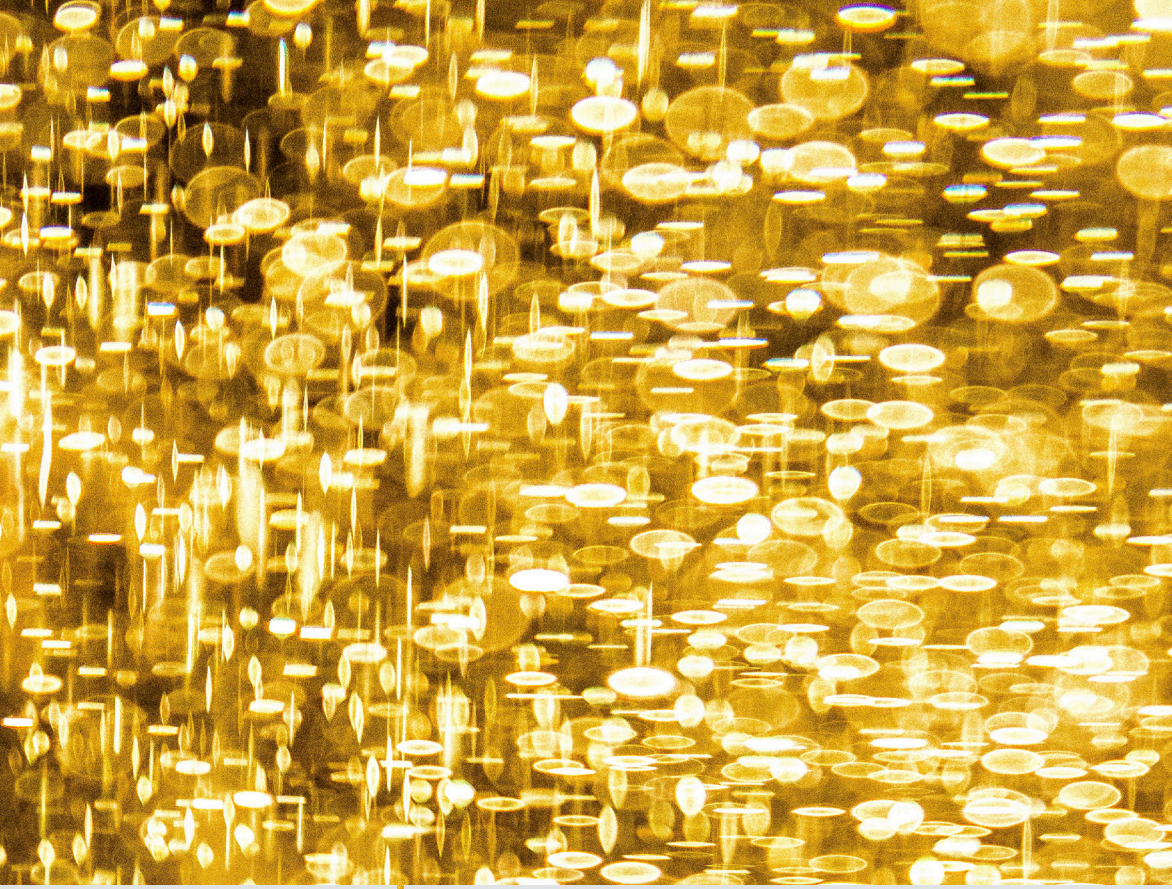

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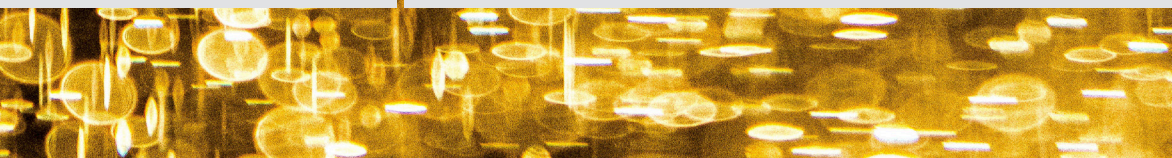

Digital Money – Taxonomy and Regulatory Approaches

Corinne Zellweger-Gutknecht/Rolf H. Weber*

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* Corinne Zellweger-Gutknecht, Professor of Private Law and Economic Law, University of Basel; Rolf H. Weber, Professor of Business Law, University of Zurich, and practicing Attorney-at-Law in Zurich. The authors would like to thank Dipl.-Kfm. univ., MLaw Rainer Baisch, University of Zurich, stud. iur. Simon Bader, and MLaw Fabia Stöcklin, both University of Basel, for their valuable assistance in the literature research and formal preparation of the paper.

A. Introduction

Digital money is not a new phenomenon. It has existed at least since the commercial banks—in which public deposits are held—migrated their accounting to an electronic format. The same may be said to the reserves issued by the central banks, which are used as transmission media for monetary policy impulses and settlement instruments at the wholesale level. Over the last decade, however, technological developments have opened up new possibilities for the representation of digital assets.

Previously, a digital record's trustworthiness solely depended on the institution that created the record. Accordingly, a dense network of prudential regulations has emerged to strengthen this institutional trustworthiness. By contrast, the so-called distributed ledger technology now makes it possible to represent assets without such an institution in a form that is resistant to double-spending and other manipulation and thus provides its owner with a position that legally comes ever closer to that of proprietary or other absolute rights (i.e., rights with effect *erga omnes*) such as, in particular, ownership.[1]

[1] See, with further references, Zellweger-Gutknecht Corinne, Developing the right regulatory regime for cryptocurrencies and other value data, in: Fox David/Green Sarah (eds.), Private and Public Law Implications of Cryptocurrencies, Oxford 2019, 57 et seq., 85 et seq. (cit. Zellweger-Gutknecht, value data).

Some assets represented by these new technologies belong to the monetary assets category. This article aims to clarify and amend the existing taxonomy and shed light on the main regulatory challenges associated with digital money. Thereby, the general and structural elements of digital money are emphasized, while specific questions are not explored in detail.

In the first part, we will address the current and potential future types of state money on the one hand (B.II) and private money on the other (B.III). This will be followed by a classification of monetary assets at large (B.IV). To this end, we outline the essential functions and properties of money and contrast money with other monetary assets — in particular, means of payments, payment instruments, and near-money assets. We will then make a technical digression (B.V) to briefly assess what components are needed to represent monetary value before examining the methods used to represent monetary value. In particular, we will distinguish between traditional digital forms and more recent crypto-based forms. This section will close with an interim conclusion (B.VI).

The second section will discuss the regulatory aspects of privately issued digital money. We analyse the notion of cryptocurrencies and their manifold types as well as the terminology used in the various jurisdictions (C.I). We then address the approaches used to regulate cryptocurrencies, with a particular focus on the potential regulatory categories chosen by different countries (C.II), and stablecoins as a special form of cryptocurrency. Additional issues of practical relevance include the issuance and trading of cryptocurrencies as well as the custody and safekeeping. Legal tender status also requires thorough consideration in the context of cryptocurrencies (C.III.1). Specific legal challenges arise with respect to operational and compliance issues (C.III.2), consumer protection (C.III.3), and, above all, the KYC/AML risks to which cryptocurrencies are significantly exposed (C.III.4).

The article concludes with forward-looking final considerations which identify possible developments that might influence the monetary order in years to come (D).

B. A taxonomy of money and other monetary assets

I. Existing taxonomies and our approach

The taxonomy of money presented here in some respects follows that developed by Bech and Garratt and later slightly refined by the Bank for International Settlements (BIS).[2] Both publications distinguish between different types of money depending on four criteria: issuer, access, form, and (ultimately) trackability.

