Decentralized finance and regulation : enhancing the role of innovative techniques through regulation

Ojo/Roedl, Marianne

Centre for Innovation and Sustainable Development

May 2021

Decentralized Finance and Regulation : Enhancing the Role of Innovative Techniques Through Regulation

ABSTRACT

In enhancing the role of innovative techniques which involve the use of distributed ledger technology platforms, consequences or implications of such techniques could initially focus on more obvious risks – such as those risks associated with financial stability, inadequate governance and control mechanisms in place, or cybercrime. However, consideration of climate risk related factors have increasingly made the aim of focus towards a sustainable future, a more popular and increasingly justified topic.

In a recent report by the European Environmental Agency, it was highlighted that " in comparison with alternative payment methods, Bitcoin was claimed to be 20,000 times more energy intensive than Visa – with an energy consumption for each Bitcoin transaction increasing to 635 kWh – an equivalent of electricity that could power approximately 21 US households for 1 day, based on 2019 estimates according to some analysts."

However there are also potential benefits to be derived from blockchain technology - one of which includes environmental protection, as further highlighted in the report. Notwithstanding, efforts and endeavors will still be required to address climate related impacts of engaging the use of such technologies. This paper will focus on other risks – as well as benefits to be derived through the use of innovative techniques such as smart contracts and decentralized finance in a rapidly evolving financial landscape. It will also highlight why central bankers and financial regulation have to adapt and evolve rapidly in engaging the use of supervisory techniques which will not only enhance the efficiency of the use of such innovative techniques but also facilitate an adequate and well balanced approached to regulation – one which whilst not overly regulating technology, seeks to ensure that the abuse or misuse of such technologies are appropriately regulated.

Key Words: distributed ledger technologies, block chains, smart contracts, decentralized finance, central banks, embedded regulation, legal, technical codes

Centre for Ingenuity, Innovation and Sustainable Development

And

Centre for Innovation and Sustainable Development

Decentralized Finance and Regulation : Enhancing the Role of Innovative Techniques Through Regulation

Professor Marianne Ojo Delaney

Introduction

How can innovative technologies be implemented in such a way which ensures maximum efficiency, whilst engaging the involvement of private and public sectors to interact which each other such that optimal benefits are realized through the use of such techniques? How can resources be channeled to where they are needed most through the use of such techniques? This would not only necessitate the engagement and involvement of experts and specialists in the use of such innovative techniques, but also ensuring that the aims of engaging such actors are not defeated or undermined through lack of due consideration of the aims and objectives to be achieved.

Is there a likelihood that major banks can become "obsolete" in an environment dominated by Big Tech and Fintech firms? According to Bache (2021) "FinTech companies and tech giants can take market shares from established banks. This can result in sweeping changes in market structure. But this does not mean that banks will become obsolete."

Amongst other objectives, this paper considers why an evolutionary system of monitoring and supervision is not only important on the part of technological firms whose expertise is being engaged in a rapidly evolving and innovative financial landscape, but also monitoring incentives on the part of central banks. In this context, the concept of embedded regulation, that is, "A regulatory framework that provides for compliance with regulatory standards in DLT-based markets to be automatically monitored by reading the market's ledger," will be discussed.

Whilst several risks are associated with the use of innovative techniques such as smart contracts and distributed ledger technologies, attributed benefits are considered to outweigh such risks and more importantly, can be enhanced and further maximized through the incorporation and application of supervisory and compliance practices which embody the concept of embedded regulation – as will be further illustrated in the paper.

Literature Review and Background to the Topic

Conceptual Framework

Smart contracts are defined as "contracts whose terms are recorded in a computer language instead of legal language, which can be automatically executed by a computing system such as a suitable distributed ledger system."

According to Schär (2021:153), decentralized finance (DeFi) refers to "an alternative financial infrastructure built on top of the Ethereum blockchain – a technique which uses smart contracts to create protocols that replicate existing financial services in a more open, interoperable, and transparent way." More specifically, he adds that decentralized finance is unique in the sense that it does not rely on intermediaries or centralized institutions – its basis and foundation being open protocols and decentralized applications (DApps).

