DECENTRALIZED FINANCE (DEFI): THE FUTURE OF BANKING

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ABSTRACT

The term "decentralised finance" refers to the provision of financial services through the use of the internet on a public blockchain. The research and development that has been done on decentralised finance, often known as DeFi, is summarised in this article. According to the findings of the literature study, decentralised finance provides a number of benefits, some of which include enhanced financial inclusion, permission-less innovation, the elimination of intermediaries, immutability of transactions, resistance to censorship, and reduced costs for international transactions. The execution of smart contracts, the possibility of legal repercussions, the possibility of data theft, the possibility of connectivity, the possibility of external data, and the possibility of an enhanced chance of unlawful behaviour through the use of DeFi applications are all risks that are associated with this. If one were to do a literature review on DeFi, one would discover that there is a scarcity of studies on the subject, with the bulk of DeFi research projects being of a non-empirical type. The vast majority of the research presented positive thoughts on DeFi. Despite the fact that they go into great length on the benefits of DeFi, they did not do any critical study on the technology or examine its disadvantages. Decentralised finance is gaining popularity in Europe, the United States of America, Asia, and Oceania, according to global observations of advancements in the field of decentralised finance (DeFi). A number of concerns have been raised regarding the possibility that the governance of decentralised finance might impede the growth of decentralised financial marketplaces in Asia. In addition, there are concerns that the prohibition of crypto assets might inhibit the growth of decentralised finance in African countries where governments do not fully permit blockchain-enabled cryptocurrencies. There is discussion over a number of policy problems that are related to DeFi. There are certain topics that need more investigation that are recommended in order to develop the literature on decentralised finance. One subfield of finance is known as decentralised finance, and it is distinguished by the fact that it functions without the participation of central authorities or financial institutions by utilising smart relationships.

KEYWORDS : Decentralized Finance , Blockchain , future banking , Defi .

INTRODUCTION

For the purpose of facilitating peer-to-peer financial transactions, a new financial system known as Decentralised Finance (DeFi) makes use of blockchain technology. This eliminates the need for middlemen that are now present in the financial system. In the same way that a ledger of transaction records assures the safety and transparency of the data that is recorded, blockchain is analogous to a ledger in this regard. One type of financial system is known as decentralised finance, and it functions without the requirement for central authority to monitor or keep track of transactions. The blockchain, which is protected by its integrity, and the higher yield that traded financial assets offer over Centralised Finance assets are credited with providing transparency and control to decentralised finance. This is despite the fact that decentralised finance operates independently of central authorities, in contrast to traditional financial systems. Both the size of the market and the amount of money that decentralised finance generates have increased dramatically since its inception. An investigation that was conducted by Research and Markets in the year 2023 found that the innovation that is taking place within the bitcoin sector and the rapid improvement of technology are the primary factors that are driving the significant development of decentralised finance.

Other factors that might potentially contribute to the significant growth of the decentralised finance industry include the increased use of digital technology and the rise in investment activity within the sector. The study conducted by study and Markets indicates that the DeFi market is anticipated to reach a valuation of USD 231.19 billion by the year 2030, with a compound annual growth rate of 46% between the present and the period of time in question. Additionally, it is projected that this development would paves the way for new opportunities in the realm of traditional finance. Decentralised finance (DeFi) is causing a significant seismic shift in the conventional financial environment all over the world, and India is not an exception to this trend. While India is working to expand financial inclusion and incorporate digital advances, the future of decentralised finance holds a great deal of potential for bringing about a change in the country's financial climate. The objective of this essay is to investigate the opportunities and challenges that are associated with decentralised finance in India, as well as the primary factors that will have an impact on the growth of this industry. The provision of financial inclusion is one of the most significant opportunities that DeFi offers in India. Through the use of blockchain technology and smart contracts, DeFi has the potential to bridge the gap that exists between various socioeconomic groups and reduce inequality. This is accomplished by providing members of the unbanked and underbanked populations with access to financial services. Obtaining funding can also be made easy for individuals and small businesses

through the use of decentralised finance. Through the use of decentralised lending and borrowing platforms, people are able to get loans and investments without having to rely on traditional financial intermediaries.