We slightly differ with regard to the first criterion, the issuer, as we do not draw the line between central bank-issued and other money but rather distinguish between state and private money, with the term "state" including money issued by any state agency. State monies today frequently have one aspect in common: they are insolvency risk-free, liquidity risk-free, and, ideally, price risk-free. The risk-free status is attributable to the fact that state money (whether traditional cash and reserves or new forms of central bank digital currency discussed below[3]) today is pure fiat money and is thus *never* a debt claim, because redeemability against the issuer's assets other than (again) state money has long since been suspended or wholly abandoned.[4] Liquidity risk is largely absent because the state's monetary sovereignty includes the competence to act as a lender of last resort or to establish one. It likewise includes the competence to implement monetary policy, thus contributing to maintaining price stability (purchasing power and exchange rates). This largely exempts state money issuers from being subject to prudential financial market regulation.[5]

The second criterion relates to the range of access. Herein, however, we use it solely with respect to state money, with the retail part accessible to the general public and the wholesale part available to selected actors—predominantly financial institutions—only. This delineation is legally relevant to state money, since the principle of equal treatment requires justification for restriction of access, whereas it appears to be less important for private money. Moreover, it is difficult to draw any convincing line for

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2 Bech Morten Linnemann/Garratt Rodney, Central bank cryptocurrencies, BIS Quarterly Review September (2017), 55 et seq., 60; Committee on Payments and Market Infrastructures and Markets Committee, Central Bank Digital Currencies, 2018, 3 et seq. (cit. BIS 2018).

3 See below B.II.1.b) and B.II.2.b).

4 Zellweger-Gutknecht, value data, paras. 4.11 et seq. and 4.25 et seq.

5 To the latter see below, C.

private money; for instance, the alleged universal accessibility of commercial bank money appears to be highly questionable in light of the millions of people who remain unbanked.

Furthermore, we fully endorse the third criterion, distinguishing between digital and tangible forms. However, given our paper's topic, we will only deal with tangible money when digital equivalents are expected to be or already are issued.

The fourth and last distinctive criterion for Bech and Garratt is the peer-to-peer design, which facilitates anonymity of holdings and transfers vis-à-vis any third party, while an intermediated design would not.[6] Deviating from this somewhat, the BIS paper distinguishes two verification technologies used to exchange money, either by verifying the validity of the money itself (token-based) or by verifying the identity of the money holder (account-based).[7] The latter two terms, however, have different connotations in information science.[8] We will refrain from making a comparable distinction here. Rather, we will contrast traditional techniques with those more recently developed for representing monetary value.

II. State monies

The vast majority of the money used in everyday transactions is denominated in official *state currency units*.[9] However, only a limited portion of it is *issued by a state agency*. Money that fulfils both criteria, and which thus qualifies as state money, exists today in two distinct forms: retail monies accessible to the public (so far only in the form of tangible coins and banknotes) and wholesale monies issued to a restricted circle of counterparties that regularly interact directly with the central bank. The latter predominantly comprise central bank reserves, recorded in traditional digital form. However, several

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6 Bech/Garratt, 67.

7 BIS 2018, 4.

8 Zellweger-Gutknecht Corinne, The right and duty of central banks to issue retail digital currency, in: Niepelt Dirk (ed.), Central Bank Digital Currency: Considerations, Projects, Outlook, London 2021, <https://voxeu.org/print/72590>, 31, 33 et seq. (cit. Zellweger-Gutknecht, currency).

9 So-called monetary aggregate M1, consisting of banknotes, coins, and sight deposits held with commercial banks: Zellweger-Gutknecht Corinne/Geva Benjamin/Grünewald Seraina Neva, Digital Euro, Monetary Objects, and Price Stability: A Legal Analysis, in: Journal of Financial Regulation 7 (2021), 284 ff., 286 with further references.

central banks are currently exploring the possibility of complementing these using cryptography-based forms: the so-called wholesale central bank digital currency (wCBDC).[10]

1. Wholesale money

a) Reserves

The term "reserves" denotes the account balances that selected financial market participants—primarily banks—hold in the central bank for their own benefit.[11] These reserves have three functions: policy transmission, liquidity, and stabilization.

First, they serve as the primary and most important transmission medium for central banks' monetary policy:[12] The central bank feeds its monetary policy impulses into the private economy through the conditions under which the central bank supplies[13] its counterparties (as money market participants) with reserves.

Second, reserves provide liquidity among financial market participants, allowing payments to be settled among them. This enables the public to make swift cashless payments, inter alia.[14]

Third, reserves contribute to the financial system's stability. As a means of payment that is insolvency risk-free, they secure payment transactions that would otherwise comprise credit and liquidity risks of involved settlement intermediaries such as correspondent banks. Likewise, the central bank can prevent money market participants' temporary liquidity shortages from spreading to other participants by providing additional reserves on the basis of an (interest-free and elastic) intraday liquidity facility.[15] Finally, during times

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10 See Boar Codruta/Wehrli Andreas, Ready, steady, go? – Results of the third BIS survey on central bank digital currency, BIS Papers 114/2021, 6 et seq.; <https://cbdctracker.org>.

11 Kumhof Michael/Noone Clare, Central bank digital currencies — Design principles for financial stability, Economic Analysis and Policy 71/2021, S. 553 et seq., 554.

12 Zellweger-Gutknecht/Geva/Grünewald, 308.

13 However, since reserves have expanded to an unprecedented extent as a result of quantitative easing, the monetary policy impulse is rather set via the conditions under which the central bank's counterparties may *hold* reserves with it.

14 See, e.g., Art. 5 para. 2 lit. a and lit. c Federal Act on the Swiss National Bank of 3. October 2003 (NBA, SR 951.11).

15 See, e.g., SNB, Annual Report 2019, Accountability Report, 63.

of crisis, when the 'inside' liquidity of commercial banks literally vanishes, the reserves issued by the central bank in its capacity as lender of last resort contribute to the financial system's stability.[16]

b) Wholesale central bank digital currency (wCBDC)

Reserves have long been stored digitally – yet, not in decentralised ledgers, but managed centrally. In contrast, non-monetary assets, such as bonds and shares, are increasingly recorded on distributed ledgers using cryptography. It is thus in the economy's interest to depict not only the asset leg but also the cash leg using this new technology.

However, if the cash leg were to be increasingly settled by means of privately issued monetary assets in the future, the reserves' stabilizing effect would decline. Moreover, the demand for reserves might generally weaken, which could further complicate or undermine the implementation of monetary policy. For these reasons, central banks are now also examining how they could likewise issue their reserves in this new form, as a so-called "wholesale central bank digital currency" or wCBDC.[17]

It should be noted, though, that wCBDC is actually a misnomer, since (as mentioned) the reserves were already 'digital'. Yet, 'central bank cryptocurrency' (CBCC) would not be a good fit either as cryptocurrencies by definition require a decentralized structure.[18] In contrast, even if central banks were to use crypto technology in the future, it is unlikely that they will adopt any truly decentralized protocol. Rather, they will choose a technology – or at least a governance setup – that imbues them with the power of determination over the money they issue. However, trust in such a currency and all its other properties would not be based on technology alone (as would be mandatory for cryptocurrencies in the strict sense), but rather, as with conventional digital central bank currency, on the trustworthiness of the issuer.

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16 See, e.g., Art. 5 para. 2 lit. e in conjunction with Art. 9 para. 1 lit. e NBA.

17 For the projects in Canada, Sweden, the Eurosystem, US, Switzerland, and the BIS, see the corresponding contributions in: Niepelt Dirk (ed.), Central Bank Digital Currency: Considerations, Projects, Outlook, London 2021, <https://voxeu.org/print/72590>, 31-38 and 83-162.

18 See below, B.III.2 and B.V.

2. Retail money

a) Coins and banknotes: cash and currency

As far as money for the general public is concerned, central banks are primarily responsible for issuing banknotes. By contrast, coins in many cases are still issued by the treasury/Ministry of Finance for historical and fiscal reasons. Banknotes and coins together are also referred to as *cash*. Tangible cash is currently the only form of state money with which the public can both carry out transactions and save.

In English, "cash" is often used interchangeably with the term *currency*. This is unsurprising, since a series of privileges granted by law enabled the particularly free circulation of official cash early on. These provisions find their antecedents in commercial practice, which allowed the acquisition of selected assets in good faith. Consequently, with their possession, their ownership and thus the monetary value they represented passed to the bona fide acquirer. Such monetary objects thus appeared to be current in the sense of negotiability, which gave rise to the term "currency".[19]

In addition to tangible forms, digital forms of state money were and are available to the public—for example, where a state postal service or state-owned commercial banks (e.g. in China)[20] maintain deposit accounts for the public. However, such deposits assume a hybrid form between state and private money and lack a state guarantee (as has been the case in Switzerland since 2017 with PostFinance deposits).[21]

b) Retail central bank digital currency (rCBDC)

An increasing number of central banks have recently deliberated as to whether they should also provide the public with digital central bank money—the so-called retail central bank digital currency (rCBDC).[22] Key questions in this context range from whether the rCBDC can and should become an instrument of monetary policy;[23] what balance should be struck between privacy and

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19 Gleeson Simon, The legal concept of money, Oxford 2018, para. 7.29 et seq. and 7.36 et seq.

