network, *supra* note 15.

166. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 18, at 1; Barrdear & Kumhof, *supra* note 6; Max Raskin & David Yermack, *Digital Currencies, Decentralized Ledgers, and the Future of Central Banking* (National Bureau of Economic Research Working Paper No. 22238, 2016), https://ccl.yale.edu/sites/default/files/files/Raskin_Max_and_Yermack_David_The%20Future%20of%20Central%20Banking.pdf [https://perma.cc/ZR7E-Q6QJ].

167. *See* Desjardins, *supra* note 7.

168. *See* BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 18, at 1, n.2.

169. FINANCIAL ACTION TASK FORCE, *supra* note 16, at 4.

170. *See infra* Section V.A.4.

171. *See infra* Sections V.A.1-4.

globe, tribes and other local groups continue to rely on archaic currencies like seashells.[172] Second, physical alternative currencies in the form of paper notes are used today by local communities in major countries like the United Kingdom.[173] Third, there is nothing precluding a group of people from using virtually any medium as a currency in transactions among them.

Physical community currencies, like the Bristol Pound,[174] are particularly interesting, since they operate in countries with well-established and highly sophisticated payment infrastructures. Furthermore, there are attempts to integrate these currencies into the existing payment system, at least at a local level (e.g., by ensuring their exchangeability into official currency[175] or allowing payment of local taxes using community currency).[176]

2. Convertible or Non-convertible?

"Virtual" or "digital" currencies[177] are often classified on the basis of the convertibility criterion.[178] The same approach can be applied to all alternative currencies. Thus, in terms of convertibility into

172. For example, this is the case in the Solomon Islands, where strings of polished seashells are accepted by merchants. *See* Pei-yi Guo, *From Currency to Agency: Shell Money in Contemporary Langalanga, Solomon Islands*, ACADEMIA, https://www.academia.edu/1613812/From_Currency_to_Agency_Shell_Money_in_Contemporary_Langalanga_Solomon_Islands [https://perma.cc/9SHE-A2FZ]. For a more recent description, see Nick Sas, *These Pacific Islanders Are Betting on a Seashell Currency Boom*, VICE (Jan. 11 2018), https://www.vice.com/en_au/article/paqmx7/these-pacific-islanders-are-betting-on-a-shell-money-boom [https://perma.cc/75DH-WT4Y].

173. *See infra* note 174.

174. There are a number of similar projects. For examples of projects in the UK, see TOTNES POUND, https://www.totnespound.org/ [https://perma.cc/NZZ2-N52S]; LEWES POUND, https://www.thelewespound.org/ [https://perma.cc/9RGH-FD6P]; EXETER POUND, http://www.exeterpound.org.uk/ [https://perma.cc/2KA8-HD5Q]; CARDIFF POUND, http://cardiffpound.co.uk/ [https://perma.cc/77AG-2C7X]; BRIXTON POUND, http://brixtonpound.org/ [https://perma.cc/FNU6-BWZ8].

175. *See infra* note 190-92 and accompanying text.

176. For example, the council tax in Bristol can be paid in Bristol Pounds. *See* https://bristolpound.org/pay-council-tax-business-rates-bristol-pounds/ [https://perma.cc/78Y4-JHZV].

177. *See supra* notes 165-66.

178. The European Central Bank distinguishes three categories: (i) "closed" virtual currency schemes, (ii) virtual currencies with "bidirectional flow," and also (iii) virtual currencies with "unidirectional" flow, which combine certain features of the first two categories. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 13-14. For an alternative approach, which does not recognize such an "intermediate" category, see FINANCIAL ACTION TASK FORCE, *supra* note 16, at 4; FINANCIAL ACTION TASK FORCE, VIRTUAL CURRENCIES: GUIDANCE FOR A RISK-BASED APPROACH 26-27 (2015).

currencies used in formal payment systems and vice versa, each alternative currency can be allocated to one of three groups: (i) non-convertible (or closed), (ii) semi-convertible and (iii) fully convertible (or open). At first glance, most alternative currencies operating in offline – and many online – computer games should belong to the first category: these units are generally obtained as a reward for performing relevant tasks (e.g., defeating foes, completing quests) and can only be spent on virtual items and benefits. The second category is interesting, as it encompasses a variety of alternative currencies that can be obtained with official currency or SOC but cannot be freely exchanged vice versa (at least in accordance with the rules of the alternative payment system).[179] Bitcoin and other similar currencies (discussed in Section V.A.4)[180] belong to the third category: they are usually created specifically as alternatives to legally recognized forms of money and can be converted into official currency or SOC.[181] The use of convertibility as a classification criterion is nevertheless problematic, since there can be different approaches to determining whether an alternative currency is truly convertible.

First, if the actual capacity to be exchanged into official currency or SOC is sufficient, then such classification will turn on the factual circumstances, namely the existence or absence of a precedent whereby a certain alternative currency has ever been converted. But since almost anything of value can be exchanged into official currency or SOC, this would mean that even computer game currency could be deemed convertible. A good example is the existence of so-called "black markets" of in-game currencies allowing purchases of virtual currency balances for official currency.[182] Furthermore, this approach lacks certainty, since not all conversions of alternative currency are recorded or able to be easily tracked.[183]

Second, only convertibility provided directly by the issuer could be recognized. This approach makes classification easier but has problems of its own. An obvious difficulty is with alternative

179. These include, for example, PlayStation Store credit, Steam Wallet balance, and various loyalty programs.

180. *See* discussion *infra* Section V.A.4.

181. For the rationale behind the issuance of Bitcoin, see Nakamoto, *supra* note 19.

182. *See*, *e.g.*, G2G.COM, https://www.g2g.com/ [https://perma.cc/W5VJ-SVYB]. The website matches buyers and sellers of various computer game currencies.

