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Regulating Crypto-finance: A Policy Blueprint

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Abstract

This paper is a chapter of a forthcoming monograph, Regulating the Crypto-economy, to be published by Hart Publishing in the latter half of 2021. The book looks at novel economic activity on permissionless blockchains, many of which taking place on the Ethereum blockchain, as having potential for economic mobilisation and development. The book argues that a holistic enterprise-based agenda is needed so that regulatory capitalism can provide appropriate institutional support for the productive crypto-economy. However, in its self-governing state, much of crypto-economy activity has become heavily financialised. Such financialisation to an extent supports the self-governing nature of the crypto-economy but also brings about certain hazards. This chapter provides discussion on the policy issues that should be considered in relation to novel developments in crypto-finance and decentralised finance, and provides a blueprint for financial regulators. It is however nested within a broader framework advocating enterprise regulation to take the lead, so that siloed emphases on financial regulation would not crowd out the policy agenda and development in the crypto-economy. The chapter does not deal with initial coin offerings, which are explored in other chapters of the book. In this manner this is a sneak preview of working material primarily focused on the development of stablecoins and decentralised finance.

Keywords: cryptocurrency, crypto-assets, financial regulation, stablecoins, decentralised finance

JEL Classifications: G2, K3

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Regulating Crypto-finance: A Policy Blueprint

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This is a forthcoming chapter in monograph 'Regulating the Crypto-economy' which will be published by Hart Publishing in the latter half of 2021.

A. Productive and Hyper Forms of Financialisation

Finance is a term that carries with it many established notions in terms of its regulatory ontologies, designs and standards. It is too easy for to latch onto existing paradigms[1] in discussing crypto-finance without considering how the technological disruptions underlying crypto-finance has changed financial business models, relations and risk. In this final chapter of the book, we argue that law and policy for crypto-finance should be based on answering two questions in the order of (a) *why* regulate crypto-finance and then (b) *how* crypto-finance should be regulated. Unpacking *why* crypto-finance should be regulated provides us with the preface to distilling *how* this should be approached. In this way, we would not merely be seeking to fit the *how* of financial regulation to crypto-finance phenomena in a coherentist manner.

First, in answering the *why* question, this chapter suggests that there should be a distinction made between the 'productive' financialisation of a capitalist economic system and its 'hyper' financialisation. This difference underpins an essential policy choice for regulating crypto-finance and the extent of regulatory scope.

Financialisation is often defined as 'the increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies'.[2] This definition does not encapsulate why private financial actors and services have become so important- which is to mobilise the economic activities of capitalist orders. Financial investment is needed for productive investment in order to generate productivity and wealth creation for economic actors.[3] According to the legal theory of finance,[4] it is the creation of legally recognised and enforceable financial claims that makes finance possible for allocation to the productive economy. For example, corporations, the economic engines for productivity, rely on debt, which creates financial claims in terms of recurring repayments and interest, and rights to collateral; as well as equity, which creates financial claims in terms of rights of distribution and governance in corporations.[5]

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[1] See the coherentist approach discussed in Chapter 1 of this volume, and approaches taken by jurisdictions such as the US to initial coin offerings discussed in Chapter 3. Editorial, 'Taxonomies of Digital Assets: Recursive or Progressive' (2019) 2 *Stanford Journal of Blockchain Law & Policy* 1.

[2] GA Epstein, 'Introduction: Financialization and the World Economy' in GA Epstein ed, *Financialization and the World Economy* (Cheltenham: Edward Elgar, 2005) at 3.

[3] JB Foster, 'The Financialisation of Capitalism' (2007) 58 *Monthly Review* 11, http://www.greeneconomics.net/Financialization.pdf.

[4] K Pistor, 'A Legal Theory of Finance' (2013) 41 *Journal of Comparative Economics* 315.

[5] E Ferran and LC Ho, *Principles of Corporate Finance Law* (Oxford, OUP 2014), Part III, and ch15 on debt, and Parts II and IV generally on equity finance.

In the crypto-economy, ICOs can be regarded as a financialised phenomenon as claims to future tokens that would embed certain protocols and rights are created in return for funds sent to developers of dApps or blockchain infrastructure.[6] These claims do not provide for similar entitlements or rights as under conventional corporate finance claims in debt or equity. Functionally, the nature of creating claims in return for funds is the same as in conventional corporate finance,[7] except that the content of such claims is novel, and the enforcement mechanism for such claims is technologically-reliant. ICOs are thus a form of productive financialisation as claims are created in order for enterprise development to take place, in the hope of creating network effects and peer-to-peer economic mobilisation in the crypto-economy.[8]

The creation of financial claims in order to mobilise the productive economy however cannot be decoupled from the other side of financialisation, which is the creation of fungibility and tradeability of these financial claims as financial assets.[9] This development is arguably necessary as the rise of secondary markets and liquidity underpin investor confidence in participating in the creation of financial claims, allowing exit for investors. Productive financialisation essentially supports the creation of financial assets, but this then opens up the opportunity for financial assets to be arbitraged and speculated upon by those seeking purely financial yield that is unconnected to productivity generation.[10] This chapter calls such financialisation 'hyper' financialisation as based on speculative or short-termist profit-seeking behaviour. Critical literature on financialisation has often focused on the negative effects of hyper financialisation, such as: the fuelling of asset price bubbles and crashes that ultimately result in social cost,[11] the widening of the wealth gap between those whose returns are from financial assets and those relying on productive wealth generation,[12] and the adverse impact on the corporate economy whose productivity may be hollowed out in order to generate financial yield, through financial engineering.[13]

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[6] See chapters 1, 5.

[7] A Collomb, P de Fillippi and K Sok, 'Blockchain Technology and Financial Regulation: A Risk-Based Approach to the Regulation of ICOs' (2019) 10 *European Journal of Risk Regulation* 263.

[8] There is also empirical research suggesting that volatile cryptocurrency prices do not significantly affect ICO demand, showing that demand is not based on merely speculative incentives, see C Masiak, JH Block, T Masiak, M Neuenkirch & KN Pielen, 'Initial Coin Offerings (ICOs):Market Cycles and Relationship' (2019) *Small Business Economy*, https://doi.org/10.1007/s11187-019-00176-3.

[9] Foster (2007).

[10] Ibid, speculation and arbitrage are essentially connected with human behavioural tendencies, but policy steering can affect these in developing solutions, see RJ Shiller, 'Speculative Asset Prices' (2014) 104 *American Economic Review* 1486.

[11] 'What are the economic costs of asset price bubbles?' (2 Sep 2015), https://www.weforum.org/agenda/2015/09/what-are-the-economic-costs-of-asset-price-bubbles/; J Stiglitz, *Freefall: Free Markets and the Sinking of the Global Economy* (NY: Penguin 2010).

[12] K-H Lin and D Tomaskovic-Devey, 'Financialization and U.S. Income Inequality, 1970–2008' (2013) 118 *American Journal of Sociology* 1284; E Hein, 'Finance-dominated Capitalism and Redistribution of Income: A Kaleckian Perspective' (2013) at http://ssrn.com/abstract=2198919; B Kus, 'Financialisation and Income Inequality in OECD Nations: 1995-2007' (2012) 43 *The Economic and Social Review* 477; G Dumenil and D Levy, 'Financialization, Neo-liberalism and Income Inequality in the USA' in Ismail Erturk, Julie Froud, Sukhdev Johal, Adam Leaver and Karel Williams (eds), *Financialization At Work: Key Tests and Commentary* (Oxford: Routledge, 2008).

[13] P Ireland, 'The Financialization of Corporate Governance' (2009) at http://ssrn.com/abstract=2068478.

It may however be argued that the development of speculative financial assets like derivatives is the necessary flip side of financial assetisation that supports productive economic activity. The two developments cannot be clearly decoupled.[14] Speculative behaviour is pursuant to selfish needs, but is part of the process for discovering price in financial markets.[15] Nevertheless, speculative opportunities can create opportunities for misallocation away from productive economic activities, and are typically not of a character consistent with patient finance.[16] Policy-makers have generally not taken steps to disincentivise speculative aspects of financial activity. However, we observe that although productive and hyper forms of financialisation both arise in the crypto-economy, the slowness on the part of policy-makers in developing an appropriate regulatory agenda has brought about accelerated growth in hyper forms of financialisation.

The productive financialisation in the crypto-economy, led by the ICO boom from 2017,[17] has created a range of tradeable financial assets, especially in terms of ERC tokens issued by dApp developers. Besides secondary trading in these tokens, innovative financial engineering involving these tokens are being developed to generate yield for holders. Indeed it is queried whether the secondary market devaluation of many token prices[18] has led to development of financial engineering in order to support yield-seeking needs. In the 'Decentralised Finance' or 'DeFi' universe, which refers primarily to the provision of financial products or services in a peer-to-peer manner that does not involve conventional financial intermediaries,[19] financial claims such as loans similar to that in the conventional economy are being generated. These DeFi loans crucially mobilise tokens as financial assets in new ways. DeFi peer-to-peer loans are organised by platform operators which construct liquidity pools. As there is no centralised underwriting loan writing authority, platform operators pool together myriad users' cryptoassets in liquidity pools so that other users can borrow these by providing their own cryptoasset collateral. Users on the supply side of the market may for example deposit ether tokens in Compound,[20] and earn interest whenever transactions occur within the pool which generate pool fees. Users can also be on the demand side of the market and borrow from the pool as long as adequate collateral (in another cryptoasset) is provided by depositing into the pool. Over-collateralisation such as at 150% or more of the value of borrowing is generally required to compensate for market volatility of cryptoasset prices. The rise of platform pools deploying decentralised automated protocols for pool deposit, collateralisation, exchange and borrowing is a spectacular phenomenon. Different platforms cater for different users holding different

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[14] D Alessandrini, 'Regulating Financial Derivatives? Risks, Contested Values, and Uncertain Futures' (2011) 20 *Socio and Legal Studies* 441.
[15] Ibid; E Avgouleas, 'A New Framework for the Global Regulation of Short Sales: Why Prohibition is Inefficient and Disclosure Insufficient' (2010) 15 *Stanford Journal of Law, Business and Finance* 376.
[16] Eg see AL White, 'The Grasshoppers and the Ants: Why CSR Needs Patient Capital' (2006), https://www.tellus.org/pub/The%20Grasshoppers%20and%20the%20Ants%20-%20Why%20CSR%20Needs%20Patient%20Capital.pdf in which the casino culture of financial markets is contrasted with long-term investing by corporates, in particular, in corporate responsibility.
[17] '2017'S ICO Boom Was The Bubble That Will Never Recover' (9 Aug 2019), https://bitcoinist.com/2017s-ico-boom-was-the-bubble-that-will-never-recover/.
[18] Ibid.
[19] S Coelho-Prabhu, *A Beginner's Guide to Decentralized Finance (DeFi)*, https://blog.coinbase.com/a-beginners-guide-to-decentralized-finance-defi-574c68ff43c4.
[20] https://compound.finance.

types of tokens with the intention of generating yield. Sushiswap for example accepts any ERC token as collateral to participate in its pools.[21] Applications such as Idle[22] even provide a meta-search service for users in order to compare yield performance across different pool providers and their pools.

It is queried whether the manner of DeFi loans made in the collateralised loan model described above is similar to the productive financialisation of real economy lending where a bank lends to small or large enterprises in order to carry out productive activities, such as purchasing inventory[23] or carrying out a project.[24] Collateralised DeFi loans described above seem more catered towards the exchange of tokens amongst users in order to arbitrage between tokens to generate purely financial yield.[25] Although structured as debt claims, DeFi collateralised loans seem to cater only for those who already possess crypto-capital and do not seem to be related to enterprise development.

The case of flash loans i.e. uncollateralised DeFi loans is even more clearly removed from productive financialisation. Flash loans are provided by lending pools to users who need to be able to return liquidity to the pool within one transaction block.[26] In other words, borrowers of such flash loans are generally withdrawing tokens from the pool for very quick arbitraging purposes, such as swapping collateral in another pool, in order to make a quick financial yield. If the liquidity is not returned to the pool, the lending protocol reverses the transaction to return the pool's status to the liquidity level before the flash loan so that the pool's liquidity is unaffected and the pool therefore does not suffer a 'default'. The flash loan protocol has however been exploited by a flash borrower who took two flash loans, one from Uniswap and one from Aave, in order to deposit on ValueDeFi and conduct exchange between cryptocurrencies in rapid succession to exploit the exchange protocols on Value DeFi. Value DeFi suffered a USD$6 million loss.[27]

The hyper forms of financialisation developing in the DeFi universe raise concerns. One area of concern lies in user protection in terms of whether users are adequately informed and protected in relation to the transactions they are engaged with.[28] In particular, many have commented on the complexity of financial transaction chains in DeFi designed for arbitrage and that users may be adversely affected if there are software bugs.[29] DeFi flash loans are

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[21] https://app.sushi.com/farms/permanent.
[22] https://idle.finance/#/.
[23] Such as inventory financing for businesses to buy stock secured against the inventory as collateral.
[24] Such as project finance where banks may participate to lend to a project special purpose vehicle in a non-recourse manner, collateralised against the project.
[25] 'Collateralized Loans in DeFi', https://defirate.com/collateralized-loan/.
[26] 'Performing a Flash Loan', https://docs.aave.com/developers/tutorials/performing-a-flash-loan, a key player in this field being Aave Protocol, https://docs.aave.com/faq/.
[27] 'Value DeFi protocol suffers $6 million flash loan exploit' (14 Nov 2020), https://cointelegraph.com/news/value-defi-protocol-suffers-6-million-flash-loan-exploit.
[28] In a peer-to-peer context, protection is often not provided as freedom of contract between parties is deemed as sufficient governance. However, Verstein questions this and advocates consumer protection in peer-to-peer lending. This arguably can be extended to a blockchain context, see A Verstein, 'The Misregulation of Person-to-Person Lending' (2011) 45 *UC Davis Law Review* 445.
[29] F Schär, 'Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets' (2020), https://ssrn.com/abstract=3571335; 'The DeFi 'Flash Loan' Attack That Changed Everything' (27 Feb 2020), https://www.coindesk.com/the-defi-flash-loan-attack-that-changed-everything.

also regarded unsuitable for those unfamiliar with Ethereum programming.[30] Another area of concern lies in the systemic effects and financial risk for many users, as DeFi systems of automated protocols can be used to create significant but inflexible and irreversible effects.[31] In other words, the policy objectives of user protection and financial stability are relevant to DeFi systems.

Another key concern of hyper financialisation in the crypto-economy is the extent to which hyper financialisation may be damaging to the productive aspects of the crypto-economy. In the conventional financial economy, hyper financialisation has been criticised to be damaging, in relation to corporate and investor short-termism as mentioned above.[32] Such hyper financialisation generally occurs over a cycle of instability, following a Minskian trajectory,[33] and may be observed in time. In this manner, *ex ante* macroprudential financial supervision, as has been implemented in the UK and many other jurisdictions,[34] could mitigate its adverse effects. In the crypto-economy, hyper financialisation may occur in a much more compressed timeframe due to the automation of protocols. It is queried how systemically damaging automation, rigidity and irreversibility of bad consequences may be.[35] Further, if crypto-economy participants are drawn to hyper financialisation for quick profit-making, would the crypto-economy be dominated by such financial development, crowding out other forms of enterprise and innovation?

Hyper forms of financialisation raise issues of a different nature from productive financialisation, although the two phenomena are tightly coupled. In this light, this Chapter argues that the regulatory policy for productive forms of financialisation should be fashioned differently from that for hyper forms of financialisation. These choices in regulatory policy, which answer the *why* question to regulating crypto-finance, can then provide the basis for regulatory ontologies, design, content, standards and regulators' supervisory architecture.

Policy Choice for Productive Financialisation

This book supports an enabling regulatory regime for supporting the productive forms of financialisation in the crypto-economy, as has been extensively set out in the preceding Chapters. This paradigm is not dissimilar from the enabling and regulative orders for banking, securities and investment regulation in the conventional economy.[36] However, speculative financial activity co-exists alongside productive financial activity in the conventional financial economy,[37] and the volumes of the former have raised concerns. For

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[30] 'Performing a Flash Loan', https://docs.aave.com/developers/tutorials/performing-a-flash-loan.
[31] P Paech, 'The Governance of Blockchain Financial Networks' (2017) 80 *Modern Law Review* 1073; Hilary J Allen, 'Driverless Finance' (2020) 10 *Harvard Business Law Review* 157.
[32] See notes 13-15.
[33] HP Minsky, *The Financial Instability Hypothesis* (Levy Economics Institute Working Paper, No. 74. 1992), http://www.levyinstitute.org/pubs/wp74.pdf.
[34] S9A to 9R, Bank of England Act 1998 amended by UK Financial Services Act 2012; the Office of Financial Research established in the Dodd-Frank Act 2010.
[35] Paech (2017).
[36] See ch1, M Andenas and IH-Y Chiu, *The Foundations and Anatomy of Financial Regulation* (Oxford: Routledge 2014).
[37] Foster (2007).

example, investment funds and their managers have been criticised to be short-termist, making returns out of short-term price arbitrage of securities as financial assets instead of perceiving their roles as patient capitalists investing in real productive growth over the long-term.[38] Further, financial derivative contracts have been used for hedging and risk management purposes but also blatantly for speculative purposes.[39] Financial innovation has often appealed to short-term competitive and profit-seeking needs by financiers[40] and decoupled from social utility.[41] The double-edged nature of financial products seems to be a necessary phenomenon in finance as the weeds and wheat grow together.[42]

It may be argued that it is impossible to regulate 'out' financial activity that are more speculative than supportive of productive uses as the utility of financial transactions can be multi-faceted.[43] However, it may also be argued that regulators do not engage in controlling speculation because such activities are usually undertaken amongst sophisticated and wholesale sector financial participants, excluding retail participants.

Many developed financial jurisdictions have adopted regulatory policies that leave wholesale markets largely untouched based on two assumptions. The first is that sophisticated participants dealing with each other at arms length in the financial markets would be able to negotiate contractual governance between themselves. Over time, privately fostered market-based governance should be sufficient. This assumption underpinned the lack of regulatory governance in the markets for short-term lending between financial institutions based on collateralised instruments (which can be rehypothecated many times over) prior to the global financial crisis 2007-9,[44] and also derivatives markets[45] and investment funds such as hedge funds catering only to

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[38] Corporate Values Strategy Group, Overcoming Short-termism: A Call for a More Responsible Approach to Investment and Business Management (New York: Aspen Institute Business and Society Programs, 2009), http://www.aspeninstitute.org/publications/overcoming-short-termism-call-more-responsible-approach-investment-business-management; UK Department of Business Innovation and Skills, *The Kay Review of UK Equity Markets and Long-Term Decision Making* (Final Report, 23 July 2012); E Duruigbo, 'Tackling Shareholder Short-Termism and Managerial Myopia' (2011-12) 100 *Kentucky Law Journal* 531.

[39] G Poitras, *Risk Management, Speculation and Derivative Securities* (Elseiver Academic Press 2002); L Stout, 'Risk, Speculation, and OTC Derivatives: An Inaugural Essay for Convivium' (2011) 1 *Accounting Economics and Law* 2.

[40] E Avgouleas, 'Regulating Financial Innovation: A Multifaceted Challenge to Financial Stability, Consumer Protection, and Growth' in N Moloney, E Ferran and J Payne (eds), *Oxford Handbook of Financial Regulation* (Oxford University Press, 2015).

