Decentralized finance (DeFi): an emergent alternative financial architecture

26th January, 2021

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Discussion Paper Series: *Notes on the 21st Century*

Abstract: Decentralized Finance (DeFi) offers the promise of an emergent alternative financial architecture that prioritizes disintermediation and decentralization to empower individuals along cryptoanarchist principles. Yet it is mired in considerable difficulties including market manipulation, distortionary incentives, excess short-termism, Ponzi-schemes, and money-laundering challenges that also foment a considerable level of dissuasion against DeFi's wider adoption. This paper critically evaluates many of these important facets at a time when DeFi is emerging as a disintermediated and experimental financial praxis.

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The aim of this paper is to discuss both the optimistic claims made in favor of Decentralized Finance (DeFi), as well as to caution against the challenges that might emerge in its broader dissemination amongst the public, particularly from an accountability/oversight perspective. For the purposes of definition, DeFi can be described as an experimental form of financial praxis that is removed from dependence on centralized financial intermediaries, which in this context might include banks, exchanges and brokerages. As such, DeFi purports to *disintermediate* financial activity from the traditional mechanisms of finance, and it does so through the use of a blockchain substitutive architecture. Oftentimes, the most commonly utilized architecture platform in DeFi applications is Ethereum, which has become a mainstay platform for many blockchain-based innovations in the past five years.

As part of its promise towards disintermediation, DeFi approaches enable users as individuals to exchange capital towards various ends, whether they be in lending-borrowing activity (liability creation), asset speculation over a range of asset classes, diversifying individual portfolios without intermediaries, obtaining insurance, and earning returns on fixed-income instruments of various sorts. In short, DeFi aims to fulfill many of the key financial activities that possess a risk-reward paradigm found in traditional finance, but without the intrusive superimposition of traditional financial intermediary institutions. DeFi therefore might represent a potent example of cryptoanarchism as manifested in cryptocurrency contexts, insofar as it seeks to empower

individuals to control their financial activity without traditional forms of state power in the realm of finance. This itself is an alluring promise to those already predisposed towards the precepts of independence in the digital realm, and more specifically towards financial autonomy in an era of big government in cyberspace.

This ideological allure is complemented, perhaps at times substituted, by the offered returns on DeFi investment instruments. Certain DeFi offerings promote high interest rate instruments to lure interested parties. However, these offerings should be seen in a risk-adjusted context, where their high interest rates, well above those found in traditional asset classes in today's low-inflation and low-interest rate environment, also pose dubious risks. In other words, the lure of high returns should be first seen in the context of excessive risk.

Whether through ideological propensity or through the siren song of high returns, DeFi has expanded considerably in recent times. In 2020, which may be seen as the Year of DeFi in many respects, more than $11 billion was "invested" or infused into the DeFi instruments ("protocols"), which represented a tenfold increase in CY2020. In addition, some analyses suggest that DeFi now comprises more than half of the cryptocurrency market in terms of price fluctuations, and also accounts for significant levels of collateral put up in the space.

Many presume that these levels might rise meteorically alongside the continued growth of cryptocurrencies, but this should not be taken as a foregone conclusion - it will depend largely on the widespread adoption of DeFi. On this point, there is some indication that some "mainstream" venture capitalists are taking an interest in Defi technology. Nevertheless, and more importantly, DeFi's success will also hinge on challenges of accountability, oversight, and regulation, which are similar to certain phenomena in the cryptocurrency space (notably Initial Coin Offerings, ICOs). These issues cannot be overlooked and shall be raised later in this paper.

DeFi's decentralized architecture emanates from DApps ("Decentralized applications") which are programmed to execute finance-functionalities on blockchains. The usage of DApps allows users to not only bypass traditional financial institutions, but also to do away with cryptocurrency structures such as cryptoexchanges, which had become hubs of cryptocurrency trading but also came with a litany of problems of their own. DApp solutions enable DeFi users to transact directly through mechanisms mediated by smart contract technologies.

The decentralized nature of these smart contract-based approaches is that they can be programmed to work in conjunction. Through building blocks of DApps, therefore, it is possible to develop mechanisms that can execute financial service requirements of ever greater complexity. For example, DApps with smart contract programming to adjust interest rates can do so in an automatized and dynamic manner, therefore allowing large pools of users to transact at dynamically-calibrated rates according to the demand for such assets.