183. This makes the "non-convertible" status rather tricky; it disappears the moment any conversion takes place.

currencies that have no single issuer,[184] which would have to be characterized as non-convertible despite the growth of exchanges specifically created to allow conversions of such currencies.[185] In addition, it is unclear how to characterize currencies for which the issuer has not established a direct conversion into official currency or SOC, but nevertheless permits it indirectly.[186]

Third, convertibility could be based on existing legal restrictions capable of making exchange of alternative currency not only unenforceable, but also unlawful. A recent example can be found in the draft Russian Federal Law "On Digital Financial Assets," which permits exchange of "digital financial assets" (a general term that includes "cryptocurrencies" and "tokens") only to the extent that they are expressly permitted by the law.[187]

Semi-convertible (also known as unidirectional) alternative currencies are a good illustration of the diversity of the broad category of alternative currencies. For the former, limited convertibility is not always a flaw, but can be an important advantage.[188] This is true of alternative currencies intended to lock in the issuer's clients (e.g., as

184. *See infra* Section V.A.3.

185. *See*, *e.g.*, BITSTAMP, https://www.bitstamp.net/ (last visited Mar. 17, 2019); BITFINEX, https://www.bitfinex.com/ [https://perma.cc/7MD9-5AMA]; COINBASE https://www.coinbase.com/charts (last visited Mar. 17, 2019).

186. Over time, many computer games with online functionality (e.g., massively multiplayer online games) and mobile platforms (iOS, Android, and Windows Mobile) have developed dedicated conversion mechanisms, allowing players to purchase in-game money with official currency or SOC. A recent example is the introduction of the World of Warcraft Token—an alternative in-game currency which can be purchased by players using the main in-game currency (World of Warcraft gold, silver, or copper). The token is convertible into yet another alternative currency (Blizzard Balance), which can be used outside the game to purchase various digital goods and services provided by the developer. Blizzard Balance uses official currency as the unit of account and can be obtained via official currency but is not itself convertible into any official currency and is not accepted by third parties. This makes it a semi-convertible alternative currency. *See WoW Token*, BLIZZARD SHOP, https://us.shop.battle.net/en-us/product/world-of-warcraft-token [https://perma.cc/LAY7-5TST]. For information on restrictions imposed on the use of WoW tokens, see *Using a WoW Token*, BLIZZARD, https://us.battle.net/support/en/article/31218 [https://perma.cc/GT95-37QE].

187. *See* Draft Federal Law of the Russian Federation "On Digital Financial Assets," § 4 (May 22, 2018), http://sozd.parliament.gov.ru/bill/419059-7 [https://perma.cc/RQ58-L4R6]. Conversion of "tokens" into Rubles and foreign official currency is allowed only via special domestic exchanges, whereas conversion of other kinds of "digital financial assets" is subject to bespoke rules to be prepared by the Bank of Russia following a consultation with the Government.

188. This is in contrast to SOC, for which close association with official currency is paramount. *See supra* Section IV.B.2.

part of loyalty programs) or to prevent official currency from escaping a certain area or region (e.g., community currencies).

In some cases, different forms of the same alternative currency may enjoy different levels of convertibility. A good example would be an existing community currency—the paper version of the Bristol Pound—that was mentioned in the previous section. According to the relevant terms and conditions, convertibility of the Bristol Pound physical notes depends on the status of the client. Non-business clients are unable to lawfully exchange Bristol Pound notes into pound sterling ("GBP") (or any other currency) and remain effectively locked in after purchasing the physical units (at one to one ratio against the GBP).[189] Businesses, on the other hand, can do a two-step conversion.[190] First, the paper notes are exchanged for an electronic balance with the Bristol Credit Union.[191] Second, this electronic balance is converted into GBP.[192]

Limited convertibility of paper Bristol Pounds aims to ensure that currency obtained in the region stays in the region (as it is only accepted by participants of the scheme). The restriction is artificially created and could hinder market efficiency, but economic aspects of community currencies are outside the scope of this Article.[193] What matters is that this limitation is part of the design and is seen as its strength, rather than a weakness.

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189. *See* Bristol Pound, *Terms and Conditions for your Bristol Pound Account*, 5.9, https://bristolpound.org/wp-content/uploads/Bristol_Pound_Individual_Terms__Conditions.pdf [https://perma.cc/DH3B-PYFN] [hereinafter Bristol Pound, *Terms and Conditions*]; Bristol Pound, *Terms and Conditions for Paper Bristol Pounds, second edition 2015*, 5, https://bristolpound.org/wp-content/uploads/PaperBristolPoundsTerms_Conditions2015.pdf [https://perma.cc/K3LS-YN46] [hereinafter Bristol Pound, *Second Edition*].

190. The need to allow businesses to convert Bristol Pound balances is understandable – after all, taxes still need to be paid in official currency. The only exception is the Bristol council tax, which is payable in Bristol Pounds as well. See Bristol Pound, *Did you know you can pay your council tax and business rates in Bristol Pounds* (Mar. 16 2016), https://bristolpound.org/pay-council-tax-business-rates-bristol-pounds/ [https://perma.cc/YJ7V-8LYR].

191. *See* Bristol Pound, *Scheme Rules for Individual Members and Trader Members*, 11-12, https://bristolpound.org/wp-content/uploads/Bristol-Pound-Scheme-Rules-2018.pdf [https://perma.cc/2VNQ-TH5V].

192. *Id*.

193. Community currencies frequently implement other artificial restrictions, such as expiry date on physical notes, to encourage spending. For example, the second edition of paper Bristol Pounds is valid until 30 September 2018. *See* Bristol Pound, *Second Edition*, *supra* note 189, at 8.