[41] 'City is too big and socially useless, says Lord Turner' (The Telegraph, 26 Aug 2009), https://www.telegraph.co.uk/finance/newsbysector/banksandfinance/6096546/City-is-too-big-and-socially-useless-says-Lord-Turner.html, on many financial activities in the City of London being of dubious social utility, opinion in the wake of the global financial crisis 2007-9. Also see critical perspectives on financial innovation in D Awrey, 'Towards a Supply-Side Theory of Financial Innovation' (2013) 41 *Journal of Comparative Economics* 401; Dan Awrey, 'Complexity, Innovation, and the Regulation of Modern Financial Markets' (2012) 2 *Harvard Business Law Review* 235.

[42] Reference to *The Holy Bible* (NIV), Matthew 13:30.

[43] Alessandrini (2011).

[44] 'Fed scholars: A run on the repurchase market caused the financial crisis and will probably happen again' (23 May 2011), https://repowatch.org/2011/05/23/fed-scholars-a-run-on-the-repurchase-market-caused-the-financial-crisis-and-will-probably-happen-again/; H McVea, 'Restoring Regulatory Credibility and Preventing "Repo Runs": A Cautionary Tale' (2019) 30 *European Business Law Review* 1.

[45] M Greenberger, 'Derivatives in the Crisis and Financial Reform' in Martin H Wolfson and Gerard F Epstein (eds), *The Handbook of Political Economy of Financial Crises* (NY: OUP 2013).

sophisticated investors.[46] The second assumption is that as retail investors are not involved in complex and sophisticated sectors of the financial markets, the public interest footprint of such activities is less significant, and regulators need not dedicate resources to control or monitor such activities. This also explains why there are carveouts and exemptions from regulatory application where only sophisticated investors are involved, such as in securities regulation.[47]

Both of these assumptions helped to maintain a proportionate financial regulatory system, which on the one hand meets the risk-based ideology that regulators subscribe to, allowing them to allocate regulatory resources efficiently to problems of greatest social visibility and demand;[48] but on the other hand meets the interests of the financial sector to push back against excessive regulation.[49] Lothian also argues that this regulatory 'dualism' underpins excessive financialisation in the US.[50]

However, the global financial crisis 2007-9 rendered the assumptions above questionable as sophisticated participants such as AIG that wrote an excessive amount of derivative contracts found itself dangerously unable to honour its commitments and had to be rescued by the Treasury due to public interest ramifications of its potential insolvency.[51] Wholesale sector participants could not necessarily manage a systemic event of market risk.[52]

Nevertheless, although regulators responded by introducing regulatory governance over financial markets and activities that only sophisticated investors would participate in, such as derivatives and repo markets, the nature of much of this governance enhanced and did not replace market-based governance. Regulatory governance still avoided being overly prescriptive where sophisticated market participants are involved.

In derivatives markets, more standardisation and central clearing of derivatives are called for in order for risks to be made more transparent, and for central clearing parties to interpose with ex ante risk management between parties.[53] In rehypothecation markets,

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[46] 'Hedge Funds Not a Primary Cause of the Financial Crisis, but Could Contribute to Systemic Risk' (19 Sep 2012), https://www.rand.org/news/press/2012/09/19.html; P Lysandrou, 'The real role of hedge funds in the crisis' (Financial Times, 1 April 2012), https://www.ft.com/content/e83f9c52-6910-11e1-9931-00144feabdc0.
[47] Such as Regulation D, Securities Act 1933 in the US, and EU Prospectus Regulation 2017, art 1(4)(a).
[48] J Black, 'The Emergence of Risk-Based Regulation and the New Public Risk Management in the United Kingdom' [2005] *Public Law* 512.
[49] S Deakin, 'The Rise of Finance: What Is It, What Is Driving It, What Might Stop It?' (2008) 30 *Comparative Labour Law and Policy Journal* 67; S Piccioto and J Haines, 'Regulating Global Financial Markets' (1999) 26 *Journal of Law and Society* 351; C Bradley, 'Private International Law Making for the Financial Markets' (2005) 29 *Fordham International Law Journal* 127.
[50] Tamara Lothian, *Law and the Wealth of Nations* (NY: Columbia University Press 2016), 101.
[51] 'Fed's $85 Billion Loan Rescues Insurer' (NY Times, 16 Sep 2008), https://www.nytimes.com/2008/09/17/business/17insure.html.
[52] S Schwarz, "Systemic Risk" (2008) 97 *Georgetown Law Journal* 193; S Schwarcz, 'Regulating Complexity in Financial Markets' (2009) 87 *Washington and Lee Law Review* 211.
[53] Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories; Alexandra G Balmer, *Regulating Financial Derivatives* (Cheltenham: Edward Elgar 2018).

there is mandatory transparency regarding collateral re-use[54] but it is still up to parties to determine if they would transact upon such terms. Even where wholesale markets such as foreign currency and gold markets were embroiled in scandals regarding price manipulation,[55] the UK opted for self-regulation by allowing an industry-based standards board to be established to provide self-governing standards and discipline.[56] Hence, even with public interest in the risk management of sophisticated financial sector participants' exposures, such as in relation to speculative forms of trading, regulatory governance over these activities remains indirect, leveraging upon market parties scrutinise transactions and determine what is optimal for their risk positions. For example, retail investment funds in the EU are regulated on a product basis[57] but hedge funds that may be marketed only to sophisticated investors are regulated in relation to managers' prudential and conduct aspects,[58] leaving sophisticated investors to figure out for themselves the wisdom of particular fund strategies and their prospects.[59]

The relative refrain of regulatory governance in controlling speculative or 'socially useless'[60] financial activities is not immune from criticism.[61] This regulatory tendency, manifest in the mainstream financial sector, would arguably be no different in the crypto-financial universe. For example, bitcoin derivatives have been allowed to be marketed to sophisticated participants as self-certified by two US major commodities trading exchanges.[62] The exemption from securities regulatory requirements in the US and EU for token offers made to sophisticated investors only,[63] and exemption from specific cryptoasset regulations

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[54] Regulation (EU) 2015/2365 of the European Parliament and of the Council of 25 November 2015 on transparency of securities financing transactions and of reuse and amending Regulation (EU) No 648/2012, art 15.

[55] 'Forex scandal: How to rig the market' (BBCNews, 20 May 2015), https://www.bbc.co.uk/news/business-26526905; 'London Gold Fix study suggests decade of bank manipulation' (28 Feb 2014), https://financialpost.com/investing/london-gold-fix-study-indicates-decade-of-bank-manipulation.

[56] The Fixed Income, Currencies and Commodities Markets Standards Board was set up as an industry body to oversee wholesale market conduct after the scandals regarding forex and gold rigging emerged, and see Bank of England, *Fair and Effective Markets Review - Final Report* (10 June 2015), https://www.bankofengland.co.uk/report/2015/fair-and-effective-markets-review---final-report.

[57] Directive 2009/65/EC of the European Parliament and of the Council of 13 July 2009 on the coordination of laws, regulations and administrative provisions relating to undertakings for collective investment in transferable securities (UCITS).

[58] Directive 2011/61/EU of the European Parliament and of the Council of 8 June 2011 on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010

[59] For example Grayscale, one of the largest asset managers for cryptoassets and currencies say clearly that their products are not registered with the SEC, https://grayscale.co/faq/, and are exclusively marketed to accredited investors. This absence of fund regulation would be similar to the UK and EU, and marketing exemptions also exist for promotions made exclusively to such investors.

[60] See note 42.

[61] Avgouleas (2015); A Chadwick, 'Regulating Excessive Speculation: Commodity Derivatives and the Global Food Crisis' (2017) 66 *International and Comparative Law Quarterly* 625 on why financial speculation should be regulated if these activities entail adverse real economic consequences.

[62] G Patti, 'The Regulation of Financial Product Innovation Typified by Bitcoin-Based Derivative Contracts' (2020) *Review of Banking and Financial Law*, forthcoming, https://ssrn.com/abstract=3380770; L Reiners, 'Bitcoin Futures: From Self-Certification to Systemic Risk' (2019) 23 *North Carolina Banking Institute* 61. The CBOE stopped offering bitcoin futures contracts in 2019 but the Chicago Mercantile Exchange still offers bitcoin futures contracts.

[63] N42.

proposed in the EU for token offers[64] made only to professional investors are examples of the continued application of similar regulatory ideology. The FCA has also banned all crypto-derivatives and exchange-traded notes from being sold to retail investors.[65] This measure, being limited to retail investors, would allow sophisticated investors to dominate in speculative activity involving crypto-derivatives.[66] Sophisticated investors also have more resources to engage in speculation, and in this manner, consumer protection measures against participating in speculative and highly risky financial activities have nothing to do with reducing the level of such activities. However, we also observe contrary directions such as the first approved listing of a bitcoin exchange-traded fund in Canada, allowing retail participation.[67] Although this approach democratises participation for retail investors in crypto-finance, retail investors' interest in the exchange-traded fund would be for the purposes of gaining exposure to bitcoin and enjoying its upsides, without real engagement with the crypto-economy.

As chapter 3 has argued, financial regulation trajectories such as the above may reshape the crypto-finance universe as a space for financier speculation and may undermine productive financialisation and the participation of ordinary 'peers' in the blockchain-based economy. We argue that a different policy choice is needed in order to enable the productive financialisation in the crypto-economy, supported by retail participation. Further, the rise of acute, automated forms of speculation in the crypto-finance universe should provide regulators with an opportunity to consider their roles in governing hyper forms of financialisation. The Section below discusses four possible approaches.

Policy Choices for Hyper Financialisation

Four sets of policy choices can be considered in relation to governing the levels of hyper financialisation in the crypto-economy. First, a policy choice can be made to ensure that those engaged in it are able to manage the risks of their activity and avoid entailing adverse consequences to others or to the financial system in general. This policy choice would however not necessarily seek to drive down the volumes of hyper financialisation. Second, moving along the spectrum of intensity of governance or control, excessive levels of speculative financial activity can be discouraged by incentive-based regulation, much like how microprudential regulation is intended to calibrate the risk-taking behaviour of banks[68]

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[64] European Commission, Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets, and amending Directive (EU) 2019/1937 (Sep 2020), https://ec.europa.eu/finance/docs/law/200924-crypto-assets-proposal_en.pdf.

[65] 'FCA bans the sale of crypto-derivatives to retail consumers' (6 Oct 2020), https://www.fca.org.uk/news/press-releases/fca-bans-sale-crypto-derivatives-retail-consumers.

[66] The largest global crypto-derivative offerings, from OKEx, Binance and Huobi centre on major cryptocurrencies such as bitcoin, ether, Litecoin, bitcoin cash, see https://www.huobi.com/en-us/markets/?tab=dm; https://www.binance.com/en/futures; https://www.okex.com/derivatives/futures/usd-btc-weekly.

[67] 'North America's First Bitcoin ETF Gets Green Light in Canada' (15 Feb 2021), https://www.bloombergquint.com/markets/purpose-investments-says-canadian-regulators-approve-bitcoin-etf.

[68] For credit institutions in the EU, see Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms, amending Directive 2002/87/EC and repealing Directives 2006/48/EC and 2006/49;

and other financial institutions.[69] Third, a more definitive policy stance can be taken against speculative financial activity so that speculative forms of financial instruments may be subject to pre-vetting and approval. Finally, financial regulators could consider positively developing allocative steer for financial resources, so that financial capital is not directed to merely speculative financial activity but to productive causes.

The first policy choice is aligned with the current regulatory approaches in major financial jurisdictions such as the UK, EU and US, where regulators respond to market failures.[70] In this manner, hyper financialisation is not regarded as an anathema as such, but only to be subject to governance and control in relation to sub-optimal effects observed. For example, high frequency traders intending to benefit from tiny arbitrage in securities markets are governed in the EU by a mandatory obligation not to withdraw liquidity arbitrarily if their presence in markets has become relied upon as a market-making mechanism.[71] In this manner, regulators see the speculative trading activities as being beneficial in the sense of constant liquidity provision but aim to moderate only the possible sub-optimal effects. Although micro-prudential regulation goes some way to moderate financial institution risk-taking, including being engaged with speculative financial activities,[72] and in the UK, structural reforms[73] have been introduced to separate retail banks from other parts of market-based banking activities, including speculative types of trading activities, such regulations are based on broader financial stability considerations.[74] Such interventions are also generally backward-looking, after scandals or crises,[75] in order for financial institutions to internalise social cost that was not internalised before. Regulators are unlikely to make prescription in terms of 'what not to do' in relation to speculative financial activity engaged by financial institutions. Regulatory governance is crafted more along the lines of imposing duties on financial institutions to risk manage prudently, and provide for plans in order to

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Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012. See IH-Y Chiu, 'Rethinking the Law and Economics of Post-Crisis Micro-prudential Regulation- The Need to Invert the Relationship of Law to Economics?' (2019) 38 *Review of Banking and Financial Law* 639.

[69] Regulation (EU) 2019/2033 of the European Parliament and of the Council of 27 November 2019 on the prudential requirements of investment firms and amending Regulations (EU) No 1093/2010, (EU) No 575/2013, (EU) No 600/2014 and (EU) No 806/2014; Directive (EU) 2019/2034 of the European Parliament and of the Council of 27 November 2019 on the prudential supervision of investment firms and amending Directives 2002/87/EC, 2009/65/EC, 2011/61/EU, 2013/36/EU, 2014/59/EU and 2014/65/EU on a microprudential regime for investment firms.

[70] FCA, *Economics for Effective Regulation* (2016), https://www.fca.org.uk/publication/occasional-papers/occassional-paper-13.pdf.

[71] Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU, art 17.

[72] See below.

[73] Financial Services (Banking Reform) Act 2013 sections 142Aff amending the Financial Services and Markets Act 2000. This is a result of recommendations made by Independent Banking Commission, *Final Report* (2011), http://bankingcommission.s3.amazonaws.com/wp-content/uploads/2010/07/ICB-Final-Report.pdf.

[74] Discussed in chapters 8, 9, 10, Iris H-Y Chiu and Joanna Wilson, *Banking Law and Regulation* (Oxford: OUP 2019).

[75] Eric A Posner and Adrian Vermeule, 'Crisis Governance in the Administrative State: 9/11 and the Financial Meltdown of 2008' (2009) 76 University of Chicago Law Review 1613.

prevent any fallouts from damaging the wider financial system, such as by making recovery and resolution plans.[76]

It may be argued that disincentivising forms of regulation, principally in microprudential regulation, are powerful constraints against sub-optimal levels of risk-taking, whether in productive or speculative financial activities. Microprudential regulation has been greatly enhanced since the global financial crisis 2007-9 in order to moderate financial institutions' risk-taking behaviour so that they could conservatively 'count' the potential cost of risk.[77] In this manner, the risks of hyper financialisation can be reflected in higher regulatory cost, therefore having a disincentivising effect on such activity. After the global financial crisis, opaque securitised products attract a high regulatory cost, in order to disincentivise poorly originated, packaged and sub-transparent financial instruments that have been priced wrongly prior to the crisis.[78] However, it can be argued that hyper financialisation can take place with respect to well-designed and transparent financial instruments, also financial instruments well-traded in liquid markets. In this manner, disincentivising regulation aimed at particular risks to financial institution solvency or liquidity are not always aligned with reducing speculative levels of activity as such. Financial markets participants that stand to gain much from speculative activity would essentially manage their regulatory cost in order to minimise such cost, and do not necessarily seek to reduce or cease engagement with certain speculative activities.

The first two policy approaches ie *ex post* regulation targeted at market failures and micro-prudential regulation arguably do not take a definitive stand against hyper financialisation as such. Macroprudential or counter-cyclical types of regulation[79] are recent developments after the global financial crisis, and it may be queried if they finally address Gerding's criticism that law and regulation do not curb speculative behaviour but instead facilitate such behaviour. Gerding argues that law often facilitates financial asset price bubbles as policy-makers refrain from prematurely 'damaging' market conditions[80] even if speculative activities are rife. Macroprudential supervision is intended to pre-empt market trends that appear risky on a forward-looking basis. However, although introduced after the global financial crisis, macroprudential regulators have behaved in a measured fashion as neither the UK nor EU have taken positive actions in view of asset price bubble signs such as in the

[76] Directive 2014/59/EU of the European Parliament and of the Council of 15 May 2014 establishing a framework for the recovery and resolution of credit institutions and investment firms and amending Council Directive 82/891/EEC, and Directives 2001/24/EC, 2002/47/EC, 2004/25/EC, 2005/56/EC, 2007/36/EC, 2011/35/EU, 2012/30/EU and 2013/36/EU, and Regulations (EU) No 1093/2010 and (EU) No 648/2012, of the European Parliament and of the Council.
[77] Iris H-Y Chiu, 'Rethinking the Law and Economics of Post-Crisis Micro-prudential Regulation- The Need to Invert the Relationship of Law to Economics?' (2019) 38 Review of Banking and Financial Law 639.
[78] Ie attracting a standard 1250% risk-weight, Arts 251-9, CRD IV Regulation (EU) No 575/2013.
[79] A Baker, 'The Gradual Transformation? The Incremental Dynamics of Macroprudential Regulation' (2012) 7 *Regulation and Governance* 417.
[80] EF Gerding, *Law, Bubbles, and Financial Regulation* (Oxford: Routledge 2016).

housing market[81] or in equity markets.[82] Instead, macroprudential policy has been most pronounced in relaxing microprudential requirements in the wake of the covid-19 pandemic to allow businesses and households needing financial support to access more borrowing.[83]

Moving along the spectrum of policy choice towards taking a more definitive stand against forms of speculative hyper financialisation, it can be argued that financial instruments that promote highly or purely speculative financial activity should be subject to control in terms of regulatory gatekeeping. In this manner, financial products and instruments should be subject to pre-vetting or comprehensive product regulation, in order to be marketed or released, even to sophisticated investors. Allen argues that in an age of highly-automated financial transactions, which is termed as 'driverless finance', a pre-cautionary approach is warranted to pre-vet financial innovations, in order to prevent severely destabilising occurrences from taking place.[84] This argument is largely premised upon financial stability concerns and would allow regulators to vet the code of automated financial transactions, such as those facilitated by tokenisation on blockchains, in order to assess 'safety'. Regulators could demand that developers include code that builds in safeguards against systemic stability risks.

Extending Allen's argument further, it is arguable that public policy choices regarding automated finance may not be confined only to stability risks but also to other public interest aspects in the crypto-financial universe, such as whether productive economic activity is undermined and whether excessive forms of speculation are crowding out the crypto-economy. In this manner, regulators could consider the application of a range of powers specific to product control, ie product intervention, product governance or more comprehensively, product regulation, coupled with the regulation of gambling.

In the UK and EU, product intervention powers were first introduced in the wake of the global financial crisis.[85] Product intervention would not involve *ex ante* vetting of products and their authorisation before release. However, regulators could subject the design or marketing of financial products to certain conditions in order to combat the risks they pose to consumer protection and financial stability objectives. The EU's product intervention regime allows national authorities to impose permanent bans or other conditions, as well as the European Banking and Securities Markets Authorities to issue temporary bans or other conditions, in relation to any type of financial instrument within ESMA's governing scope (i.e. securities, derivatives and fund products) or structured deposits and products within

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[81] 'Financial Policy Committee statement on housing market powers of Direction from its policy meeting, 26 September 2014' (2014), https://www.bankofengland.co.uk/-/media/boe/files/statement/2014/fpc-statement-from-its-policy-meeting-26-september-2014.pdf, but the powers were not exercised, despite the European Systemic Risk Board's warning to the UK in 2016, https://www.esrb.europa.eu/pub/pdf/warnings/2016/161128_ESRB_UK_warning.en.pdf.