The features and characteristics mentioned above, highlight crucial and potential advantages which may be inherent in the application and use of decentralized finance. Advantages such as the facilitation of transparency and disclosure – as well as incorporating greater accountability in respect of governance and control matters through greater segregation of responsibilities – even though accountability and control may also require that a central body be authorized to manage the delegation of such roles. Whereas risk diversification as well as expertise in the management of more sophisticated technological facilities constitute attributes which technological firms can introduce in their partnership with regulators – in their aim to serve public interest, there are also concerns that regulators should not over-regulate the way technological firms operate.

A resonating theme which has been discussed in relation to centralized and decentralized finance is the blurring of boundaries between these – as well as the role of innovation, regulation in the evolving digital age to engage central bankers and large technological firms in the enhancing benefits to be derived through private-public sector interaction – with a focus on sustainability and consequences of such applications.

Main Areas to Be Discussed

The Concept of Embedded Supervision

In arguing for embedded supervision, that is "a regulatory framework that provides for compliance in tokenized markets to be automatically monitored by reading the market's ledger – thereby reducing the need for firms to actively collect, verify and deliver data", Auer (2019:1) is also of the opinion that even though regulation should remain technology neutral, supervision should evolve in parallel with technology. In this sense he illustrates saying that, instead of trying to fit crypto assets into existing regulations, such as securities laws formulated long before distributed

ledger technologies came into existence, the question should rather, relate to how new technologies could serve to facilitate improved monitoring of risks in financial markets. To which can be added that supervision would also have to evolve in adjusting to cater for the development and evolution of such technologies – not leaving the role of monitoring solely to new technologies. The involvement of regulators in centralized and decentralized finance also necessitates a consideration of the boundaries which banking and securities regulators, in particular, need to respect.

This presents a further challenge in the collaborative efforts between regulators and Big Tech firms. Should a separate and distinct entity be entrusted with the role of governance and control in monitoring certain activities undertaken by technological firms, bank and securities regulators in matters of regulation and supervision of decentralized finance? Such role entailing a determination of when regulators exceed their limits and boundaries in interfering with technologically designated roles – as well as a determination of an abuse of powers by technological firms.

During the 2021 BIS Innovation Summit, "CeFi to DeFi: Can Global Finance be De/re-constructed?" , the following points were made by Lupin, J, in addressing the question of whether regulation would be required to mitigate those risks arising from decentralized finance and more specifically, de configuration:

- Different economies will have to decide whether or not they wish to embrace these technologies. Trust component of blockchain needs to be developed. Regulators should look to regulate the uses of the technology but not the technology itself. Systems are too complex for regulators to stay on top of things in real time – even though regulators have an important role to play. There will be a role for separate regulation but ideally there will be need for collaboration between both communities.

Further, it was added by Peirce H, "Don't regulate technology but uses of the technology. In respect of regulators, go back to basics. Remember the purposes for which you are designated. Our role is not to make decisions but set up regulatory mechanisms through which they can make those decisions."

Risks associated with smart contracts are considered to include reliance on the computing system that executes the contract (Gov Office for Science: 2016:18). As noted by Bache (2021), "Innovation and competition can bring better and cheaper services, but can also bring risks associated with, for example, cybercrime, data protection and financial stability. There is also the risk that some participants gain substantial market power."

In confronting those risks associated with more innovative and sophisticated technologies, and particularly distributed ledger technologies, distinct from legal risks, " the same risk, same regulation" principle has been considered and investigated by Auer (2019: 1) in illustrating how it could be applied to the financial supervision of markets founded on distributed ledger

technologies. In addition, the concept of "embedded supervision" was propounded, which can be defined as follows:

"A regulatory framework that provides for compliance with regulatory standards in DLT-based markets to be automatically monitored by reading the market's ledger. It would reduce the administrative burden for firms, while increasing the quality of data available to the supervisor."

Advantages of Embedded Supervision are therefore summarized as follows:

- Through such features like compliance monitoring, it reduces the need for firms to actively collect, verify and deliver data;
- The facilitation of innovation in the form of decentralized trading of asset backed tokens and decentralized financial engineering, through DLT, is anticipated to promote the development of financial markets through new forms of transparency and data credibility;
- It could ease the conflict between data availability, the cost of data collection and verification, and privacy;
- The trust creating mechanism of decentralized markets for supervisory purposes being relied upon to facilitate compliance monitoring imposes a feature which provides necessary backing as well as validation in a de centralized environment – as well as confers added security.