20 Among them, the Industrial and Commercial Bank of China, the China Construction Bank, and the Agricultural Bank of China: Wang Heng, China's Approach to Central Bank Digital Currency, SSRN 16 February 2022, <http://dx.doi.org/10.2139/ssrn.4036466>, 5.

21 See, e.g., Art. 15 para. 3 Federal Act on the Organisation of Swiss Post of 17 December 2010 (POA, SR 783.1).

22 See, e.g., Boar/Wehrli, 7 et seq. See also <https://cbdctracker.org>.

23 Against such use, see Zellweger-Gutknecht/Geva/Grünewald, 312 et seq.

financial integrity; whether the rCBDC will lead to the disintermediation of banks; and whether the rCBDC should be reduced to a mere means of payment—that is, deprived of its store-of-value function. Such tendencies are evident, for example, in the digital euro project, whereby holding large amounts is to be rendered unattractive by negative interest rates or prevented by relatively low caps.[24] However, such a design would leave it to the private sector alone to provide assets with a saving function, without the disciplining 'competition' of state money, such as today's banknotes.

III. Private monies

1. State-sponsored money: denominated in official currency units

State-sponsored private money—above all, deposits held with commercial banks—is regularly denominated in the official currency. This, in turn, is only permissible if such money is structured as a claim to state money.[25] As such, it comprises the holder's right to convert private money to state money on demand. This increases confidence in this private money but conversely results in increased prudential requirements:[26] It can only be issued by actors licenced as financial intermediaries and who have satisfied the corresponding onerous prudential requirements.[27]

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24 Brunnermeier Markus/Landau Jean-Pierre, The digital euro: policy implications and perspectives, Publication for the committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg, January 2022, 30 et seq. and 40 et seq., <https://www.europarl.europa.eu/RegData/etudes/STUD/2022/703337/IPOL_STU(2022)703337_EN.pdf>.

25 Gleeson, 2018, para. 1.28.

26 Sáinz de Vicuña Antonio, An institutional theory of money, in: Giovanoli Mario/Devos Diego (eds.), International monetary and financial law - the global crisis, New York 2010, 517 et seq., para. 25.26.

27 Admittedly, like bank deposits, e-money is subject to prudential regulation (in Switzerland, for instance, it limits the issuance to small sums per person or subjects it to the banking license; in the EU, Directive (EU) 2009/110/EC of the European Parliament and of the Council of 16. September 2009 on the taking up, pursuit and prudential supervision of the business of electronic money institutions amending Directives 2005/60/EC and 2006/48/EC and repealing Directive 2000/46/EC, OJ L 267 of 10. October 2009, 7 et seq., specifically regulates the issuing institutions). However, despite its name, e-money is ultimately not money but is merely a means of payment, which is why it is only dealt with in greater detail under said category in B.IV.2.a).

Because debt involves a credit risk on the part of the issuing debtor, states have enacted detailed financial market regulations with respect to authorization, supervision, capital, and other prudential requirements since the 1930s at the latest to bring private money circulating in the official currency in line with state money in terms of quality.[28] Sponsorship should thus be understood primarily in qualitative terms. However, in the case of the lender of last resort (LOLR) function and any bail-ins, sponsorship also has a financial dimension.

2. Virtual currency: denominated in an individual currency unit

Privately issued assets are called virtual currencies if they represent value in a digital format that can be traded digitally. Moreover, they are neither state-issued or state-guaranteed nor otherwise sponsored by any state or state agency. In particular, they are denominated in a currency unit of their own. An old example is the Swiss WIR money (CHW), first issued in 1934.[29] Finally, they function as money solely by virtue of private agreements or customary practice (e.g., in the case of ICOs).[30]

Ultimately, however, the term 'virtual currency' is a misnomer: it is no currency, since this expression is reserved for monetary assets that fulfill all three money functions and thus circulate particularly freely.[31] This is not (yet) the case, as private digital monies are often illiquid and accepted only by a small group of enthusiasts at best. Moreover, it shall suffice (at least, according to the Financial Action Task Force, FATF) if virtual currency fulfils only *one* monetary function (e.g., 'functions as a medium of exchange and/or a unit of account and/or a store of value').[32] Consequently, most virtual currencies might turn out to be mere means of payment or simply near-money assets (as

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28 Zellweger-Gutknecht/Geva/Grünewald, 300 with further references.

29 However, the issuing WIR cooperative received a banking licence in 1936, which implies some state support as discussed in B.III.1 since then.

30 See (with some variations) e.g. Art. 5 para. 18 Directive (EU) 2018/843 of the European Parliament and of the Council of 30 May 2018 amending Directive (EU) 2015/849 on the prevention of the use of the financial system for the purposes of money laundering or terrorism financing, and amending Directives 2009/138/EC and 2013/36/EU, OJ L 156/43 of 19. June 2018, 43 et seq.

31 See above, B.II.2.a).

32 Financial Action Task Force (FATF), Virtual Currencies Key Definitions and Potential AML/CFT Risks, 2014, 4.

defined below).[33] Therefore, only virtual currencies that fulfil all three money functions within a considerable community belong to the category of private monies – which for now probably applies at most to BTC and ETH.

IV. Distinguishing money from other monetary assets

In addition to the above categorization of money as such, money can be further distinguished from other monetary assets. In the following taxonomy of monetary assets at large, we highlight the essential functions and characteristics of money and thus distinguish it from means of payments, payment instruments, and near-money assets in particular.

1. Money

a) Essential functions and properties

From a purely functional perspective, an asset may qualify as money if it serves cumulatively as a medium of exchange, store of value, and unit of account.[34] However, this definition is often and rightly criticized because it fails to account for *why* a given asset is suitable to fulfil these functions.

In essence, this suitability to function as money depends on three properties: durability, scarcity, and necessity. That is, an asset must, first, be durable (i.e., it should be capable of representing monetary value independently of time); in the digital age, this includes, for example, cyber security. Second, it must be relatively scarce (to maintain its monetary value in relation to non-monetary goods and services); in the case of state money, scarcity must be maintained by a monetary authority. Third, and most importantly, it must be necessary for as broad a sector of the economic actors as possible. Only then may a consistently sufficient number of these actors be willing to accept it in exchange for the widest possible range of goods and services.

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33 See below, B.V.2.

34 Green Sarah, It's virtually money, in: Fox David/Green Sarah (eds.), Private and Public Law Implications of Cryptocurrencies, Oxford 2019, 13 et seq., para. 2.15–2.25.

b) *The necessity of fiat money: monetary debt*

The need for money stems largely from a single fact: money is regularly created on credit. Today, this is particularly applicable to what is by far the most important source of money supply—commercial bank money created in the course of lending.[35] It extends the bank's balance sheet by increasing both its assets (its clients' monetary debts) and its liabilities (the client's deposits or bank money). Therefore, the decisive driver for money demand (i.e., monetary debt) is an inherent feature of money creation by lending. The debtor of an asset will, in cases of doubt, accept this asset in exchange for other goods to be able to repay his or her debt. Again, the larger the group of debtors, the greater the chance that they will include among them an individual who offers precisely the consideration that a money holder demands.

c) *Monetary theories*

The question of which assets should be considered money is also addressed by two classical and one more recent monetary theories: While the social theory of money recognizes money's quality, provided an asset is ultimately used as such,[36] the state theory of money, which is often traced back to Knapp,[37] requires that the issuance, currency unit, and payment modalities at least be established under the authority of the law in force within the state of issue.[38] The institutional theory of money, developed by Sáinz de Vicuña bridges the gap between the abovementioned two theories: it acknowledges the institutional and normative framework as the 'conceptual centre of gravity' but also recognizes privately issued assets as money if they are state-sponsored by lender of last resort mechanisms and prudential regulations concerning their issuers.[39]

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35 See McLeay Michael/Radia Amar/Ryland Thomas, Money creation in the modern economy, Bank of England Quarterly Bulletin 2014, 2014, S. 14 et seq.