Interestingly, unlike physical Bristol Pounds, electronic accounts denominated in Bristol Pounds are freely exchangeable into GBP. This raises an important question of separating alternative currencies from SOC. Indeed, if each facility allows conversion into official currency, then where is the fine line between them? This matter is discussed in some detail in Section V.B.2 below.[194]

3. Centralized or Decentralized?

In terms of issuance and administration method, alternative currencies can be centralized (i.e., have a single center of issuance and administration) or be decentralized (i.e., not have a central authority and control mechanism).[195] Many digital alternative currencies followed the example of Bitcoin (which was the first truly decentralized alternative currency) and do not exist as records kept with a single trusted party (such as the issuer). They use other methods to offer greater *transparency* and *resilience*, such as a publicly accessible register of transactions shared among users, and blockchain and cryptographic hashing to prevent manipulation of transaction records.[196]

At the same time, transparency and resilience alone are not enough. In a truly decentralized system, end-users who adopt the relevant currency may wish to have the collective ability to tweak its parameters to improve certain features, correct mistakes or modernize the currency to adjust to the changing technological, legal or economic realities. Elimination of a trusted intermediary creates the need for a decision-making layer and end-user democracy. In the history of Bitcoin (discussed in the upcoming section),[197] the corresponding changes are represented by a "proof-of-work"[198] consensus algorithm

194. *See infra* Section V.B.2.

195. *See* EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 9; FINANCIAL ACTION TASK FORCE, *supra* note 16, at 5.

196. *How do Bitcoin Transactions Work?*, COINDESK (Jan. 28, 2019), https://www.coindesk.com/information/how-do-bitcoin-transactions-work [https://perma.cc/P9MP-977G].

197 *See infra* Section V.A.4.

198. In a proof-of-work algorithm, different user-operated nodes try to solve a resource-intensive mathematical problem. "The first node to solve the problem is compensated, while all others use the solution provided by the first node to verify that the problem has been correctly solved." Dirk A. Zetzsche, Ross P. Buckley & Douglas W. Arner, *The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain*, 2018 U. ILL. L. REV. 1361, 1372 n.44 (2018).

and so-called "forks" in the development of the currency protocol, in particular "hard forks" that essentially split the user base.[199]

4. The Bitcoin Legacy

The launch of Bitcoin[200] in 2009 gave rise to the subsequent development of a whole range of new digital alternative currencies (now commonly referred to as "cryptocurrencies"), the number of which has skyrocketed. According to some calculations, in 2015 their overall number reached 500,[201] and at the time of writing, in mid-2018, it has more than tripled, to over 1,700. These figures have been increasing steadily and have become significantly outdated by the time this Article is published, exceeding 2,100.[202]

The word used to collectively describe Bitcoin and its spin-offs—"cryptocurrency"—is extremely confusing. After all, cryptography is an implicit feature not only of most digital alternative currencies, but also bank accounts and SOC. This makes the term "cryptocurrency" essentially meaningless in the context of this Article. Unfortunately, alternative names (like "algorithmic digital currencies") are not that much better.[203] The reason is the same: the terms do not capture the entire specter of digital alternative currencies that were brought into existence following Bitcoin's lead.

Let us consider Bitcoin alone for now. From a technical perspective, this digital currency is a combination of various technologies, including: (i) blockchain[204] (based on hashing transaction data)[205] (ii) use of distributed ledger technology, whereby the transaction database is shared among all users, (iii) a special consensus algorithm called "proof of work,"[206] and (iv) very high but flexible

199. Walch, *supra* note 11, at 738-39.

200. Bitcoin was the first cryptocurrency and the first decentralized convertible virtual currency. *See* FINANCIAL ACTION TASK FORCE, *supra* note 16, at 5-6. For additional detail, see EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 22; Nakamoto, *supra* note 19.

201. EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 4.

202. *See All Cryptocurrencies*, *supra* note 1.

203. *See* Raskin & Yermack, *supra* note 166, at 1. It is unclear which algorithms are covered. If these are cryptographic algorithms, then the problem is the same as with "cryptocurrencies." If these are algorithms designed to generate new currencies, these exist even in the simplest of digital alternative currencies, making it hard to identify algorithmic currencies as a separate group.

204. *See supra* note 19 and accompanying text.

205. Bitcoin uses a hashing algorithm called SHA-256. Even a slight variation of the input data results in an entirely different hash.

206. *See* ZETZSCHE, BUCKLEY & ARNER, *supra* note 198 and accompanying text.

requirements for confirming new transactions.[207] Although many digital alternative currencies have attempted to copy the Bitcoin structure, others have chosen to alter certain features, to create a unique currency, with a different set of resulting characteristics.[208] There is simply no common denominator, and this variety makes it impractical to develop a *single* term for all the Bitcoin spin-offs.

B. Alternative Currencies: Legal Status and Regulatory Implications

1. Uncertain Legal Status of Alternative Currencies

Only certain types of alternative currencies have triggered a regulatory response. Unlike their freely convertible counterparts, alternative currencies operating (at least nominally) within closed virtual systems remain unregulated. Semi-convertible alternative currencies are becoming increasingly popular[209] in mobile and computer games and also do not seem to attract regulatory attention insofar as their use is limited to virtual communities. This is not to say virtual economies cannot have a connection to the real one, as the European Central Bank ("ECB") helpfully reminds us in its paper:

> Therefore, an illustration of a flower sent to someone else in a social network or better equipment for a character which is needed to reach higher levels in an online game are two examples of virtual goods that are sold in virtual communities. However, in our view, there should be a clear differentiation between goods that are used only in the virtual environment and those which are used in the real world (e.g. music files or electronic books).[210]

The situation with regulatory treatment of freely convertible alternative currencies is more complicated. Clear links to the real economy and entry points to the formal payment system are a cause for concern, which is reflected in various regulatory measures adopted throughout the globe. These currencies are predominantly[211] not

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207. The algorithm is adjusted to ensure that the mathematical problem that needs to be solved as part of proof of work does not become trivial as the overall computational power of the DLT network increases.