The trust worthiness of data within the current compliance process, as guaranteed by the legal system, relevant authorities and the threat of penalties, is contrasted with DLT based markets, in which, it is added, that data credibility is "assured by economic incentives" (see Auer 2019:2). Furthermore, the extrinsic based nature of consequences which emanate from the breaking of legal codes is also highlighted in the sense that when such rules are broken, "consequences flow from its breach to ensure compliance" whereas with technical code, "if its rules are broken, then an error is returned and no activity occurs – so compliance is ensured through the operation of the code itself" (see Gov Office for Science: 2016: 41).

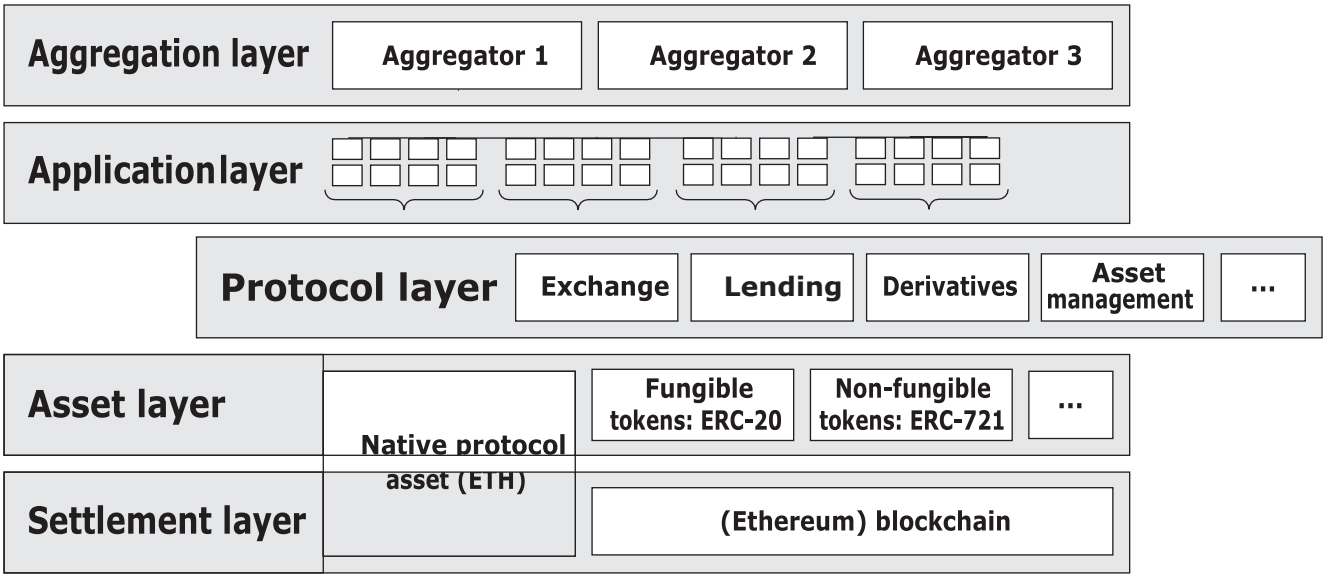
In contrasting the rule based regime in which Government legislates and creates a framework of regulation – usually engaging a regulator, with the case of a digital world, two sets of rules or codes are considered to control the operation of digital technologies (Gov Office for Science: 2016: 11): namely i) the "classical" set of rules provided by the legislative framework, the code of law and regulation and secondly, those set of rules which determine the operation of the algorithms encoded by the soft ware – referred to as the "technical code".