By way of illustration, the owners of a stablecoin might choose to pool their asset holdings to the effect that other users may borrow from this pool after posting collateral. A DApp protocol may then adjust the lending rates at which the pool's liquidity is extended to borrowers in real-time. This is but a suggestive example, and other creative financial service solutions are actively being actively developed by the DeFi community.

The first entity that may be considered a DeFi platform was MakerDAO (the term DAO signifying "Decentralized Autonomous Organization"), which also produced and today maintains the stablecoin DAI. The DAO and MakerDAO are roughly contemporaneous (the former launching in 2016 and the latter in 2015). MakerDAO enables people to assume a credit liability on DAI cryptocurrency, while attempting to maintain a peg with the US Dollar. Although this mechanism of DAI dissemination on a credit-basis represented a novel form of transacting with

cryptocurrencies, there has been a flourishing of other new models for DeFi since 2020.

One DeFi example is that of Compound Finance, whose incentive structure for promoting transactions involved not merely interest payment in lending activity, but also the distribution of a cryptocurrency to both lenders and borrowers (the COMP token). The COMP token is thus an imitation of a monetary authority's approach to promote circulation of a currency between savers and spenders, while allowing exchange of the currency with other platforms (such as large crypto-exchanges).

This phenomenon has caught on with other DeFi entities as well, which allows for a freer exchange among cryptocurrencies for participants. As a downside, however, it also generates considerable speculative activity based on arbitrage opportunities between cryptocurrencies - which is now commonly referred to as "liquidity mining" or as "yield farming." Such arbitrage-oriented speculative activity is in many ways analogous to speculative hedge fund activity in traditional markets, in that it does not wield economic contributions as much as it reflects the fast circulation of unproductive capital across assets with the sole purpose of yield maximization. The additional caveat with DeFi yield mining is that it depends not just on transaction costs and interest payments, but also on appropriating additional tokens emitted from DeFi platforms for excessive transactions.

Another DeFi example is that of Uniswap, which represents a decentralized exchange premised on forming large liquidity pools for the purposes of swapping tokens. Built on the Ethereum blockchain, Uniswap serves as an exchange for hundreds of Ethereum-based digital tokens, and its algorithm creates dynamic incentive structures for users to form liquidity pools by compensating them for trading fees. Uniswap thus offers an alternative structure for order-filling as performed by centralized market makers. Its substitute role is powered by an algorithmic incentivization mechanism for liquidity providers, and even though the algorithm was created by a development team,

its operational governance is dictated by users' liquidity-formation.

This conforms with cryptoanarchist precepts of disintermediation and freedom to exchange, and to a more extensive degree than cryptocurrencies (given that it subsumes the space of transaction and exchange), but it also magnifies the risks associated with anonymity. Uniswap cannot assume responsibility for the identities of user participants in a way that a cryptoexchange that is compliant with traditional securities laws might. Cryptoexchanges can, at least in theory, be held responsible for losses to users, so long as they are bound by the regulatory oversight of traditional public managerial structures. A DeFi exchange such as UniSwap cannot comply with such oversight - which is likely to put it (and other such DeFi solutions) in the crosshairs of national and international regulators. In fact, the case for sanctioning or de-legitimizing DeFi exchange systems is stronger than that for larger cryptoexchanges.

Yet another DeFi example is that of “flash loan” issuers, such as the lending protocol Aave. A flash loan is an uncollateralized liability whose duration is mere minutes (or even seconds) in length. Such loans mature almost instantaneously, being borrowed and repaid within a single block interval, i.e. between two blocks on a chain. Flash loans thus constitute an instant-credit cycle, and so raise questions about the merits of creating such lending instruments in the first place. In the parameters of traditional finance, one would struggle to find reasons for flash loans. One exception might be in short-selling strategies, which may be automated to borrow and sell stock instantly, with the aim of repurchasing and repaying at a near-immediate rate during spikes of extreme volatility.

However, even such a scenario, and short-selling in the wider sense, appears to be highly dubious practice, as the Gamestop Short Squeeze of 2021 demonstrated. Short selling at extremely short intervals does not bode well for the promise of

decentralized finance, if it is to pose an alternative to the defects of traditional structures and practices of capitalism. On this point, in the DeFi context, flash loans have been found to serve frequently as instruments of short-term manipulations of the spot prices for cryptocurrencies. This itself de-legitimizes the rallying cry for decentralized finance, if it is merely to replicate the defects of spot price manipulations of traditional assets but at infinitesimally short periods.

