The Dark Side of Licensing Cryptocurrency Exchanges as Payment Institutions[†]

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Abstract

The ultimate objective of cryptocurrencies is to become a payment system substituting, complementing, or competing with the existing conventional fiat-based payment systems. Irrespective of whether such an objective could be accomplished, the functional similarities between certain cryptocurrencies and fiat money has persuaded competent authorities of certain EU Member States to grant payment institution licenses to cryptocurrency exchanges. At first blush, granting such an authorization would seem to be a step forward as it would bring otherwise unregulated cryptocurrency exchanges within the scope of the existing payment regulatory framework. However, such an authorization not only faces major legal challenges related to the definition of a payment institution, but also introduces new lesser-known risks. Aside from the semantic and definitional issues, authorizing cryptocurrency exchanges as payment institutions can bring activities and instruments - with a different risk profile than that of conventional payment instruments - within the scope of payment systems. It appears that such risks embedded in those instruments cannot be fully addressed under the existing payment laws.

This paper studies two examples of unattended risks under the cryptocurrency-exchange-as-payment-institution regime. The first risk concerns the use of untethered, non-convertible, illiquid and volatile settlement assets for settlement purposes in cryptocurrency exchanges. The second risk concerns the risks associated with finality of settlements arising from the use of probabilistic finality in some of the most popular cryptocurrency blockchains. Given that in the conventional payment institutions central bank money or commercial bank money is primarily used as the settlement asset, such risks have already been addressed or otherwise taken for granted, however, in cryptocurrency exchanges, the risks involved in the settlement of liabilities with an illiquid and volatile asset relying on probabilistically final settlement mechanism cannot be dealt with by the existing applicable regulations. As the risks cannot be addressed within the current European payment regulation framework, an alternative policy option would be granting a *special* license to cryptocurrency businesses or introducing ring-fencing mechanism to protect the conventional payment systems from the risks of cryptocurrency payments.

Keywords: *Cryptocurrency, Payment, Payment Institution License, Settlement Finality, Liquidity*
JEL classification: *E42, E51, E58, G01, G23, G28, K22, K23, K24*

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Introduction

The advent of bitcoin in 2009 gave rise to a whole host of various cryptoassets having different features with oftentimes hybrid nature, which allows them to be used as a means of payment,[1] investment,[2] and access.[3] The multiple use-cases of such tokens led to a surge of interest in studying cryptocurrencies among regulators ranging from banking, securities, and commodity markets regulators to financial crime enforcement agencies.[4] Despite the skepticism about the economic functions of bitcoin as money or currency,[5] cryptocurrencies used for payment purposes or payment tokens are evolving into a viable medium of payment at least in certain virtual environments. From among several hundred cryptocurrencies, bitcoin, as the most popular and largest cryptocurrency in terms of its market capitalization is increasingly coming under the radar of the regulator in charge of banking and payment institutions.

From among the efforts aimed at bringing cryptocurrencies within the regulatory net, licensing requirement has been considered as the first natural step. However, it was not evident which type of license to be issued for engaging in cryptocurrency activities. In certain jurisdictions, such as in New York, where Bitlicense is issued, regulators decided to create a specific license for such activities.[6] Other jurisdictions opted for granting payment institution license to cryptocurrency exchanges. For example, in Luxembourg, Bitstamp Europe S.A. and bitFlyer Europe S.A., which provide the possibility of cross-border transfers of cryptocurrencies across wallets and across exchanges, are licensed as *payment institution*.[7] To date, there has been no clarity about either the legal basis for granting such authorizations or about their potential risks and implications for the conventional payment systems.

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[1] Primarily known as 'cryptocurrencies'

[2] Also known as 'security tokens'

[3] Also known as 'utility tokens'

[4] *See* European Securities and Markets Authority, "The Distributed Ledger Technology Applied to Securities Markets," (Paris: European Securities and Markets Authority, 2017).; European Central Bank, "Virtual Currency Schemes," (Frankfurt an Main: European Central Bank, October 2012).; European Central Bank, "Virtual Currency Schemes- a Further Analysis," (February 2015 2015).
Authority, "The Distributed Ledger Technology Applied to Securities Markets."
For an overview of regulatory challenges of originating from the rise of distributed ledger technology, fintech and cryptocurrencies, see: Peter Yeoh, "Regulatory Issues in Blockchain Technology," *Journal of Financial Regulation and Compliance* 25, no. 2 (2017). https://doi.org/doi:10.1108/JFRC-08-2016-0068.; Phoebus Athanassiou, "Impact of Digital Innovation on the Processing of Electronic Payments and Contracting: An Overview of Legal Risks," *ECB Legal Working Paper Series No 16* (October 2017).; European Central Bank, "The Potential Impact of Dlts on Securities Post-Trading Harmonisation and on the Wider Eu Financial Market Integration," (Frankfurt am MainSeptember 2017).; Authority, "The Distributed Ledger Technology Applied to Securities Markets."

[5] David Yermack, "Is Bitcoin a Real Currency? An Economic Appraisal," *National Bureau of Economic Research* Working paper no. 19747 (2013).; Bank, "Virtual Currency Schemes."; European Central Bank, "Virtual Currency Schemes- a Further Analysis." For the legal nature and treatment of virtual currencies, see: Noah Vardi, "Bit by Bit: Assessing the Legal Nature of Virtual Currencies," in *Bitcoin and Mobile Payments: Constructing a European Union Framework*, ed. Gabriella Gimigliano (London: Palgrave Macmillan UK, 2016).

[6] New York Department of Financial Services, New York Codes, Rules and Regulations; Title 23, Department of Financial Services, Chapter I. Regulations of the Superintendent of Financial Services, Part 200, Virtual Currencies

[7] *See* Commission de Surveillance du Secteur Financier (CSSF), "Newsletter No. 157," news release, February 2014, http://www.cssf.lu/fileadmin/files/Publications/Newsletter/Newsletter_2014/newsletter157eng.pdf.; *See also* Jean-Louis Schiltz and Nadia Manzari, "The Virtual Currency Regulation Review: Luxembourg," *The Law Reviews* (2018).