Five DeFi layers are identified and categorized by Schär as follows (2021:156):

- The *settlement layer* (Layer 1) consisting of the blockchain and its native protocol asset (e.g., Bitcoin [BTC] on the Bitcoin blockchain and ETH on the Ethereum blockchain) - allowing the network to store ownership information securely and ensuring that any state changes adhere to its ruleset. The blockchain is also regarded as the foundation for trustless execution and serves as a settlement and dispute resolution layer;
- The *asset layer* (Layer 2), which consists of all assets that are issued on top of the settlement layer - including the native protocol asset as well as any additional assets; that are issued on this blockchain (usually referred to as tokens);
- The *protocol layer* (Layer 3) provides standards for specific use cases such as decentralized exchanges, debt markets, derivatives, and on-chain asset management. Owing to the fact that such standards are usually implemented as a set of smart contracts, which can be accessed by any user (or DeFi application), such protocols are considered to be highly interoperable.
- The *application layer* (Layer 4), which creates user-oriented applications that connect to individual protocols.
- The *aggregation layer* (Layer 5) , an extension of the application layer.

Source: Schär , F (2021). "Decentralized Finance: On Blockchain and Smart Contract Based Financial Markets" page 156 Federal Reserve Bank of St. Louis *Review*

The DeFi Stack



In accentuating on the need for adequate balance in regulating and the engagement of technology, it is added that (Gov Office for Science: 2016:11) "determining the optimum balance between governance and regulation, and between legal code and technical code, will require unusual mixes of skills – including the need for lawyers, mathematicians and computer experts to work together to resolve many key issues" such as those attributed to overlapping regimes – as illustrated in the blurring boundaries between centralized and decentralized finance – as well as those relating to overlaps between the banking and securities industries.

Further, it is added that opportunities exist in taking advantage of potential interactions between legal and technical codes – rather than solely relying on the legal code – as is currently the case. In so doing, costs of legal compliance would be reduced through "the use of a technical code which is used to assure compliance with legal code – providing a "use case" for the use of technology to enhance regulation " so called Reg Tech".

In recommending a system that is safeguarded from systemic risks and market failures, the following recommendations have been put forward (Gov Office for Science: 2016:44):

Recommendations relating to :

Regulation of distributed ledgers via legal code:

- Owing to complications of "unpermissioned systems" like Bitcoins – attributed to the absence of a single entity in control of the system – which makes it difficult to regulate what software people are allowed to install on their computers, attempts to regulate Bitcoin via legal code have instead focused on regulating the businesses that deal with Bitcoin, for example businesses such as exchanges and wallet providers.

Regulating distributed ledgers via technical code

- the public sector could develop a permissioned system that allows public regulatory influence to be exerted through a combination of legal and technical code, rather than exclusively through legal code as at present.

Whilst certain risks such as, *smart contract execution risk*, *operational security*, and *dependencies* on other protocols and external data, are associated with decentralized finance, attributed benefits also include the following, namely, increased *efficiency*, *transparency*, and *accessibility* of the financial infrastructure (Schär, 2021, 168-170).

However what does the future hold for innovative carbon intensive innovative techniques? Particularly in view of uncertainties revolving round climate risk – as well as its rapidly changing impacts?

As highlighted in a recent paper by the Bank for International Settlements (2021:14), "Efforts to manage climate change are expected to facilitate technological innovations that enable transition to lower-carbon economies. These could make existing carbon-intensive technologies relatively more expensive if carbon taxes or more stringent regulations are introduced. Consequently, corporates that rely on carbon-intensive technologies may become less competitive if they fail to adopt newer technology."

Conclusion

In order to enhance the efficiency of decentralized finance, the concept of embedded regulation would serve as a facilitating tool , not only in fostering compliance with regulatory standards in DLT-based markets, and enabling automatic monitoring, but also in reducing the administrative costs for firms, and simultaneously improving the quality of data.

Supervision would also have to evolve in adjusting to cater for the development and evolution of such innovative technologies – not leaving the role of monitoring solely to new technologies. Given associated risks, with the use of innovative techniques such as smart contracts and distributed ledger technologies, the regulation of distributed ledgers through legal and technical codes would also serve to ensure that costs of legal compliance are reduced.

The rapid pace at which climate related risks are impacting the financial environmental does not only constitute cause for concern, but also the phenomenal pace of development of financial innovation techniques. If such climate related risks are to be mitigated and addressed, this would also necessitate the imposition on supervisory and regulatory modes of intervention, which as discussed in the paper, need to evolve accordingly with the pace of development in respect of innovative techniques.