[82] 'ESMA Sees Potential Decoupling of Financial Market Performance and Underlying Economic Activity' (14 May 2020), https://www.esma.europa.eu/press-news/esma-news/esma-sees-potential-decoupling-financial-market-performance-and-underlying. However no action is yet discussed at the macroprudential level.

[83] IH-Y Chiu, A Kokkinis and A Miglionico, 'Debt Expansion as 'Relief and Rescue' at the Time of the Covid-19 Pandemic: Insights from the Legal Theory of Finance' (2020-21) *Indiana Journal of Global Legal Studies* forthcoming.

[84] HJ Allen, 'Driverless Finance' (2020) 10 *Harvard Business Law Review* 157.

[85] S137D, Financial Services and Markets Act 2000 amended by Financial Services Act 2012;

the EBA's governing scope, or a financial activity or practice, to address the consumer protection or financial stability objectives.[86] The UK's product intervention objectives are arguably wider than those introduced under EU legislation as they can also be exercised in relation to meeting the market integrity objective. This means products that may be speculative and distorting of markets can potentially be considered for product intervention.[87] The UK Financial Conduct Authority's powers are also wider in scope, as product intervention can be exercised against any specified agreement (of financial transaction), or particularly to specified persons. Product intervention may be in the form[88] of banning products, at the most severe end, or limiting the scope of marketing and promotion, or attaching more severe conditions at point of distribution or sale, such as disallowing non-advised sales. The regulator could also require the use of warning labels or impose additional requirements in the process of product design and development,[89] or impose recovery, enforcement and compensation rights against financial institutions for the benefit of their customers, or order the unenforceability of obligations against customers.[90]

Examples of product intervention carried out by ESMA include a continuing ban against marketing contracts for differences and binary option products to retail customers since June 2018.[91] The UK FCA has permanently banned the marketing of binary option products to retail investors,[92] and has also issued a year's ban from late 2019 on marketing to retail investors mini-bond products composed of largely illiquid securities.[93] The FCA has also banned all crypto-derivatives and exchange-traded notes from being sold to retail investors.[94] As can be observed, product intervention is regarded as an exceptional measure in an otherwise liberal financial market, and this is reflected in the qualifications set out in EU legislation for the exercise of this power.[95] Further, it has been sparingly used, focused on consumer protection contexts. We have already argued above that the regulatory dualism of leaving sophisticated investors to speculative financial activity without much regulatory oversight is significantly contributory to the levels of hyper financialisation observed in both the conventional and crypto-financial spheres. There is a need to consider if product intervention powers can go further beyond being merely consumer-focused. A

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[86] Arts 40-42, Regulation (EU) No 600/2014 of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Regulation (EU) No 648/2012 (MiFIR).
[87] S137D(1)(b), Financial Services and Markets Act 2000, amended by Financial Services Act 2012.
[88] Discussed in FSA, 'Product Intervention' (January 2011) DP11/01 http://www.fsa.gov.uk/pubs/discussion/dp11_01.pdf, ch 6.

[89] FCA, 'The FCA's Use of Temporary Product Intervention Rules' (March 2013) at http://www.fsa.gov.uk/static/pubs/policy/ps13-03.pdf, finally in FCA Handbook PROD 2.2.6.
[90] S137D(7), Financial Services and Markets Act 2000, amended by Financial Services Act 2012.
[91] See https://www.esma.europa.eu/policy-activities/mifid-ii-and-investor-protection/product-intervention.
[92] FCA, *PS19/11: Product Intervention Measures for Retail Binary Options* (29 March 2019), https://www.fca.org.uk/publications/policy-statements/ps19-11-product-intervention-measures-retail-binary-options.
[93] FCA, 'Temporary intervention on the marketing of speculative mini-bonds to retail investors' (26 Nov 2019), https://www.fca.org.uk/publications/temporary-product-interventions/temporary-intervention-marketing-speculative-mini-bonds-retail-investors.
[94] 'FCA bans the sale of crypto-derivatives to retail consumers' (6 Oct 2020), https://www.fca.org.uk/news/press-releases/fca-bans-sale-crypto-derivatives-retail-consumers.
[95] Also see V Colaert, 'Product Intervention: Keystone of the EU Investor Protection Regime' (2020-21) European Company and Financial Law Review, forthcoming, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3440557.

couple of commentators opine that even for sophisticated or institutional participants, product risks do feature, such as in relation to insurance products that may be traded between reinsurers.[96] The refrain from intervening into sophisticated participants' markets continues to be an underlying ideology for financial regulation. However, regulators should call to mind that such refrain has allowed sophisticated investors and complex financial products to bring about systemic risk leading up to the global financial crisis 2007-9.[97]

Product governance powers have been introduced in the EU more recently in 2017. This regime imposes internal procedural regulation for product manufacturers and distributors, so that they are required to consider a suitable target market and the risks to this target market, during the process of product design.[98] Distributors are also to perform an independent assessment of product suitability for the target market ahead of marketing, but are compelled to obtain comprehensive information from product manufacturers in order to make their independent assessments.[99] Product governance seems *ex ante* in nature, and can achieve a regulative effect in terms of aligning financial institutions' incentives in product innovation with public interest objectives in terms of consumer welfare and protection. At best, such a regime can shape behaviour and culture at firms in an *ex ante* manner without being prescriptive as to regulators' gatekeeping of each product. However, as discussed in Chapter 5 in relation to ICOs, product governance rules are aimed at internally regulating firms' conduct and seems procedural in nature.[100] It is uncertain if any shortfalls give rise to investor enforcement as each aggrieved investor still needs to establish a case for 'unsuitable' personal advice[101] given to him/her. Further, it is uncertain what regulatory enforcement is possible against product manufacturers or distributors. Enforcement under these rules may not be warranted even where there may be individual cases alleging unsuitable personal advice in relation to these products. Unsuitable personal advice for any particular aggrieved individual may not be causatively linked to manufacturers' or distributors' policies in product governance. In this manner, it is uncertain if product governance rules provide sufficient incentives and compulsion to financial institutions to design products responsibly, as the legal risks posed to them may be limited.

Both product intervention and product governance rules still defer significantly to the freedom of financial institutions to engage in innovation (even if self-interested) and to bring them to market. Product intervention is largely based on *ex post* evaluations as

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[96] M Goldby and A Keller, 'Product Intervention as a Macroprudential Tool: the Case of Catastrophe Bonds' (2019) 51 *George Washington International Law Review* 1, discussing the systemic risks in catastrophe bond markets and the need for product intervention as macroprudential policy.

[97] RE Mendales, "Collateralized Explosive Devices: Why Securities Regulation Failed To Prevent The CDO Meltdown, And How To Fix It" (2009) *University of Illinois Law Review* 1359.

[98] Commission Delegated Directive (EU) 2017/593 of 7 April 2016 supplementing Directive 2014/65/EU of the European Parliament and of the Council with regard to safeguarding of financial instruments and funds belonging to clients, product governance obligations and the rules applicable to the provision or reception of fees, commissions or any monetary or non-monetary benefits, Art 9.

[99] Art 10, ibid.

[100] A Maracci, 'European Regulatory Private Law Going Global? The Case of Product Governance' (2017) 18 *European Business Organisations Law Review* 305.

[101] Suitability refers to meeting three criteria, ie that investors' objectives are met, they understand the risks involved and that they are financially able to bear those risks, Art 25, Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61, enacted in FCA Handbook COBS 9 and 9A.

currently practised, and product governance provides only a broadly-framed regime for internal proceduralisation. Financial regulation has so far avoided more intense measures such as comprehensive product regulation where financial products are subject to pre-vetting, even if they have complex features.[102] It is questioned if the time has come for such an approach in relation to crypto-financial products in order to mitigate excessive speculation and hyper financialisation that poses risks to users, consumers, the economic development of the crypto-economy as well as the stability of its financial universe.[103] Such an approach can also be infused with the regulation of gambling in general.[104]

The Gambling Act 2005 in the UK explicitly provides for gambling activities to be licensed so that they can be subject to continuous oversight and specific conditions imposed by the Gambling Commission.[105] These broadly framed gatekeeping and licensing powers are for the purposes of preventing crime and disorder resulting from gambling, preventing vulnerable or young people from being exploited and to ensure that gambling activities are conducted fairly and openly.[106] A similar ethos for regulating hyper financialisation and speculative financial activities is arguably applicable. Dedicated supervision can be extended over speculative crypto-financial activity for specified public interest objectives such as harm prevention, stability preservation and promotion of productive economic development. In this manner, we call for a form of product regulation in crypto-finance, for the purposes of the above objectives. It may be argued that such a regulatory stance applied to crypto-finance would be inconsistent with the regulation of other mainstream financial products. This Chapter suggests that the product complexity and opacity exacerbated in a dynamic technological context for crypto-finance warrants special attention at the moment. Moreover, product regulation in this area can provide regulators with experimental learning on how a broader product regulation agenda may be carried out. In light of continued problems in retail investment discovered in the UK,[107] there may be a case for introducing product regulation more generally. Product regulation may be criticised to be paternalistic in nature, and regulators need not necessarily make the right judgments about what innovations to gatekeep. Involving regulators in the *ex ante* approval of financial products

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[102] Eric A. Posner & E. Glen Weyl, 'An FDA for Financial Innovation: Applying the Insurable Interest Doctrine to the Twenty-First-Century Financial Markets' (John M. Olin Law & Econ. Working Paper No. 589, 2012), available at http:// papers.ssrn.com/sol3/papers.cfm?abstract_id=2010606; Saule T Omarova, 'License to Deal: Mandatory Approval of Complex Financial Products' (2012) 90 Washington University Law Review 63.

[103] Discussed in Section below.

[104] Jerry Brito and Houman Shadab and Andrea Castillo, 'Bitcoin Financial Regulation: Securities, Derivatives, Prediction Markets, and Gambling' (2014) 16 Colum Sci & Tech L Rev 144.

[105] https://www.gamblingcommission.gov.uk/home.aspx.

[106] S1, Gambling Act 2005.

[107] Such as retail investment in illiquid funds that collapsed in late 2019 leading to significant losses, 'Investors in collapsed Woodford fund to get half their cash in January' (Reuters, 13 Dec 2020), https://www.reuters.com/article/us-woodford-inv-fund/investors-in-collapsed-woodford-fund-to-get-half-their-cash-in-january-idUKKBN1YH1N4; the issue under the investigation of the FCA at the time of writing; the mis-selling of unregulated mini-bond products by failed investment firm London and Capital Finance, a subject of the Gloster inquiry, see Rt. Hon. Dame Elizabeth Gloster DBE, *Report of the Independent Investigation into the Financial Conduct Authority's Regulation of London Capital & Finance plc* (Dec 2020), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945247/Gloster_Report_FINAL.pdf.

could stifle innovative efforts.[108] On the other hand, product regulation that exists in the books can be implemented in a relaxed manner, therefore not amounting to meaningful gatekeeping at all.

The final policy choice we discuss along the spectrum is that of allocative regulation in relation to how financial resources are allocated. This policy paradigm would likely be regarded as 'paternalistic' as it would involve public sector steering (though not necessarily exclusively) in relation to allocation of financial capital, radically affecting the freedoms of private sector market participants to do so. But on the other hand, this policy paradigm may be seen as a form of structural re-ordering, so that institutions, policies and structures may be changed in response to the more fundamental and normative question of how finance should be put to work. We refer to Lothian's work on this as well as the structuralist vision proposed by Omarova and Hockett.

In Lothian's final work,[109] she argued that a new vision for finance should be fostered, so that financial resources can be allocated, in a highly democratised and socially-inclusive manner, to real production, and not merely to chase after financialised pursuits and profits. Her broad paradigm-shifting agenda called for policy change towards accumulation of savings instead of debt in developed countries such as the US, deep policy reform to stimulate the supply-side so that productive activity can be generated in order to attract the demand side for investment, the development of an industrial policy so that the channels for meeting economic development needs would not merely be dominated by private sector financialisation. She called for a broad policy steer towards financing real productivity and moving away from speculative transactions and financial activity that would have no social contribution.[110] The applicational implications include public sector leadership in allocation, such as through industrial policy or public-private partnership vehicles,[111] as well as regulatory frameworks that constrain speculative activities, such as by way of a Tobin tax.[112]

It may be argued that such proposals for change requiring heavy-lifting would likely face opposition, in terms of the extent of institutional change required and the cost of implementation. Omarova and Hockett also argue that regulatory reform can bring about a new allocative steer for financial capital. Omarova and Hockett[113] argue that financial intermediation is ultimately a finance franchise granted by the public sector, based on the monetary order backed by the sovereign. Hence, finance should serve public interest purposes such as developmental purposes in the economy. Although the sovereign does not provide the monetary order in the crypto-economy, it can be argued that the creation of money in the conventional economy does support the crypto-economy as much of

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[108] AI Ogus, 'Regulatory Paternalism: When is it Justified?' in KJ Hopt, E Wymeersch, H Kanda, and H Baum (eds), *Corporate Governance in Context: Corporations, States, and Markets in Europe, Japan, and the US* (Oxford: OUP 2005), ch15.

[109] T Lothian, *Law and the Wealth of Nations* (NY: Columbia University Press 2016), ch2.

[110] Indeed Lothian (2016) argues for speculative transactions without any service to the productive economy to be banned, p104.

[111] Also Lothian (2016), 105ff.

[112] 'The Tobin tax explained' (Financial Times, 28 Sep 2011), https://www.ft.com/content/6210e49c-9307-11de-b146-00144feabdc0.

[113] RC Hockett and ST Omarova, 'The Finance Franchise' (2017) 102 *Cornell Law Review* 1143.

cryptocurrency is transformed and not innately produced eg by mining. In this manner, regulative steer can be warranted to provide support for the productive financialisation of the crypto-economy, [114] while mitigating the adverse effects of speculative or hyper financialisation.

Allocative financial regulation is not the norm in many developed financial jurisdictions as there is a hazardous fine line with central planning. The distinct disadvantages of central planning include possible corrupt practices in terms of political steering, as well as poor or inefficient judgments. In sum, policy choices along the spectrum of greater paternalism or public-sector ordering offer possibilities for bringing speculative activity and hyper financialisation under control, as the berth for private sector freedom is more constrained. There are however hazards with such approaches which can seem 'authoritarian', which is on the face of it opposed to the ethos in the crypto-economy. The fine balances of regulatory capitalism in facilitating productive financialisation but taming hyper financialisation may not be easy to achieve. Such choice sets are underpinned by ideological preferences and social values, and are reflected in regulatory design. It is nevertheless possible that authoritarian risks in policy choice sets can be subject to regulatory design mechanisms that mitigate such risk, by having accountable and inclusive regulatory spaces where regulators' discretion can be subject to co-regulation and *ex post* scrutiny.

This chapter has so far set out the broad policy choices for productive and hyper financialisation in the crypto-economy, such considerations not being evident in extant policy discussions at the time of writing. Regulatory design should be based on policy choices made with regard to supporting productive financialisation (or otherwise), and taking a stance on hyper financialisation. This would be preferred to a coherentist approach of fitting crypto-financial developments into existing financial regulation categories.

We turn to developments in crypto-finance to date, critically discussing emerging regulatory initiatives. In examining the emerging regulatory treatment, possible flaws and lacunae, this Chapter highlights the hazards of a coherentist approach to fitting crypto-financial developments into existing regulatory regimes, or to develop new regimes heavily drawn from existing frameworks, such as the EU Regulation for Markets in Crypto-assets discussed earlier in this book. We provide at the end of this chapter a high-level framework for regulatory policy and design.

B. Trends in Regulating Crypto-finance

It is asserted that '[d]igital currencies are more regulated than you think',[115] demystifying the myth that crypto-finance, broadly defined, is simply unregulated and left in the wild west. A good number of crypto-finance products are not marketed in the shadows and about 40% of crypto service providers are subject to a form of formal regulation.[116] Indeed being regulated can shore up an appearance of legitimacy. Impression is also given of the sufficiency and purposefulness of the regulation behind crypto-finance or service providers.

[114] Discussed in chapters 5, 6 of this volume.

[115] Opinion by Craig Salm of digital asset manager Grayscale, 11 May 2020, https://www.investmentnews.com/digital-currencies-are-more-regulated-than-you-think-192634.

[116] A Blandin, G Pieters, Y Wu, T Eisermann, A Dek, S Taylor, D Njoki, *3rd Global Cryptoasset Benchmarking Study* (Cambridge Centre for Alternative Finance, 2020).

However, we argue that there is a need to consider not only innovative crypto-finance that appears to be 'uncategorised' or unregulated under extant financial regulation, but also the already-regulated forms of crypto-finance and service providers, to consider if extant regulation really addresses the *why* of regulating them. In this manner, we articulate more purposefully the *why* and *how* of regulating crypto-financial products and service providers.

First, there are many already-regulated crypto-finance products, particularly those that offer speculative exposure to bitcoin and other major cryptocurrencies. These are traded on regulated exchanges and markets in the US and EU. These are regulated in a similar manner as their conventional financial counterparts in terms of derivative products. The relatively light regulatory oversight over these can be attributed to one or both market characteristics, ie intermediation by established regulated markets and the availability only to sophisticated investors.

Crypto Hedge Funds, Derivatives and Exchange-traded Products

Crypto hedge funds are relatively lightly regulated in the US and EU in relation to their investment strategies. In the US, such products are available only to sophisticated investors, as availability to retail investors entails more onerous mutual fund regulation.[117] In the EU, although hedge fund managers are subject to the regulatory requirements in the Alternative Investment Fund Managers' Directive, and this allows them to market (to an extent) to retail investors,[118] there is little regulatory reach over the funds themselves. Funds can be incorporated offshore and have significant freedom to employ investment strategies as they see fit.[119] In practice crypto hedge funds usually engage in speculative trading of major cryptocurrencies to take advantage of price volatility in order to make trading gains.[120] The assets under management are growing,[121] largely from family wealth offices and high net worth individuals, as institutional interest remains cautious.[122] Although such products cater for the portfolio diversification needs of sophisticated investors[123] with certain risk appetites, the dominance of speculative activities is clear, and this universe seems largely to cater for the already-wealthy in order to fund speculation in crypto-finance.

Crypto-derivatives, most significantly bitcoin derivatives such as futures and options, can be offered by regulated providers, usually regulated markets or exchanges, providing a venue

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[117] PwC, *2020 Crypto Hedge Fund Report* (2020), https://www.pwc.com/gx/en/financial-services/pdf/pwc-elwood-annual-crypto-hedge-fund-report-may-2020.pdf. Critique of the relatively lighter regulatory regime, see E Mokhtarian and A Lindgren, 'Rise of the Crypto Hedge Fund: Operational Issues and Best Practices for an Emergent Investment Industry' (2018) 23 *Stanford Journal of Law Business & Finance* 112.

[118] Art 43, Directive 2011/61/EU of the European Parliament and of the Council of 8 June 2011 on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010.

[119] Preamble 10, ibid. There is provision for fund level transparency to investors, such as in terms of prudential matters such as leverage levels employed, but market discipline is heavily relied upon as the modus of governance.

[120] PwC (2020).

[121] Ibid, ie two-fold over the course of 2019-2020.