As is the case with many legal issues, making a determination on issuing such an authorization or license often boils down to whether cryptocurrency exchanges can fall within the definitional parameters of *payment institution*. However, what is often overlooked in such a discussion is the potential risks that this authorization would pose to the conventional fiat-based payment systems. Although on their own, cryptocurrency service providers and exchanges function as parallel payment rails, issuing payment authorizations would inerasably integrate them in the payment infrastructures and would allow them to piggyback onto the conventional payment systems. This paper argues that such licensing would result in increased levels of exposure of conventional payment systems to cryptocurrency service providers and exchanges.

This paper first studies the semantics of issuing payment institution license to cryptocurrency exchanges and questions the underpinning of such a licensing based on the textual interpretation of the relevant directives and regulations. Second, it studies the volatility of the settlement asset and the risks it creates when cryptocurrencies are used as ultimate settlement asset for discharging gross or net liabilities. Third, it turns to studying the finality of cryptocurrency settlements. The highlight of the latter two parts are that even if the European payment services laws were fully applicable to cryptocurrency exchanges, such exchanges would be subject to idiosyncratic risks that would not be addressed under the current legal regime applicable to payment institutions and systems. Finally, the paper concludes that from among different policy options, issuing a payment institution license for cryptocurrency exchanges conducting their final settlements in cryptocurrencies is the least attractive policy option as it would increase the exposure of the fiat-based payment systems to cryptocurrency payment service providers.

This paper is only concerned with the tokens used for payment purposes that are similar in function to fiat money. More specifically the focus of the paper is on bitcoin, which has a probabilistic finality model for the settlement of its transactions, and which is the most well-known and the largest cryptocurrency in terms of market capitalization. Despite the focus on bitcoin, the analysis of this paper would apply, with varying degrees, to many other cryptocurrencies that exhibit features that are considerably closer to currencies or commodities than investment contracts (securities).[8]

European regulatory framework for payment institutions

Risks in the traditional fiat-based payment systems include credit risk, liquidity risk, operational risk, legal risk, and systemic risk.[9] To address such risks, payment systems in Europe rest on an edifice of robust

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[8] The arguments about probabilistic finality only applies to bitcoin and those cryptocurrencies relying on probabilistic finality, but the arguments about the volatility and illiquidity and the problems arising from semantics applies to all tokens.
[9] European Central Bank, *The Payment System: Payments, Securities and Derivatives, and the Role of the Eurosystem* (Frankfurt am Main: European Central Bank, 2010), 115-30. For an overview of legal risks in the use of cryptocurrencies as payment media,

institutional and legal infrastructure. In Europe, and more specifically in the euro area, there is a multilevel regulation and supervision of payment systems; at the European level and at the Member-State level. In addition to this multilevel regulation, there is another level of bifurcation in regulation of payment services, which concerns with the regulation of retail payment systems (handling large volume, low value payments) vis-à-vis wholesale payment systems (handling low volume, large value payments). The latter type of regulatory bifurcation has its root in the difference in the nature of the risks involved in the retail and wholesale payments. For example, the risks in the retail payments mainly stems largely from information asymmetry and certain externalities that give rise to issues such as consumer protection. An additional driver has been the fragmentation in the provision of payment services within the EU. These problems have put the Commission in the driver's seat within the efforts to integrate the retail payments in Europe with the aim of creating a single market for payment services.[10] In contrast, given the importance of the wholesale payments for the conduct of monetary policy and ensuring price stability, and their potential financial stability implications, the European System of Central Banks (ESCB) has been leading the regulation and oversight of such systems.[11]

The ESCB's competence in the area of payments includes ensuring safe and efficient payment systems, which consists of the *provision* of facilities and the exercise of oversight powers.[12] Within this system, the Eurosystem has the authority both in a centralized and decentralized manner (by the European Central Bank (ECB) and National Central Banks (NCBs) respectively) to oversee retail and wholesale payment systems.[13] In doing so, the ECB has developed regulations, guidelines and decisions, for the wholesale payment systems to address operational, liquidity and counterparty risks as well as settlement finality risks. In general, more rigorous regulatory and oversight standards, which provide for the legal certainty on collateral & finality of settlements, are applicable to the wholesale payment systems, and systemically important payment systems (SIPS) such as Target2 (Trans-European Automated Real-time Gross Settlement Express Transfer System), T2S (Target2-Securities), CLS (Continuous Linked Settlement). Likewise, within the retail payment systems, more stringent prudential standards are applicable to systemically important retail payment systems (SIRPS).[14]

In addition to the laws and regulations applicable to the wholesale payment systems, there is a well-established legal framework for the retails payment systems. Within this framework, a subset of the laws

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see Phoebus Athanassiou, "Impact of Digital Innovation on the Processing of Electronic Payments and Contracting: An Overview of Legal Risks," 16-18.

[10] Agnieszka Janczuk-Gorywoda, "Evolution of Eu Retail Payments Law," *European Law Review* 40, no. 6 (2015): 3.

[11] Sheller K. Hanspeter, *The European Central Bank: History, Role and Functions*, Second ed. (Frankfurt am Main: European Central Bank, 2006), 86.; *See also* European Central Bank, *The Payment System: Payments, Securities and Derivatives, and the Role of the Eurosystem*, 153. See in general Article 127(2) of the TFEU.

[12] European Central Bank, *The Payment System: Payments, Securities and Derivatives, and the Role of the Eurosystem*, 309.

[13] European Central Bank, "Revised Oversight Framework for Retail Payment Systems," (Frankfurt am MainFebruary 2016), 7.

[14] Ibid., 3. *See also* The Regulation of the ECB on oversight requirements for systemically important payment systems (hereinafter "the SIPS Regulation"), Regulation of the European Central Bank (EU) No 795/2014 of 3 July 2014 on oversight requirements for systemically important payment systems (ECB/2014/28) OJ L 217, 23.7.2014, p. 16–30, Art. 1(2)

and regulations applicable to payment systems aims at addressing the problems arising from information asymmetry,[15] and enhancing competition among payment service providers (PSPs), and among PSPs, banks and Third Party Payment Service Providers (TPPs). A further group of rules address access to payment accounts (payment accounts directive), user protection issues (e.g., by imposing asset segregation rules and limitations on fees), and ensuring finality of transactions and ultimately the trust in the payments system to achieve payment system stability. An additional set of directives and regulations attempt to address concerns about payment system integrity and the abuse of payment systems for financial crimes, such as Anti Money Laundering (AML) regulations, Know Your Customer (KYC) requirements, and regulations aimed at Combating the Financing of Terrorism (CFT) and financial fraud.