208. For example, Ripple is essentially centralized. *See* Bitmex Research, *The Ripple story*, BITMEX, (Feb. 6 2018) https://blog.bitmex.com/the-ripple-story/ [https://perma.cc/S3J9-QW7U].

209. *See supra* note 186.

210. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, n 6.

211. A notable exception is a sub-class of digital alternative currencies called "stablecoins": their value is linked to fiat money (e.g., Tether, Dai, Utility Settlement Coin) or

backed by any real assets and total supply of them is typically limited, which makes them inherently volatile, as has been demonstrated by the very significant fluctuations in Bitcoin prices.[212] High risks and low numbers of accepting merchants make their use as a store of value and unit of account problematic. By warning end-users about underlying risks[213] and restricting commercial banks from engaging in operations with digital alternative currencies, regulators safeguard the formal payment system against exogenous money supply and the resulting implications for system stability.[214]

The most popular regulatory reaction to digital alternative currencies so far has been warnings and prohibitions on their use as part of the formal payment system, as well as clarifications on their legal status.[215] In contrast, some states have gone further, attempting to subject digital alternative currencies to comprehensive domestic regulation.[216]

2. Digital Alternative Currencies and SOC

Although currencies used in computer games and Bitcoin are unlikely to be confused with SOC due to insufficient links to official currency,[217] the same is not always true for all digital alternative currencies. Classification difficulties are possible when a digital alternative currency is (i) issued and administered by a single entity (i.e., not via a distributed ledger using consensus algorithms to verify transactions, as is the case with Bitcoin) and (ii) convertible by the issuer into official currency. In this scenario, similarities with SOC would be striking. Neither enjoys the status of legal tender, and thus

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other assets (such as bullion in the case of Digix). Despite apparent advantages, convertibility of stablecoins is not guaranteed as a matter of law and is based entirely on the infrastructure created by their developers. Insufficient (or non-existent) disclosure, oversight, and enforcement mechanisms add to the underlying risks.

212. Although the price of a single Bitcoin did not exceed US$1 initially, December 2017 recorded an all-time high of nearly US$20,000. By the end of January 2018, Bitcoin fell sharply to almost US$11,000. *See Bitcoin Price*, COINDESK, https://www.coindesk.com/price/.

213. These include limited transparency, lack of continuity, high IT and network dependency, as well as anonymity/pseudonymity. *See* EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 20-23.

214. For examples of integration of digital alternative currencies in real life economy, see EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 16.

215. EUROPEAN CENTRAL BANK 2015, *supra* note 12, at 30-32.

216. *See*, *e.g.*, Draft Federal Law of the Russian Federation "On Digital Financial Assets," § 4 (May 22, 2018), http://sozd.parliament.gov.ru/bill/419059-7 [https://perma.cc/RQ58-L4R6].

217. *See supra* Section IV.B.2.

their usability depends on available infrastructure and arrangements with the other members participating in the scheme (e.g., merchants). Consequently, the underlying systemic risks are limited to the users of the relevant scheme, meaning that the impact on the real economy is directly proportional to the popularity of the relevant network among end-users.[218] In the light of these similarities, both can be seen as knock-offs of official currency. But if this is the case, why are only SOC considered part of the formal payment system?

It appears that the key distinction should lie in how the currency is sourced and supplied. Circulation of a digital currency that is issued only in *exchange* for official currency of similar value has a neutral effect on official currency and ensures seamless integration into the formal payment system. This is a feature of SOC. In contrast, digital alternative currencies that are convertible into official currency, but have no similar checks on their supply, increase the number of currency units in circulation thereby creating exogenous supply of official currency. In other words, the supply of alternative currencies is ultimately determined by developers of the corresponding technology, rather than by the amount of official currency in circulation (with which alternative currencies have no, or very limited, correlation).

Unfortunately, the nature of this distinction between SOC and digital alternative currencies has not been given sufficient weight: early attempts to differentiate between the two were based on regulatory implications instead. For example, in 2012 the ECB adopted a simplistic view that the key difference is that electronic money (a type of SOC) is regulated and is expressed in the same units of account as official currency.[219] This analysis could have remained purely theoretical if it were not for a recent revision of the EU law. Accidentally, however, the Fifth Anti-Money Laundering ("AML") Directive, that came into force on July 9, 2018,[220] has provided an excellent opportunity to examine and compare actual rules of law governing electronic money and virtual currencies (a type of official currency) within a *single* legal system. Let us now compare the relevant

218. As a result of these similarities, the two categories are sometimes used interchangeably. *See*, *e.g.*, BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 18, at 4.

219. *See* EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 16-17; EUROPEAN CENTRAL BANK 2012, *supra* note 8, at 11 & Table "A money matrix."

220. Directive 2018/843, of the European Parliament and of the Council of 30 May 2018, 2018 O.J. (L 156).

definitions in the E-Money Directive and the Fifth AML Directive. The former defines "electronic money" as follows:

> "[E]lectronic money" means electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of funds for the purpose of making payment transactions . . . , and which is accepted by a natural or legal person other than the electronic money issuer.[221]

The key elements of this definition are: (i) a store of value, (ii) electronic form, (iii) claim on the issuer, (iv) credit based on receipt of funds, and (v) acceptance by third parties. In contrast, the Fifth AML Directive clearly states that virtual currencies are a separate legal category, which "should not . . . be confused with electronic money"[222] and defines the new term as follows:

> "[V]irtual currencies" means a digital representation of value that is not issued or guaranteed by a central bank or a public authority, is not necessarily attached to a legally established currency and does not possess a legal status of currency or money, but is accepted by natural or legal persons as a means of exchange and which can be transferred, stored and traded electronically.[223]

The new term was designed to be separate, but many of its elements are similar to the "electronic money" definition. Just like in the definition of "electronic money," it refers to (i) a store (or representation) of value, (ii) electronic form, and (iii) acceptance by third parties. Just as easily a virtual currency can meet the two remaining features of "electronic money," namely issuance on receipt of funds and being a claim on the issuer (this would be the case for certain centralized digital alternative currencies). Additional elements that are unique for the definition of "virtual currencies" not add much to separate the two terms. First, electronic money does not have to be (and is almost never) issued by a central bank or a public authority. Second, it follows from the second definition that a virtual currency attached to a "legally established currency" remains a possibility.