There are various other examples of DeFi which will warrant exploration, but their nascent stages leave much room for evolution that is otherwise prone to speculation at this juncture. Flash loans and biased liquidity pools are two elements which, nevertheless, raise a cautionary note to which traditional financial regulatory bodies will express dismissive reactions. Beyond this, it is important to note that blockchains are by their very nature immutable, and therefore cannot be reversed without a larger intervention such as a hard-forking of the chain. For DeFi, the immutability creates a risk of locking-in transactions that might be erroneous.

Smart contracts may themselves contain errors in their code, and as recent history shows, they may be vulnerable to hacks or sabotage (as in the first DAO). This is illustrated by the case of Yam Finance, which was a DeFi platform that crashed due to code errors, and this disappointment occured after the platform had raised $750 million in deposits. Such risks loom large at the incipient phase which DeFi is currently undergoing. As DeFi platforms' smart contract codes improve, these risks may well decline, but they continue to loom large for the moment. Nevertheless, this trial-by-fire approach to designing better code is a significant disincentive to the early adoption trajectories of DeFi systems, since the fear of significant losses due to inherent system issues dissuades otherwise amenable investors.

There are also microeconomic issues related to DeFi platforms that require attention. By and large, DeFi systems are built on open source code, which allows for numerous versions of the same

platform to be launched by competing users. Using the lens of perfect competitive markets, where countless entrants may offer a near-identical product, this means that they will either depend on a greater quantity (volume) of transactions to outshine competitors, or they will attempt to seek a degree of differentiation based on non-market factors, such as excessive marketing or branding that doesn't reflect the otherwise substitutable nature of the product (platform).

Aside from the difficulty of differentiating platforms that rely on a common open source code base, there is also a risk of arbitrage exploitation among competitors, since investors can shift funds between competing platforms in a manipulative manner, i.e. that which does not reflect the underlying competitiveness of the platforms. It is also a dissuading factor for investors that funds may well be shifted based on arbitrary movements between platforms without an underlying logic free from short-term manipulative behavior.

Extending this logic of fund movements forwards reveals the risk of Ponzi schemes embedded across the DeFi landscape, a point that several large DeFi investors have articulated. If the volume of transactions and deposits are the sole basis of competitive advantage among platforms, then this creates incentives for generating false marketing and misinformation to lure ever greater investors, especially with the promise of additional token issuances and absurdly high interest rates. This appears to be the case with several DeFi platforms that are expanding rapidly, and given that there is no regulatory schema or institutional architecture, nor is there any counter-measure to the anonymity of DeFi designers (and investors), the DeFi space remains frighteningly vulnerable to Ponzi shenanigans.

To put this in traditional financial parlance, DeFi is non-compliant with two key elements of financial regulation: Know Your Customer (KYC) and other anti-money laundering (AML) stipulations. For KYC, it is the inherent anonymity of DeFi that leaves Know Your Customer requirements by the wayside. This remains a risk with many cryptocurrency instruments (beyond DeFi

specifically). For AML, DeFi offers an almost surefire way to further exploit the worrying accusation against cryptocurrencies that their value and proceeds may be directed towards illicit activities - a point that has damaged the reputation of crypto-instruments more broadly. AML may come to be a decisive factor in the de-legitimization of DeFi as a space, especially if institutions such as the Financial Action Task Force (FATF) issue detailed guidelines on DeFi, as they have done for cryptocurrencies.

There are many parallels to be drawn with the wider cryptocurrency space, but one that is striking is that of Initial Coin Offerings (ICOs), where many coins were issued in a manner that was highly dubious and posed risks of accountability and oversight. Many investors lost significant amounts of money in bogus ICOs, and this became a significant cause of disrepute for the cryptocurrency space. Not all ICOs were guilty in the sense mentioned above, but a sufficient number of bogus ICOs dented the reputation enough to raise alarm among investors. A similar set of risks, as discussed above, presents itself (and arguably with greater intensity) in the realm of DeFi.

As such, the early verdict on DeFi should be one of caution that is tempered with a mild optimism that draws on the abstract cryptoanarchist principle of empowering individuals through decentralization and disintermediation. This mild optimism does not, as of yet, offer a significant cushion to the very real risks of malfeasance, which range from the worrying (hacks, manipulations) to the downright abhorrent (terrorist financing, money laundering). Traditional regulatory institutions of public managers will struggle even more with the task of dealing with DeFi than with the more mainstream elements of the cryptocurrency space (such as cryptoexchanges).

Nevertheless, this opens the door to considerable research into how DeFi can truly provide value for the cryptoanarchist public, and that is the attitude with which the conundrum of building an alternative financial architecture should be visited.

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