At the moment, the risks of using cryptocurrencies as a payment instrument for large value payments (e.g., inter-exchange payments) include operational risks, liquidity risks, and legal risks. The sources of such risks lie in two idiosyncratic aspects of cryptocurrencies such as bitcoin. One is the settlement finality risk stemming from the probabilistic finality of settlements and the risks of fork formation leading to possible double-spends. The second risk stems from the fact that bitcoin and certain other cryptocurrencies might not be sufficiently liquid to pass muster with the liquidity standards applicable to assets playing the role of a settlement asset in a sophisticated Large Value Payment System (LVPS).

As will be discussed, the above-mentioned European regulatory framework for payments does not seem to be applicable to the payments made using cryptocurrencies.[16] Despite the inapplicability of the payment laws to cryptocurrencies, certain Member States have decided to grant payment institution license to cryptocurrency exchanges as the authorization of payment institutions rests with the home Member State. These attempts have been underway because the licensing authorities wanted to extend the application of the existing payment services regulatory framework to cryptocurrency service providers. Although such attempts were successful in bringing certain aspects of cryptocurrency business within the regulatory net, they leave out certain important aspects that can pose risks to the conventional payment systems in the long run. In what follows, the paper highlights the increasing exposure of conventional payment systems to cryptocurrencies that such authorizations would bring about and that would affect conventional payment systems in ways that would eventually trigger further regulatory actions by regulators, supervisors or central banks.

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[15] Information asymmetry often give rise to concerns about consumer protection, which are often dealt with measures such as prohibition on blending in interchange fees.

[16] Except those rules applicable to financial fraud or financial crime. For a similar argument, *see* Phoebus L. Athanassiou, *Digital Innovation in Financial Services: Legal Challenges and Regulatory Policy Issues* (Alphen aan den Rijn: Kluwer Law International B.V., 2018), 86-88. *See also* Asress Adimi Gikay, "Regulating Decentralized Cryptocurrencies under Payment Services Law: Lessons from European Union Law," *Journal of Law, Technology & the Internet* 9 (2018): 20-21.; Noah Vardi, "Bit by Bit: Assessing the Legal Nature of Virtual Currencies.";

Emerging interconnections between conventional payment systems and cryptocurrencies

Granting payment institution licenses to cryptocurrency exchanges faces one major legal challenge regarding the definition of a payment institution. Although at first blush, authorizing cryptocurrency exchanges as payment institution would seem to be a step forward in the sense that it would include otherwise unregulated cryptocurrency exchanges in the scope of regulation, and would apply otherwise non-applicable payment rules to cryptocurrency exchanges, granting such licenses brings activities and instruments with different risk profiles that may not be adequately addressed under conventional payment laws, including the Payment Services Directive 2 (PSD2). In particular, the major risks concern the illiquid, volatile, untethered and non-convertible settlement asset and the concerns about the finality of the settlements in cryptocurrencies relying on probabilistic settlements.

Payment institution license and definitional issues

At least indirectly, one may surmise that the decision to grant a payment institution license is backed by the reasoning that cryptocurrencies are *money*. In its communiqué on virtual currencies, dated 14 February 2014, the relevant Luxembourg regulator, i.e., Commission de Surveillance du Secteur Financier (CSSF), states that ""virtual" currencies are considered as money, since they are accepted as a means of payment of goods and services by a sufficiently large group of people…". The CSSF continues to point out that virtual currencies are "scriptural money as opposed to cash in the form of banknotes and coins. The scriptural nature does not require a tangible writing, similarly to electronic documents or signatures that do not require paper. Virtual currencies may thus be electronic money, but not necessarily within the meaning of the European Directive 2009/110 which provides for a definition of electronic money limited to its own scope."[17]

As the above excerpt suggests, it seems that the discussion about the moneyness of cryptocurrencies has been a decisive factor in granting payment institution license to cryptocurrency exchanges. However, there has been much dispute about the nature of cryptocurrencies and whether they can be categorized as money. Currently, cryptoassets face a crisis of identity.[18] The increasing proliferation of cryptoassets adds additional layers of complexity to such a problem, as such assets differ widely from one another.[19] Not surprisingly, regulators have taken different stances on the nature of cryptocurrencies. Tax authorities have

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[17] *See* Commission de Surveillance du Secteur Financier (CSSF), "Newsletter No. 157," 4.
[18] Hossein Nabilou and André Prüm, "Ignorance, Debt and Cryptocurrencies: The Old and the New in the Law and Economics of Concurrent Currencies," *Journal of Financial Regulation (forthcoming)* (2018).
[19] European Central Bank, "Virtual Currency Schemes- a Further Analysis," 9-11.

designated cryptocurrencies as property.[20] Commodity markets authorities have viewed them as commodity.[21] Securities regulators have seen some of them as security,[22] and regulators and supervisors in charge of money or financial crime have designated them as currency.

By the same token, legislators and regulators around the globe have attempted to define cryptocurrencies. According to one classification, assets created using cryptography could fall under the umbrella term of cryptoassets[23] that could further be classified as digital commodities (cryptocommodities) representing raw digital resources, or digital tokens (cryptotokens) representing finished digital goods and services.[24] The vast majority of the tokens or cryptocurrencies listed in cryptocurrency exchanges may not meet even the minimum required criteria of moneyness. On the contrary, some of the digital tokens issued through Initial Coin Offerings (ICOs) can easily meet the definition of an investment contract (security), such as the tokens issued by the DAO.[25] Overall, it seems that they do not have but three main use-cases allowing them to be used as a means of payment (cryptocurrencies), investment (security tokens), and access (utility tokens). Some of these assets are expected to become a new asset class with potential of maturing into a valuable portfolio diversification instrument.[26]

In many legal and statutory texts, as well as central banking nomenclature, cryptocurrencies are often referred to as virtual or digital currencies. For example, a virtual currency is defined in the § 102(23) of the U.S. Uniform Regulation of Virtual-Currency Business Act (URVCBA) as a "(A) digital representation of value that: (1) is used as a medium of exchange, unit of account, or store of value; and (2) is not legal tender, whether or not denominated in legal tender".[27] The New York Bitlicense defines virtual currencies as "any type of digital unit that is used as a medium of exchange or a form of digitally stored value."[28] According to the Bitlicense, "Virtual Currency shall be broadly construed to include digital units of exchange that (i) have a centralized repository or administrator; (ii) are decentralized and have no centralized repository or administrator; or (iii) may be created or obtained by computing or manufacturing effort."[29] The ECB defines virtual currencies as "a digital representation of value, not issued by a central bank, credit institution or e-

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[20] *See* Phoebus Athanassiou, "Impact of Digital Innovation on the Processing of Electronic Payments and Contracting: An Overview of Legal Risks," *ECB Legal Working Paper Series No 16* (Octover 2017): 22-24.