This leaves us with only one meaningful criterion to separate the two concepts—"a legal status of currency or money"—being a test that virtual currencies are not expected to meet. Unfortunately, it is not clear what exactly gives a "legal" status to a currency. Presumably, the text

221. Directive 2009/110, 2009 O.J. (L 267), art. 2(2).
222. Directive 2018/843, 2018 O.J. (L 156), Preamble ¶ 10.
223. Directive No. 2018/843, 2018 O.J. (L 156), art. 1(2)(d).

implies a status of official currency (which is usually the currency issued by the state), as well as SOC (in EU terminology – electronic money). If this assumption is correct, the test works by making it impossible to meet the criteria of a "virtual currency" as long as all criteria of "electronic money" are met (the latter precludes characterization as virtual currency).

This highlights the residual nature of the category of "alternative currencies." In the example above, all other things being equal, classification of a currency as "electronic money" and not "virtual currency" can only result from the primacy of one category ("electronic money") over the other ("virtual currency"). This primacy is based on the idea that the former has a certain "legal" status that the latter lacks (even though the nature of this legal status is not adequately established by the law).

VI. NEXT STEPS IN THE EVOLUTION OF OFFICIAL CURRENCY

A. Implications of the Formal Payment System

As recently as fifteen years ago, the fundamentals of a two-tier payment system based on official currency issued by central banks and commercial banks appeared axiomatic. A 2003 report by the Bank for International Settlements summarized the joint position of the central banks on its Committee on Payment and Settlement Systems ("CPSS") as follows:

> The CPSS central banks share the conviction that the composite of central and commercial bank money, convertible at par, is essential to the safety and efficiency of the financial system and should remain the basis of the singleness of the currency. In other words, central banks would accept neither an outcome in which central bank money crowds out private initiative, nor an outcome in which central bank money is phased out by a market mechanism. Neither of these two outcomes is regarded as plausible in the near future.[224]

224. BANK FOR INTERNATIONAL SETTLEMENTS, *supra* note 71, at 6-7.

The future has now arrived, with the lessons (hopefully) learned from the Global Financial Crisis of 2007-2008 and renewed warnings about the shaky foundations of the current banking system.[225]

Despite all its benefits,[226] the ultimate form of settlement—central bank accounts—enjoys only limited use among non-banks, smaller financial institutions and the public: cash is reserved for minor transactions, while settlements via central bank accounts are usually performed only by the largest banks. Everywhere else, commercial banks provide the dominant form of digital official currency, which, in legal terms, remains no more than a claim against the relevant financial institution. Since a claim is only as good as the reputation and financial standing of the party promising to honor it, this monopoly is built on public trust regulators aim to reinforce (e.g., by way of deposit insurance schemes), and if for whatever reason that trust is misplaced, end-users of official currency have little choice (except hoarding cash or investing in other assets).

The unavoidable result is that end-users essentially take on credit risks vis-à-vis their banks every time, even when they do not intend to extend credit (e.g., when earning a salary).[227] For the great majority of end-users there is simply no way at present to use official currency without such credit risk. Interestingly, while there are instruments protecting banks against additional credit exposure, such as subordinated loans eligible for capital inclusion,[228] there is no extra protection for individual account holders (except deposit insurance[229]—which is inconvenient because of upper coverage limits and the resulting need to spread one's accounts across various financial institutions to circumvent this restriction). For businesses, deposit insurance is of even lesser use (or may not exist in the first place). Finally, in the case of negative interest rates, this status quo seems

225. *See* Martin Wolf, *Banking Remains Far Too Undercapitalised for Comfort*, FINANCIAL TIMES (Sept. 21 2017), https://www.ft.com/content/9dd43a1a-9d49-11e7-8cd4-932067fbf946 (last visited Mar. 17, 2019).

226. *See supra* note 78 and accompanying text.

227. Even where deposit insurance exists, the credit risks persist above statutory limits. In addition, recovery of funds following a bank collapse may take time and effort.

228. The criteria such loans must meet to qualify as capital often include restrictions on early repayment, such as the need to obtain regulator's approval. *See*, *e.g.*, Bank of Russia, Regulation No. 395-P of Dec. 28, 2012, on the methodology for Determining the Amount of Own Funds (Capital) of Credit Institutions (Basel III), § 3.1.8.

229. *See* Federal Deposit Insurance Act, 12 U.S.C. §1821 (1989); *see also* in Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 331-336, 124 Stat. 1376, 1540 (2010) (codified at 15 U.S.C. § 78o).

totally absurd: depositors are charged for taking on credit risk vis-à-vis their bank.

B. Three Ways Forward for Official Currency

In her recent speech at the Bank of England, Christine Lagarde cautiously pictured a future that may not be too distant: "If privately issued virtual currencies remain risky and unstable, citizens may even call on *central banks* to provide digital forms of legal tender."[230]

In this section we outline three possible approaches: (i) central bank accounts with general access, (ii) central bank accounts with intermediated access, and (iii) new digital forms of official currency.