36 Nussbaum Arthur, Basic Monetary Conceptions in Law, in: Michigan Law Review 35/1937, 865 et seq., 888; Walker Francis Amasa, Money in its relations to trade and industry, London 1880, 4; the latter being cited with approval by Darling J in Moss v Hancock [1899] 2 QB 111 at 116: "that which passes freely from hand to hand throughout the community in final discharge of debts …".

37 Knapp Georg Friedrich, The state theory of money, 2. A., London 1924, 154.

38 Proctor Charles/Mann F A, Mann on the legal aspect of money, 7. A., Oxford, United Kingdom 2012, para. 1.17.

39 Sáinz de Vicuña, para. 25.26 and 25.47.

2. Other monetary assets

Money differs in particular from three other monetary assets: means of payment, payment instruments, and near-money assets. These terms are not always clearly distinguished from one another, and sometimes the transitions are actually extremely fluid, because, in practice, an asset may be used in one way and again in another. What they have in common is that *none* of them possesses *all* the properties of money. Hence, they cannot fulfil all the functions of money simultaneously and, accordingly, do not qualify as money as such.

a) Means of payment

First, means of payment, including vouchers, some virtual currencies, and local currencies, transfer the monetary value they represent in a manner that is comparable to money. According to this definition, e-money falls likewise within this category. Admittedly, the FATF deems that it functions as a 'digital transfer mechanism for fiat currency' because 'it electronically transfers *value* that has legal tender status'[40] However, that does not make it a payment instrument (defined shortly), as e-money does not trigger a transfer of legal tender *as such* (i.e., cash). Rather, the e-money itself—the monetary asset *itself* (consisting of a claim against the issuing entity and in the form of a record on a technical device)—is transferred and is thus a means of payment.

As their name suggests, plain means of payment are not suitable for storing value, particularly owing to their eventual expiration dates or high volatility.[41] Consequently, they serve predominantly as means of exchange. However, if demand broadly increases despite these shortcomings for reasons of circumvention or speculation, regulators tend to restrict even the payment function more and more, whether in terms of the amount available or the circle of acceptance points. In this regard, it is simultaneously interesting and alarming to witness economists' intentions to design possible future rCBDC

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40 FATF, 4 (emphasis added).

41 With regard to cryptocurrency, e.g., Diehl Martin, Kapitel 2 Formen programmierbaren Geldes und Rolle der Zentralbank, in: Omlor Sebastian/Link Mathias (eds.), Kryptowährungen und Token, Frankfurt am Main 2021, 43 et seq., para. 17 and 28.

as mere means of payment from the outset. As cash is phased out, the public would then lose the opportunity to hold state money at all[42] along with all the associated disadvantages.[43]

b) Payment instruments

Payment instruments include such traditional media as bills of exchange and cheques as well as debit and credit cards.[44] More recent but similar in nature are payment apps and—in relation to cryptocurrency—private keys. At least in their original form, they are themselves neither money nor a means of payment. They can be defined as a personalised device or set of procedures or may be agreed upon between user and provider and used to *initiate* a payment.[45] Thus, they do not transfer monetary assets themselves but are a means of payment initiation that causes the disposal of monies or means of payment.

In monetary history, however, several payment instruments have developed into money or means of payment. This is the case when such a payment instrument is itself transferred and, moreover, is not redeemed into money or a means of payment after acceptance. Consider banknotes, which were initially merely negotiable promissory notes denominated in the actual currency and payable in "real" money: the precious metal coins.

The same may occur in the future with stablecoins—in particular, when they can no longer be redeemed for money with a state currency unit or are in fact no longer redeemed because the ecosystem in which they are used becomes so vast and attractive that conversion into (state) money is unnecessary.

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42 Brunnermeister/Landau, 40 et seq. on "specialising the digital euro as a medium of exchange".

43 On this, see Zellweger-Gutknecht/Geva/Grünewald, 304 et seq. (loss of public good and anchor function) and 312 et seq.

44 Gleeson Simon, The legal concept of money, Oxford 2018, N 10.49.

45 See, e.g., Article 4 para. 14 of Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC, OJ L 337 of 23 December 2015, 35 et seq.

c) *Near-money assets*

Finally, near-money assets are those that can easily be exchanged for money with a high level of confidence[46] but for which the purpose of saving, hoarding, or investing clearly predominates until they are exchanged. Examples include savings accounts, certificates of deposit (CDs), foreign currencies, money market accounts or fund shares, marketable securities, treasury bills (T-bills), and, more recently, potentially some cryptocurrencies.

V. Final technical reflections: representation of monetary value

1. Components of representation

An asset that (owing to its properties) functions as money or a means of payment essentially consists of three components: a unit of account, a quantity thereof, and a combination of the two. The *unit of account* (i.e., the monetary unit) gives a money its name. The amount provides information about the *quantum* of a monetary unit in a given instance. However, only when the *combination* of these two elements is *represented in a form* that is perceptible to the human senses, reproducible, secure, and thus legally valid can this function and qualify as money.[47]

2. Techniques of representation

Throughout history, mankind has developed various techniques to facilitate exchange, collecting and attributing value to shells, minting metal coins, recording account balances in bank ledgers, and printing banknotes. Since 2009, cryptography has been used to register units of monetary value and their quantities in distributed ledgers—either in token form (e.g., Bitcoin and Corda) or in the form of account balances (Ethereum, Quorum, Ripple, and others).[48]

The *crypto* technology just mentioned makes it possible to design rival and exclusive assets. Rivalry means that the same asset cannot be used by more than one person simultaneously (which would otherwise amount to double-spending). An asset's exclusivity is assured if its holder can exclude others

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46 Gleeson, para. 4.59.

47 Zellweger-Gutknecht/Geva/Grünewald, 292.

48 Zellweger-Gutknecht, central banks, 33.

from using it.[49] Therefore, *cryptoassets* are assets for which the power of disposal is exclusively mediated and protected via a crypto-based access procedure, while *cryptocurrency* forms a subgroup for which the monetary function predominates (see in more detail C.1).

With a *traditional bank account*, for example, a bank will theoretically be in a position to multiply money (deposits) at will by simply 'pressing a key'. This risk is mitigated as far as possible by the fact that only prudentially regulated and supervised—and thus particularly trustworthy—institutions are permitted to maintain bank accounts.

With cryptoassets (including cryptocurrency), however, rivalry and exclusivity are no longer based on the trustworthiness of the institution that issues or safeguards them. Rather, cryptoassets are rivalrous and exclusive owing to the trustworthiness of the technology—that is, the protocol—with which they are recorded.[50] At least in their classic form, such protocols are implemented in a decentralised manner and are based on computationally intensive proof-of-work procedures that render manipulation largely impossible.

VI. Tabular overview as an interim result

The following figure summarizes the taxonomy discussed above and expresses the different manifestations of money:[51]

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49 Samuelson Paul A., The Pure Theory of Public Expenditure, in: Review of Economics and Statistics 4/1954, 387: rival goods (called *collective consumption goods* by Samuelson) "all enjoy in common in the sense that each individual's consumption of such a good leads to no substraction from any other individual's consumption of that good ... simultaneously"; Buchanan James M., An Economic Theory of Clubs, Economia 125/1965, 1 et seq., 1.

50 Zellweger-Gutknecht, value data, para. 4.80.

51 For a somewhat different approach, see Committee on Payments and Market Infrastructures, Digital currencies, Basel 2015, 6; Kuhn Hans, Taxonomie, in: Weber Rolf H./Kuhn Hans (eds.), Entwicklungen im Schweizer Blockchain-Recht, Basel 2021, 35 et seq., 50.

Money	State issued	Wholesale	Reserves	wCBDC
		Retail	Cash	rCBDC
	Privately issued	State-sponsored (prudential regulation etc.)	Sight deposits at commercial banks; WIR	
				Virtual currencies with complete money function within a considerable community such as (probably) ETH and BTC
Other monetary assets		Means of Payment	e-money	Virtual currencies with prevailing payment function
		Payment instruments	Debit/ credit cards; Apple Pay	Private Key
		Near-money asset	Savings accounts at commercial banks	Virtual currencies with prevailing investment function

C. Regulatory environment of cryptocurrencies

I. Notion and types of cryptocurrencies

1. Notion of cryptocurrencies

As far as privately issued digital money is concerned,[52] due to the technological particularities of the cryptocurrencies the existing regulatory frameworks cannot easily be applied, i.e. an adaptive normative environment must be created. For the time being, many regulators around the globe are in the process of shaping the legal landscape for cryptocurrencies.