[21] Commodity Futures Trading Commission, "In the Matter Of: Coinflip, Inc., D/B/a Derivabit, and Francisco Riordan, Respondents: Order Instituting Proceedings Pursuant to Sections 6(C) and 6(D) of the Commodity Exchange Act, Making Findings and Imposing Remedial Sanctions (Cftc Docket No. 15-29)," (September 17, 2015).

[22] Securities and Exchange Commission, "Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The Dao," (Washington, DCJuly 25, 2017).

[23] Chris Burniske and Jack Tatar, *Cryptoassets: The Innovative Investor's Guide to Bitcoin and Beyond* (New York: McGraw Hill, 2018).

[24] Ibid. Chapter 4.

[25] DAO stands for Decentralized Autonomous Organization. *See* Commission, "Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The Dao."

[26] Aleksander Berentsen and Fabian Schär, "A Short Introduction to the World of Cryptocurrencies," *Federal Reserve Bank of St. Louis Review* 100, no. 1 (First Quarter 2018). https://doi.org/https://doi.org/10.20955/r.2018.1-16.

[27] § 102(23) of the Uniform Regulation of Virtual-Currency Business Act (URVCBA)

[28] Section 200.2(p) Bitlicense, New York Department of Financial Services, New York Codes, Rules and Regulations; Title 23, Department of Financial Services, Chapter I. Regulations of the Superintendent of Financial Services, Part 200, Virtual Currencies.

[29] Ibid.

money institution, which in some circumstances can be used as an alternative to money". [30] It seems that these definitions have been intentionally broadly constructed to include the majority of the cryptocurrencies, even if they may not be a store of value or a medium of exchange. Although the above-mentioned regulatory developments are introducing a new category of assets called virtual currencies, they are silent about the *moneyness* of such assets.

Despite being designated as a commodity, bitcoin has a hybrid nature, displaying the features of both commodities and currencies. This has been highlighted in the case Skatteverket v. David Hedqvist, in which the Court of Justice of the European Union (CJEU) characterized bitcoin as a means of payment, rather than a 'tangible property' for the purpose of Council Directive 2006/112/EC (VAT Directive).[31] Furthermore, the Court admitted that in addition to the state currencies with legal tender status, virtual currencies with bi-directional flow are valid means of payment without being legal tender.[32] However, even a being a valid means of payment does not make them money or currency in the eyes of regulators and central bankers, such as the ECB in whose view virtual currencies are not money nor currency from a legal standpoint.[33] Perhaps, given its hybrid nature, and adopting a functional definition, bitcoin might best be seen as a form of digital commodity money, or in Selgin's words 'synthetic commodity money'.[34]

Irrespective of this functional definition, or treatment of cryptocurrencies as property or commodity for tax and commodity market regulation purposes, granting a payment institution license should also conform to the statutory definition of a payment institution. The regulatory framework for payment institutions in Europe (i.e., Payment Services Directive 2; hereinafter, PSD2)[35] relegates the authorization of payment institutions to the competent authorities of the home Member State who should make a determination whether a specific entity is a payment institution or not.[36] As the definition of a payment institution in turn relies on the term *money* and similar terms, it is important to determine if bitcoin can be classified as *money*, or more specifically, *fund*, under the European payment services laws that governs the granting payment institution licenses.

PSD2 defines a payment institution as "a legal person that has been granted authorisation …. to provide and execute *payment services* throughout the Union."[37] [Emphasis added.] Therefore, the definition of a

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[30] European Central Bank, "Virtual Currency Schemes- a Further Analysis," 4.
[31] § 17 of the opinion of the Advocate General Kokott Skatteverket v David Hedqvist, Case C-264/14
[32] § 49 & 50 of the Judgment of the Court (Fifth Chamber) of 22 October 2015, Skatteverket v David Hedqvist, Case C-264/14
[33] European Central Bank, "Virtual Currency Schemes- a Further Analysis," 4.
[34] Slegin defines synthetic commodity money as "money that lacks nonmonetary value but is nevertheless reproducible only at a positive and rising marginal production cost, if indeed it can be reproduced at any cost at all." *See* George Selgin, "Synthetic Commodity Money," *Journal of Financial Stability* 17 (2015/04/01/ 2015): 95. https://doi.org/https://doi.org/10.1016/j.jfs.2014.07.002.
[35] 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 (Text with EEA relevance)**,** *OJ L 337, 23.12.2015, p. 35–127*
[36] Article 5, PSD2
[37] Art. 4(4), PSD2.

payment institution largely relies on the definition of 'payment services' in the PSD2. The Annex I of the PSD2 defines payment services as services enabling *cash* placement or withdrawal on or from a payment account, "as well as all the operations required for operating a payment account." In addition, execution of 'payment transactions', and *money* remittance fall under the definition of payment services.[38]

PSD2 defines 'payment transaction' as "an act, initiated by the payer or on his behalf or by the payee, of placing, transferring or withdrawing *funds*, irrespective of any underlying obligations between the payer and the payee".[39] Therefore, it seems that the issue boils down to the definitions of the words 'cash', 'fund' and 'money'. As cryptocurrencies cannot be classified as cash or money,[40] the closest term that could be associated with cryptocurrencies is the term 'fund'. PSD2 defines funds as "banknotes and coins, scriptural money or electronic money as defined in point (2) of Article 2 of Directive 2009/110/EC".[41] As bitcoin is not banknote or coin, nor is it scriptural money,[42] the closest concept can be electronic money (e-money). Therefore, from a legal perspective, cryptocurrencies should also be differentiated from electronic money (e-money).[43] The e-money directive[44] defines electronic money as "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".[45] E-money is always at par with fiat money. The main difference between e-money and fiat money is that e-money is the digital representation of fiat money stored on an electronic chip.[46] However, cryptocurrencies are self-anchored and are not pegged to any currency.[47] In addition, e-money issuers should redeem the monetary value of the e-money at par on demand, whereas such an obligation does not exist for cryptocurrency developers or issuers.[48] Therefore, as bitcoin does not represent any claim, classification of bitcoin as e-money would be a mistake.[49]