This empowerment, particularly for those who have historically struggled to acquire formal finance, has the potential to encourage economic activity, entrepreneurial endeavours, and the expansion of businesses. Decentralised finance, often known as DeFi, is a revolutionary concept that is revolutionising the conventional financial system. It does this by providing direct financial services for customers without the need for intermediaries. This is significant because it will contribute to the democratisation of money, the promotion of inclusivity, and the stimulation of creativity. Decentralised finance empowers individuals by providing them with the capacity to control assets and transactions, as well as by utilising blockchain technology to guarantee security and transparency. The gap that is generated by financial exclusion is bridged by it, which enables those who do not have bank accounts to access services. As an additional benefit, DeFi encourages creativity by rethinking previously established procedures and coming up with novel approaches to financial problems.

The term "decentralised finance" refers to any and all financial services and products that are developed on top of an open-source public blockchain based on blockchain technology. Decentralised finance, often known as DeFi, has been characterised in a variety of different ways when it comes to the literature. Through the utilisation of blockchain technology, decentralised finance may be described as any financial infrastructure that offers financial services without the requirement of intermediaries. In the context of finance, decentralised finance refers to the process of transforming traditional financial products into ones that may be used without the involvement of a third party through the use of smart contracts on a blockchain. The term "decentralised finance" refers to an ecosystem of financial applications that are generated and made feasible by the technologies of distributed ledgers and blockchain. According to Maia and Vieira dos Santos (2021), decentralised finance is an ecosystem consisting of decentralised applications that provide financial services via trustless and peer-to-peer networks.

Decentralised finance's advantages

The decentralisation of financial systems has a number of positive aspects. Decentralised finance has the potential to increase financial inclusion, encourage innovation that does not require permission, eliminate the need for middlemen, guarantee the immutability of transactions, protect against censorship, ensure that the rules apply to all parties equally, guarantee that transactions can be audited by anyone who has access to the internet, reduce the cost of international transactions, advance trustless financial intermediation, and encourage global participation. Through the facilitation of loan accessibility, decentralised finance has the potential to improve financial

inclusion. All individuals are able to obtain loans as a result. Due to the fact that it does not rely on credit score and does not need compliance with know-your-customer requirements, this may be useful for small businesses and individuals who do not have a credit history. A decentralised financial system offers a more cost-effective alternative to the conventional financial system that is already in place. This is the primary benefit why decentralised finance should be considered. It is generally believed that decentralised financial systems are more cost-effective than centralised ones. This is due to the fact that (i) everything is driven by peers, (ii) there are no fees for banks or intermediate services, and (iii) everything is decentralised on the blockchain.

Prospects for decentralised finance

There are a great many benefits associated with decentralised money. The most important advantage of decentralised finance is the opportunity to improve efficiency. The use of decentralised finance has the potential to enhance the effectiveness of financial transactions. When it comes to decentralised finance, intelligent contracts have the potential to replace the requirement for trust, which will ultimately lead to better efficiency. A decentralised financial ecosystem allows for the exchange of tokens for digital assets to take place between two parties that are ready to do so without the need for a third party or financial intermediary to facilitate the transaction. Tokens can also be utilised for the purpose of carrying out digital asset transactions between two parties directly. The requirement for third-party audits is reduced, which is another advantage of greater efficiency. Transaction costs are reduced, transactions are completed more quickly through token transfers, and the necessity for audits by third parties decreased. The second advantage that comes with decentralised money is the increased level of transparency. The use of decentralised finance has the potential to significantly boost transparency. On apps that use decentralised finance, each and every financial transaction will be transparent and accessible to both parties. This indicates that they are accessible to the general public, and the smart contract scripts may be utilised for research on the blockchain. It is possible that this type of openness will be beneficial to research and policy aims. For the purpose of conducting major research to evaluate the social value of decentralised finance and to improve the adoption of decentralised finance apps (dApps) in the financial sector, academics may collect a lot of rich historical data on the blockchain. This data can be used to carry out important research. Additionally, the open nature of decentralised finance would make it easier for policymakers and financial regulators to remotely monitor protocols for decentralised money in order to gain a better understanding of the impact that decentralised finance has on the stability of the financial system.