But the legislation in most countries does not yet contain a definition of the term "cryptocurrency" or "virtual currency". Usually, a cryptocurrency is defined as a *digital non-governmental asset* based on a combination of cryptographic algorithms; its existence is confirmed and recorded on a ledger being distributed on a network of independent computers.[53] In 2012 already, the European Central Bank defined cryptocurrencies as a type of unregulated currency which is issued and often controlled by its developers, and used/ accepted among the members of a specific virtual community.[54]

In general, digital money issued by a Central Bank is not qualified as cryptocurrency. The decentralized architecture of the validator network in case of private cryptocurrencies is supposed to create the necessary trust in lieu of a centralized authority (such as a Central Bank). This architecture based on the operation of multiple independent entities eliminating a single point of failure or control is designed to reduce the risk of double-spending while preserving transactional pseudonymity.

"State-backed" cryptocurrencies are not yet available in most countries. However, a large number of Central Banks is involved in different projects that envisage to create a central bank digital currency (CBCD); in the medium term it is to be expected that many countries will introduce rather wholesale

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52 The privately issued virtual money in the form of account-based money will not be further discussed; a Swiss example is the mentioned WIR cooperative (B.III.2).

53 World Economic Forum (WEF), Navigating Cryptocurrency Regulation: An Industry Perspective on the Insights and Tools Needed to Shape Balanced Crypto Regulation, 2021, <https://www3.weforum.org/docs/WEF_Navigating_Cryptocurrency_Regulation_2021.pdf>, 5.

54 European Central Bank, Virtual Currency Schemes, Frankfurt am Main 2012.

CBCD than retail CBCD.[55] For example, the Swiss National Bank has started a project together with the Bank for International Settlement (BIS Innovation Hub Centre) for the development of a digital Swiss Franc.[56]

2. Types of cryptocurrencies and terminology

Mostly, two types of cryptocurrencies are distinguished:[57]

- Traditional (native) cryptocurrencies being created by a standalone blockchain; thousands of currency projects exist in the meantime, the most important are Bitcoin (BTC) and Ether (ETH).
- Cryptocurrencies constituting digital representations of other assets (fiat currencies, securities, commodities, etc.), sometimes called stablecoins (for example USDC issued by Circle).[58]

Even though cryptocurrencies are generally expressed in their individual unit of account, the value of the second type usually reflects a fiat currency since the assets represented or used as collateral are priced in a fiat currency.

Often, in the regulatory environment, the term "*payment token*" is used. For example, FINMA refers to "payment tokens" synonymously with native cryptocurrencies.[59] In the European Union, the proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets (MiCA)[60] intends to introduce the term "electronic money token" being narrowly defined as a "type of crypto-asset the main purpose of which is to be used as a means of exchange and that purports to maintain a stable value of a fiat currency that is legal tender" (Art. 3 para. 4 MiCA).

Payment tokens (as native cryptocurrencies) do not give rise to any claims towards an issuer or a third party, these tokens are "purely factual intangible assets" to be used as means of payment or as means of money/value transfer.

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55 See also above, B.II.1.b) and B.II.2.b).

56 See e.g. the report on the cross-border wholesale CBDC experiment "Jura" concluded by the Swiss National Bank, the Banque de France and the Bank for International Settlements, <https://www.snb.ch/en/mmr/reference/project_jura_report/source/project_jura_report.en.pdf>.

57 WEF, 5.

58 See also C.II.3.

59 FINMA, ICO Guidelines of February 16, 2018, <https://www.finma.ch/de/news/2018/02/20180216-mm-ico-wegleitung>.

60 Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937, COM (2020) final of 24 September 2020; the respective rules are contained in Art. 43 et seqq. MiCA.

In a Supplement to the ICO Guidelines of September 11, 2019, FINMA has specifically regulated the so-called stablecoins.[61] The electronic money tokens as of the MiCA proposal are described in a similar manner.

Cryptocurrencies fall into the category of *crypto-based assets*, i.e. are one form of them. In Switzerland the Federal Ordinance on Banks and Savings Institutions (FBO)[62] having been revised as of August 1, 2021 as consequence of the enactment of the DLT-Law[63] defines the term "crypto-based assets" as assets that, pursuant to the originator's or issuer's intention, are issued with the primary objective to substantially serve as (i) a payment instrument for the acquisition of goods or services, or (ii) an instrument for money or value transfers.

II. Approaches for the regulation of cryptocurrencies

1. Overview

By their very nature, cryptocurrencies are global means of payment or of money/value transfer. Therefore, due to the lack of international rules a fragmentation can occur caused by national regulations. On the one hand, in view of the cross-border effects of cryptocurrency networks a multi-jurisdictional risk exists if different legal frameworks apply; on the other hand, the question arises which governmental agency should oversee the markets for cryptocurrencies (for example with regard to the relatively high volatility) and the financial market infrastructures that interact with crypto-assets in payment.[64]

An *internationally coordinated regulatory approach* appears to be necessary in view of the cross-border nature of cryptocurrencies' networks since cryptocurrencies are not only used as payment means for physical goods but also for crypto-assets having an impact on the financial market infrastructures. It is also generally recognized that cryptocurrencies can become critical for sovereign monetary regimes and – as a consequence – for the financial stability of a country. A lender of last resort function is missing.

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61 FINMA, Supplement to the guidelines for enquiries regarding the regulatory framework for initial coin offerings (ICOs) of 11. September 2019, <https://www.finma.ch/de/news/2019/09/20190911-mm-stable-coins> (cit. FINMA, ICOs 2019), see C.II.3.

62 Art. 5a der Verordnung über die Banken und Sparkassen vom 30. April 2014 (BankV/FBO, SR 952,02).

63 Bundesgesetz zur Anpassung des Bundesrechts an Entwicklungen der Technik verteilter elektronischer Register vom 25. September 2020, BBI 2020 7801.

64 WEF, 7.

Therefore, international regulatory bodies of financial markets have become active during the last few years. These bodies have identified a number of issues which need further attention:[65]

- The *Financial Action Task Force* (FATF) examined and extended the existing Recommendations in order to regulate cryptocurrencies aimed at preventing money laundering and terrorism financing. In particular the so-called travel rule is now encompassing the obligation of cryptocurrencies' providers to identify the beneficiaries and originators of cryptocurrency transfers.[66]
- The *Financial Stability Board* (FSB) analysed cryptocurrencies from the lenses of financial stability (Report of 2019) and outlined recommendations for the treatment of stablecoins (Report of 2020).
- The *Basle Committee on Banking Supervision* (BCBS) works on the development of policy frameworks related to capital adequacy in order to tackle the risks due to the increased exposure of banking systems.
- The *Organisation for Economic Co-operation and Development* (OECD) has published detailed reports on the issue of taxation of cryptocurrencies and on the tokenisation of crypto-assets.
- The *International Organization of Securities Commissions* (IOSCO) analyses investor protection with the objective of ensuring that markets are transparent and efficient by reducing systemic risks.

2. Possible regulatory approaches

Cryptocurrencies are a new technological and thereafter an economic phenomenon; as a consequence, regulators are called to set a normative framework. Most countries do not know tailor-made regulations for cryptocurrencies. In pursuing the objective of implementing a normative framework, the risks of over-regulation and of under-regulation must be avoided since both scenarios may imply undesirable regulatory arbitrage.[67]

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65 See also the overview given in the Report of the WEF, 24.

66 Below, C.III.4.

67 WEF, 23 and 25.

Recently, the World Economic Forum has outlined four regulatory approaches which potentially may be combined and/or vary over time:[68]

(i) "*Wait and see*" *approach*: This model avoids issuing detailed specific regulations on a nascent industry with the objective of not jeopardizing its development. Apart from monitoring the business activities it is assumed that existing laws can be applied in case of potential upcoming risks. Such regulatory concept is innovation-friendly but can cause stability and system challenges.

Examples: This approach is usually not intentionally chosen by countries but rather the consequence of a certain reluctance towards an early activity. This is not necessarily a bad approach since experience can be gained and the implementation of adequate rules becomes possible. But the regulator should be alert to intervene at a not too late stage.