1. Central Bank Accounts with Intermediated Access

The idea to provide safer options for storing value in the form of official currency is not new. Back in 1987, Nobel Laureate James Tobin suggested making available to the general public so-called "deposited currency" to minimize reliance on deposit insurance schemes: "I think the government should make available to the public a medium with the convenience of deposits and the safety of currency, essentially currency on deposit, transferable in any amount by check or other order."[231] The new type of currency, according to Tobin, could be provided by Federal Reserve Banks themselves or by commercial banks, provided that the funds so deposited are isolated from the rest of their own liabilities.[232] At the time, direct central bank accounts appeared a somewhat distant opportunity: even in the first scenario Tobin expected Federal Reserve Banks to act via "conveniently located agencies in private banks or post offices."[233]

Many of the more recent proposals similarly suggest an intermediated approach, whereby central banks act through specially authorized counterparties providing access to central bank accounts. In a 2016 research paper, Dyson and Hodgson argue in favor of "Digital Cash Accounts" held by private operators guaranteed by central

230. Christine Lagarde, *Central Banking and Fintech – A Brave New World?*, INTERNATIONAL MONETARY FUND (Sept. 28, 2017), https://www.imf.org/en/News/Articles/2017/09/28/sp092917-central-banking-and-fintech-a-brave-new-world [https://perma.cc/EF3Y-BSR3] (emphasis added).

231. James Tobin, *A Case for Preserving Regulatory Distinctions*, 30 CHALLENGE 10, 13 (1987).

232. *Id*.

233. *Id*.

banks.[234] These operators (labelled "DCA Providers") would be prohibited from lending or taking on any new risks on client funds.[235] In addition, it is expected that a multiplicity of operators would create competition and reduce the administrative burden on central banks.[236] In a similar fashion, Ketterer and Andrade envisage (as one of the possible alternatives) a model whereby private firms "would provide all the transactional and costumer [sic] services related to CBM [central bank money] accounts," while maintaining a 100% reserve for each deposit at all times.[237]

Intermediation of central bank accounts can take various forms, from new types of commercial bank accounts, to accounts with trusted intermediaries fully guaranteed by the central bank. In each case, however, users of the new currency should have direct recourse to central bank accounts.

2. Central Bank Accounts with Direct Access

Needless to say, over the past thirty years, technology has advanced way beyond Tobin's cautious expectations: "Computer capabilities should soon make it possible to withdraw conventional currency at any office or agency, and even to order payments to third parties by card or telephone."[238] With this in mind, modern commentators call for broader *direct* access to central bank accounts for the general public and non-financial institutions.[239]

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234. Ben Dyson & Graham Hodgson, *Digital Cash: Why Central Banks Should Start Issuing Electronic Money*, POSITIVE MONEY, (Jan. 2016), 2, http://positivemoney.org/wp-content/uploads/2016/01/Digital_Cash_WebPrintReady_20160113.pdf [https://perma.cc/L5NV-VKAH].

235. *Id*.

236. *Id*.

237. Juan Antonio Ketterer & Gabriela Andrade, *Digital Central Bank Money and the Unbundling of the Banking Function* (Inter-American Development Bank discussion paper No IDB-DP-449 2016), 7, https://publications.iadb.org/bitstream/handle/11319/7587/Digital-Central-Bank-Money-and-the-Unbundling-of-the-Banking-Function.pdf?sequence=1 [https://perma.cc/BJ7S-Y8C4].

238. Tobin, *supra* note 231, at 13.

239. *See*, *e.g.*, Nicholas Gruen, *Why Central Banks Should Offer Bank Accounts to Everyone*, EVONOMICS (Dec. 16 2016), http://evonomics.com/central-banks-for-everyone-nicholas-gruen/ [https://perma.cc/87X8-FK67]; George Hatjoullis, *Allow Deposit Accounts With Central Banks*, FINANCIAL TIMES (Sept. 24 2017), https://www.ft.com/content/00f796cc-9f99-11e7-8cd4-932067fbf946 [https://www.ft.com/content/00f796cc-9f99-11e7-8cd4-932067fbf946]; JP Koning, *Central Banks Deposits for You and Me*, MONEYNESS (Aug. 10 2016), http://jpkoning.blogspot.com.au/2016/08/central-banks-deposits-for-you-and-me.html [https://perma.cc/Y3AD-M95V]; Dyson & Hodgson, *supra* note 234.

As discussed previously in Section IV.A,[240] the list of persons or entities with direct access to central bank accounts is rather limited. Expansion of this list to cover a wider user base is fraught with three major difficulties: (i) it requires a greatly increased amount of computing power and cybersecurity; (ii) more significantly, it requires a massive amount of customer-facing infrastructure that central banks today lack and are not configured to ever provide; and (iii) more systemically, central bank accounts with direct access would compete with other formal currency types and would likely undermine the position of other currency operators (such as commercial banks) with massively destabilizing consequences for the broader economy.

3. New Forms of Official Currency

Whereas the first two options are based on central bank accounts and, consequently, can be seen as steps in the evolution of existing currency types, the third option represents a major change – the creation of a new type of official currency. This new currency is issued by the state, but is not tied to central bank accounts and does not rely on intermediaries. The first example of such official currency is the Petro launched in Venezuela in February 2018.[241]

At first glance, the Petro can be easily confused with alternative currencies. First, it is issued in the form of a public offering (commonly known as an "ICO").[242] Second, its terms and technical characteristics are listed in a "white paper"—the standard practice for issuing new digital alternative currencies.[243] Third, it utilizes blockchain[244] for secure recordkeeping and disintermediation. Despite these similarities, the new currency cannot be characterized as an alternative currency due to its distinct legal status.[245] The official white paper declares:

> The Bolivarian Republic of Venezuela guarantees that it will *accept* Petro's as a form of payment of national *taxes*, *fees*,

240. *See supra* Section IV.A.

241. Kevin Helms, *Venezuela Makes Petro Crypto a National Currency, Publishes New Whitepaper*, BITCOIN (Oct. 4, 2018), https://news.bitcoin.com/venezuela-petro-new-whitepaper/ [https://perma.cc/6R3M-V9H9].