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[38] See: Art. 4(3), PSD2 & Annex I, PSD2.
[39] Art. 4, PSD2.
[40] European Central Bank, "Virtual Currency Schemes- a Further Analysis," 4.
[41] Art 4(25), PSD2.
[42] *See* European Banking Authority, "Report with Advice for the European Commission on Crypto-Assets," (9 January 2019), 14. In ECB's opinion of 26 April 2006 on a proposal for a directive on payment services in the internal market (ECB/2006/21) (2006/C 109/05), the ECB suggests that a definition of scriptural money should be provided. However, it specifies that only central banks and credit institutions (which include e- money institutions) may hold scriptural money. Available at: https://www.ecb.europa.eu/ecb/legal/pdf/c_10920060509en00100030.pdf
The PSD2 does not contain any definition of scriptural money. However, it seems that the term scriptural money can hardly be stretched to include cryptocurrencies.
[43] Sarah Rotman, "Bitcoin Versus Electronic Money," in *CGAP Brief* (Washington, D.C.: The Consultative Group to Assist the Poor Brief, 23 January 2014).
[44] Directive 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, 10.10.2009, p. 7–17. (Hereinafter, E-money directive)
[45] Art. 2, E-money directive.
[46] Article 2(2) for the E-money directive defines e-money as a monetary value represented as a claim on the issuer which is stored on an electronic device and accepted as a means of payment by undertakings other than the issuer.
[47] Though they can be pegged to fiat currencies (e.g., Tether or USDT)
[48] Art. 11, E-money directive.
[49] Although some other cryptocurrencies, depending on their features may qualify as e-money. See: Authority, "Report with Advice for the European Commission on Crypto-Assets." *See also* Niels Vandezande, "Between Bitcoins and Mobile Payments: Will the

As the above analysis suggests, under the current legal framework for payments in Europe, cryptocurrencies cannot fall under the definitional scope of cash, money or funds,[50] casting a shadow of doubt on the applicability of European payment services directives and regulations to cryptocurrency exchanges. Even assuming the full applicability of the payment services laws to the cryptocurrency exchanges, such exchanges would be subject to idiosyncratic risks that would not be covered under the current legal regime applicable to payment institutions and systems. The two such idiosyncratic risks are the risks associated with the reliance of cryptocurrency exchanges on an illiquid and volatile settlement asset whose convertibility to central bank money (CeBM) is not guaranteed and the risks associated with the settlement finality within certain major cryptocurrency blockchains.

Liquidity and volatility of the settlement asset

Payment and settlement systems often use assets bearing the least credit and liquidity risks as their settlement asset. This is particularly important within the wholesale payment systems, where an otherwise illiquid settlement asset or an asset having counterparty risk would create systemic implications for the SIPS. For example, in Europe and the euro area SIPS operators must ensure that the final settlements of the one-sided payments in euro takes place in CeBM.[51] The same requirement applies to settling two-sided payments or non-euro one-sided payments, where practicable and available. If CeBM is not used, the operator should ensure that the settlement asset for money settlements be of little or no credit and liquidity risks.[52] For settlements in commercial bank money (CoBM) certain conditions are imposed on the SIPS.[53]

Against this background, there are two idiosyncratic aspects to cryptocurrencies compared to fiat money that create specific risks, which cannot be addressed by granting payment institution licenses to cryptocurrency exchanges. Under current legal framework and commercial practices, in domestic fiat-based systems, either the CeBM, which is the unit of account, or the CoBM, which is convertible at par to CeBM, is used as the settlement asset. This ensures that there is virtually no volatility risk associated with the settlement asset. However, although under bitcoin, there is virtually no counterparty risk, the concerns about illiquidity and volatility remain valid. To understand this, it is important to contrast the liquidity profile of bitcoin to fiat money, both CeBM and CoBM.

European Commission's New Proposal Provide More Legal Certainty?," *International Journal of Law and Information Technology* 22, no. 3 (2014): 309. https://doi.org/10.1093/ijlit/eau003. (Arguing for a more inclusive approach to the scope of the e-money directive to potentially include bitcoin)

[50] Authority, "Report with Advice for the European Commission on Crypto-Assets," 14.

[51] Art. 10(1) of the Regulation of the European Central Bank (EU) No 795/2014 of 3 July 2014 on oversight requirements for systemically important payment systems (ECB/2014/28). (SIPS Regulation)- as amended by the Regulation (EU) 2017/2094 of the European Central Bank of 3 November 2017 amending Regulation (EU) No 795/2014 on oversight requirements for systemically important payment systems (ECB/2017/32)

[52] Art. 10(3) SIPS Regulation

[53] Art. 10 SIPS Regulation

Similar to CeBM, bitcoin is not a debt instrument and carries no default risk.[54] In addition, on-chain bitcoin transactions are conducted on a near real-time gross settlement basis on the Bitcoin Blockchain, reducing the default risk of the counterparty. For our purposes, the main difference between bitcoin and CeBM is that the discretionary monetary policy in central banking means that CeBM carries an inflation risk.[55] Unlike CeBM, bitcoin effectively carries no inflation risk as it has a capped and fixed supply schedule.[56] However, a virtually hard cap or inflexible supply schedule on the number of bitcoins begets price volatility in response to demand shocks, making bitcoin a hard sell as a unit of account. Therefore, the elimination of inflation risk comes at the cost of price volatility. In addition to the risk of price volatility, such limitations would effectively remove the possibility of having a lender of last resort (LOLR).[57] The absence of LOLR means that unlike CeBM or CoBM, bitcoin exposes users to the risks associated with price volatility as well as illiquidity. In addition to the fixed supply schedule of certain cryptocurrencies, as the cryptocurrency exchanges offer bidirectional flows between fiat money and cryptocurrencies, market participants have an easy way out to fiat money, which could give rise to the extreme volatility of the settlement asset in cryptocurrency payment systems in times of illiquidity.