(ii) *Public-private ownership approach*: This model entails a collaborative engagement between regulators, policy-makers and the private sector trying to introduce a balanced/risk-proportionate approach. Businesses tend to adapt to the new technological environment but nevertheless can adjust to regulators' concerns to protect the value of the ecosystem and the reputational integrity.

Insofar, a possible model is the so-called sandbox regulation. Such an approach can be seen as an experimental exercise in order to let market forces drive the process.[69] Afterwards, regulation can be implemented subject to an identified need in the financial markets.

Examples: The United Kingdom and Switzerland each have their own sandbox regulation for FinTech businesses. Singapore follows the described approach

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68 WEF, 18 with further references. On the Internet, descriptions of the manifold regulations of cryptocurrencies around the globe can be found; see for example the lists under: <https://www.investopedia.com/cryptocurrency-regulations-around-the-world-5202122>; <https://law.asia/comparison-cryptocurrency-regulation>; <https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html>. For specific country reports see: <https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations>.

69 For a general overview see Zetzsche Dirk A./ Woxholth Jannik, The DLT sandbox under the Pilot-Regulation, Capital Markets Law Journal 2022, <https://academic.oup.com/cmlj/advance-article/doi/10.1093/cmlj/kmac003/6564116>.

and Brazil appears to go a similar way. As long as the regulations proposed by the European Commission in September 2020 are not in force (in particular MiCA),[70] the EU also follows a collaborative approach.

(iii) *Comprehensive regulatory approach*: This model intends to design and implement a specific regulatory framework governing the (or even all) activities of the regulated and supervised entities. Nevertheless, the intensity of the regulations can be quite different.

Examples: Most countries having a developed economy are falling into this group, amongst others the State of New York, Japan, the United Kingdom, the United Arab Emirates, Liechtenstein, Switzerland and (after the implementation of the mentioned MiCA-proposal) the European Union.

(iv) *Restrictive approach*: This model implies imposing more and broadly restrictive measures that affect the market generally.

Examples: The most prominent country having implemented restrictive measures or a general prohibition related to private cryptocurrencies is China (thereby supporting the own CBDC); other countries falling into this group are India, Turkey and Nigeria.

Assessment of the different regulatory approaches: From a theoretical perspective, it would be desirable to analyse the need for regulatory certainty and to develop a coordinated approach. A complete banning of cryptocurrencies does not appear to be necessarily efficient, however, the promotion of an environment of legal certainty is valuable, particularly while allowing for innovation.

3. Stablecoins in particular

Stablecoins are defined as crypto assets that aim to maintain a *stable value* relative to a specified asset or a pool of assets. Through this stability "backing" stablecoins should be able to become an alternative payment mechanism. Their value fluctuates depending on the market value of the underlying assets, for example linked to fiat currencies, commodities, securities, real estate.[71]

During the last few years (not at least in the light of the Libra/Diem project of Facebook), policymakers identified emerging concerns about several challenges, for example fragilities in the governance, deficiencies in operational

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[70] To follow the steps of procedure, see <https://eur-lex.europa.eu/legal-content/EN/HIS/?uri=CELEX:52020PC0593>.

[71] See for example the groups that have been built in FINMA Stablecoins, ICOs 2019.

resilience and cyber defences, integrity and stability of the underlying infrastructure and mechanisms, abuse for money laundering and terrorist financing or other forms of illicit finance (market integrity) as well as data protection and consumer protection issues. The potential vulnerabilities could particularly accrue if the stablecoins were to be adopted on a global scale.[72]

Depending on how such stablecoins' issuance is structured and organized, they may suddenly resemble a money market fund or form part of an actual payment system, be comparable to bank money or e-money, so that the relevant regulatory rules and licensing requirements then become applicable to them.

Therefore, several regulators envisage to set a *normative framework* for stablecoins complying with topics such as the financial stability, the fairness and integrity of markets, the prevention from money laundering, the protection of monetary stability, etc. A foundational study has been published by the Financial Stability Board (FSB) addressing the various regulatory issues and proposing a potential normative framework for stablecoins.[73]

Such a normative framework should be functional and risk-based; the regulations could encompass the following aspects:[74]

– Licensing requirements specifying what types of entities are allowed to participate in the issuance and distribution of stablecoins and under which terms;

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72 Adachi Mitsutoshi et al., The expanding functions and uses of stablecoins, in: Financial Stability Review November 2021, 54 et seq.; Ferreira Agata, The Curious Case of Stablecoins – Balancing Risks and Rewards?, in: Journal of International Economic Law 4/2021, 755 et seq.; Haun Katie/Tillemann Tomicah/Rathmell James, Stablecoins, Stability, and Financial Inclusion, 2021, <https://future.a16z.com/stablecoins-stability-and-financial-inclusion>.

73 Financial Stability Board, Regulation, Supervision and Oversight of "Global Stablecoin" Arrangements, Final Report and High-Level Recommendations, 2020, <https://www.fsb.org/2020/10/regulation-supervision-and-oversight-of-global-stablecoin-arrangements>. For the United States see President's Working Group on Financial Markets, the Federal Deposit Insurance Corporation, and the Office of the Comptroller of the Currency, Report on Stablecoins, November 2021.

74 Hüpkes Eva, Towards an international framework for the regulation and supervision of "stablecoins", in: Blair William/Zilioli Chiara/Gortsos Christos V. (eds.), International Monetary and Banking Law in the Post COVID-19 World, ch. 4.3.3 (forthcoming).

- Prudential rules in respect of risk management measures such as capital requirements, counterparty risks, minimization of market and credit risks, segregation of assets (with multiple custodians), matching with reserve assets, liquidity provision, etc.
- Management of operational and cyber risks and business continuity planning in order to minimize risks in case of disruption;
- Transferability of stablecoins and finality of stablecoin transactions;
- Implementation of an appropriate AML/CFT framework being suitable to combat any forms of illicit finance;
- Establishment of further precautionary measures, for example transparency/disclosure requirements, consumer and investor protection, data privacy protection, promotion of fair competition (incl. interoperability and connectivity of stablecoin arrangements).

In addition, cross-border cooperation and coordination must be improved through recommendations of international bodies and arrangements between supervisory authorities.[75]

4. Issuance and trading of cryptocurrencies

Most countries[76] do not know tailor-made regulations governing the mining of cryptocurrencies; hence the mining of cryptocurrencies is permitted. In addition, the mere use of cryptocurrencies is not considered to constitute a financial intermediation.

The *public offering* of cryptocurrencies is in most countries not subject to a license requirement if the respective payment tokens do not contain elements of asset tokens. For example, in Switzerland, the mentioned FINMA ICO Guidelines of February 2018 make it clear that the issuance of cryptocurrencies is not restricted to the providers of financial services supervised by the regulatory authorities. In practise, the most difficult issue concerns the aspect of the design of the respective tokens; as soon as the cryptocurrencies in question exhibit functions of securities or assets to which they are linked, a license might be necessary. In parallel to the possibility of issuing cryptocurrencies without a license, the respective issuers are also not supervised by the regulatory authorities in the further handling of the payment token business.

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75 Hüpkes, ch. 5.

76 See above C.II.2.

As mentioned, a different treatment often applies in respect of stablecoins since this type of cryptocurrency might have an impact on the monetary stability or on the financial market infrastructure.[77]

A "Crypto Market Index Fund" primarily investing in crypto-based assets usually qualifies as an *investment fund* (belonging to the category of other funds for alternative investments) under the applicable Collective Investment Fund legislation.

A special issue concerns the question of whether cryptocurrencies can be traded on a *DLT-trading platform*, similarly to crypto-assets. Some countries, amongst others Switzerland, have implemented new regulations governing DLT-trading platforms. Obviously, the sale and purchase of crypto-assets on DLT-trading platforms can be executed by using cryptocurrencies as payment means. However, cryptocurrencies can also be tokenised in the way that an exchange in the form of crypto-assets becomes possible.