242. For more detail on the operation of ICOs, see Dirk A. Zetzsche, Ross P. Buckley, Douglas W. Arner & Linus Föhr, *The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators*, 63 HARV. INT'L L. J. (forthcoming 2019), available at https://ssrn.com/abstract=3072298 (last visited Mar. 17, 2019).

243. *Id*. at 10-11.

244. *See supra* note 19 and accompanying text.

245. Assuming the corresponding changes are adequately reflected in the law.

> *contributions* and *public services*, taking as a reference the price of the barrel of the Venezuelan basket of the previous day with a percentage discount.[246]

The emphasis here is not on the connection with oil prices – after all, there are a number of alternative currencies pegged to various assets, and this is simply a price-setting mechanism.[247] Instead, the focus should be on the mechanisms used by the state to promote circulation of the new currency as a medium of exchange. A state's acceptance of a currency in payments to itself is a defining feature of official currencies.[248] So upon the taxonomy proposed in this Article, the Petro is a strange creature, it is an official currency offered not by issuance by a national central bank in the usual way, but in an ICO, so that presumably the supply of Petros is limited until another ICO issues more into the market.

The Petro is likely to pave the way to new state-backed digital official currencies, and one can already see the first signs of regulatory changes reflecting the emergence of such new currencies. For example, the new definitions introduced in the Fifth AML Directive discussed in Section V.B.2 above[249] make it clear that an alternative digital currency "issued or guaranteed by a central bank or a public authority"[250] is not considered a virtual currency. What is it then if not a new sovereign digital official currency?

C. New Opportunities and New Challenges

Evolutionary features of the new approaches to official currencies stem from their prospective benefits. First, all three approaches listed in Sections VI.B.1-VI.B.3[251] offer an opportunity to reduce the risks of using official currency, either by completely eliminating any intermediaries, or by making intermediation riskless (in the case of intermediated central bank accounts discussed in Section VI.B.1 above).[252] Second, in either case the resulting medium of exchange

246. GOBIERNO BOLIVARIANO DE VENEZUELA, PETRO WHITE PAPER FINANCIAL PROPOSAL 14 (2018), https://d158ejkbvy3pxw.cloudfront.net/wp-poricontent/uploads/2018/01/Whitepaper_Petro_en.pdf [https://perma.cc/J6S9-E4LA] (emphasis added).

247. *See supra* note 211 and accompanying text.

248. *See* Part III above; *supra* note 190 and accompanying text.

249. *See supra* note 223 and accompanying text; *supra* Section V.B.2.

250. *See supra* text accompanying note 223.

251. *See supra* Sections VI.B.1-3.

252. *See supra* Section VI.B.1.

enjoys the status of official currency – and consequently increases the variety of payment instruments available to end-users. Third, the new instruments are likely to implement some of the useful features of alternative currencies. For example, the Petro uses blockchain technology as an instrument for arranging transaction data into tamper-proof chronologically-arranged data units – in hopes that algorithm-based transaction recording will promote end-user trust in the new currency.[253] Blockchain's enhanced record-keeping functionality can be used to greatly enhance states' capability to monitor the flow of funds in the economy and resolve other technical problems.[254] It should be noted, however, that these new technologies are likely to undergo a number of transformations in the hands of the state before implementation. Thus, in contrast to Bitcoin, which first implemented blockchain as part of a public currency with a decentralized governance system accessible by anyone with a computer, the "sovereign blockchain" is likely to be built in a closed, private system controlled by the state and with a strong governance layer provided by the state that sits atop the blockchain and with power to amend it.[255] Fourth, increased circulation of new state-backed digital official currencies would reduce circulation of cash and reduce the costs of replacing deteriorating banknotes.

Despite the above opportunities, challenges will be many. First, integration of a new currency having the benefit of state backing may jeopardize the utility of bank accounts and SOC. States will have to make important policy decisions to maintain a healthy balance within the payment system: uncontrolled expansion of new state-backed official currencies may lead to instant bank runs. One should note, however, that regulators and legislators have a wide range of instruments to address this potential problem: from purely economic (such as negative interest rates for central bank accounts to discourage mass withdrawals from commercial bank deposits) to administrative (such as limitations on the amount of new currency owned by each person or increasing the coverage limits of deposit insurance). Second, the recent revisions to the Fifth AML Directive, which provides for

253. PETRO, *supra* note 246, at 8 & 12.

254. One such problem is controlling the prohibition of lending SOC balances. *See supra* Section IV.B.

255. This is true in the case of the Fedcoin proposal. *See* Koning, *supra* note 6, at 23.

additional AML checks for virtual currencies,[256] indicate that states are unlikely to permit anonymous circulation of new units of digital currency. As a result, additional identification and know-your-customer mechanisms will have to be implemented, at additional costs. Third, benefits of the new official currencies for end-users, particularly individuals, may be questionable. On the one hand, those who prefer anonymized transactions are unlikely to appreciate the complete visibility of payment transactions monitored by the state. On the other hand, governments may offer tangible benefits to support the new projects, such as simplified conversion of new digital official currencies into official currency of other states based on arrangements with other states implementing similar initiatives.[257] Fourth, legal systems will need to be adjusted to formalize the legal status of the relevant currencies as a medium of exchange accepted as official currency.[258]

However, one of the biggest possible challenges stems from the herding effect that may result from the adoption of a disintermediated state-backed official currency by a major economy, like the United States. The utility of an official medium of exchange digitally available to end-users without any intermediaries is hard to overestimate – such a currency could quickly become a dominant medium of exchange in international transactions, without meaningful ways for other states to regulate it, since the underlying technology easily penetrates national boundaries. One possible response for other states in this scenario could be the development of their own competing sovereign digital currencies and their promotion for internal use. This could explain, at least in part, why so many national regulators have expressed interest in devising a new sovereign currency.[259] Few nations appear keen to

256. *See* Directive 2018/843 (amending Directives (EU) 2015/849, 2009/138/EC, and 2013/36/EU), 2018 O.J. (L 156), art. 1(1)(c).