The third advantage of decentralised finance is that the protocols that govern decentralised money will be accessible to anybody who wants these protocols. This has the potential to create a financial system that is open and accessible to everyone. With the implementation of decentralised financial protocols, individuals of all socioeconomic backgrounds will be able to carry out transactions. It has the potential to eradicate the prevalent practice of income discrimination between the wealthy and the poor that is seen in the conventional financial system. Furthermore, even if legislation requires access limits, such as a strong security token, such constraints may be implemented in token contracts without damaging the decentralisation qualities of the decentralised finance infrastructure. This is the case even if the regulation requires access restrictions. In a decentralised financial system, the simplicity with which contracts may be drafted is the fourth potential that decentralised finance brings about through its implementation. Shared settlement layers are a feature of the blockchain that is utilised in a decentralised financial infrastructure. These layers make it possible for decentralised financial protocols and apps to communicate with one another. The creation of anything completely new can be accomplished by combining, removing, or modifying any two or more of the elements. Because of the simplicity with which it may be compiled, an infinite number of options and financial engineering can be accomplished.

Decentralised finance's risks

There are a number of uncertainties that are connected to decentralised monetary systems. First and foremost, there is the risk that is connected to the implementation of smart contracts. Flaws in the code might be the source of this issue when it comes to the creation of smart financial contracts. Coding errors can lead to vulnerabilities, which an adversary can exploit to either render the code worthless or to get control of the money that is contained in a smart financial contract. Both of these outcomes are possible. The conclusion that can be drawn from this is that the security of the decentralised financial protocol is dependent on the smart contract software that are underneath it. However, there is a major danger of legal liability associated with the utilisation of smart contracts for decentralised monetary systems. This is because there is a chance that an unskilled user of technology may be duped into signing a compromised smart contract. This would place the user at danger of unforeseen legal obligation and render them incapable of interpreting the code of a smart contract or evaluating its level of security. The third point is that there is the danger of data theft. Admin keys are utilised by a multitude of decentralised financial protocols and apps for the purpose of performing emergency shutdowns and upgrading smart contracts.

In the event that the key-holders fail to produce or store the keys in a safe manner, it is possible that malicious third parties will steal the keys and put the smart contract at risk. Furthermore, there is the possibility of dependence or interconnectedness inside the system. This is due to the fact that decentralised financial protocols

make it possible for various smart contracts and decentralised blockchain applications to connect with one another. This allows for the creation of unique services that mix aspects of those that already exist. Because of the considerable linkages that are created by these interactions, a mistake with a single smart contract might potentially have ramifications for several decentralised finance applications that are spread out over the ecosystem of decentralised finance organisations.

It is a cause for worry because a significant number of decentralised financial applications are dependent on data from external sources. It is the responsibility of external data sources to deliver information that is required by a smart contract in the event that it is not available on the blockchain. Because of this, blockchain applications that rely heavily on data sources from the outside face the risk of encountering issues with the availability and quality of the data they collect. Last but not least, the use of decentralised financial applications is strongly predisposed to illegal behaviour. Illicit activities are drawn to decentralised financial systems because of the distributed nature of these systems. The use of decentralised financial applications by dishonest actors as a way of supporting unlawful behaviour and laundering money is a possibility.

LITERATUE REVIEW

Dr. Isabell Welpe (2020) The goal of the (r)evolutionary movement known as Decentralised Finance (DeFi) is to create a financial system that is entirely code-based and does not include any intermediaries. The initiative has increased the amount of assets that are locked up from $4 billion to $104 billion over the course of the previous three years. In the still-fragmented field of DeFi research, we present the first complete appraisal of the existing body of literature currently available. Through the process of locating, analysing, and incorporating 83 works connected to DeFi that have been peer-reviewed, our findings contribute fivefold. We begin by establishing that there is an increasing number of scientific DeFi articles by means of an exhaustive examination. The second step is that we classify the research on DeFi into three distinct categories: micro, meso, and macro, with seven subcategories for each of these categories. Thirdly, we have decided to make Ethereum the dominant blockchain for academic purposes. As a fourth point, we show that although only one study has made use of the original research data, prototyping is the research method that is employed the most frequently. Fifth, we select four research areas that should be prioritised: i) platforms for DeFi protocol interaction and aggregation; ii) integration of decentralised off-chain data to DeFi; iii) DeFi agents; and iv) regulation. These are the four research directions that we conclude should follow.