Unlike bitcoin, CoBM (or bank-issued IOUs representing a claim against a commercial bank in CeBM) is a claim against the issuer. This difference in nature entails that cryptocurrencies are also different from CoBM in terms of their risks profile. This means that CoBM has a certain degree of counterparty default risk. However, in terms of monetary policy, bitcoin is dissimilar to CoBM, which is demand driven and very much responsive to the demands for credit.[58]

In addition to the risks associated with the settlement asset, cryptocurrency payments are mainly gross and (near) real time. Hence, they may be subject to substantial liquidity risks, as is the classic problem with real-time gross settlement (RTGS) systems. Since RTGS systems are liquidity intensive, the deferred net settlement (DNS) systems have emerged. However, DNS systems increase the counterparty default risks

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[54] See: Nick Rowe, "From Gold Standard to Cpi Standard," *Worthwhile Canadian Initiative: A mainly Canadian economics blog*, April 05, 2015, 2015, http://worthwhile.typepad.com/worthwhile_canadian_initi/2012/04/from-gold-standard-to-cpi-standard.html.; Nick Rowe, "Is Money a Liability?," *Worthwhile Candadian Initiative: A mainly Canadian economics blog*, March 12, 2012, 2012, http://worthwhile.typepad.com/worthwhile_canadian_initi/2012/03/is-modern-central-bank-money-a-liability.html. However, such a promise would not be considered as a binding legal contract as the central bank has theoretically unlimited discretion on inflating the currency.
Some theories, such as the credit theory of money, suggest that there is no need for redeemability or convertibility. For example, Mitchell Innes casts significant doubt on whether redeemability has been a feature of currency even under the metallic standard. See: A Mitchell Innes, "What Is Money?," in *Credit and State Theories of Money: The Contributions of A. Mitchell Innes*, ed. L. Randall Wray (Cheltenham, UK: Edward Elgar Publishing Limited, 2004), 36.
[55] Thomas J. Jordan, "How Money Is Created by the Central Bank and the Banking System," (Zurich: Swiss National Bank, 16 January 2018).
[56] This cap can also be changed in the protocol if there is sufficient consensus. It seems that such a consensus would be very hard to come by. Although each cryptocurrency (bitcoin) has a limit on its total number, there is no limit on the cryptocurrency brands that could be issued. Currently, there are more than 2,000 different cryptocurrencies and proliferation of such currencies are likely to lead to suboptimal or unstable equilibria and affect price stability. See: Daniel R Sanches, "Bitcoin Vs. The Buck: Is Currency Competition a Good Thing?," *Federal Reserve Bank of Philadelphia Economic Insights Q2 2018* (2018): 13.
[57] Dong He, "Monetary Policy in the Digital Age," *Finance & Development* 55, no. 2 (June 2018).
[58] The same applies to the quasi-money created by the shadow banking system.

due to the extra time needed between the execution of an order and the final settlement of obligations. As bitcoin uses real-time gross settlement mechanism, it eliminants counterparty risks, but it requires higher levels of liquidity. Recently, there has been move towards the 'hybrid' RTGS systems used extensively today in order to achieve the best tradeoff between the risks and rewards of the RTGS and DNS systems.

Furthermore, the monetary economics of bitcoin seems to put further pressure on its use as a wholesale settlement mechanism as bitcoin tries to bring together three features of decentralization, fixed money supply and sufficient liquidity. In other words, it strives to become a decentralized, liquid and capped currency. However, it seems impossible to have full decentralization, fixed money supply, and sufficient liquidity simultaneously.[59]

In the banking system, to fend off the liquidity risks, banks have developed several lines of defense. They often establish liquidity policies that limit the extent of the maturity transformation. Banks also acquire committed credit lines from other banks,[60] or they borrow from interbank repo markets. On top of all internal and external measures comes the government safety nets.[61] In this framework, liquidity problems are often dealt with in a centralized manner. For example, in the eurozone, the ECB offers LOLR services (equivalent to Fed's discount window) through the marginal lending facility.[62] The reason that the ECB can be the LOLR is that it has access to unlimited sources of liquidity. However, in the bitcoin network, the predetermined supply schedule and fixed money supply rules out the possibility of an ultimate liquidity provider.

The mounting interest in creating stablecoins in the cryptocurrency industry in 2018 showed the importance of price stability to a settlement asset and an effective medium of exchange. However, most of these attempts were limited to using collateralization techniques to create safety and stability giving birth to

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[59] Frances Coppola, "Lightning Network May Solve Bitcoin's Scaling 'Trilemma'," *Coindesk*January 20, 2018.

[60] Authority Financial Services, "The Turner Review: A Regulatory Response to the Global Banking Crisis," (2009), 21.

[61] In addition to banks' internal risk mitigating strategies, deposit insurance funds guarantee bank deposits up to certain limits. Deposit insurance is primarily introduced to prevent bank runs and panics, thereby to sustain financial stability. See: Alan S. Blinder and Robert F. Wescott, "Reform of Deposit Insurance: A Report to the Fdic," (2001).; Charles W Calomiris, "Is Deposit Insurance Necessary? A Historical Perspective," *The Journal of Economic History* 50, no. 02 (1990)..
Further, banks are provided with access to the 'discount window' or the 'lender of last resort' (LOLR) facilities of central banks. The LOLR function of central banks is devised to prevent bank runs on illiquid but solvent banks when they have liquidity problems due to their inability to borrow from interbank market or other central bank facilities. *See Xavier Freixas et al., "Lender of Last Resort: What Have We Learned since Bagehot?," Journal of Financial Services Research 18, no. 1 (2000).;* Xavier Freixas and Bruno M. Parigi, "The Lender of Last Resort of the 21st Century," in *The First Global Financial Crisis of the 21st Century: Part Ll June-December 2008*, ed. Andrew Felton and Carmen M. Reinhart (VoxEU.org Publication, 2009), 163-67.; Carlos Garcia-de-Andoain et al., "Lending-of-Last-Resort Is as Lending-of-Last-Resort Does: Central Bank Liquidity Provision and Interbank Market Functioning in the Euro Area," *ECB Working Paper Series No 1886* (2016).
Historically, the LOLR function in the market was played by private financial institutions. A bold example of taking up of such a role in the crisis of 1907 was J. P. Morgan's provision of liquidity to markets and institutions in the banking panic of that year. *See* Robert F. Bruner and Sean D. Carr, *The Panic of 1907: Lessons Learned from the Market's Perfect Storm* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2007). However, after the 1913, the year in which the Federal Reserve came into being, it took up such a function. All these protections are to ensure that banking entities' main functions, i.e., maturity transformation, and their role in payment system are not impaired because of sudden liquidity shocks.