257. According to the World Bank, international transfer costs remain significant. *See Remittance Prices Worldwide*, THE WORLD BANK (Dec. 2015), https://remittanceprices.worldbank.org/sites/default/files/rpw_report_december_2015.pdf [https://perma.cc/L7R6-Z6K5].

258. This list is not meant to be exhaustive and merely outlines some of the immediate concerns identified by the Authors.

259. For an example in Canada, see Walter Engert & Ben S.C. Fung, *Central Bank Digital Currency: Motivations and Implications* (Bank of Canada Staff Discussion Paper 2017-16, 2017), https://www.bankofcanada.ca/wp-content/uploads/2017/11/sdp2017-16.pdf [https://perma.cc/JZ27-7BLV]. For China, see Will Knight, *China's Central Bank has begun Cautiously Testing a Digital Currency*, MIT TECH. REV. (June 23, 2017), https://www.technologyreview.com/s/608088/chinas-central-bank-has-begun-cautiously-

take the leap into the unknown involved in issuing a sovereign digital currency. However, many nations recognize that should a credible major country issue a sovereign digital currency, it may offer considerable advantages over regular currency in the first-mentioned nation's jurisdiction, and so the nation could rapidly face the loss of both monetary sovereignty and of the data associated with the use of the sovereign digital currency which will be collected by the issuing sovereign abroad, not the nation within which it is being used. Only time will tell the answer, but for now one question remains: which country will be the first to throw down the gauntlet in the sovereign digital currency battle?[260]

VII. CONCLUSION

The currency taxonomy proposed in this Article, which is based on separating formal and alternative payment systems, offers two main advantages: consistency and flexibility. The focus on just one function of money (medium of exchange) ensures that elements of taxonomy are comparable and eliminates characterization issues (such as whether a state's national currency is not stable enough to perform the store of value function necessary for classification as "money"). Flexibility stems from the functional approach, which makes it possible to flawlessly integrate new state-backed digital currencies, which are

testing-a-digital-currency/ [https://perma.cc/ERB2-EG9L]. For India, see Eugenia Kovalovia, *India wants to issue Bitcion-like Cryptocurrency backed by Central Bank*, COINSPEAKER (Sept. 18, 2017), https://www.coinspeaker.com/2017/09/18/india-wants-issue-bitcoin-like-cryptocurrency-backed-central-bank/ [https://perma.cc/4653-DSRQ]. For Israel, see Omri Milman & Amarelle Wenkert, *Israel considers issuing an official state currency*, CTECH (Dec. 24, 2017), https://www.calcalistech.com/ctech/articles/0,7340,L-3728018,00.html [https://perma.cc/UX34-E76K]. For Russia, see Arseniy Sheltsin, *Exclusive: the cryptor will be released in mid-2019*, HI-TECH (Jan. 15, 2018), https://hi-tech.mail.ru/news/ehksklyuziv-kriptorubl-budet-vypushchen-v-seredine-2019-goda/?frommail=1#a01 [https://perma.cc/6JFN-9G4Q]. For Singapore, see SOPNENDU MOHANTY & NG NAM SIN, PROJECT UBIN: SGD ON DISTRIBUTED LEDGER (2017). For Sweden, see Sveriges Riksbank, *E*-krona, RIKSBANK (May. 05, 2018), https://www.riksbank.se/en-gb/financial-stability/payments/e-krona/ [https://perma.cc/BV89-XY6P]. For the UK, see Victoria Cleland, *Digital future for sterling: assessing the implications*, BANK OF ENGLAND (July 05, 2017), https://www.bankofengland.co.uk/-/media/boe/files/article/2017/digital-future-for-sterling-assessing-the-implications-article-by-victoria-cleland.pdf?la=en&hash=8036AC7641A4E1ADC0227CDA7DC3B00F04D81E88 [https://perma.cc/6JPM-4JRY].

260. Venezuela's example is not indicative due to the current state of its economy and the US sanctions. *See* Patrick Gillespie, *Venezuela tries a cryptocurrency to solve its economic crisis*, CNN MONEY, (Feb. 20, 2018), https://money.cnn.com/2018/02/20/news/economy/venezuela-petro/index.html [https://perma.cc/GES3-2MPH].

likely to have a major impact on how payment systems operate – either by allowing broader access to central bank accounts (whether directly or indirectly), or by implementing entirely new, bespoke media of exchange.

Our analysis of the formal payment system shows that payment instruments that were designed to be tightly connected to official currency should be classified as part of the formal payment system. Although they possess sufficient distinguishing features not to be assimilated with official currencies, their association with the latter (including the neutral effect on the supply of official currency) justify their classification as surrogates.

The taxonomy in this Article highlights important classification problems. First, in some situations (e.g., when an alternative currency has a single issuer and is pegged to official currency), SOCs and alternative currencies may be so similar functionally, that any difference in classification has to be based on regulatory treatment alone. Second, the use of convertibility as a classification criterion for alternative currencies is fraught with practical difficulties, since, even where conversion may be officially prohibited, it is frequently arranged by other, indirect, means – provided there is sufficient demand.

This Article suggests three different ways forward for the evolution of official currencies. Major economies are very highly unlikely to structure their own state-backed digital currencies along the lines of Venezuela's newly issued sovereign digital currency (the Petro). However, the launch of the Petro has heralded the entry of governments onto the digital currency stage in a process that will most likely continue so that digital alternative currencies like Bitcoin are going to face increased competition. Furthermore, we explain that the launch of additional state-backed digital currencies – particularly by major economies – is likely to have a strong flow-on effect, resulting in the proliferation of similar currencies across the globe. This future is very real and may be very near.