5. Custody and safekeeping

Cryptocurrencies are suitable to be held in *self-custody*; such wallets are less convenient and usually require the execution of additional protection measures. Since the holders of cryptocurrencies deposited in self-custody have the unilateral ability to access, manage and transfer their holdings without relying on any financial institution to act on their behalf it becomes necessary to implement means that avoid AML and CFT risks.[78] The Financial Crimes Enforcement Network made self-hosted wallets the vocal point of its Notice of Proposed Rulemaking. This Notice intends to require service providers to collect KYC information when performing transactions involving self-hosted wallets.[79]

As an alternative, a custodian can offer *wallets* together with proper key management practices safeguarding the customer's ability to directly dispose of the cryptocurrencies. In practice, most users of cryptocurrencies opt for custody providers as intermediaries/fiduciaries.

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77 See above C.II.3.

78 See below C.II.4.

79 Financial Crimes Enforcement Network, Requirements for Certain Transactions Involving Convertible Virtual Currency or Digital Assets, 23 December 2020, <https://public-inspection.federalregister.gov/2020-28437.pdf>.

Another distinction can be made between *hot wallets* that are connected to the Internet, and *cold wallets* that are kept in an offline environment. Cryptocurrencies held in a hot wallet can be traded more easily and speedily but the risk of cyberattacks (theft of crypto assets) is higher.

In addition, technical and jurisdictional interoperability of the cryptocurrency environments is important. *Interoperability* improves competition, drives up levels of participation, and increases inclusion and market liquidity. Industry standards and protocols can help ensure smooth interactions between market actors and their service providers.

Another crucial point is the *surrender of cryptocurrencies* from the bankruptcy estate of the provider of custody wallets. Switzerland recently introduced a respective right of surrender. A surrender claim is justified if the debtor has undertaken to hold the crypto-based assets (incl. cryptocurrencies) in readiness at all times for the third party, and provided that these are (i) allocated individually to the third party, or (ii) allocated to a community ownership and it is clear which proportion of the community asset is due to the third party.[80]

III. Specific legal topics

1. Cryptocurrencies and the status as legal tender

Legal tender is a status that could in principle be conferred on any form of money.

To date, no generally accepted definition of legal tender exists. In its essence, however, it is a legally privileged form of money. The content of the relevant provisions in the various monetary laws can be broken down into three common denominators:

– First, the *legal* provisions exert a more or less strong *pressure* on the creditors of a monetary debt to *accept* a certain type of asset with a debt-discharging effect.[81]

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[80] Art. 242a des Bundesgesetzes über die Schuldbetreibung und Konkurs vom 11. April 1889 (Debt Enforcement and Bankruptcy Law, SchKG, SR 281.1).

[81] See on the different approaches to create legal pressure (repressive, exclusive, liberal and privileging approach): Bank for International Settlement (BIS), Summary of the webinar on legal aspects of digital currencies, 2021, <https://www.bis.org/events/210126_digital_currencies.htm> (cit. BIS 2021).

- Second, the monetary debt is *discharged* by the acceptance of such an asset.
- Third, settlement takes place in the legal *unit* of account (usually the national currency) and at the *nominal* value of the offered and accepted asset (i.e., the amount paid), without taking inflation or other value risks into account.[82]

The range of assets constituting a legal tender can even include foreign government money (as in the case of dollarization) as well as private money (as recently in the case of Bitcoin in El Salvador, see shortly). Assets that are not suitable to fully perform the three monetary functions are not likely to be accepted as money, despite their status, but at most as a performance in lieu of payment.

According to the prevailing view in most countries, cryptocurrencies are not considered "money" in the legal sense (for Switzerland, see Art. 84 Code of Obligations[83]), as they generally do not sufficiently fulfil the typical money functions and would therefore be all the less suitable as legal tender.[84] However, partly it is argued that widely used cryptocurrencies accepted by the public can adopt the typical functions of money and, therefore, qualify as "money" in a broader sense.

Even governmental agencies (for example the Canton of Zug in Switzerland) are partly prepared to accept cryptocurrencies for tax payments. In addition, a state may, on the basis of its sovereignty, assign the status of legal tender to a cryptocurrency where (own and foreign) state monies do not or insufficiently fulfil a monetary function, as the example of El Salvador shows: It has granted Bitcoin (limited) legal tender status in the hope of improving domestic transfer payments.

2. Operational and compliance issues

The use of cryptocurrencies presents new risks of an operational nature, for example due to the irreversibility of the transactions being an inherent part of the design of most cryptocurrencies. The "double-spending" problem

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82 BIS 2021.

83 Federal Act on the Amendment of the Swiss Civil Code (Part Five: The Code of Obligations) of 30. March 1911 (OR, SR 220).

84 See also Haeberli Daniel/Oesterhelt Stefan/Wherlock Alexander, Switzerland, in: Dewey Josias N. (ed.), Global Legal Insights, Blockchain & Cryptocurrency Regulation, 3. ed. London 2021, 348 et seq., no. 1.

requires operational safeguards in order to avoid risks of systemic stability.[85] Another aspect concerns the *settlement finality* and the legal constitution of finality for the manifold cryptocurrency systems; it might be necessary (i) to define what would legally constitute finality for the variety of cryptocurrencies systems, i.e. how that state is determined in a decentralised environment[86] as well as (ii) to validate processes and identify the roles and functions of the network participants. The development of respective standards would be desirable (for example in respect of the "double-spending" problem). In addition, cryptocurrencies are vulnerable to *security breaches*, i.e. the transactional safety is a general objective that is increasingly exposed to threats caused by malware attacks etc.

Furthermore, compliance risks must be considered. Compliance plays a role in various respects (corporate governance, corporate social responsibility, data protection and data security, competitive behaviour, etc.)[87]. But in financial markets in particular, the pseudonymous and borderless nature of cryptocurrency systems raises the below discussed financial integrity risks and KYD/AML challenges.[88]

In light of the decentralized infrastructure used for cryptocurrency transactions, governmental regulatory measures and eventually sanctions can hardly be enforced against participants interacting in the crypto markets (issuance and transfer of tokens). Rather, the interface between cryptocurrencies and the broader economy will often be established by an exchange or another virtual asset service provider. In this context, *compliance measures* and other preventive activities (such as customer due diligence) must be implemented. Finally, record-keeping and accounting requirements as well as the tax regulations vary across countries.

3. Consumer protection

In general, consumer protection has become an important regulatory topic. Safeguarding consumer interests and ensuring transparent and fair service levels are key for the acceptability of cryptocurrencies in the public. This aspect needs to be considered for cryptocurrencies and retail CBDC.

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85 WEF, 8.

86 For the problem of the settlement finality see also European Central Bank, the Use of DLT in Post-Trade Processes: Advisory Groups on Market Infrastructures for Securities and Collateral and for Payments, April 2021.

87 WEF, 9.

88 See C.III.4.

The general consumer protection laws also apply in respect of the new payment and value means but apart from the described *multi-jurisdictional risks* new challenges are given,[89] for example (i) the price volatility of cryptocurrencies, (ii) the absence of specific depositor protection, (iii) the lack of payment protection due to the irreversibility of transactions, (iv) the problem of establishing accountability towards the users, (v) the privacy risks stemming from the pseudonymous nature of cryptocurrencies, as well as (vi) the risks of market manipulation (in particular by so-called whales, i.e. individuals or entities that hold large amounts of a cryptocurrency), which have so far not been adequately covered by regulatory safeguards.

The new emanations of decentralized finance (DeFi) require fresh approaches in the consumer protection context. Thereby, adequate *information and transparency* play an important role:[90] In case of self-hosted wallets (without any custody function of an intermediary) individual users must understand the interface, security mechanisms, private key management and storage particularities in order to empower them to appropriately act if for example a wallet is lost. Eventually, the applicable information requirements in financial market law need to be amended.

Due to the fact that private forms of money "only" constitute liabilities of private issuers, certain imminent risks are existing. The *financial soundness* of the issuer or DLT administrator is essential; instead of made promises fraud, mismanagement of liquidity or solvency issues are risks that could materialize.[91] The expectation of *convertibility* into a fiat currency and any exchange for goods or services depends on the willingness of someone to do such transaction based on certain value assumptions.[92]

4. KYC / AML

Cryptocurrencies bear the risk that the monetary means are used in a way not being compliant with *anti-money laundering* (AML) and *counter-financing*

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89 WEF 9.

90 For an overview of the DeFi challenges see World Economic Forum, Decentralized Finance (DeFi) Policy-Maker Toolkit, June 2021.