[122] Ibid. Also see 'UK's first regulated crypto hedge fund set to close down after failing to attract investors' (22 July 2020), https://www.fnlondon.com/articles/uks-first-regulated-crypto-hedge-fund-set-to-close-down-after-failing-to-attract-investors-20200722.

[123] One of the largest global crypto hedge fund managers is Grayscale, see https://grayscale.co.

for legitimate exposure to speculative trading in cryptocurrency. In the US, the CME bitcoin futures and options contracts offered by the Chicago Mercantile Exchange[124] is the avenue for retail investors to be exposed to cryptocurrency via many registered brokers.[125] The CME bitcoin futures product is self-certified in the US. Regulatory governance is not extended over the product, as it suffices for existing trust to be reposed in the Exchange as a regulated and accountable institution to the CFTC.[126]

In the UK, sophisticated investors can gain exposure to crypto derivatives offered by regulated exchanges such as Kraken.[127] Regulated exchange-traded products are popular with investors, as these products, traded on an exchange with daily liquidity, provide exposure for investors who have the freedom to liquidate their risks readily on the markets. There are many EU national regulators who oversee exchange-traded crypto derivative products, allowing these services to be passported across the EU by virtue of national regulation and oversight of the exchanges themselves. Brokers such as Kraken, Coinshares and IG Index used to offer these products to retail investors in the UK,[128] but the FCA has now brought in a ban on marketing and selling such products to retail customers on 6 January 2021, attracting criticism in terms of locking retail investors out of portfolio diversification.[129] It is uncertain if shadow trading by retail investors in the UK could migrate to unregulated offshore exchanges such as Huobi, Binance, OKex etc.[130] It is also noted that these exchanges offer leverage facilities to allow investors speculate in these cryptocurrency derivative contracts.[131] The UK ban is based on consumer protection against highly risky financial products, but it is not a strong statement against speculative financialisation in the crypto-economy. Sophisticated and institutional investors are unaffected by the ban.

The US SEC has so far taken a strict view to exchange-traded products, especially the exchange-traded fund. It has taken the view that the underlying liquidity and market conditions for cryptoassets that would be included in such funds do not meet the criteria

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[124] CME Bitcoin futures, see https://www.cmegroup.com/trading/cryptocurrency-indices/cme-options-bitcoin-futures-frequently-asked-questions.html. The CBOE's futures product has been relatively uncompetitive compared to the CME's and has been pulled, 'Cboe pulls the plug on bitcoin futures trading — for now' (15 March 2019), https://www.marketwatch.com/story/cboe-pulls-the-plug-on-bitcoin-futures-trading-for-now-2019-03-15.

[125] Such as Ameritrade, one of the largest brokerages in the US that offer accounts for trading in CME bitcoin futures.

[126] Reiners (2019).

[127] https://www.kraken.com/en-gb/features/futures.

[128] https://coinshares.com/etps/xbt-provider, a significant provider of exchange-traded products to retail investors, many of which approved and listed on EU exchanges outside of the UK.

[129] 'FCA bans the sale of crypto-derivatives to retail consumers' (6 Oct 2020), https://www.fca.org.uk/news/press-releases/fca-bans-sale-crypto-derivatives-retail-consumers.

[130] Largest offshore crypto derivatives exchanges compiled by Coingecko, see https://www.coingecko.com/en/exchanges/derivatives; also see Huobi's introduction to its futures platform, https://support.hbfile.net/hc/en-us/articles/360000113102-Introduction-of-Huobi-Futures for example.

[131] Leverage is offered on major offshore crypto derivatives exchanges eg OKEx, https://www.okex.com/spot/margin-trade; Poloniex, https://poloniex.com/support/aboutMarginTrading/; 'Huobi Futures Locked Margin Mechanism:How Does It Work and What Are The Advantages' (15 July 2020), https://medium.com/huobi-dm-news-roundup-archieves/huobi-futures-locked-margin-mechanism-how-does-it-work-and-what-are-the-advantages-55b420518e2a.

met by conventional securities assets that underlie exchange-traded funds.[132] However, this policy may be set for change as the SEC is considering inter-agency coordination and learning in order to apprise the crypto ETF properly for marketing to the public.[133] It may be argued that although crypto exchange-traded products are available for speculative purposes, they are not particularly 'harmful'. Massive retail uptake is stemmed in the US and UK at the time of writing and institutional allocation is cautious. It may also be argued that such speculative financial activity is not harmful to the crypto-economy as increased demand for cryptocurrency can further the development of the crypto-economy too. However, speculation in cryptocurrency does not help to create a stable monetary order or reinforce productive financialisation in the crypto-economy.

The availability of crypto derivative products still constitutes a 'fringe' movement in the developing asset classes for financial allocation, as important financial intermediaries such as banks are disincentivised from holding crypto-financial assets. Holdings of such assets entail high levels of microprudential regulatory cost.[134] There is also legal uncertainty in terms of using crypto-holdings as collateral in order to drive financial transactions and leverage.[135] Potential disadvantageous treatment of crypto-financial assets as collateral can disincentivise excessive amounts of their holding by conventional financial institutions. Borrowing in fiat against crypto collateral still tends to be non-conventional and relatively expensive.[136]

In sum, regulators seem to tolerate some extent of assimilation of crypto-financial assets in mainstream financial economies, without much change to extant financial regulatory

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[132] 'SEC Quashes Dreams of Bitcoin ETF With Another Rejection' (Bloomberg, 26 Feb 2020), https://www.bloomberg.com/news/articles/2020-02-26/sec-quashes-dreams-of-bitcoin-etf-with-another-rejection; but Americans may be able to trade crypto exchange-traded notes, which are not fund products but unsecured debt products based on exposure to cryptocurrencyt, as American Depositary Receipts on Nasdaq Sweden, 'U.S. Investors Can Now Trade Bitcoin ETN On Swedish Exchange' (25 June 2019), https://www.investopedia.com/news/us-investors-can-now-trade-bitcoin-etn-swedish-exchange/.

[133] 'Cryptocurrency ETFs under active consideration, says SEC Chair' (Financial Times, 16 Oct 2020), https://www.ft.com/content/9f2c1303-678e-486e-b3f1-d4f234f85f47. Further, a new bitcoin ETF application is pending before the SEC at the time of writing, see 'NYDIG Files for Bitcoin ETF, Adding to Firms Hoping 2021 Is When SEC Finally Says 'Yes'' (16 Feb 2021), https://www.coindesk.com/nydig-files-for-bitcoin-etf-adding-to-firms-hoping-2021-is-when-sec-finally-says-yes.

[134] The prudential treatment of cryptoassets held by regulated entities such as banks is under international development. , but banks in the UK are asked to consider their risks carefully in in holding cryptoassets for investment, BIS, 'Designing a Prudential Treatment for Crypto-Assets' (Dec 2019), https://www.bis.org/bcbs/publ/d490.htm; and the PRA may reserve the discretion to impose regulatory cost under its supervisory powers (Pillar 2), see 'Letter from Sam Woods: Existing or planned exposure to crypto-assets' (28 June 2018), https://www.bankofengland.co.uk/prudential-regulation/letter/2018/existing-or-planned-exposure-to-crypto-assets.

[135] This is because existing treatment of how crypto-assets are held or safekept for the purposes of security may not fit well with the US Uniform Commercial Code, Art 9, see KN Johnson and SE Hsu Wilbur and S Sater, '(Im)Perfect Regulation: Virtual Currency and Other Digital Assets as Collateral' (2018) 21 *SMU Science & Technology Law Review* 115; KV Tu, 'Perfecting Bitcoin' (2018) 52 *Georgia Law Review* 505, or in common law, see X Foccroulle Ménard, 'Cryptocurrency: Collateral for Secured Transactions?' (2019) 34 *Banking and Finance Law Review* 347. H Tjio and Y Hu, 'Collective Investment: Land, Crypto and Coin Schemes: Regulatory 'Property'' (2020) 21 *European Business Organisations Law Review* 171 argues for regulatory intervention to legitimise the financial property character of various assets including cryptoassets.

[136] X-T Nguyen, 'Lessons from Case Study of Secured Transactions with Bitcoin' (2018) 21 *SMU Science & Technology Law Review* 181.

regimes. This position is however dynamic in nature and depends largely on regulators' perception of financial stability risks from crypto-financial assets. As more crypto-financial innovations emerge or more institutional diversification takes place into crypto-financial products, albeit for speculative purposes, regulatory initiatives and policy over these may be changed. Although the extension of regulation provides more certainty, and can be enabling for market developments, as this volume has argued, the regulatory legitimation of crypto-finance needs to be considered in terms of *what* regulators are legitimating. In particular, poorly considered regulatory designs may create impressions of legitimacy for consequences that are unintended.

Next, we observe that many regulated financial institutions are carrying out crypto-type innovation in a space that may not be captured by existing regulation. This presents new challenges for financial regulators as they need to be vigilant in relation to how such activities affect existing regulatory scope and supervision. Regulators especially need to take care that existing regulatory regimes may be under-inclusive and may provide a false sense of assurance if simply applied to innovations, even if undertaken by already-regulated entities.

Bank-based Platform Coins

The JPM Coin is being developed by global banking behemoth JP Morgan in order to facilitate direct instantaneous transfers between institutional clients of JP Morgan, ie clients who hold accounts at JP Morgan.[137] Using a blockchain infrastructure, institutional clients can complete transfers to each other directly, without needing centralised reconciliation within JP Morgan's systems. This allows for speedier remittance than if a centralised reconciliation system were used. In terms of same-jurisdiction transfers, the use of the JPM Coin need not add any efficiency as centralised systems may already be at this level of efficiency, such as 'faster payments' transfers available in the UK.[138] However, for international remittances, the JPM Coin could increase speed of transfer and minimise exchange rate fluctuation risk between parties. In Austria, Raffeisen bank has issued an RBI Coin to effect instant bank-to-bank or bank-to-business payments on a permissioned blockchain, joining up forces with other players in the banking sector so as to create sufficient internal economies.[139] In a new development, a number of financial institutions in the UK who are members of Corda,[140] a permissioned blockchain architecture provided by R3 that services bank-to-bank transactions, have come together to form a cooperative in the UK called Cordite in order to issue a digital currency the XKD.[141] The XKD will be used on Corda for bank-to-bank transfers.[142] The XKD may facilitate speedier transfers for financial institutions who are not clearing banks that benefit from the UK's 'faster payments' framework, and therefore allows these financial institutions to work together towards

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[137] See https://www.jpmorgan.com/solutions/cib/news/digital-coin-payments.

[138] https://www.fasterpayments.org.uk.

[139] 'Raiffeisen Bank Bringing Blockchain Interoperability to Its Stablecoin Project' (22 Oct 2020), https://www.coindesk.com/raiffeisen-bank-bringing-blockchain-interoperability-to-its-stablecoin-project?utm_source=newsletters&utm_medium=blockchainbites&utm_campaign=&clid=00Q1I00000LtSLoUAN.

[140] See https://corda.network/governance/board-election/.

[141] 'XKD' (Oct 2020), https://cordite.foundation/the_white_paper/xdc_white_paper.pdf.

[142] 'R3 Corda Network Set to Go DeFi With XDC Digital Currency' (20 Oct 2020), https://www.coindesk.com/r3-corda-network-xdc-token-cordite-society.

greater competitiveness and efficiency. The UK and Austrian initiatives may be confined to local transfers and direct customer participation seems not envisaged. In this manner, JP Morgan's innovation to facilitate business customer transfers within its large internal cross-border network is pioneering and revolutionary. This initiative may meet the needs for instantaneous transfer especially on a cross-border basis, as inefficiencies in remittance has been a long-running problem.[143] Payments for international trade can be improved in radical ways, perhaps eliminating the need for extant instruments such as letters of credit, as well as the inconvenience of chains of documentation and delays in payment in international trade.

How should permissioned platform tokens like the JPM or XKD Coin be treated in regulatory terms? Should regulators ignore the coins themselves and continue to regulate the banking institutions involved in terms of their banking services and payment functions? Or should the issue of the coins themselves raise regulatory attention for specific treatment?

JPM coins are issued to users to effect blockchain-based transactions across JP Morgan's banking books. For the RBI or XKD coin, they are minted and issued by financial institution members who are nodes on the permissioned blockchain, and it is surmised that customer users are not involved. The latter seems to be an innovation in relation to payment, clearing and settlement infrastructure but the production of new financial instruments cannot be ruled out, as the Chainstack introduction to XKD clarifies.[144] The JPM Coin can arguably create new financial claims for banking customers.

As customer users are involved, the JPM Coin is a claim against the issuer in favour of the customer, and also a payment token held by the customer. If issued against a positive balance in the customer's account with the bank, the coin is a transformation from the deposit claim against the issuer, but it is uncertain if the transformation of the deposit into the coin would affect its characterisation, for example, in relation to deposit guarantee protection. If it is issued as a form of credit, the coin represents indebtedness, possibly against collateral and it is imperative that such credit creation be not treated as a form of shadow banking that is not accounted for in banks' prudential management. There is also the issue of whether it is transferable and fungible as collaterised 'money' so that a customer can collateralise this in favour of a third party, for example. Further, it is unclear whether the RBI or XDK coin can be used to represent new financial claims, and if so whether there is a risk of shadow banking and regulatory arbitrage.

As the JPM Coin can effect international transfers for business clients within the internal blockchain provided by JP Morgan, can such a platform substitute for international payment architecture currently maintained under the aegises of Swift?[145] Further, can such a platform permit large value transfers currently routed through central banks such as the Fedwire maintain by the Federal Reserve Board[146] or the Bank of England's real-time gross

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[143] Victoria Cleland, 'Cross-border payments – innovating in a changing world' (speech, 13 Oct 2020), https://www.bankofengland.co.uk/speech/2020/victoria-cleland-keynote-presentation-at-the-central-bank-payments-conference-2020.

[144] https://chainstack.com/marketplace/cordite/.

[145] https://www.swift.com.

[146] https://www.federalreserve.gov/paymentsystems/fedfunds_about.htm.

settlement system?[147] The diversification away from centralised payment and settlement architecture is also a trend observed with the RBI or XKD Coin. These seem to be tokens that are used to improve the efficiencies of inter-bank payment, clearing and settlement. The pertinent regulatory issues are therefore whether such networks create pockets of self-regulatory payment architecture and how these should be overseen.

Payment clearing and settlement infrastructures are arguably public goods[148] that operate under an institutional architecture co-opting public sector oversight.[149] Would the same regulatory regimes apply to these new blockchain-based payment and settlement platforms, and would there be a need for new standards in light of new technology? In particular, can large value transfers be made via these coins, and what are the implications for central banks' roles in providing large value transfer architecture and supervising them?[150] Can large value transfers be migrated away from central banks' settlement systems and what risks does this pose for financial stability? It may however be argued that in light of the Federal Reserve's operational error in its Fedwire real-time gross settlement system for large value transfers that resulted in a suspension of service for a few hours,[151] central bank systems are no guarantee for financial stability too. The proliferation of permissioned blockchains for interbank settlement and clearing may provide diversification that reduces systemic risk.

In dealing with the JPM, XKD or RBI Coin, it is possible that regulators would treat an innovation from an existing regulated entity as subsumed within an existing regulatory regime. This is because some regulators, such as in the US, undertake entity-based regulation. Indeed the proposed Stable Act[152] in the US could reinforce an approach that allows incumbent authorised banking institutions to develop tokenisation under the current regulatory regime, not attracting new regulatory considerations. The Act proposes to regulate all stablecoin issuers as deposit-taking institutions, hence disallowing private stablecoins to be issued outside of the bank regulatory perimeter. Such an approach could force stablecoin projects pegged to the US dollar or other foreign currency to be outlawed in the US unless authorisation is obtained for the issuer to operate as a deposit-taking institution. The Act's focus may be to weed out private stablecoin issuers who would unlikely meet bank authorisation requirements. It may be argued that, although this means that only established banks can develop stablecoin projects, the Act subjects every stablecoin proposed to be issued to a six-month notice, presumably to invite regulatory scrutiny. This would not bring about an automatic recognition of stablecoin projects issued by regulated entities, but it remains to be seen if incumbents would be subject to strong scrutiny.

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[147] https://www.bankofengland.co.uk/payment-and-settlement.

[148] IH-Y Chiu, 'A New Era in Fintech Payment Innovations? A Perspective from the Institutions and Regulation of Payment Systems' (2017) 9 *Law, Innovation and Technology* 190.

[149] Banks as payment services providers would be subject to the Payment Services Directive 2015 regime but a clearing bank is also subject to peer-level governance in the UK Payments Administration Limited for retail payment clearing, https://www.ukpayments.org.uk/what-we-do/.

[150] https://www.bankofengland.co.uk/payment-and-settlement.

[151] 'US central bank payment system down for 'hours'' (BBCNews, 25 Feb 2021), https://www.bbc.co.uk/news/business-56186658.

[152] https://tlaib.house.gov/sites/tlaib.house.gov/files/STABLEAct.pdf.

The UK has moved away from sectoral regulation since the 2000s but sectoral legacies still loom large in its 'regulated permissions' regime.[153] The legacies of regulatory ontologies for regulators, particularly influenced by sectoral boundaries, are likely to affect regulatory perceptions of boundaries, in responding to crypto-finance. Regulators should take care that existing regulatory boundaries for already-regulated entities do not obscure them from perceiving and scrutinising innovations that raise new regulatory issues. Further, coordination between relevant regulatory agencies such as microprudential regulators, payment services regulators and the administration of the financial services or deposit compensation scheme would be optimal for advancing policy thinking.

USD Coin

The USD Coin,[154] issued by New-York regulated money services business Circle is a programmable ERC-20 token for the Ethereum blockchain, seeking also to become programmable in other blockchains. It is captured within the regulatory perimeter for money service businesses in the US although it may be doubted as to whether existing regulation fully accounts for its novel features. It is also queried whether under the Stable Act, Circle would need to be authorised as a deposit-taking institution.

In substance, it may be argued that the USD Coin is similar to Tether, an 'asset-referenced' stablecoin which is, at the time of writing, unregulated.[155] The USD Coin purports to be fully collateralised to maintain parity with the US dollar and is a claim upon the issuer, much like Tether.
However, as the USD Coin is issued by an already-regulated money services business, the regulatory ontology of 'payment and money service business' provides framing for Circle's regulatory obligations in relation to the USD Coin.[156] This regulatory ontology focuses Circle's obligations in relation to prudential regulation, in order to meet claims issued against the USD Coin, anti-money laundering, customer due diligence, transaction monitoring and reporting, and accountability to FinCen. This regulatory ontology focuses on the USD Coin's use for payment in the conventional as well as crypto-economies. The USD Coin's regulatory treatment raises questions in relation to the future of regulatory policy for asset-referenced stablecoins that purport to maintain parity with the US dollar. With the US considering the Stable Act at the time of writing, it is uncertain if the issuer of the USD Coin will maintain its status as a regulated money service business or be required to fall in line with bank regulation, which may be regarded as an overreach.[157]

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[153] Schedule 2 to s19, Financial Services and Markets Act 2000.
[154] https://www.circle.com/en/usdc.
[155] The lack of regulation for Tether has however entailed ad hoc approaches such as fraud investigations carried out by the NY Attorney-General and Tether's non-admission settlement, see 'NY AG's $850M Probe of Bitfinex, Tether Ends in an $18.5M Settlement' (23 Feb 2021), https://www.coindesk.com/ny-ags-850m-probe-of-bitfinex-tether-ends-in-an-18-5m-settlement.
[156] https://support.invest.circle.com/hc/en-us/articles/360000209826-What-licenses-does-Circle-have-and-are-you-regulated-by-someone-.
[157] See 'Stable Coin Regulation, With A Focus On The STABLE Act' (Forbes, 20 Dec 2020), https://www.forbes.com/sites/vipinbharathan/2020/12/20/stable-coin-regulation-with-a-focus-on-the-stableact/?sh=6edca55a3e5a.