Patrick Schueffel (2021) The concept of decentralised finance, sometimes known as DeFi for short, is a unique concept that is gaining popularity in the financial world. From the perspective of DeFi, it is imperative that financial services be provided by users for users, rather than relying on centralised intermediaries. The addition of software components to a blockchain-based decentralised peer-to-peer network is the means by which this objective is realised. Within this introduction, the history of decentralised finance (DeFi) is discussed, as well as the characteristics that set it apart from traditional money.

Campbell R. Harvey (2022) Both the potential for progress and the imbalance in opportunities have been limited as a result of our very old financial infrastructure. On our world, there are 1.7 billion people who do not have bank accounts. Small businesses, even those that have a relationship with a regular bank, are usually denied access to loan funding through traditional banking. As a result, many businesses are forced to rely on more expensive financing sources, such as credit cards. The same thing happens to retailers who lose three percent on every single credit card sale transaction. High charges have the same effect. According to every metric, the overall expenditures that small businesses are experiencing are exorbitant. Consequently, there will be a reduction in investment and a slowdown in economic development. The concept of decentralised finance, often known as DeFi, is a challenge to the current state of affairs and offers a number of potential solutions to problems that are associated with the traditional financial infrastructure. There are a lot of fintech businesses, but we believe that those who interface with the current financial system are probably just going to be there for a short time. Our contention is that the initiatives that make use of decentralised methods, in particular blockchain technology, are the ones that have the greatest potential to influence the future of the financial industry.

Fabozzi and Drake (2022) characterised finance as the process of creating, managing, and investing money in many activities. It is necessary to have a financial system in order to link individuals who are in need of borrowing money (borrowers) and those who have money to give (depositors). It is impossible for an economy to function properly without a financial system. They give an efficient and risk-free service to the many stakeholders in the sector. The components that comprise a financial system include the markets, the financial instruments, and the financial institutions. Financial institutions are any middleman that provides financial services, such as banks, trust funds, insurance, and so on. Financial institutions are also known as financial institutions. As a written document or contract that carries monetary value and functions as a legal representation of an agreement, a financial instrument is a type of financial instrument. A financial market is a place where people may trade various financial items with one another.

Klagge and Martin (2019) recognised two different facets of the current market for financial stocks. According to their assertions, there are two theories in existence: the conventional theory and the Keynesian theory. In accordance with the conventional notion, there exists an ideal financial market that is characterised by agents who maximise their utility. In this scenario, there is perfect competition, information symmetry, and transactions that are completely frictionless. This reality is accurately represented in the financial system that is in place today. Centralization is a characteristic of the current financial system, which means that players are connected to one another through intermediaries. They are the one who has money and the person who is in need of money. The purpose of these intermediaries is to facilitate commerce and establish a connection between the parties involved, so ensuring that money may continue to flow to their respective destinations. These middlemen are partially to responsible for the inefficiencies that are brought about. As a result of the numerous additional expenses that are linked with it, it is inefficient behaviour.

OBJECTIVES

1. To educate oneself in decentralised finance, often known as DEFI.
2. To learn more about the technology behind the Defi blockchain.
3. To educate oneself on the banking of the future.
4. To learn more about the Defi industry.
5. To learn more about the financial services offered by Defi.

HYPOTHESIS

1. Changing DeFi to Encourage Access to Finance.
2. For decision-makers, bankers, and other professionals working in the financial sector to have an understanding of the disruption and effectively execute the necessary policy adjustments.