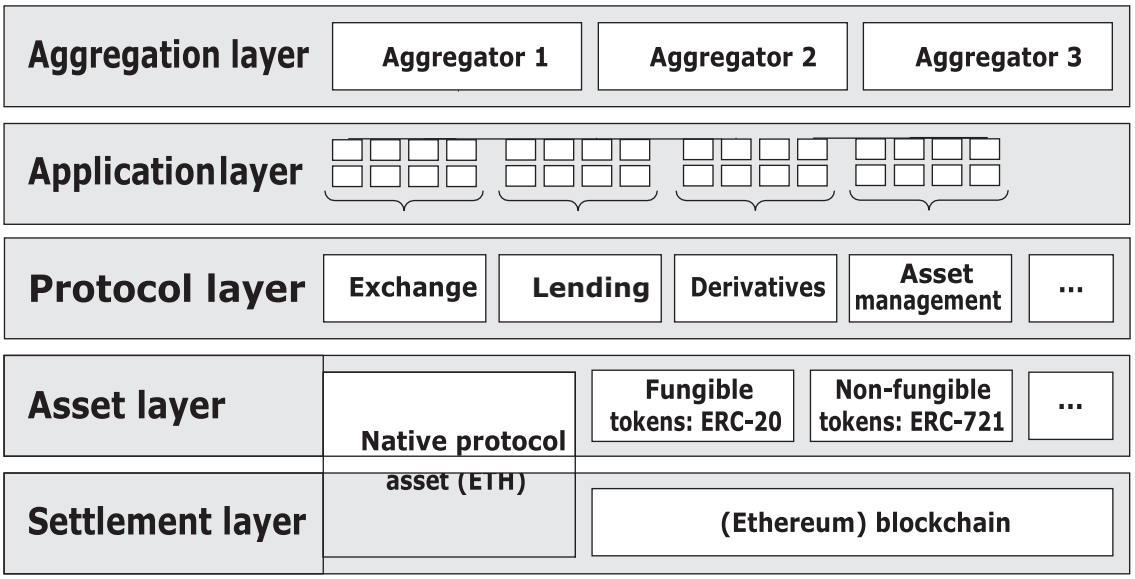
Figure One: Examples of Privately and Publicly Produced Legal Code and Computer Code

Source : Government Office for Science (2016). Distributed Ledger Technology: Beyond Block Chain, page 45

Privately produced	Visa Core Rules Faster Payment Service Rules	Financial Information eXchange (FIX) protocol Bitcoin
Publicly produced	European Market Infrastructure Regulation BitLicense	Internet (TCP/IP) World Wide Web (HTTP)

Source: Schär , F (2021). “Decentralized Finance: On Blockchain and Smart Contract Based Financial Markets” page 156 Federal Reserve Bank of St. Louis *Review*

The DeFi Stack



References

Bache, I.W. (2021). " Fintech, Big Tech and Cryptos: Will New Technology Render Banks Obsolete?" Speech by Ms Ida Wolden Bache, Deputy Governor of Norges Bank (Central Bank of Norway), Oslo, 11 May 2021

Basel Committee on Banking Supervision (2021). "Climate-Related Risk Drivers and their Transmission Channels" April 2021 Bank for International Settlements

BIS Innovation Summit 2021, (2021). CeFi to DeFi: Can Global Finance Be De/Re-constructed?

Bank for International Settlements (2019). "Embedded Supervision: How to Build Regulation into Blockchain Finance" R Auer, Monetary and Economic Department September 2019 BIS Working Papers No 811

European Environmental Agency, (2021). "Blockchain and the Environment: An Energy Intensive Technology Undermining Climate Change Mitigation or a Game Changer for the Governance of Sustainability Transitions? www.eee.europa.eu

Government Office for Science (2016). Distributed Ledger Technology: Beyond Block Chain https://assets.publishing.service.gov.uk, https://www.gov.uk

Schär , F (2021). "Decentralized Finance: On Blockchain and Smart Contract Based Financial Markets" Federal Reserve Bank of St. Louis *Review*, Second Quarter 2021, *103*(2), pp. 153-74. https://doi.org/10.20955/r.103.153-74