The USD Coin would pose challenges to the EU's regulatory treatment as it possesses e-money characteristics but is also an 'asset-referenced' stablecoin. The EU's approach to asset-referenced stablecoins reflects its appreciation for the 'asset management' aspect of the stablecoin, as the regime resembles money market fund management. In this manner, users benefit from a range of investor protection and accountability flowing from the 'asset management' functions of stablecoin issuers. However, the shortfall in the EU's approach is that the payment aspect of asset-referenced stablecoins is ignored and there is no provision for them to be so utilised. This could frustrate stablecoin issuers who intend these instruments to be capable of multifaceted functions. In this manner, regulatory characterisation in both the EU or US may be under-inclusive and over-inclusive at the same time.

There is a lack of joined-up regulatory thinking in relation to the multifunctional aspects of crypto-finance. The USD Coin has grown in market volumes since March 2020, and although there is steady adoption of the USD Coin as a payment token, its exponential growth is due to its use in DeFi yield farming, such as through DeFi loans discussed earlier in this chapter.[158] Crypto-financial assets often offer multifaceted forms of market uses, some of which can be productive, such as for payment purposes and some of which can reinforce speculative forms of hyper financialisation. Regulatory policy for such innovative products need to transcend existing regulatory categories and engage with fundamental objectives.

Coherentist applications of existing regulatory regimes gives rise to issues of inappropriate fit and gaps. We acknowledge that an effort has been made by the EU to offer tailor-made regulation for crypto-financial assets and crypto-asset service providers,[159] and we turn to examine to what extent the tailor-made regime addresses the novelties that are being developed. In Chapters 3 and 5, we suggest that regulatory design for ICOs in the EU is excessively derived from securities regulation and is not altogether appropriate for pre-development financing in ICOs. In this Section, a similar trajectory is detected for the regulation of crypto-asset service providers and asset-referenced stablecoins in the EU. We point out the deficits of this derivative approach.

Cryptoasset Service Providers

Although the decentralising properties of blockchain is what drives new business models in the productive crypto-economy, as discussed in chapters 2 and 6, crypto-finance is not always decentralised. Many new service providers and intermediaries have arisen in this space. The Table below provides a snapshot of the intermediaries in the crypto-financial space.

Financial Activity	**Intermediaries involved**
Commercial payment, for dApp services or virtual goods	Developers of payment protocol
	Wallet provider
	Stablecoin issuer

[158] 'Coinbase and Circle-Backed Stablecoin USD Coin Breaks $1B Market Cap' (3 July 2020), https://cointelegraph.com/news/coinbase-and-circle-backed-stablecoin-usd-coin-breaks-1b-market-cap.

[159] Proposed Markets in Crypto-assets Regulation, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020PC0593.

Investment (primary market)	ICO Issuer and developer, including pooled structures like DAO
	Cryptoasset Exchange if conducting an offering
	Cryptoasset rating services eg ICOBench
Exchange or trading	Centralised cryptoasset exchange
	Wallet provider
	Decentralised liquidity pool
	Decentralised services short of transaction execution eg information matching
Saving	Savings dApp and interest rate provider
	Liquidity pool, decentralised or otherwise
Arbitrage or speculation	Centralised crypto or conventional exchanges offering derivative products
	Exchange-traded products issuer
	Cryptoasset fund manager
	Liquidity pools
	Market making protocols/platforms
	Stablecoin issuer

In connection with the productive crypto-economy, chapters 5 and 6 have discussed regulatory proposals for a number of service providers, such as wallet providers, centralised and decentralised exchanges. These service providers may perform services resembling those of their conventional financial sector counterparts, but can also provide services in new ways, therefore changing the nature of risks in relation to their service provision, or offer novel combinations of services. However, the trend is that many regulators tend to treat crypto-financial service providers and their conventional financial sector counterparts similarly. Even in jurisdictions that are developing specific crypto-finance regulations, crypto-financial service providers are treated in broad-brush or vague ways, and inappropriate forms of regulation could be extended to them.

First there is an issue of scope of regulatory application. Service providers in the EU's proposed Markets in Crypto-asset Regulation are not defined in terms of the categories of services provided, and a broad-brush and vague approach is also taken in the Maltese Virtual Financial Assets Act. Should the scope of application be interpreted to refer only to service providers related to cryptoasset offers, given the context of the legislations? However, the proposed EU Regulation also deals with e-money tokens. So, would 'service provider' extend to payment-related service providers? Further, would rating services for ICOs be regarded as caught within the scope of service providers, but remains unspecifically mentioned in either the proposed EU legislation or Maltese Act?

As the Maltese Act also requires service providers organised as blockchain-based businesses to adhere to the Innovative Technological Arrangements Act that deals with organisational and governance aspects, would this requirement extend only to service providers organised as blockchains? If service providers do not serve solely the crypto-economy, how would overlaps between mainstream financial regulation and regulation extended to crypto-

finance be reconciled?[160] There is clarity in the proposed EU Regulation that banks and existing regulated electronic money institutions are exempt from further regulation pertaining to the issue of digital money tokens. However, one queries if this treatment is under-inclusive as special characteristics of tokenisation carried out by regulated banks and e-money institutions should be carefully considered for regulatory policy. In particular, we have proposed in chapter 6 that regulatory oversight of payment functions and infrastructure in the crypto-economy should be designed differently, in terms of code-vetting and pre-emptive testing.

The treatment of service providers grouped together under a generic label is arguably unsatisfactory. The proposed EU Regulation extends the same prudential and conduct regulations over the universe of service providers, but it is queried if this is both over- and under-inclusive. Service providers are susceptible to different types and intensities of user engagement, and the same conduct regulation applicable to all may be inappropriate. For example, even if it can be argued that the duty to 'manage conflicts of interest' can be framed at a level of generality that is not unwarranted, the nature and extent of conflicts of interest for each type of service provider differ, and specific policy should be considered where more significant forms of harm can occasion to users. Service providers also carry out different extents of decentralisation, using automated protocols to replace centralised service provision, as discussed in chapter 6 in relation to decentralised exchange and trading services. Should conduct risks in relation to each of the service providers set out in the Table above be more carefully interrogated in order to develop more appropriate policy?

Further prudential regulation is meant to moderate the financial risks of intermediation activities so as to prevent risks of failure and wider disruptive risks to the financial system. According to the Table of service providers, it needs to be determined if prudential regulation should apply to any of them and to what extent. Prudential implications may be attracted for savings service providers for example, but it may be argued that in a decentralised crypto-financial universe, prudential regulation is unwarranted as risk is not centralised upon intermediaries. Automated protocols for collateralisation are programmed for each participant to bear his/her share of risk. Should such self-regulation be sufficient? Should providers of liquidity pools for example not be treated collectively for prudential purposes? If providers of 'centralised' features, whether for liquidity pools, protocols to govern decentralised trading services or other DeFi services, should be treated as a collective entity for prudential regulatory purposes, then the question arises as to what the prudential regulation is for. Would we be seeking to apply prudential regulation to constrain levels of risk build-up in these platforms, or would we be applying prudential regulation for loss absorption in case of unexpected events? A blanket approach in prudential regulation seeking to ensure that there is conventional shareholder equity backing the service provider may be an inappropriate policy, whose purposes are also unclear.

Further, the proposed EU Regulation and Maltese Act provide more distinct treatment of cryptoasset exchanges. The familiarity with centralised exchanges has caused development of regulation very much in the vein of mainstream trading markets, and targeted at

[160] This issue was raised critically in DA Zetzsche, F Annunziata, DW Arner and RP Buckley, 'The Markets in Crypto-Assets Regulation (MICA) and the EU Digital Finance Strategy' (2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3725395.

centralised exchanges. The proposed EU Regulation, as well as the Thai and Maltese regimes recognise and regulate centralised cryptoasset exchanges. However, this may leave decentralised exchanges either in a vacuum or inappropriately regulated.[161]

In sum, this Chapter raises concerns in relation to excessive coherentism on the part of financial regulators dealing with financial developments in the crypto-economy, as well as in the conventional financial economy where cryptoassets may be assetised. Financial regulators' treatment of novel developments such as the stablecoin and Decentralised Finance also raise concerns with regard to coherentist approaches. We propose below that unpacking different stablecoins may mean different regulatory approaches to them, along the lines of functional regulation. Further, the movement of Decentralised Finance (DeFi) raises distinct issues that are not similar to credit and lending.

Novelties for Regulatory Policy: Asset-referenced Stablecoins

The asset-referenced stablecoin is an exponentially growing industry as both crypto-economy users and mainstream financiers have flocked into this space.[162] As discussed in chapter 6, Tether is an example of an off-chain managed stablecoin, while Dai is an example of an onchain-managed stablecoin. The USD Coin discussed above resembles Tether but is subject to different regulatory treatment. Tether and Dai are currently unregulated, but there is potential that they could be captured by the proposed Stable Act and EU Regulation. We discuss here that different stablecoins should be functionally interrogated and this reveals differences in terms of functional characteristics and purpose of use. In this manner, perhaps it is even inappropriate to have an overarching umbrella regime to regulate stablecoins indiscriminately.

Tether International Limited is incorporated as a company based in the British Virgin Islands, and its business model is to issue Tethers or USDT, purportedly maintaining parity with the US dollar. This business model has now extended to fiat currencies such as the euro,[163] yuan[164] and gold.[165] Tether is a programmable cryptocurrency that can be accepted as payment on the Ethereum blockchain or on the Omni layer of the Bitcoin blockchain. In the alternative, USDT can be held for hedging purposes against the volatility of cryptocurrency such as bitcoin and ether. In the US, Tether is incorporated as Tether Limited dealing only with accredited investors.[166] The USDT can be treated as a promise to redeem at parity, such a promise being backed up by reserves and the daily publication of reserve levels.[167] This promise is not dissimilar to the promise to repay a deposit or a promise to redeem at par value in relation to a money market fund. In this manner, regulatory design could be targeted at issuers in terms of prudential provision and robust and credible management of reserves.. The US Stable Act would treat Tether as a stablecoin equivalent to a deposit. The

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[161] I Salami, 'Decentralised Finance: The Case for a Holistic Approach to Regulating the Crypto Industry' (2020) 35 *Journal of International Banking and Financial Law* 496.
[162] 'Stablecoins post triple-digit growth in 2020, but institutional rivals loom' (11 Sep 2020), https://cointelegraph.com/news/stablecoins-post-triple-digit-growth-in-2020-but-institutional-rivals-loom.
[163] https://tether.to/usd₮-and-eur₮-now-supported-on-ethereum/.
[164] https://tether.to/tether-now-supports-offshore-chinese-yuan-cnh-launches-cnht-stablecoin/.
[165] https://gold.tether.to.
[166] Clause 3.3, https://tether.to/legal/.
[167] https://wallet.tether.to/transparency.

proposed European Regulation[168] also focuses on reserve maintenance and redemption robustness. Issuers are in sum subject to prudential regulation, mandatory audit and accountability, though the EU regime is somewhat lighter than the regime for money market funds for example.[169] Both the US and EU approaches are derivative in nature, but it may be said that the EU proposal is more proportionate as the fall gamut of equivalent regulation applicable for conventional finance is not applied. Bank regulation would be applied in full to stablecoin issuers in the US under the Stable Act.

It can be argued that the focus on the nature of Tether's financial promise, which is the 'back-end' mechanics of how Tether works, should not be isolated from Tether's 'front-end' purpose. Tether serves a significant speculative market for hedging against the price volatility of bitcoin, as it is held by many mainstream and crypto-investors in the place of fiat currencies for speculating against bitcoin.[170] Further, many bitcoin derivatives offered by cryptocurrency exchanges are settled in Tether.[171] Hence, Tether's main purpose seems to be acting as the programmable alternative to the US dollar that enables swift changes in position in and out of bitcoin for speculative trading purposes. In this manner, it should be queried whether the regulatory ontology for Tether should be confined to the technical nature of its financial promise, or should be extended to its market purpose, connecting with the wider policy concerns regarding hyper financialisation. Regulating asset-referenced stablecoins in the manner proposed by the EU Regulation could give such products more legitimacy and promote more participation, reinforcing speculative forms of financialisation in the crypto-economy. Such consequences should be carefully considered in designing regulatory regimes that would inevitably clarify the status of stablecoins like Tether.

Different from Tether or the USD Coin, Dai is an on-chain collateralised stablecoin with payment, investment/reserve management as well as deposit and savings features.[172] As discussed in chapter 6, Dai is issued by Maker DAO to anyone who wishes to lock approved collateral in a 'vault' for the issue of dai. Such collateral includes ether, as well as Ethereum-based tokens approved by the governance body for Maker DAO, ie the holder of MKR tokens. Dai is soft-pegged to the US dollar, hence the value of collateral locked in vaults is determined by price oracles approved and trusted by the governance body, and oracle mechanisms are crucial to determining if the vault is sufficiently collateralised. Withdrawers of dai can use this for spending or for saving, such as in the Oasis app,[173] which generates a savings rate determined by the MKR token holders in the governance body. The savings rate is a mechanism for affecting demand for dai so that a market for dai can be built up. Price stability for dai is maintained by market makers or 'keeper nodes' that run a protocol on their computers to automatically buy or sell dai in accordance with market demand conditions to keep parity with the dollar. Keepers also participate in collateral liquidations

[168] European Commission Proposal (2020).
[169] Regulation (EU) 2017/1131 of the European Parliament and of the Council of 14 June 2017 on money market funds.
[170] 'Sizable Portion of Tether's $4.5B Growth Comes from Exchange Fiat' (21 July 2020), https://cointelegraph.com/news/sizeable-portion-of-tethers-45b-growth-comes-from-exchange-fiat.
[171] Ibid.
[172] https://makerdao.com/en/whitepaper#use-of-the-mkr-token-in-maker-governance.
[173] https://oasis.app/save.

which are automatically deployed if a vault triggers certain risk parameters. Withdrawers of dai can redeem collateral by repaying the dai and a stability fee.

There are a number of financial promises made with regard to holding dai- ie that the stability of dai is maintained by demand-led decisions that determine the savings rate for dai, the market-making protocols and collateralisation protocols. Although the latter two are automatically deployed, the Maker governance body determines and regularly votes on policies in relation to the interest rate for dai savings and collateralisation risk policies. These governance powers also underpin the selection of price oracles which affect the automatic deployment of collateralisation policies and other discretionary matters such as system upgrades or shut downs in an emergency. In sum, users' financial claims are totally reliant on the robustness of Maker's governance, where decision-making powers are held by holders of the MKR tokens. MKR tokens were publicly auctioned by Maker DAO to raise dai. The dai system ran into a crisis in March 2020 when ether price volatility triggered large scale liquidation protocols for collateral. The governance body stepped in and secured capital injection from financiers to stabilise the system.[174] At the time of writing, Paradigm Capital, a digital asset management firm based in San Francisco is the major holder of MKR tokens.[175]

It may be argued that due to the nature of the financial promise made in relation to dai in terms of creation and redemption, dai can be governed along the same ideology as that applicable to offchain collateralised stablecoins. However, it can also be argued that dai should be ontologically different from other collateralised stablecoins. As Lipton et al argue,[176] different stability mechanisms can give rise to different taxonomies or ontologies, such as whether the stabilisation mechanism is based on a claim against reserve, or a claim against good faith in stabilisation practices or policies. It can be argued that dai should be ontologically different from other collateralised stablecoins, as its stability mechanisms premised upon collateralisation may be a transition phase for the establishment of dai as a self-maintaining cryptocurrency. In this manner, the protocols that moderate market conditions for dai in order to prevent speculative disruptions to dai's stability are likely of more importance as dai matures in terms of adoption and circulation. This model of transitional collateralisation and soft-pegging, which should ultimately pave the way for a self-sustaining payment currency, is the model explicitly adopted by Reserve, another asset-referenced stablecoin.[177] In this manner, can it be argued that payment regulation is most appropriate for such stablecoins? The governance of such stablecoins can be subject to a co-regulatory system of oversight involving the governance body and regulators. Despite the structures of 'asset management' that are involved in collateralisation and reserve management, could these be less important for regulatory policy and design, in view of a more purpose-led inquiry into what dai serves and how it is used?

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[174] 'The Market Collapse of March 12-13, 2020: How It Impacted MakerDAO' (1 April 2020), https://blog.makerdao.com/the-market-collapse-of-march-12-2020-how-it-impacted-makerdao/.

[175] 'Paradigm Is Biggest Winner of MakerDAO Lending System's MKR Governance Tokens, to Cover $4.5 Million of Undercollaterized Debt' (1 April 2020), https://www.crowdfundinsider.com/2020/04/159604-paradigm-is-biggest-winner-of-makerdao-lending-systems-mkr-governance-tokens-to-cover-4-5-million-of-undercollaterized-debt/.

[176] A Lipton, A Sardon, Fa Schär, and C Schüpbach, 'From Tether to Libra: Stablecoins, Digital Currency and the Future of Money' (2020), https://arxiv.org/pdf/2005.12949.pdf.

[177] https://reserve.org/our-vision.

The universe of stablecoins presents products of different designs that serve predominantly different purposes, and pose different risks to users. We could adopt a purpose-led approach so that stablecoin functions are regulated to commonly accepted standards for their use purpose/s. Yet the purpose-led approach can be hazardous. This is because significant use changes can occur in this technologically mobile and agile universe, and dai is now significantly deployed as collateral for DeFi loans in yield farming strategies, to be discussed more below. Users of dai in this manner rely upon its nature as a financial asset and its value stability features in order to arbitrage with other tokens to generate yields based on price differences in different markets. Hence, in order to protect users of dai whose interests lie in the value stability features of the stablecoin, the proposed EU Regulation's approach that focuses on reserve management may seem most in keeping with their latest needs. That said, the combination of different types of financial claims and financial uses that stablecoins can be put to raises the broader issue of whether a 'multifaceted' or 'multifunctional' crypto-financial product should be regulated as a unique product as a whole, or functionally along different aspects.

Further, being an onchain stablecoin instead of an offchain stablecoin like Tether, dai is governed and managed differently. An offchain stablecoin may be said to be governed in a similar manner to fund management under the control of the asset manager. However, dai is governed by automated protocols, although a governance body designs its policies and engages in crisis management. In what ways should regulatory policy differ between onchain and offchain stablecoins? Could onchain stablecoins, whose governance is more decentralised and transparent be subject to a meta-regulatory or co-regulatory regime where self-governance and experimentation are permitted within certain frameworks? Regulatory design addressed to decentralised forms of coordination such as in a DAO cannot be the same as addressed to a corporatized entity. In addressing a decentralised structure, Auer proposes *ex ante* and technologically embedded forms of regulatory governance,[178] such as embedding regulatory accountability in governance tokens. Protocols may have to be considered for periodic transparency to be made to regulators. Further, the equivalent of external audit could be built into the governance system.