METHODOLOGY

Acquiring Data

After visiting the websites tokenterminal.com, defillama.com, and dappradar.com, we were able to collect information on thirty different DeFi tokens by using the data that was available in the defillama, tokenterminal, and dappradar cryptocurrency databases. The many types of DeFi and protocols that were investigated are detailed in Table 1, which can be found here. Defillama and Tokenterminal are the data aggregators that are the most complete in terms of gathering crucial indicators for DeFi systems as well as financial information for DeFi

protocols. A number of important DeFi performance characteristics, including market capitalization, TVL, protocol revenue, total revenue, gross merchandise volume, and the inflation factor of DeFi protocols, have been extracted from the datasets that were previously discussed.

Table 1 The DeFi protocols employed in this research.

Decentralized Exchanges	Lending Protocols	Asset Management
Uniswap	Aave	Convex Finance
Synthetix	MakerDAO	Lido Finance
Looping	Compound	Yeam.Finance
PancakeSwap	Abracadabra Money	Yield Guild Games
Curve	Centrifuge	Fei Protocol
linch	Liquity	Ribbon Finance
Osmosis	Venus	Rail Capital
Maiar	Maple Finance	Enzyme Finance
Ox	TrueFi	Alchemic Finance
SushiSwap	Homora	Harvest Finance

The purpose of this study is to investigate the relationships that exist between a number of attributes that are incorporated into the assessments of the DeFi protocol. For the purpose of accomplishing this, we have utilised a variety of research methods that are appropriate for analysing the connections between this kind of data. These methods include panel regression analysis and causality analysis, both of which are supported by the study's examination of longitudinal data, which includes both cross-sections and time series. This research on causality not only reveals how knowing individual elements makes it possible to analyse how they interact with one another, but it also demonstrates how it may be used to anticipate values in the future. The causality analysis gives one the ability to determine how the variables interact with one another. Y has the ability to dictate x, despite the fact that x is the one who determines y. In the process of panel regression analysis, one-sided interaction might take place. When it comes to providing a more thorough solution to the question of how to decrease the decline in values during a terrible market, selecting a data frame of this sort has the advantage of presenting a more comprehensive response.

One way to accomplish this is by exercising control over the token supply, which ought to be subject to more stringent regulation by means of an appropriate inflation factor. Obviously, there are a great deal of extra considerations that need to be taken into account. There is a possibility that one of these causes is the investment strategies made by the protocols themselves. One such example is Umami Finance, which is leading the way in the mainstream adoption of decentralised finance thanks to its developing ecosystem of professional, legally permissible decentralised finance solutions that are geared towards the institutional sector at large. In order to generate long-term gains on significant cryptocurrency assets like $USDC, $ETH, and $BTC, the Umami team is now working on constructing a variety of vaults that are extremely scalable and have been validated extensively. By building decentralised, permissionless smart contracts as the foundation of the global financial system, Umami intends to advance the cause of financial sovereignty for investors all over the world. Because of the Umami Finance system, market players who wager their governance tokens are qualified to get a portion of the return on their investment.

To put it succinctly, the Umami Protocol utilises a delta-neutral strategy, which means that it makes money from both long and short positions. It is projected that it will not have any negative impact on the delta and will be able to provide returns in the region of 15% to 35%. For the sake of historical comparison, Umami Finance's non-native treasury assets were evaluated at $5.6 million in February 2022. By the end of May 2022, the value had reduced to $5.4 million, which is a decline of $0.2 million. This is a loss of 3.5%. One thing that should be taken into consideration is the fact that the entire market has witnessed a decrease of thirty percent during the same time frame. The fact that the United States Treasury was able to generate sufficient returns and fees to reward protocol token holders, pay for operating expenditures, and beat the general market suggests that the Treasury was able to do so even while the market was underperforming.

Table 2. Descriptive data about the token type used as the lending protocol.

Lending	Total Lending Revenue	Aave Dominance	Median Lending Revenue	Median Lending P/S Ratio
	$1.25b	+43.6%	$736.44k	17.2x

Table 3. Descriptive statistics for the token class of decentralised exchanges.

Exchange	Total Exchange Revenue	Uniswap Dominance	Median Exchange Revenue	Median Exchange P/S Ratio
	$5.80b	+41.4%	$3.87m	14.6x

Table 4 Descriptive data on the DeFi token class.

DeFi	Total DeFi Revenue	Uniswap Dominance	Median DeFi Revenue	Median DeFi P/S Ratio
	$13.14B	+25.7%	$6.33m	13.4x

Table 5 Descriptive data for tokens in the blockchain class.