[62] This is made redundant by the introduction of fixed rate full allotment policy (FRFA). See: Carlos Garcia-de-Andoain et al., "Lending-of-Last-Resort Is as Lending-of-Last-Resort Does: Central Bank Liquidity Provision and Interbank Market Functioning in the Euro Area," 10.

cryptocurrencies that are either collateralized by fiat money or by cryptocurrencies. However, collateralized stablecoins are highly vulnerable to speculative attacks. Prior financial crises, and in particular runs on repos during such crises, have demonstrated that such techniques can hardly bring long-term safety and stability.[63] Although some stablecoin projects, such as Basis,[64] are being structured on the algorithmic central banking model, which provides for price stability using flexibility in money supply, it is unlikely that stablecoin experiments would succeed in the presence of a credible CeBM with a long-established reputation for price stability. In the case of cryptocurrencies based on algorithmic central banking, it is hard to imagine their success in the absence of a long-established reputation of price stability.

Where the cryptocurrency exchanges licensed as payment institutions, which are intertwined with the regulated payment institutions and use an illiquid, highly volatile and unconvertible settlement asset without access to LOLR facilities, become large enough, they may effectively function as contagion channels for the shocks of originated from cryptocurrency ecosystems to conventional banking and payment systems.[65] Needless to say, the increasing number of payment institution licenses granted to cryptocurrency exchanges would increase the magnitude of the interconnectedness of the cryptocurrency payments with the conventional payment systems. In this case, one policy option for central banks or other NCAs would be to require the separation of cryptocurrency payment systems from conventional regulated payment systems on prudential grounds.[66] In addition, the ECB may cut access to its infrastructure for the credit and payment institutions that have exposures to cryptocurrency exchanges or payment institutions.

It is worth mentioning that although cryptocurrencies would be prone to liquidity risks, as of yet, there has been no documented risks to the conventional payment systems posed by illiquidity in cryptocurrencies. However, the probability of such system-wide events cannot be ruled out in the future.

Finality of settlements

Another major risk about the payments made by cryptocurrencies, which may not be covered by the existing payments law, concerns the probabilistic finality of certain cryptocurrencies such as bitcoin. The finality of payments and settlements on the Bitcoin blockchain is probabilistic due to the likelihood that the most recent transactions embedded in the blockchain may be undone, or bitcoins maybe double-spent mainly due

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[63] *See* Gary B. Gorton and Andrew Metrick, "Securitized Banking and the Run on Repo," *Journal of Financial Economics* 104, no. 3 (2012).; Antoine Martin, David Skeie, and Ernst-Ludwig von Thadden, "Repo Runs," *The Review of Financial Studies* 27, no. 4 (2014). https://doi.org/10.1093/rfs/hht134.; Adam Copeland, Antoine Martin, and Michael Walker, "Repo Runs: Evidence from the Tri-Party Repo Market," *The Journal of Finance* 69, no. 6 (2014). https://doi.org/10.1111/jofi.12205.; Arvind Krishnamurthy, Stefan Nagel, and Dmitry Orlov, "Sizing up Repo," ibid. (https://doi.org/10.1111/jofi.12168.; See in general: Hossein Nabilou, "Testing the Waters of the Rubicon: The Ecb and Central Bank Digital Currencies," *SSRN Working Paper Series* (2019).
[64] For more details see: https://www.basis.io/. For a critique of this project, see: Jemima Kelly, "The John Taylor-Backed "Stablecoin" That's Backed by, Um, Stability," *Financial Times* June 25, 2018. This project was shut down in December 2018.
[65] In addition, the failure of such cryptocurrency payment institutions/exchanges would also pose reputational risks to the EU license brand of payment institutions.
[66] European Banking Authority, "Eba Opinion on 'Virtual Currencies'," (London: European Banking Authority, 4 July 2014).

to a formation of a fork.[67] This probability is a function of the block height, meaning that the probability of undoing transactions embedded in the blockchain depends on how deep the transaction is recorded in the blockchain. As more and more blocks are built on the Bitcoin blockchain, the lower the probability of undoing the embedded transactions, and as it gets deeper and deeper in the blockchain, the probability becomes infinitesimal as the Proof-of-Work (PoW) algorithm of the Bitcoin protocol[68] ensures that the extrinsic investment in expended energy would act as a 'thermodynamic guarantee of immutability'.[69] Therefore, it is safe to assume that the transactions are final after six confirmations, as undoing six blocks requires a very high investment in energy.[70] To reduce the uncertainty about the settlement finality especially within the first sixty minutes, the industry has developed its own commercial customs. Depending on the wallet used, as soon as a transaction is broadcast to the Bitcoin blockchain, the receiving wallet receives a notification confirming the receipt of a payment, but the payment is considered final after six confirmations.

In the debate about the probabilistic finality, it is important, however, not to confuse two different aspects of transaction finality: actual, technical, or *de facto* finality, and legal or *de jure* finality. The technical settlements on the Bitcoin blockchain is probabilistic, so is the actual settlement with cash and any other means of electronic payments, as there is always the possibility of taking the cash back by using brute force or reversing the transaction due to a technical failure in the payment system, including that of a central bank. However, the near impossibility of a de facto finality does not necessarily mean that the payment is not *legally* final, in the sense that legal challenges cannot invalidate the payment ex-post. In other words, *de facto* probabilistic finality does not necessarily mean *de jure* probabilistic finality and vice versa.[71] The difference between settlements with conventional payments vis-à-vis the settlements within the blockchain with probabilistic finality is that the settlement on the conventional payment systems enjoys legal protections, whereas there is no legal protection as to the finality of the settlements on the Bitcoin blockchain.