A number of algorithmically-managed stablecoins may be characterised as stablecoins that aim towards becoming self-maintaining currencies for the crypto-economy. Algorithmically-managed stablecoins are usually on-chain stablecoins, purporting to maintain price stability, usually within a narrow range, soft-pegged to the US dollar.[179] They may be collateralised in an initial phase,[180] but ultimately seek to be self-sustaining, managing price stability by responding to market conditions, where sufficient circulation and liquidity have been achieved.[181] Fundamentally, such projects are designed to be for payment purposes, and

[178] R Auer, 'Embedded Supervision: How to Build Regulation Into Blockchain Finance' (BIS Working Paper 2019), https://www.bis.org/publ/work811.htm.
[179] Eg Reserve, https://reserve.org/our-vision; E Kuo, B Lles and M Rincon-Cruz, 'Ampleforth: A New Synthetic Commodity' (2019), https://www.ampleforth.org/papers/, also the failed Basis project, see N Al-Naji, J Chen and L Diao, 'Basis: A Price-Stable Cryptocurrency with an Algorithmic Central Bank' (2018), https://www.basis.io/basis_whitepaper_en.pdf.
[180] Reserve above, and the failed Basis project, above.
[181] Reserve above, but Ampleforth seeks to be managed without a reserve from the start.

regulatory policy for payment protocols and services should arguably be most applicable. It is queried whether soft pegging to a fiat currency, without a reserve mechanism, would be outlawed under the US and EU legislations. Or would the stablecoins with an initial reserve mechanism be subject to full regulatory treatment proposed in the US and EU, even if the reserve mechanism is intended to be phased out? For example, Ampleforth and Reserve tend towards de-pegging and becoming self-maintained in due course.

Novelties for Regulatory Policy: DeFi

One of the most structurally challenging phenomena for regulators is the rise of 'DeFi', or decentralised finance.[182] This is because DeFi allows retail participation in rather complex hedging financial activities, driven by automated algorithmic protocols. Although DeFi seems to be self-governed by precise smart contract protocols and offers a range of democratising opportunities for individuals to participate in financial yield-generation, there are two concerns. One is that governance needs are not completely addressed by automation, and the suite of risks that an individual is exposed to can be highly uncertain. These risks include technical/security risks of protocol exploitation and transactional complexity, economic risks in terms of potential financial loss and governance risks in terms of problem-solving and crisis management.[183] The second is that speculative forms of hyper financialisation are encouraged and the normative approach to these trends ought to be addressed.

DeFi allows token-holders to engage in financial yield generation, potentially stripping out rent-extracting intermediaries.[184] On the Compound platform,[185] users can deposit their tokens into liquidity pools, ready to be swapped with others who have matching demands. The participation in the Compound pools yields a deposit-like interest rate for the token 'lender' who locks up his/her tokens in the Compound smart contract in return for a Compound token. Such yield is akin to yield made by wholesale financial institutions such as in prime brokerage in conventional finance. The holder of the Compound token can further generate yield on the Compound token by depositing it into another liquidity pool, or may use the Compound token as collateral for swapping with another token that may be generating yield in another liquidity pool.

On the Uniswap platform,[186] users deposit their tokens into paired liquidity pools by locking their tokens into a smart contract, in exchange for a Uniswap token. The Uniswap token is coded with protocols to provide users with yield that is dependent on the liquidity conditions of the pool. High demand and usage of the relevant paired pool would be more rewarding for users, and users also potentially earn more yield if they lock up more tokens and provide more liquidity, therefore being entitled to sharing more from the proceeds of

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[182] 'Five Years In, DeFi Now Defines Ethereum' (1 Aug 2020), https://www.coindesk.com/five-years-in-defi-now-defines-ethereum.

[183] SM Werner, D Perez, L Gudgeon, A Klages-Mundt, D Harz, WJ Knottenbelt, 'SoK: Decentralized Finance (DeFi)' (2021), https://arxiv.org/pdf/2101.08778.pdf.

[184] Y Chen and C Bellavitis, 'Blockchain Disruption and Decentralized Finance: The Rise of Decentralized Business Models' (2020) 13 *Journal of Business Venturing Insights* e00151, https://doi.org/10.1016/j.jbvi.2019.e00151.

[185] https://compound.finance.

[186] https://uniswap.org/docs/v2/protocol-overview/how-uniswap-works/.

the pool. Again the Uniswap token can be further collateralised in yield farming, or deposited in other liquidity pools. It is also possible for Uniswap users to trade against the smart contract in order to exploit opportunities for high yield generation in changing liquidity conditions. Such financial participation creates opportunities for financial yield generation similar to those enjoyed by conventional broker-dealers in market-making, an activity that is shut to ordinary retail financial participants.

The freedom of asset transformation for 'yield-farming' is made possible by the technology of tokenisation but may only be limited by the lack of interoperability between blockchains. Service providers such as Idle[187] have arisen in this space to provide users with comparative information on pool prices across blockchains, and can automate executions to manage users' assets to facilitate yield-farming.

These DeFi examples above offer a form of democraticised access to asset creation and transformation for ordinary retail users. Further, Compound and Uniswap are governed in a decentralised manner where users are free to propose protocol changes, governance decisions etc to be voted upon.[188] Is DeFi the beginning of a new form of finance altogether that challenges the conventional delineation between wholesale and retail finance? How such regulators respond?

Can it be argued that DeFi is ultimately self-regulating, graduating from any need for externally-imposed governance or regulation. This is because DeFi is based on democratic participation and not the opaque intermediation processes that conventional financial institutions engage in *and* charge their customers for. Further, DeFi is based on full or excess collateralisation for risk management locked in smart contracts that are defined to perform precise protocols. Even where losses may occasion to individuals, such as by way of collateralisation top-ups or liquidation in response to volatile token prices, the sort of systemic seizure that conventional financial institutions may experience, threatening the loss of business continuity or financial stability could be unlikely. Even the price volatility crisis experienced by Maker DAO discussed above was resolved by way of private governance and capital injection.

There are however a few points of concern. First, each DeFi platform provides its own precisely defined protocols in smart contracts, and these tend to be rigid as certainty is required to cater for safe collateral lock-up and for how financial reward is made. As is general with smart contract governance, unforeseen problems may arise in due course.[189] In particular, commentators have modelled attacks on protocols.[190] It may be argued that these will be solved by democratic governance on DeFi platforms. However, *ex post* problem-solving in rapid automated transactional contexts may be too late for victims. Further, governance risks also persist in that participants involved in governance may have

[187] https://idle.finance/#/.
[188] https://uniswap.org/docs/v2/governance/overview/; https://compound.finance/governance.
[189] WA Kaal, 'Digital Asset Markets Evolution' (2020) Journal of Corporation Law, forthcoming, https://ssrn.com/abstract=3606663.
[190] K Qin, L Zhou, B Livshits, and A Gervais, 'Attacking the DeFi Ecosystem with Flash Loans for Fun and Profit' (2020), https://arxiv.org/pdf/2003.03810.pdf.

conflicting interests.[191] For example a number of the largest voters on Compound are financial institutions such as hedge funds, and it is uncertain if their governance would be conflicted by their profit-seeking agendas.

Next, as yield farmers look to swap tokens in multiple venues in order to exploit the opportunities for yield maximisation, one commentator has queried how a bug or flaw in one smart contract protocol may affect the chain of transactions and whether such linkages would then result in systemic impact for the DeFi landscape.[192] Further, wallet providers also need to be able to keep up with the transactions[193] and cannot become weak links for hackers and exploitations. One example of significant loss occasioned when a protocol bug was exploited by a hacker against ValueDeFi in a flash loan transaction.[194] Nevertheless, it may be argued that the ValueDeFi loss is due to the availability of uncollateralised flash loans. Collateralised business models may not be so adversely affected.

Third, yield farming can rely on extremely short-term strategies speedily executed with the help of automated smart contract protocols. Hence DeFi supports speculative trading arbitrage at speed and potential exploitation amongst users. It is uncertain how such speculative forms of hyper financialisation is ultimately helpful for productive aspects in the crypto-economy. For example, a user may deposit dai into Compound to earn a 10% interest rate[195] and receive a c-dai token in return from the Compound protocol. The c-dai token can be deposited into Sushiswap, in order to borrow a riskier paired token, say, issued by a recent dApp developer, that may benefit from hype and rising secondary market prices. Suppose the holder of the riskier token knows of inside information regarding the dApp developer's risk, the loan can be made for timely arbitrage to generate yield on the token's price, by perhaps swapping with another investor for USDC on Airswap.[196] The final investor holding the 'hot potato' token may suffer loss in relation to the value of the token, as well as collateralisation and liquidation loss based on the lending protocols enforced by both Sushiswap and Compound. Other attacks such as pump arbitrage and oracle manipulation are discussed by commentators, and although these are more prevalent in a flash loan context,[197] these episodes show that self-governance is often not immune to determined fraudsters or scammers who exist alongside arbitrageurs and speculators.[198]

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[191] Werner et al (2021).

[192] F Schär, 'Decentralized Finance: On Blockchain- and Smart Contract-based Financial Markets' (2020), https://ssrn.com/abstract=357133

[193] A-D Popescu, 'Decentralised Finance (DeFi)- The Lego of Finance' (2020) 7 *Social Sciences and Education Research Review* 321.

[194] 'Value DeFi Suffers $6M Flash Loan Attack' (16 Nov 2020), https://www.coindesk.com/value-defi-suffers-6m-flash-loan-attack.

[195] Eg see 'DeFi yield farming, explained' (26 Sep 2020), https://cointelegraph.com/explained/defi-yield-farming-explained.

[196] https://www.airswap.io.

[197] Qin et al (2020).

[198] Chen and Bellavitis (2020); the levels of cryptoasset crime and fraud although not overwhelming, are noted in M Tiwari, A Gepp & K Kumar, 'The Future of Raising Finance - A New Opportunity to Commit Fraud: A Review of Initial Coin Offering (ICOs) Scams' (2020) 73 *Crime, Law and Social Change* 417.

Finally, there is a need to determine if service providers that arise to help token-holders compare pool prices or even manage their assets directly, should be subject to standards of conduct of business for user protection.

There is however a vision of democratisation, diversity, open-ness, inclusiveness, competition and even resilience associated with decentralised spheres. Even if we may be concerned about some extent of financier dominance in the voting power on the Compound platform,[199] users who do not favour such governance can choose to join other liquidity pools or diversify their participation. A competitive landscape where power is diffuse can promote innovative problem-solving.[200] Further, decentralised platforms can contribute to overall financial system resilience as different types of financial assets are created and transformed, and the systemic risks of homogeneity at scale may be mitigated.[201]

Perhaps what DeFi needs is not a retreat from, but an organic partnership with, governance notions so that certain social expectations can be met, such as of civic behaviour, standards of problem-solving and systemic sustenance. Avgouleas and Kiaiyas,[202] writing on how fintech *ought to* transform the financial eco-system, propose a more diverse landscape for financial actors working in asset transformations of various novel forms and over different horizons, interfacing with users in different ways. Diversity will add to market competition and is key to resilience, ultimately promoting more holistic socio-economic goals. Crucially the authors propose that decentralised systems of finance should be governed by a mixture of self-governance, partnered governance between regulators and the industry, as well as stakeholders, and a continuous and dynamic co-monitoring of the system.[203]

We argue that policy-makers and regulators should engage with developers in the crypto-economy and crypto-financial universe in partnered coordination to generate *ex ante* protocols for decentralised financial eco-systems that embed regulatory and governance objectives to protect the commons. In this manner, developments in Regtech[204] which facilitate the financial industry's automated compliance with regulations can be leveraged

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[199] Financiers such as Paradigm and Polychain Capital are dominant voters, see https://compound.finance/governance.

[200] R Rajan, *The Third Pillar* (Penguin 2020), advocating for localised communities to enjoy more power alongside states and markets. In this manner, decentralisation and fragmentation of power is not necessarily to be regarded as sub-optimal.

[201] E Avgouleas and A Kiayias, 'The Architecture of Decentralised Finance Platforms: A New Open Finance Paradigm' (2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3666029.

[202] Ibid.

[203] Ibid.

[204] The rise of the Regtech industry, driven by data-based governance in financial regulatory reporting and automated compliance framed by such information returns, can be integrated into *ex ante* regulatory regularisation of automated finance. See for eg DA Zetzsche, DW Arner, RP Buckley and RH Weber, 'The Future of Data-Driven Finance and RegTech: Lessons from EU Big Bang II' (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3359399. The growth of Regtech is charted in E Schizas et al, 'The Global RegTech Industry Benchmark Report' (2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3560811. Types of Regtech are critically discussed in L Enriques, 'Financial Supervisors and Regtech: Four Roles and Four Challenges' *Revue Trimestrielle de Droit Financier* 53 (2017), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3087292.

upon for further integration with crypto-finance.[205] Such partnered coordination should also extend to *ex post* monitoring and audit for DeFi platforms in order to solve problems and engage in system improvement. It is queried if regulatory involvement would result in governance convergence, such as amongst international regulators.[206] There may be pros and cons to regulatory convergence, as regulatory homogeneity can lead to stagnation in governance and augment systemic risks if a flaw is subsequently discovered in regulatory mechanisms. However, international consistency can promote certainty and clarity for the crypto-financial industry.

Decentralised finance raises ontological, design, standards and architectural challenges for regulators. In the Section below, we propose a high-level framework for rethinking regulatory policy formulation, ie the *how* to regulate crypto-finance. This is intricately connected to the *why* question for regulatory policy. Our high-level matrix for regulatory design in the next Section integrates the objectives of regulatory policy more tightly with regulatory design, with the recognition that automation, decentralisation and innovation are structural changes that influence the *how* question for regulation. We argue that the high-level matrix, rather than narrow prescriptive suggestions, is a better way forward in order to accommodate the dynamic nature of innovations and regulators' different considerations.

C. A Framework for Developing the Regulatory Agendas for Crypto-finance

In determining appropriate regulatory responses to novelties in crypto-finance, policy makers have often discussed issues such as resemblance to existing regulatory ontologies and arbitrage,[207] types of risks and the corresponding regulatory objectives that need to be addressed in managing those risks,[208] as well as scale of risks in order to warrant regulatory intervention.[209] In the EU, the purported introduction of cryptoasset regulation[210] and the CBDC[211] are also pursuant to market-building, deepening pan-European infrastructure and

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[205] Arguably the industry of Regtech can be further interfaced with crypto-finance developments, see support for the inherent coordinative possibilities in governance opened up by Regtech, V Colaert, 'RegTech as a Response to Regulatory Expansion in the Financial Sector' (2018), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2677116; AY-P Yang and C-Y Tsang, 'RegTech and the New Era of Financial Regulators: Envisaging More Public-Private Partnership Models of Financial Regulators' (2018) 21 *University of Pennsylvania Journal of Business Law* 354, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3382005.

[206] DW Arner, RP Buckley and DA Zetzsche, 'Decentralised Finance' (2020), www.ssrn.com/abstract=3539194.

[207] Eg, the initial approach taken by the FSB, 'Addressing the Regulatory, Supervisory and Oversight Challenges Raised by "Global Stablecoin" Arrangements' (14 Apr 2020) at https://www.fsb.org/wp-content/uploads/P140420-1.pdf on stablecoins, Alex Collomb, Primavera de Fillippi and Klara Sok, 'Blockchain Technology and Financial Regulation: A Risk-Based Approach to the Regulation of ICOs' (2019) 10 European Journal of Risk Regulation 263 on ICOs' similarity to securities offerings.

[208] Such as financial stability risks, M Adachi, M Cominetta, C Kaufmann and A van der Kraaij, 'A Regulatory and Financial Stability Perspective on Global Stablecoins' (5 May 2020) at https://www.ecb.europa.eu/pub/financial-stability/macroprudential-bulletin/html/ecb.mpbu202005_1~3e9ac10eb1.en.html#toc1.

[209] Ibid.

[210] European Commission Proposal (2020), https://ec.europa.eu/finance/docs/law/200924-crypto-assets-proposal_en.pdf.

[211] ECB, *Report on a Digital Euro* (Oct 2020), https://www.ecb.europa.eu/euro/html/digitaleuro-report.en.html.

linkages. The debates in these rationales, sometimes competing, do not necessarily yield clear conclusions for policy-makers and regulators. This book argues that regulatory policy should be enabling in nature for the productive aspects of the crypto-economy, hence the regulatory agendas to support productive financialisation, as set out in Chapters 4-6. However, other forms of crypto-finance should be subject to more considered thinking instead of a coherentist approach.

This Section explores a framework towards developing regulatory agendas, instead of arguing for specific regulatory agendas as such. We endeavour to offer a high-level matrix for the key aspects of the 'regulation enterprise',[212] in order to allow the characteristics of crypto-finance to be mapped against it. In this manner we 'break down' the regulatory enterprise into four component elements which are like the building blocks of regulatory design. Regulators should then map particular regulatory objectives and rationales against these building blocks in order to build up appropriate regulatory designs for crypto-finance. These four components are: (i) regulatory ontologies, ie the categories of subject matter within the scope of regulators' mandates,[213] (ii) regulatory design i.e referring to the methodologies for addressing the subjects of regulation and methodologies to take account of risks in regulatory ontologies;[214] (iii) regulatory content, ie the substantive and procedural rules, standards that comprise the compliance obligations for regulated entities;[215] and (iv) regulatory architecture, ie the set-up, organisational and networked aspects of regulatory bodies.[216]

Regulatory Building Blocks and the 'How-to' Matrix

First, regulation comprises of regulatory ontologies, ie the definitions of what subject matter falls within the scope of regulation. Regulators often have broadly-framed mandates, such as consumer protection and market confidence to be maintained by the FCA. In order to have a sustained course of operations for regulatory mandates. Law is utilised as the instrument that establishes the regulatory agency and its mandate, such as the UK PRA's and FCA's mandates,[217] and the manner in which the regulatory agency's operations are carried out, such as in rule-setting and enforcement. Regulators applying their broadly-framed mandates would engage in the legal interpretation and definition of their regulatory parameters. Determining regulatory ontologies may be regarded as pursuant to such an

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[212] T Prosser, 'Introduction: Two Visions of Regulation and Four Regulatory Models' in *The Regulatory Enterprise* (Oxford: OUP 2010), p11.

[213] Ibid; also ch2, B Morgan and K Yeung, *An Introduction to Law and Regulation* (Cambridge: CUP 2012); M Cave and R Baldwin, *Understanding Regulation* (Oxford: OUP 2011), ch2. The rationales for regulation underpin the regulatory set-up and mandates.

[214] Regulatory design and strategies often involve different ways of securing cooperation and compliance by regulated subjects, see Part II, Cave and Baldwin (2011), ch3, Morgan and Yeung (2012), also see ch3, M Andenas and IH-Y Chiu, *The Foundations and Future of Financial Regulation* (Oxford: Routledge, 2014).

[215] Part III, Cave and Baldwin (2011); ch4, Morgan and Yeung (2012); C Parker and VL Nielsen, *Explaining Compliance: Business Responses to Regulation* (Cheltenham: Edward Elgar 2011).

[216] RA Abrams and MW Taylor, "Issues in the Unification of Financial Sector Supervision" IMF Working Paper 2000, https://www.imf.org/external/pubs/ft/wp/2000/wp00213.pdf on choices of regulatory architecture in financial regulation for example.

[217] S1C-1E, s2B, Financial Services and Markets Act 2000 amended by Financial Services Act 2012.

exercise. In this manner, regulatory ontologies are legalised categories for regulatory action, and are intimately infused with regulatory objectives.