Blockchain	Total Blockchain Revenue	Ethereum Dominance	Median Blockchain Revenue	Median Blockchain P/S Ratio
	$20.12b	+76.3%	$3.87m	7559.8x

In the same way that Granger causality analysis and panel data analysis are methods that are frequently used to evaluate the relationship between different variables, the purpose of this study is to investigate the relationship between the DeFi Protocol valuations and a number of financial variables that can be used to represent and justify the performance of this market. Panel analysis is a well-known statistical method that is utilised for the purpose of assessing two-dimensional data, which includes cross-sectional and time-series information. For the purpose of estimating values, panel regressions are employed in the empirical portion. To provide a more specific explanation, the days that follow are represented as time, and the protocols used by DeFi are depicted as panels. Given that the pooled OLS specification makes the assumption that there is no heterogeneity across a large number of DeFi projects, the following formula is used to describe the assumption:

$$Val_{it} = \alpha + \beta X'_{it} + e_{it}$$

in where v represents the value that belongs to each project and is log-linearized in order to take into account inconsistencies, improve the investigation of the dynamic elements of the projects, and simplify computations. To put it another way, the number of unique projects that are included in the database is represented by the symbol i = 1, 2,..., 30, and the number of days that have passed in a row is represented by the symbol t = 11 January 2022...8 July 2022. To put it another way, the findings are obtained via the use of a certain set of predetermined control variables. In this context, the word "α" is used to refer to the common intercept, whereas "X''" is the vector that contains the variables that are being predicted. All of the models make use of the same predictors, which are the gross merchandise volume (gmv), the protocol revenue (pr), the total revenue (tr), and the inflation factor (inf). In addition, the word "error" is used to denote the erroneous term in the model that was shown as an example before. This equation is a representation of the specification FE with individual effects that never change:

$$Val_{it} = \alpha_I + \beta X'_{it} + e_{it}$$

where α_i reflects the fixed effects that pertain to each DeFi protocol. It works to manage the heterogeneity that exists across the various DeFi protocols. When compared to the OLS model, the FE specification is distinguished by the fact that it takes into consideration the effects of DeFi protocols, which are symbolised by the phrase α_i. Therefore, α_i can be seen as the absence of knowledge regarding any other systematic criteria, apart from X', that are used to anticipate the values of DeFi projects.

DATA ANALYSIS

As was noted before, the research is based on daily data from the first two quarters of 2022, which span from the 11th of January to the 8th of July. In particular, we make use of data on the response variable, circulating market capitalization (val), and the total value locked (tvl), in addition to a wide range of other variables, such as protocol revenue (pr), total revenue (tr), gross merchandise volume (gmv), and inflation factor (inf). These variables serve as explanatory variables for the thirty distinct DeFi protocols that were investigated (for example, Uniswap, Synthetix, Loopring, PancakeSwap, and Curve, among others).

The research analyses the ways in which the data are connected to one another, with a particular focus on the ways in which the TVL and the other explanatory elements influence the way in which these procedures are valued. To put it another way, the purpose of the panel regression research is to collect data that will help us gain a better understanding of the factors that influence DeFi values in relation to specific intrinsic characteristics and