Although the case law may evolve and presume settlement finality after six confirmations for private-law purposes, given the potential for systemic risk arising from the ambiguity as to the finality of payments, such issues may better be dealt with ex-ante within a *regulatory* framework, as is the case with conventional

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[67] Bank for International Settlements, "Cryptocurrencies: Looking Beyond the Hype," in *Annual Economic Report* (Basel2018), 101-04.

[68] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," (2008).; For more details, *see* Andreas M. Antonopoulos, *Mastering Bitcoin: Programming the Open Blockchain* (Sebastopol, CA: O'Reilly Media, Inc.,, 2017), Chapters 2 & 10.

[69] (Andreas Antonopoulos) – proof of work; Let's talk bitcoin #368 the internet of money & https://vevo.site/video/Bw3-Waz04X8/andreas-antonopoulos-talks-bitcoin-blockchain-and-beyond.html

[70] This is not to say that it amounts to complete immutability. Theoretically complete immutability cannot be achieved.

[71] In fact, technically speaking, in most transactions, the real world may not provide a solid 100% certainty; therefore, there is a need for the law to intervene and presume that as soon as certain requirements are met, a transaction would be deemed final. As on the Bitcoin Blockchain, similar to any other payment system, the actual transfers are not 100% final and immutable, but the law may presume that at certain point in time a transaction becomes final. In other words, the fact that the finality on the Bitcoin Blockchain is not deterministic does not stop the law to presume the finality of a transaction on its blockchain.

payment and settlement systems. However, under the current payments law, the laws ensuring settlement finality (e.g., the Settlement Finality Directive),[72] which require payment and settlement systems to specifically define the moment of entry and irrevocability of the orders and transactions, do not seem to be applicable to payments made by cryptocurrencies.[73] The lack of legal protection in itself may entail systemic implications if the cryptocurrency markets become sufficiently large and more sophisticated products and services develop around them.

The concerns about probabilistic finality and the absence of legal protections might be reduced as certain developments, such as the Lightning Network,[74] may significantly diminish the use of Bitcoin blockchain for large volume, low value transactions. But such developments may eventually increase the number of large value, low volume transactions on the Bitcoin blockchain. In addition, it seems that most transactions in cryptocurrency exchanges take place through book entries rather than using blockchains to transfer tokens, however, inter-exchange and inter-wallet transactions go through the relevant blockchain. Therefore, at the time of writing, due to transaction batching used for discharging inter-exchange liabilities, which is essentially similar to the DNS system, the number of transactions that settle on the blockchain does not appear to be large, however, the amounts that would be settled remain sizeable. In other words, these inter-exchange markets exhibit the attributes of an LPVS, where the systemic risks are prevalent. If cryptocurrency markets become sufficiently large, these markets would become the Achilles heel of the cryptocurrency industry due to settlement finality risks as well as the volatility and illiquidity of the settlement assets. As these types of risks are not addressed under the current laws and regulations, granting payment institution license would allow the risks stemming from probabilistic finality to permeate from cryptocurrency ecosystem to fiat payment systems. At the moment, it is not clear if the cryptocurrencies become large enough, whether regulators or even central banks would be able to readily deal with such risks.

Summary and conclusion

This paper discussed the potential risks arising from authorizing cryptocurrency exchanges as payment institutions. It argued that such a licensing strategy faces several challenges. In addition to the problems arising from semantics and textual interpretation of the existing laws, which entail that cryptocurrency exchanges do not fall within the definitional ambit of payment institutions, the paper identifies idiosyncratic risks associated with the cryptocurrency payments that cannot be fully addressed even assuming the full

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[72] Directive 98/26/EC of the European Parliament and of the Council of 19 May 1998 on settlement finality in payment and securities settlement systems, OJ L 166, 11.6.1998, p. 45–50. (Settlement Finality Directive)
[73] *See* Arts. 1 & 2 of the Settlement Finality Directive.
[74] Joseph Poon and Thaddeus Dryja, "The Bitcoin Lightning Network: Scalable Off-Chain Instant Payments," (2016).; Aaron van Wirdum, "The History of Lightning: From Brainstorm to Beta," *Bitcoin Magazine* (4 April 2018).

applicability of the payment services laws to the cryptocurrency exchanges. Two prominent examples of such risks are the risks associated with the illiquidity and volatility of the settlement asset in cryptocurrency payments, and the risks arising from the probabilistic finality of the settlements in blockchains relying on indeterministic or probabilistic finality.

Granting payment institution license only covers those risks that are prevalent in the fiat-based payment systems. For example, the risks associated with illiquidity and volatility of the settlement asset are traditionally dealt with by requiring the use of primarily CeBM or - if not available or practicable - CoBM as the settlement asset, especially in wholesale payment systems. Settlement finality risks are also addressed by the specific rules and mechanisms enshrined in the Settlement Finality Directive and the Financial Collateral Directive by introducing specific moment of entry and irrevocability of the orders and transactions and exempting the financial collateral (including cash collateral) from bankruptcy procedures respectively. At the moment, neither the above directives nor other relevant regulations appear to be applicable to cryptocurrency payments. Thus, the existing payment regulations do not address the problems that are specific to cryptocurrencies and might arise from the idiosyncratic features of settlements made by cryptocurrencies.

As for the settlement finality risks, the settlement finality directive and the financial collateral directive could eventually be revised to include cryptocurrencies. However, regarding the risks in the use of unstable and illiquid settlement asset, given that in certain cryptocurrencies such as bitcoin, for all practical purposes, there is no possibility of a flexible supply schedule, such risks cannot be effectively dealt with by legal mechanisms or policy tools.

From among the policy options of issuing a special license, allowing cryptocurrencies to run as parallel payment rails alongside the existing payment system without a specific license (subject to ring-fencing),[75] and issuing a payment institution license, the latter seems to be the least attractive one as it would increase the exposure of the fiat-based systems to cryptocurrency payment service providers. Therefore, instead of shoehorning the new innovative payment instruments into the traditional payments regulatory framework, issuing a new type of license other than a payment institution license to cryptocurrency exchanges and service providers, which could take account of the specific nature of risks and their potential wider implications for the conventional payment systems, would be the appropriate long-term policy option.

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[75] This is not to say that such service providers would go unrestrained and the laws applicable to the abuse of financial system for criminal purposes would not apply.

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