(a) The Development of Regulatory Ontologies and Need for Dynamism

Risks[218] in markets, as well as private sector activities and transactions, are mediated through the lens of regulatory objectives, so that regulators can determine appropriate policy against such risks. Regulatory policy is usually not premised on zero failure, as it may be impossible with regulatory resources to prevent all wrong-doing and financial losses. Over time, certain policies associated with certain risks coalesce into regulatory ontologies. Although this is not a necessary consequence, many regulatory ontologies developed in financial regulation have become sectorally-based.

How do regulatory ontologies such as 'bank' regulation arise, for example? Banks arose as entities providing a unique model of full intermediation of financial capital, making their promises crucially based on their solvency. The regulatory mandate is in relation to the public interest in protecting bank solvency while promoting their economic development roles.[219] Hence, regulatory frameworks designed towards that purpose coalesce around the regulatory ontology of 'bank regulation', making such ontology tied to a certain type of financial entity. Being tied to a type of financial entity makes for a sound ontology as long as the nature of governed risks continue to exclusively reside with that type of entity. If the type of entity in question engages in new business lines, or other types of entities undertake similar risks, then the regulatory ontology should be more meaningfully tied to the nature of risk incurred for particular purposes, rather than type of entity. In similar reasoning, partial intermediation services where financial entities do not intermediate investors' risks, leaving them to bear capital risks themselves, give rise to investor protection risks such as mis-selling, as a 'principal- agent' problem. In this manner, regulatory design for the purpose of ameliorating the principal-agent problem attaches to partial intermediation service providers, regardless of entity. Regulatory ontologies for 'securities', 'funds' or activities such as 'advice', 'brokerage' arise in order to address particular investor protection risks in each of these aspects.

Regulatory ontologies are constantly faced with challenge and such challenge is sharpened by confrontation with the novelties in crypto-finance. First, regulation based on type of entity (sectoral-based) is challenged when entities take on new risks.[220] Further, entities in a particular sector may develop risks that overlap with other sectors, due to scale of activity

[218] OECD, 'Risk and Regulatory Policy', https://www.oecd.org/gov/regulatory-policy/risk.htm; Christopher Hood, Henry Rothstein, Robert Baldwin, Judith Rees and Michael Spackman, 'Where Risk Society Meets the Regulatory State: Exploring Variations in Risk Regulation Regimes' (1999) 1 Risk Management 21.
[219] Hal S Scott, "Models-Based Regulation of Bank Capital" in ch 16, R Cranston ed, *Making Commercial Law* (Clarendon 1997) at 378.
[220] Such as banks becoming universal banking groups engaged in market risk and trading activities, see AE Wilmarth Jnr, "The Transformation of the Financial Services Industry: 1975-2000, Competition, Consolidation and Increased Risks" (2002) *University of Illinois Law Rev*iew 215; EF Brown, 'The Continuum of Financial Products' (2020) 25 *Stanford Journal of Law Business & Finance* 183.

and changes in social expectations,[221] or the carrying out of activities in shadow banking.[222] Goodhart and Lastra[223] argue that financial innovation often entails 'boundary' challenges for law and regulation as unregulated entities perform the equivalent of regulated activities or regulated entities undertake new and unregulated activities, raising questions for an appropriate institutional response.

The UK has moved away formally from sectoral regulation to functional, activity-based regulation,[224] and has instituted regulatory architecture[225] to manage the changes from sectoral regulatory ontologies. The EU has also, in its reform of payment services regulation, broken away from the sectoral stranglehold of banks upon payment services and introduced new regulatory ontologies in payment services[226] in order to open up competition and clarify the rationales for regulating payment services providers. Developing regulatory ontologies according to regulatory risk and rationales is nevertheless a work in progress, as the sectoral legacy can still potentially bring about confusion. For example, in relation to the USD Coin regulated as a money service business in the US,[227] we ask whether this is the right regime, or is the bank regulation regime in the Stable Act more appropriate, or are both ill-fitting regimes for the multifunctional novelties in the Coin? Sectoral legacies in financial regulation can potentially obscure the perception of need for new or changing regulatory ontologies. The regulatory ontology of 'securities' is regarded by the US SEC as sufficiently elastic to accommodate ICOs,[228] although this may be doubted in other quarters where new regulatory ontologies for ICOs are proposed.[229]

Regulators should map out their existing regulatory ontologies underpinned by regulatory objectives and the targeted risks, and be prepared to engage in ontological dynamism, recognising current limitations and assumptions. Regulatory ontologies can then be considered for expansion to capture more manifestations of similar risk, as well as accommodate divisions and sub-sets, or give rise to new ontologies altogether where 'ontological fits' have reached their limits.

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[221] Such as the systemic profiles of large asset managers that hold trillions under assets in management and being able to affect market pricing systemically, Financial Stability Board, 'Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities' (12 Jan 2017), https://www.fsb.org/2017/01/fsb-publishes-policy-recommendations-to-address-structural-vulnerabilities-from-asset-management-activities/.

[222] See for eg IH-Y Chiu, 'Transcending Regulatory Fragmentation and the Construction of an Economy-Society Discourse: Implications for Regulatory Policy Derived from a Functional Approach to Understanding Shadow Banking' (2016) 42 *Journal of Corporation Law* 327.

[223] CAE Goodhart and RM Lastra, 'Border Problems' (2010) 13 *Journal of International Economic Law* 705.

[224] S19, Financial Services and Markets Act 2000 and the 'regulated permissions' regime based on activity and not entity for regulatory approval.

[225] The twin peaks architecture governed by regulatory objectives. The Prudential Regulation Authority has the mandate to maintain the stability of financial institutions and the Financial Conduct Authority promotes consumer protection, competitive markets and guards against risks to market integrity.

[226] Art 5, 35-37, 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.

[227] The regulation of money service businesses is critically examined in Dan Awrey, 'Bad Money' (2020) *Cornell Law Review*, forthcoming, https://ssrn.com/abstract=3532681.

[228] https://www.sec.gov/corpfin/framework-investment-contract-analysis-digital-assets.

[229] J Rrustemi & NS Tuchschmid, 'Fundraising Campaigns in a Digital Economy: Lessons from a Swiss Synthetic Diamond Venture's Initial Coin Offering' (2020) 10 *Technology Innovation Management Review* 53; also European Commission Proposal (2020).

For example, the regulatory ontology for 'hedge fund' may have been based on certain assumptions in terms of fund management strategy and investor sophistication, but these assumptions may change. If investment strategies involving crypto-finance become complex and inscrutable even by sophisticated investors, then questions may arise as to whether extant regulatory ontology accommodates novel investment risks.[230] The DAO[231] also raises issues in terms of regulatory ontology as the 'collective investment fund' ontology does not neatly apply although similar risks entail. The risks pertaining to a collective investment fund lie in the principal-agent problems in the central management of pooled assets. However the risks that DAOs incur pertain to problems in the management of pooled assets as may occasion from failure in automated protocols and decentralised governance protocols. Should the new technologically-based risks form a basis for a new regulatory ontology for DAO-governed financial products? New intermediaries such as code vetters required under the Maltese Innovative Technological Arrangements Act 2019 could also give rise to a new regulatory ontology,[232] and it is expected that new technologically-based definitions of risk could form the basis for new regulatory ontologies.

Another example would be multifunctional crypto-financial products such as the asset-references stablecoin discussed above. Asset-referenced stablecoins resemble managed 'investment' pools, which is the ontological treatment that the European Commission proposes to extend to them.[233] At the same time, as Singh argues, blockchain-based assets like tokens have significant velocity for transfer and fungibility, making them as good as 'money'[234] for payment purposes. Are regulators able to cope with multifunctional crypto-financial products and should these be regulated under different regulatory ontologies that deal with different risks, or should these be regulated under a new regulatory ontology that may more holistically take account of the total matrix of risks posed by these innovations?

Regulators should map out the risks posed by each type of crypto-financial activity and intermediary service in order to examine what regulatory objectives are to be pursued in relation to those risks, and to what extent those risks could be ameliorated by self-governance, as commons governance is arising in decentralised financial platforms.[235]

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[230] In the EU and UK, the Alternative Investment Fund Managers Directive 2011 governs fund managers' conduct and prudential management but not the products. Promotion and marketing is also relatively unregulated, as is the case in the US. This position is queried in E Mokhtarian and A Lindgren, 'Rise of the Crypto Hedge Fund: Operational Issues and Best Practices for an Emergent Investment Industry' (2018) 23 *Stanford Journal of Law Business & Finance* 112.

[231] Q DuPont, 'Experiments in Algorithmic Governance: A History and Ethnography of "The DAO," A Failed Decentralized Autonomous Organization' in Malcolm Campbell-Verduyn (ed), *Bitcoin and Beyond: Cryptocurrencies, Blockchains, and Global Governance* (Oxford: Routledge 2018), ch8; Ori Oren, 'ICO's, DAO'S, and the SEC: A Partnership Solution' (2018) 2018 *Columbia Business Law Review* 617 on a different organisational perspective of the DAO from SEC, *Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO* (25 July 2017) at https://www.sec.gov/litigation/investreport/34-81207.pdf.

[232] V Villanueva Collao and V Winship, 'The New ICO Intermediaries' (2019) 5 *The Italian Law Journal* 731, https://ssrn.com/abstract=3540250.

[233] European Commission Proposal (2020).

[234] M Singh, 'How Programmable Digital Assets May Change Monetary Policy: Collateral and Financial Plumbing', Bloomberg (4 Sep 2020).

[235] Davidson (2019).

Where the incentives for commons governance are misaligned with public goods, or commons governance is inadequately fostered, regulatory governance may be better-placed to provide such governance for example in relation to anti-money laundering, anti-market abuse,[236] and systemic stability.

Regulatory mapping of crypto-finance risks should be compared to the risks and objectives addressed in existing regulatory ontologies in order to determine if ontological fits can be found. New regulatory policy would involve debates in how regulatory ontologies should be framed, and these are not merely technocratic discourses.[237] They involve discourse on normative underpinnings,[238] as well as political bargains[239] as new constitutive orders[240] are ultimately forged in constructing or extending a regulatory enterprise. The rise of crypto-finance in its multiple forms of manifestations compel regulators to engage with the needs of ontological dynamism in the shifting boundaries of their regulatory enterprises.

(b) Regulators Need to Approach Regulatory Design with an Open Mind

In conventional finance, regulators deal with corporatized entities as their regulated subjects. Regulatory design has evolved from prescribing compliance obligations and enforcement for non-adherence, ie 'command-and-control', to a variety of models of engagement with the regulated to secure compliance. Regulators can engage corporatized entities, which have internal capacities and resources, to co-design standards and procedures to meet regulatory objectives, in models of enforced self-regulation[241] or meta-regulation (and its variants).[242] Regulators can also co-opt third parties to be gatekeepers of

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[236] 'The Mechanics of Market Manipulation' (30 Nov 2019), https://www.coindesk.com/the-mechanics-of-market-manipulation.

[237] RH Pildes and CR Sunstein, 'Reinventing the Regulatory State' (1995) 62 *University of Chicago Law Review* 3.

[238] Such as the extent to which measurable economic phenomena in market mechanisms and self-regulation should influence institutional and policy choices, discussed in AE Kahn, *The Economics of Regulation: Principles and Institutions* (Mass: MIT Press 1988), 15-18; or that social policies and common good are underpinned by the regulatory state, over and beyond economically efficient and minimalist regulation, see CR Sunstein, *After the Rights Revolution: Reconceiving the Regulatory State* (Mass: Harvard University Press, 2003).

[239] Eg M-F Cuéllar, 'Coalitions, Autonomy, and Regulatory Bargains in Public Health Law' in Daniel Carpenter, Steven P Croley, and David A Moss (eds), *Preventing Capture: Special Interest Influence in Regulation and How to Limit It* (Cambridge: Cambridge University Press 2020), forthcoming, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1974690.

[240] CD Shearing, 'A Constitutive Conception of Regulation' in John Braithwaite and Peter Grabosky (eds), *Business Regulation and Australia's Future* (ANU Press 1993), ch5, https://www.anu.edu.au/fellows/jbraithwaite/_documents/Articles/Business%20Regulation%20and%20Australias%20Future.pdf#page=79.

[241] Enforced self-regulation can involve privately generated standards to which regulated entities bind themselves and are publicly accountable for doing so, but this regime can be subject to shaping by self-interest, see for example BM Hutter, 'Is Enforced Self-regulation a Form of Risk Taking?: The Case of Railway Health and Safety' (2001) 29 *International Journal of the Sociology of Law* 379.

[242] C Parker, *The Open Corporation* (Cambridge: Cambridge University Press 2002) arguing for a form of corporate conscience that would be shaped and reinforced by procedural forms of regulation that attempt to change culture and behaviour. Meta-regulation inevitably involves some form of devolved implementation of procedures by organisations to meet public regulatory goals, see C Ford, "New Governance, Compliance, and Principles-Based Securities Regulation" (2008) 45 *American Business Law Journal* 1, but the hazards of this, ie effective self-regulation without supervision, has been criticised, see C Scott, 'Regulating Everything: From Mega- To Meta-Regulation' (2012) 60 *Administration* 61; J Black, 'Paradoxes and Failures:"New Governance" Techniques and the Financial Crisis' (2012) 75 *Modern Law Review* 1037. It is also argued that management-

compliance,[243] or to co-enforce compliance.[244] Regulators are able to adopt flexible strategies in engaging and negotiating with regulated entities in securing compliance, without necessarily maintaining an adversarial relationship with them.[245]

Conventional regulatory designs are built around regulator engagements with corporatized entities, involving human discretion and procedural implementation. The regulator is able to count the number of regulated entities on its register,[246] and may have established points of contact in regulated firms to engage in conversation. Regulators are also able to navigate organisational and governance phenomena[247] in firms and address regulatory content at these. Regulators are able to pin down responsible individuals in corporatized organisations and impose personal responsibility on them,[248] an initiative that the UK regulators have spearheaded since the global financial crisis. These regulatory designs could be severely challenged in the crypto-financial context.[249]

In the face of developments in crypto-finance, it may be argued that regulators do not necessarily have to jettison the strategies they have developed over the years dealing with corporatized entities, as similar outfits still exist in crypto-finance. Entities that provide points of intermediation and exchange can be regarded as being in a similar position to corporatized regulated entities. For example, the centralised cryptoasset exchange and even decentralised exchanges providing aspects of 'centralised' services can be subject to regulatory designs that impose responsibilities at entity-level or on responsible persons.[250] Further, intermediaries that underwrite claims or rights for crypto-investors are in a principal-agent relationship with them and generate similar risks that warrant conventional

based regulation which prescribes procedural regulation to meet public regulatory goals also engages with how organisations respond to compliance needs, Cary Coglianese and David Lazer, "Management-Based Regulation: Prescribing Private Management to Achieve Public Goals" (2003) 37 *Law and Society Review* 691.

[243] Such as the audit profession, critically discussed in M Power, *The Audit Society* (Oxford: OUP 1997); and lawyers, auditors and analysts as external gatekeepers, see critical discussion in J Coffee, *Gatekeepers* (Oxford: OUP 2002). For internal gatekeepers, see banks' internal control functions, see IH-Y Chiu, *The Legal Framework for Internal Control in Banks and Financial Institutions* (Oxford: Hart 2015).

[244] N Gunningham, P Grabosky and D Sinclair, *Smart Regulation: Designing Environmental Policy* (Oxford: Oxford University Press 1998, rep 2004).

[245] I Ayres and J Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate* (Oxford: OUP 1992).

[246] The combined register for the FCA and PRA, https://www.fca.org.uk/firms/financial-services-register.

[247] There is a lot of regulation targeted at the governance aspects of financial services firms, their organisational aspects that affect robustness, treatment of clients, business continuity, prevention of money laundering and crime, cybersecurity, risk management, remuneration, conflicts of interest management etc see for example Art 16, Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU, also see chs 11, 12 IH-Y Chiu and J Wilson, *Banking Law and Regulation* (Oxford: OUP 2019), and earlier overview of regulation's intersection with organisational and governance aspects in financial institutions, IH-Y Chiu and M McKee (eds), *The Law of Corporate Governance in Banks* (Cheltenham: Edward Elgar 2015).

[248] The senior managers and certified persons regime that institutes personal responsibility for organisational compliance by senior managers overseeing key areas of responsibility in financial institutions, s66A, 66B, Financial Services and Markets Act 2000 amended in 2013.

[249] C Ford, *Innovation and the State: Finance, Regulation and Justice* (Cambridge: CUP 2017) on the continued relevance of regulatory design developments to informing policy for regulating innovations.

[250] Discussed in chapter 6.

investor or consumer protection.[251] New entities with business models that support crypto-financial markets, such as ICO rating services,[252] could also arguably attract regulatory obligations if there is sufficient public interest in relation to their responsibilities assumed in information intermediation. In this manner, regulatory design need not be radically overhauled but could be adapted and extended.

Where crypto-finance service providers organise their business models in forms different from corporatized entities, or their assumed forms may not be legally recognised, such as the DAO,[253] how should regulatory design be adapted in order to attach responsibilities and accountability appropriately? Where such organisation results in a substantive change in the nature of risk assumption and distribution, the issue is even one for regulatory ontology-should there be new ontological framing for the financial activity in question, and in that manner shape appropriate regulatory design?

The decentralised finance (DeFi) universe raises many such challenges for regulators. For example, participants in liquidity yield farming atomise the risk of lending by each contributing collateral and assuming risk commensurate with the level of collateralisation. Such atomisation of risk is a radically different model from a bank engaging in full intermediation that centralises credit risk on its own books. Would financial risk be sufficiently self-governed this way? It can be argued that participants' financial risk may be more affected by what they cannot control, i.e. governance protocols for the liquidity pools. In this manner, should regulators focus on the principal-agent risk between governance holders on DeFi platforms and non-governance participants? If so, this would entail regulatory design and principles in a different manner than in conventional regulation dealing with lending. Regulators may focus on meta-regulatory oversight of governance protocols and on the governance body responsible for such development, rather than the DeFi activities themselves. However, if large scale losses occasion and the regulator is compelled to respond, consideration can be had as to whether standards in financial activity conduct should be instituted, and in particular, be embedded in automated protocols.

For example Auer proposes that regulatory design should be embedded in technological designs that serve regulatory objectives,[254] as the need for *ex ante* problem-solving intensifies in a context of automation and transaction irreversibility on a permissionless blockchain. Would regulators have to consider the possibility of becoming nodes on

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[251] Eg discussed in relation to Diem's stablecoin issuance and management, R Rirsch and S Tomanek, 'Facebook's Libra: A Case for Capital Markets Supervision?' (2019) 13 *Journal of Payments Strategy and Systems* 255.

[252] Empirical evidence shows some extent of investor reliance, and that would raise questions whether investors are adequately protected without regulatory standards, see T Bourveau, ET De George, A Ellahie, D Macciochi, 'Information Intermediaries in the Crypto-Tokens Market' (2019), https://ssrn.com/abstract=3193392; D Boreiko and G Vidusso, 'New Blockchain Intermediaries: Do ICO Rating Websites Do Their Job Well?' (2019) 21 *The Journal of Alternative Investments* 67-79.

[253] The decentralised autonomous organisation discussed in chapters 1 and 4.