helpful metrics of the DeFi protocols. Every single correlation coefficient that we examined (for each and every pair in isolation) had a p-value that was much lower than 0.05. Each of the numbers 3 and 4 Consequently, this indicates that the correlation estimates between the variables that are being investigated have a statistically significant level of significance. The correlation of 0.6080682 between the TVLs and the valuation of the DeFi protocols is an example of a discovery that is statistically significant. The Pearson t-test value is 52.639, the degrees of freedom are 4723, and the p-value is less than $2.2 \times 10{-16}$ on the statistical significance scale. However, because we are working with a time series, the reliability of these tests is not as high as it would be if we were collecting data from a cross-sectional perspective.
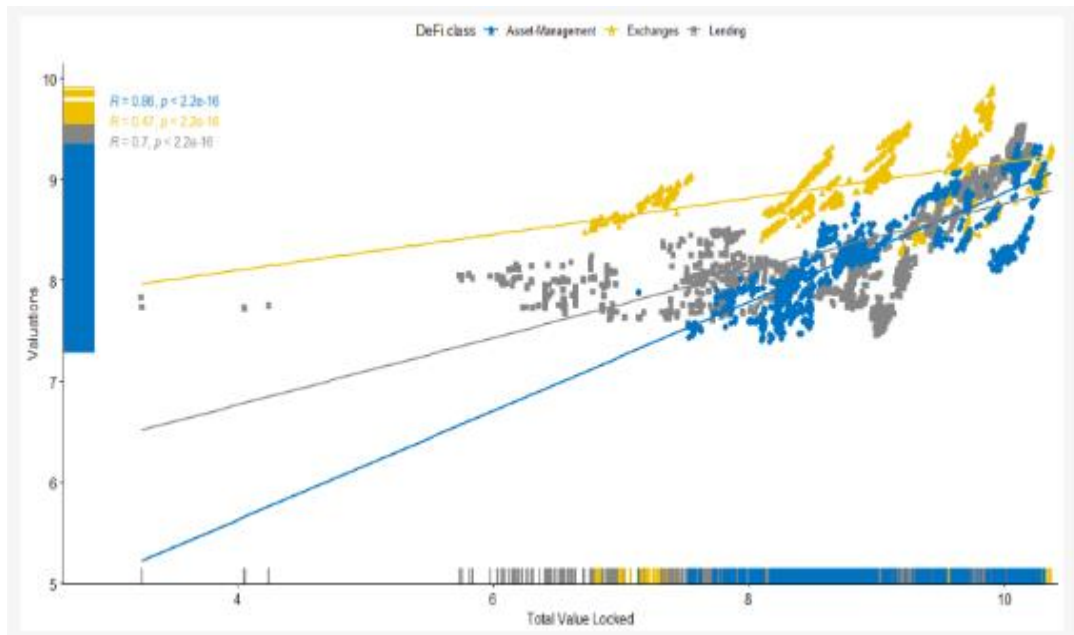

Figure 1. Correlations between TVLs and valuations for three distinct DeFi class protocols.
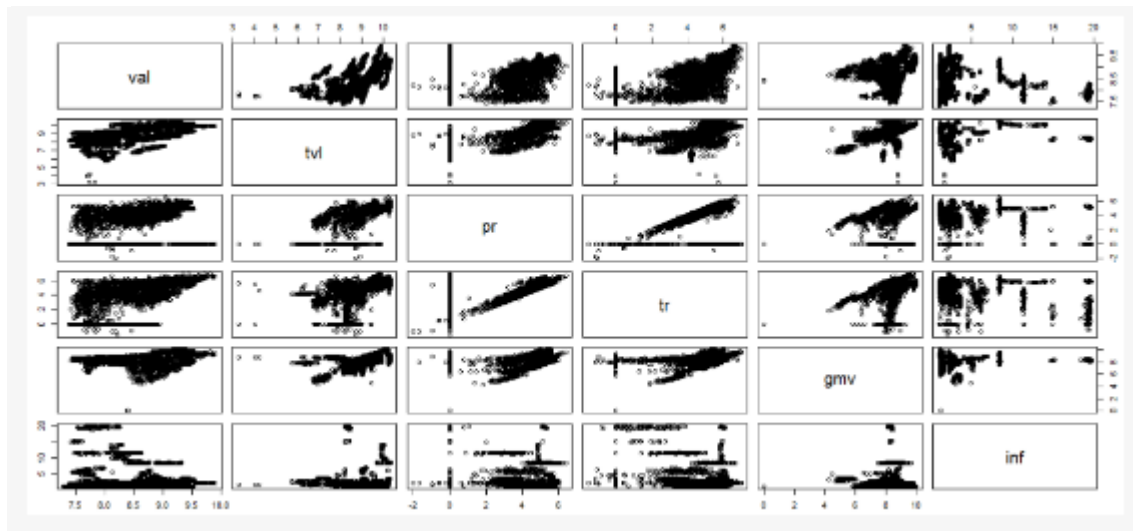
Figure 2. Correlations between pairs for the study's variables.