91 See Zetzsche Dirk A. et al., The ICO Gold Rush: It's a scam, It's a Bubble, It's a Super Challenge for Regulators, in: Harvard International Law Journal 2/2019, 267 et seq.

92 Panetta Fabio, Designing a digital euro for the retail payments landscape of tomorrow, Speech, Brussels, 18. November 2021, <https://www.ecb.europa.eu/press/key/date/2021/html/ecb.sp211118~b36013b7c5.en.html>.

of terrorism (CFT) regulations. In the meantime, the design of the AML/CFT normative framework has become an intensively discussed topic in international bodies.

AML risks occur due to the *anonymity* (or pseudonymity) and the decentralization of the network structures as well as the abuse of unregulated borderless networks. The identity of the involved persons is often unknown and is not linked to a certain wallet or transaction. Some privacy coins go even further (for example Dash, Monero) being designed in a completely anonymous way.[93]

In order to establish "clean" financial markets, providers of cryptocurrencies' services must be subject to *know your customer* (KYC) due diligence obligations and AML observance requirements. Even if uniform rules have not yet emerged, the guidelines of international organizations and of regional organizations do have an important impact.

The *Financial Action Task Force* (FATF) is constantly amending and improving its guidelines in order to minimize the AML risks. The "Guidance for a Risk-Based Approach: Virtual Currencies" of June 2015 has been amended several times. An update of the FATF recommendations stems from October 2018; in June 2019 the FATF adopted an Interpretative Note to Recommendation 15 setting requirements for effective regulation and supervision. The applicable rules provide for a dense regulatory framework. According to the so-called "*travel rule*", the involved providers should obtain and hold required and accurate originator and beneficiary information in relation to cryptocurrency transfers.[94]

In the European Union, the fifth Anti-Money Laundering Directive (AMLD) of 2018 aims at tackling the providers engaged in exchange services (virtual against fiat currencies) and the custodian wallet providers, i.e. the scope of application is very wide.[95] In July 2021, the European Commission presented a proposal for the sixth AMLD that not only envisages to implement stricter regulations (for example by broadening the scope of the "travel rule") but also intends to establish a new EU-authority coordinating the activities of the different national AML supervisors.[96] In Switzerland, the Anti-Money

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93 Poskriakov Fedor/Chiriaeva Maria/Cavin Christoph, Cryptocurrency compliance and risks: A European KYC/AML perspective, in: Dewey Josias N. (ed.), Global Legal Insights, Blockchain & Cryptocurrency Regulation, 3. ed., London 2021, 111 et seq., 114 et seq.

94 Poskriakov/Chiriaeva/Cavin, 119 et seqq.

95 Poskriakov/Chiriaeva/Cavin, 116.

96 The proposals are contained in COM/2021/420 final and COM/2021/421 final.

Laundering (AML) Act and the AML Ordinance equally encompass the whole digital money business. In addition, some provisions of the new Act relating to Blockchain and Digital Ledger Technology (DLT-Act) can become relevant. Therefore, the implementation of compliance measures becomes a far-reaching fit and proper requirement in financial markets businesses and new technological solutions must be implemented.

5. Further topics

Many other topics also play an important role in the digital money context, but can only be shortly addressed in this article. Digital identity is essential in order to secure financial integrity and AML/CFT compliance. For example, the KYC principle requires a clear allocation of assets to the (designed) beneficial owner. Therefore, some countries have implemented digital identity rules (for example the EU with the eIDAS Regulation 910/2014) in connection with an electronic KYC regime.[97]

A further topic concerns reporting requirements and tax regulations. The proper valuation of cryptocurrencies is relevant for the corporate accounting and the tax assessments. So far, most countries base the applicable provisions on a cost-based rule-making as long as the digital assets are held in custody. But an actual realization of such values in form of an exchange into goods or fiat money can lead to a taxable gain.

D. Outlook

The value allocation in cryptocurrencies and other digital assets and the use of such means not only for value storage but also as an instrument for payments facilitation is rapidly growing. However, the efforts of international regulators to establish a *reliable and enforceable legal framework* have not yet led to resilient approaches. For example, even without such a framework the market capitalization of stablecoins has substantially increased from USD 5 billion to USD 120 billion since early 2020.[98]

When the Libra project was announced in 2019, *stablecoins* entered the agenda of Central Banks, capital market authorities and international regulators due

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97 For an overview see Weber Rolf H., Open Finance and Decentralized Finance – Entwicklungen in einem disruptiven Finanzmarktumfeld, SZW 1/2022, 3, 9-10.

98 Adachi et al., 54 et seq.

to concerns that global network platforms could reach billions of potential users.[99] However, the pathway to find solutions has remained difficult in the light of potential risks related to financial stability and market integrity.[100]

While DLT entrepreneurs and proponents of decentralized finance (DeFi) promise low transactions costs, the potential of cryptocurrencies to inherit the traditional functions of money as a means of exchange or a unit of account is partly undermined by volatilities and attempts to primarily store the respective values.[101]

The need to maintain a permanent 24/7 record of all executed transactions requires computer power and a sufficient number of tokens to validate the processes. "*Staking awards*" are granted by the concerned blockchain community to remunerate the individual contribution to the validation processes in the growing sector of proof-of-stake blockchains. Even individuals owning only small amounts of a certain coin can participate in such interest-like rewards by pooling coins with others; after deducting the services fees, the prospect of high yields compared to the zero interests rate level in the real economy is tempting.[102]

In the past, mainly investors used traditional investment vehicles such as funds (ETFs) to diversify their portfolios with crypto assets. For such investments, a certain level of trust into the financial intermediaries involved is essential. Such *trust* can be built if regulators and supervisory authorities *foster* the *confidence* of the investors. An internationally accepted understanding of the legal framework is necessary since the new products and services go beyond the boundaries of traditional financial market regulations.

In principle, it appears to be necessary to distinguish between cryptocurrencies in general and stablecoins and CBDCs in particular. Stablecoin reg-

99 Ferreira, 755 et seq.

100 Haun/Tillemann/Rathmell, passim.

101 For a recent analysis of the DeFi challenges see IOSCO, Decentralized Finance Report, OR01/2022, March 2022.

102 See Schärli Kilian/Meisser Luzius/Luthiger Reto, Finanzmarktrechtliche Einordnung der Stakings von Kryptowährungen, Jusletter IT 30, September 2021.

ulations must address conflicting national laws, the cross-border use and uncertainties about international enforceability.[103] In the EU, MiCA attempts to introduce specific regulations.[104]

Regarding CBDC new aspects such as the competition with commercial bank deposits and the (non-)reliance on a distributed ledger system or the (non-)use of retail CBDC as a monetary policy tool[105] are relevant regulatory issues that have an impact on *financial stability* and monetary policy concerns. Based on the idea that a CBDC replicates physical cash, such an electronic coin must preserve transaction privacy while meeting regulatory requirements.[106]

The heterogeneous approach to property rights depending on different legal traditions influences the possibility of constituting *ownership rights* regarding cryptocurrencies under existing laws. Some jurisdictions amend general provisions, others create a special regime.[107] Particularly if it comes to insolvency proceedings it is important to have regimes in place that help creditors to separate their deposited coins and to have them surrendered from the bankruptcy estate. A further unsolved issue relates to the question of whether at all or eventually which coins deposits could be covered by an applicable depository insurance regime.

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103 Schwarcz Steven L., Regulating Global Stablecoins: A Model-Law Strategy, in: Duke Global Woking Paper Series, Forthcoming, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3966569>.

104 See Zetzsche Dirk A. et al., The Markets in Crypo-Assets regulation (MiCa) and the digital finance strategy, in: Capital Markets Law Journal 2/201, 203 et seq.

105 See Zellweger-Gutknecht/Geva/Grünewald, 314 et seq.

106 Chaum David/Grothoff Christian/Moser Thomas, How to issue a central bank digital currency, SNB Working Papers 3/2021, <https://www.snb.ch/n/mmr/reference/working_paper_2021_03/source/working_paper_2021_03.n.pdf>.

107 See Allen Jason G. et al., Legal and Regulatory Considerations for Digital Assets, Cambridge 2020, <https://www.jbs.cam.ac.uk/wp-content/uploads/2020/10/2020-ccaf-legal-regulatory-considerations-report.pdf>.