[254] R Auer, 'Embedded Supervision: How to Build Regulation Into Blockchain Finance' (BIS Working Paper 2019), https://www.bis.org/publ/work811.htm; 'Embedded Supervision: How to Build Regulation into Libra 2.0 and the Token Economy' SUERF Policy Note 159 (2020), www.suerf.org/policynotes.

financial transaction blockchains,[255] so that regulatory supervision is embedded contemporaneously? Regulators need to maintain an open mind where structural differences present themselves, radically changing from the familiar engagement paradigms with corporatized entities.

(c) Regulators Need to Consider Reframing or Reform of Regulatory Standards and Content

Regulators may have become used to key regulatory tools such as: mandatory disclosure and transparency, in relation to financial products publicly offered;[256] conduct of business regulation where intermediaries and customers are in a principal-agent relationship;[257] prudential regulation, as well as organisational and governance regulation where the solvency and stability of the institution should be maintained for the protection of the financial system as well as customers.[258] These established tools should however not become an end in themselves, and regulators should consider if they are indeed applicable to crypto-finance risks and regulatory objectives.

Faced with crypto-finance, which is often described as 'money legos' that can be combined in many novel ways,[259] regulators would need to engage in reconsidering ontologies and designs, as discussed above, and such an exercise would also entail rethinking or reframing of regulatory standards and tools. Regulators need to consider what regulatory standards or content are appropriate for the nature of the risks they wish to address in new phenomena in crypto-finance. For example, whether and how new service providers or intermediaries

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[255] I Cedillo Lazcano, 'A New Approach for ''Cryptoassets" Regulation' (2017-8) 35 *Banking and Finance Law Review* 37.

[256] JC Coffee Jnr, 'Market Failure and the Economic Case for a Mandatory Disclosure System' (1984) 70 *Virginia Law Review* 717 for a discussion on fundamental rationales; see EU Prospectus Regulation 2017, Art 6; UCITs Directive 2009, Art 76, Regulation (EU) No 1286/2014 of the European Parliament and of the Council of 26 November 2014 on key information documents for packaged retail and insurance-based investment products (PRIIPs), Arts 5-12, Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability‐related disclosures in the financial services sector, arts 8-9 (on marketing of sustainably-labelled investment products).

[257] For investment firms generally, Arts 23-28, MiFID 2014; also fund managers, see Arts 17-23, Commission Directive 2010/43/EU of 1 July 2010 implementing Directive 2009/65/EC of the European Parliament and of the Council as regards organisational requirements, conflicts of interest, conduct of business, risk management and content of the agreement between a depositary and a management company; Arts 12, 14, Directive 2011/61/EU of the European Parliament and of the Council of 8 June 2011 on Alternative Investment Fund Managers and amending Directives 2003/41/EC and 2009/65/EC and Regulations (EC) No 1060/2009 and (EU) No 1095/2010.

[258] This is commonly used for bank regulation, see extensive discussion in Chiu and Wilson (2019), chs 8, 9; investment firm regulation in MiFID 2014, art 15; Regulation (EU) 2019/2033 of the European Parliament and of the Council of 27 November 2019 on the prudential requirements of investment firms and amending Regulations (EU) No 1093/2010, (EU) No 575/2013, (EU) No 600/2014 and (EU) No 806/2014 for non-systemically important investment firms, as well as funds under the UCITs Directive 2009 (Art 7); AIFMD 2011 (Art 9). Money market funds for example need to first be authorised as a UCITs or managed by an AIFM, hence subject to prudential requirements that way, see Art 4, Regulation (EU) 2017/1131 of the European Parliament and of the Council of 14 June 2017 on money market funds.

[259] A-D Popescu, 'Decentralised Finance (DeFi)- The Lego of Finance' (2020) 7 *Social Sciences and Education Research Review* 321.

should be regulated depends on the nature of claims generated, the reliance placed on them and the need to protect social trust.[260] Regulatory standards may also be more stringently calibrated where levels of social trust required to be maintained are high.

For example, we have argued in Chapter 5 that although there are similarities in the regulatory objectives for governing fund-raising in ICOs and IPOs, the main regulatory tool for IPOs, ie disclosure and transparency regulation at point of sale, is not appropriate for ICOs. Although both types of fund-raising exercises involve sales of credence goods, the risks in relation to credence goods like pre-development tokens should be differently regarded from the risks in sales of conventional securities. In offering conventional securities, price can be based to an extent on existing information regarding the issuer, although historical information cannot predict performance. Where an ICO is concerned, there is arguably no real basis for an up-front price, by the sheer nature of its pre-development status. However, tokenisation is made possible by new technology, even if what is sold is a premature bundle of future use and investment rights. Hence, unlike in an IPO where the modus of regulation is to hold issuers to accountability for the price represented, a similar regulatory methodology would not be appropriate for ICOs. An *ex post* model of accountability is arguably more appropriate, as issuers' performance are judged *ex post* in order to be entitled to funds.[261] In this manner, we do not agree with the proposed European Regulation's approach that relies on mandatory disclosure in the form a white paper for crypto-asset offers, as being the main modus of regulatory governance. Such an approach is arguably too derivative and has not fully engaged with the differences that should be recognised for regulatory ontology and design, which should then shape regulatory tools and standards.

Regulatory standards and tools would likely need to be adjusted or reformed in light of new mappings in terms of risk and responsibility dispersion in crypto-finance. If, as mentioned above, regulators treat liquidity pool governance as the source of risk for financial participants, appropriate regulatory methodology to address such risk may be to (a) attach *ex post* governance accountability to responsible persons, such as code developers; or (b) to specify certain *ex ante* governance standards that need to be embedded within protocol, such as standards that prevent manipulation, front-running etc; or (c) to require continuous supervision by having the regulator established as a node. Option (c) may be similar to developments in SupTech which allow regulators to make regulations machine readable and to facilitate automated compliance and reporting from regulated entities.[262] SupTech is however in an emergent phase and there may be limits to embedding regulatory standards into *ex ante* protocol programming- in relation to the nature of the standards and the fact that risks may not all be foreseen and fore-managed.

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[260] KM Stein, 'Investor Protection in the Digital Age' (2020) 85 *Brooklyn Law Review* 631.

[261] Chapter 5 of this volume.

[262] HJ Allen, 'Experimental Strategies for Regulating Fintechs' (2020), https://ssrn.com/abstract=3533240 arguing that this space is still developing as regulators are using Suptech largely for building large data-sets or processing voluminous regulatory reports, or in fraud detection and anti money laundering compliance. Also see S Zeranski and IE Sancak, 'Digitalisation of Financial Supervision with SupTech' (2020) 35 *Journal of International Banking Law and Regulation* 309.

The choice of regulatory methodology would depend on the extent of the risk that is sought to be addressed, the level of regulators' resources, [263] the technological robustness of regulatory compliant protocols etc. If for example there is a need to prevent money laundering in liquidity pools, then such a risk could justify option (c) even if option (c) may be regarded as an overkill for dealing with participant protection risk. Option (c) may also mitigate participant risk as participants could suffer collective adverse consequences if anti-money laundering enforcement takes place against the pool.[264]

Whether regulatory tools in relation to systemic stability in conventional finance are as applicable in crypto-finance may also be queried. In crypto-finance, which is highly reliant on decentralised participation, the unravelling of social trust and 'run' on any particular platform or project could be destabilising and exacerbate losses that may be suffered by every participant. The execution of automated protocols exacerbate such destabilisation[265] as experienced by Maker DAO in March 2020. In this manner, crypto-financial systems may be less resilient than in conventional finance where key institutions can play centralised roles offering stabilisation, such as on the part of central banks, significant market makers and central counterparties for derivatives trading. Nevertheless, are crypto-finance platforms as interconnected with each other as financial institutions may be in conventional finance, warranting systemic stability oversight and standards? Can it be argued that instability episodes, such as suffered by Maker DAO are likely to be contained in scale and can be privately governed? In this manner there may not be a need for systemic stability standards to be introduced in crypto-finance, at least as yet.

Finally, regulators need to consider regulatory methodology in terms of public and private enforcement, and how these can be effective, in terms of who the enforcement is addressed to and what discipline is sought to entail. Further, would public and/or private enforcement be embedded in technological protocols?

(d) Regulators Need to Consider Agility in Regulatory Architecture to Respond to Crypto-finance Developments

Since the rise of financial supermarkets[266] in the 2000s, the reorganisation of financial services and markets has compelled many regulators to rethink the appropriateness and responsiveness of regulatory architecture.[267] In particular, the UK opted for a single

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[263] See C-Y Tsang, 'From Industry Sandbox to Supervisory Control Box: Rethinking the Role of Regulators in the Era of Fintech' (2019) *Journal of Law, Technology and Policy* 355.

[264] Such as the enforcement against BitMex by the Department of Justice in the US, this has caused bitcoin volatility and it remains uncertain how users and their funds may be adequately protected, see 'Giant cryptocurrency exchange BitMEX hit with criminal and civil money laundering charges' (Fortune, 1 Oct 2020), https://fortune.com/2020/10/01/giant-cryptocurrency-exchange-bitmex-hit-with-criminal-and-civil-money-laundering-charges/.

[265] Discussed in W Magnuson, 'Artificial Financial Intelligence' (2020) *Harvard Business Law Review*, forthcoming, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3403712.

[266] Wilmarth (2000).

[267] E Ferran and CAE Goodhart (eds), *Regulating Financial Services in the 21st Century* (Oxford: Hart 2001); Brooklyn Law School Conference, 'Do Financial Supermarkets Need Super Regulators?' (2003) 28 *Brooklyn Journal of International Law* 1.

regulator, the Financial Services Authority in order to administer a seamless and holistic regulatory agenda for financial services across the board, not limited to sectoral boundaries.[268] Although the single regulator has come to an end, the UK's twin-peaks approach after the global financial crisis embeds regulatory agency coordination at formal and informal levels.[269] Regulatory architecture can affect regulators' agility in responding to regulatory issues in ontologies, design and standards. In the US, the maintenance of sectoral boundaries has, as discussed in chapter 3, resulted in different regulators acting upon different aspects of the crypto-economy, such as FinCen in relation to cryptocurrency providers and businesses, the SEC in relation to cryptoasset offerings and the CFTC in relation to fraudulent cryptocurrency offerings which they regard as commodities,[270] and some aspects of derivative trading. Fragmented regulatory treatment poses significant regulatory risk to the crypto-economy due to potential inconsistency of approaches, and does not reconcile with more enabling state-based approaches for encouraging blockchain-based enterprises. It could however be argued that the early extension of legal and regulatory risk shapes crypto-financial behaviour to be more circumspect in the crypto-economy,[271] overall having a discouraging effect upon lemons. That said, in considering whether to permit cryptocurrency exchange-traded funds, the SEC has now explicitly stated that it is working with the Office of the Comptroller of Currency and the CFTC, hence taking an inter-agency approach to fully apprise of cryptocurrency ETFs due to their multifunctional nature.[272] The first signs of regulatory agility from the US is encouraging.

In responding to crypto-finance, and more generally financial innovation, regulatory architectural agility would be beneficial in relation to enabling regulators to embrace greater open-ness in considering ontological, design and standards adjustments, as well as to tap into a greater 'pool' of technocratic expertise and resources that can be potentially joined up. In this manner, jurisdictions with single regulators may be able to enjoy such agility and economies of scale. However, going by the Financial Services Authority's ill-fated experience,[273] a single regulator need not always work, as the large single regulator can still be internally organised along sectoral lines, or internally manage its resources with poor regulatory judgment.[274] The internalisation of all financial regulatory activities under one roof can also render regulatory activity more inscrutable. Hence, single regulators need to inculcate a responsive culture to financial innovation and be internally nimble in terms of

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[268] First established by the Financial Services and Markets Act 2000, see E Ferran, 'Examining the UK's Experience in Adopting a Single Financial Regulator Model' (2003) 28 *Brooklyn Journal of International Law* 257.

[269] Sections 3D, 3E, Financial Services and Markets Act, amended in 2012.

[270] A Kogan, 'Not All Virtual Currencies Are Created Equal: Regulatory Guidance in the Aftermath of CFTC v. McDonnell' (2019) 8 *American University Business Law Review* 199.

[271] M Dell'Erba, 'From Inactivity to Full Enforcement: The Implementation of the 'Do No Harm' Approach in Initial Coin Offerings' (2020) 26 *Michigan Technology Law Review* 175.

[272] 'Cryptocurrency ETFs under active consideration, says SEC Chair' (Financial Times, 16 Oct 2020), https://www.ft.com/content/9f2c1303-678e-486e-b3f1-d4f234f85f47.

[273] Dismantled in order to make way for two regulatory agencies organised by objective, Financial Services Act 2012.

[274] Financial Services Authority, *The Turner Review* (2009), http://www.actuaries.org/CTTEES_TFRISKCRISIS/Documents/turner_review.pdf, chapters 2.7-2.9.

management and organisation, as well as sufficiently engaged with a diverse range of external stakeholders.[275]

Although the UK has now opted for a 'twin-peaks' regulatory architecture where prudential supervision of systemically important institutions lies with the Bank of England,[276] and supervision of conduct of business, financial crime and market activities lies with the Financial Conduct Authority,[277] the UK has been keen to ensure that financial regulation is not fragmented and regulators remain capable of joining up perspectives, resources and initiatives. Mandatory coordination is instituted for the financial regulators in the UK.[278] This structure is also seen at the pan-European level, where the European agencies that are supervisors of national regulators are organised along sectoral lines,[279] but work extensively in a coordinated fashion in a formal Joint Committee grouping[280] and in relation to overseeing signs of systemic risk.[281]

We suggest that whether financial regulators are organised as single regulators with many departments or along objective-based or sectoral lines, creating networked linkages amongst different pools of technocratic expertise is crucial for developing regulatory responsiveness and regulatory innovation. For example, where stablecoins are ontologically treated as managed investment pools as well as payment mechanisms, as discussed earlier, the UK FCA should consider pooling together regulatory expertise in collective investment fund, money market fund and payment provider supervision in order to forge perspectives for stablecoins, in relation to ontologies, design as well as standards. Where regulators need to reach outside of their agency boundaries to work with other public sector agencies, this should be encouraged and enabled.[282] We particularly suggest that networked linkages and architecture should be forged between enterprise/business regulators for blockchain-based enterprises and financial regulators. For example, ICOs raise an issues in terms of enterprise development and legitimation, as well as in relation to sale of a financial product that becomes tradeable.

Regulatory networks, linkages and greater agility within and beyond structural set-ups would also facilitate regulatory innovations such as joint task forces or committees to deal with specific issues and concerns, or hazards. Further, regulatory innovations such as sandboxes or innovation hubs can be instituted for activities that challenge ontological paradigms, regulatory design and standards, in order for regulators to engage with

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[275] Eg S Omarova, 'Bankers, Bureaucrats, and Guardians: Toward Tripartism in Financial Services Regulation' (2012) 37 *Journal of Corporation Law* 621.
[276] The Prudential Regulation Authority see s2B, Financial Services and Markets Act 2000 amended in 2012.
[277] The Financial Conduct Authority, see s1C-1E, Financial Services and Markets Act 2000 amended in 2012.
[278] S3D to 3Q, Financial Services and Markets Act 2000 amended in 2012.
[279] The European Banking Authority, European Securities and Markets Authority and European Insurance and Occupational Pensions Authority established in 2010.
[280] See discussion in IH-Y Chiu, 'Power and Accountability in the EU Financial Regulatory Architecture: Examining Inter-agency Relations, Agency Independence and Accountability' (2015) *European Journal of Legal Studies* 68.
[281] In relation to the Authorities' work in feeding into the European Systemic Risk Board.
[282] Although legislative clarification may be required in the interests of public accountability, see for eg critique against the Fed's extensive mandates in the wake of the Covid-19 pandemic, D Zaring, 'The Government's Economic Response to the Covid Crisis' (2020), 9, https://ssrn.com/abstract=3662049.

innovators at an early stage.[283] In this manner, a network of regulators that may be concerned with an innovation can engage with the innovation and innovators in coordinated spaces,[284] a need particularly relevant in light of the sectoral regulatory architecture maintained in the US.[285] Discourse and networks in governing innovation can extend two ways, first, horizontally across financial and business sectors more generally. The engagement space between regulators and innovators can be extended more broadly beyond financial activities to enterprisal activities as these are tightly interwoven. Second, agile and open structures in financial regulatory architecture at national, and EU levels also helps promote discourse at international levels,[286] which is important given the global nature of crypto-finance.

The need for agility in regulatory architecture is more pressing than ever in light of the ontological dynamism posed by decentralised finance. Regulators need to be willing to engage outside of their traditional domains and in inter-agency collaborations to consider suitable regulatory policy that is holistic in nature. Regulators cannot rely merely on Regtech or Suptech to catch up with automated finance, as these can only be calibrated based on the regulatory policy choices in ontology, design and standards for crypto-financial phenomena.[287] Although commentators opine that regulators are instinctively protective of their regulatory turf,[288] other research has found regulators more focused on problem-solving[289] and being open to agency regrouping, especially as a response to crisis management.[290] Preparedness for dynamism may be needed even if a crisis context is not yet perceived. Business and financial regulators need to respond the needs in growth and scale in the crypto-economy and its financial universe.

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[283] See FCA, *Regulatory Sandbox* (2015); IH-Y Chiu, 'A Rational Regulatory Strategy for Governing Financial Innovation' (2017) 8 *European Journal of Risk Regulation* 743. It is argued however that sandboxes may be too tied to existing regulatory regimes and 'innovation hubs' provide more open structures for regulators to engage with innovation, see DW Arner, RP Buckley, DA Zetzsche and R Veidt, 'Building Fintech Ecosystems: Regulatory Sandboxes, Innovation Hubs and Beyond' (2020) 61 *Washington University Journal of Law and Policy* 55.

[284] HJ Allen, 'Regulatory Sandboxes' (2019) 87 *The George Washington Law Review* 579.

[285] MM Piri, 'The Changing Landscapes of FinTech and RegTech: Why the United States Should Create a Federal Regulatory Sandbox' (2019) 35 *Banking and Finance Law Review* 233.

[286] D Ahern, 'Regulators Nurturing FinTech Innovation: Global Evolution of the Regulatory Sandbox as Opportunity Based Regulation' (2020), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3552015. There is a loose network called the GFin of a few voluntary global regulators engaged in discourse to explore common interest and issues, see GFin, *One Year On* (2019) at https://static1.squarespace.com/static/5db7cdf53d173c0e010e8f68/t/5dbfaaca6b4e151deddc42ae/1572842207667/GFIN-One-year-on-FINAL-20190612+%28CLEAN+VERSION%29.pdf.

[287] The need for human judgment to be made at regulators' end in terms of what regtech achieves and how supervisory purposes are achieved remains important, see N Geslevich Packin, 'Regtech, Compliance and Technology Judgment Rule' (2018) 93 *Chicago-Kent Law Review* 193. See also E Micheler and J Jiang, 'Regulatory Technology - Eight Policy Recommendations' (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3423899.

[288] Regulatory turf laws, attributed to extreme versions of public choice theory is referred to in WW Buzbee, 'A Theory of Regulatory Gaps' (2003) 89 *Iowa Law Review* 1.

[289] SP Croley, 'Theories of Regulation: Incorporating the Administrative Process' (1998) 98 *Columbia Law Review* 1.

[290] BM Hutter and S Lloyd-Bostock (eds.), *Regulatory Crisis: Negotiating the Consequences of Risk, Disasters and Crises* (Cambridge: Cambridge University Press 2017).

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