As can be seen from the elasticities of the regression lines in Figure 1 above, it is noteworthy to note that there are discrepancies in the linkages between the TVLs and values of the various classes of DeFi protocols. This is something that should be taken into consideration. In a general sense, the regression line for the "Asset Management" class is the steepest, while the line for the "Decentralised Exchanges" class is the flattest. Given that the success of "Asset Management" protocols is strongly dependent on the amount of money that is being managed, it follows that the TVL is somewhat more significant for these protocols than it is for other protocols. A comparison to mutual funds can be helpful in better understanding this concept since the values of mutual funds are strongly reliant on the amount of money that is under management, which is significantly greater than the values of other firms in the financial industry. When determining the value of a fund, it is common practice to utilise the net asset value (NAV), which is calculated by subtracting the entire value of the fund's liabilities from the total value of the fund's possessions. As an additional point of interest, the total market value of investments is reflected by assets under management (AUM), which is dependent on the flow of money that investors commit. AUM, on the other hand, determines the total amount of asset management charges, which in turn have an effect on the pricing of these funds.

However, the pairwise correlations that exist between the variables that are being investigated do not necessarily indicate that there is a causal relationship between them. Our research hypotheses that DeFi valuations are dependent on TVL, total revenue, and gross merchandise volume—which may be interpreted as proxies reflecting the success of the DeFi protocols—would be confirmed if it were clear from the results presented above whether TVL and other exogenous variables cause an increase in DeFi valuations. This would serve to confirm our

hypotheses. There are a great number of indications that point to the potential that this has occurred. Clearly, this is the situation, as demonstrated by the statistics pertaining to the correlation coefficient. To be absolutely certain, we use the Granger causality test to determine whether or not there is a causal connection between the variables that are being investigated. Having this information can help us better understand whether or not particular explanatory factors provide statistically significant insights into the values of DeFi that are to come. The findings of the Granger causality test [F = 5.6021, Pr($>$F) = 0.009755] suggest that having a grasp of DeFi valuations (as defined by daily circulating market capitalization) might potentially assist in the forecasting of TVL values in the future for these processes. As it turns out, out of all the explanatory parameters that were included in the study, the only one that can be utilised to properly estimate the future values of the DeFi protocols is the Gross Merchandise Volume [F = 2.6968, Pr($>$F) = 0.04435]. In Table 6, you will find a list of every connection that was examined.

Table 6. Granger causality tests in pairs.

Dependent	Hypothesis Tested:	F-Statistic		p-Value
VAL	TVL: there is a unidirectional relationship	5.1128		0.00
	PR: there is a unidirectional relationship	5.556		0.000
	TR: there is a unidirectional relationship	27.354		$<$2.2 x
	GMV: there is a bilateral relationship	2.6968;		0.04435';
TVL	PR: there is a unidirectional relationship	18.321		8.4 x
	TR: there is a bilateral relationship (TVL0,TR)	4.6502;		0.003005 **;
	GMV: there is a unidirectional relationship (TVL	17.384		3.385 x 10-
PR	TR: there is a bilateral relationship (PRoJR)	9.3282; 11.368		3.819×10^{-8} "*; 2.008×10^{-7}
	INF: there is a unidirectional relationship	3.4802		0.015
TR	GMV: there is a unidirectional relationship (TR)	3.7378		0.010
	INF: there is a unidirectional relationship	3.4491		0.015

The outcomes of the Granger causality test indicate the direction of the relationships between the variables that is most likely to be the connection. As a result, the data suggest that the values of the DeFi protocols are the primary factor in determining the changes in TVL as well as other significant factors such as protocol income, total revenue, and gross merchandise volume. On the other side, TVL is the company that is responsible for driving protocol revenue, total revenue, and gross merchandise volume. Taking this into consideration, it is possible that higher values are attracting new users and liquidity providers to these protocols at this early stage in the development of the decentralised finance market. Consequently, this results in an increase in the overall income of the protocols as well as the amount of money generated by the protocols that is distributed to token holders. This, in turn, attracts a greater number of users and capital (via staking and yield farming). When it comes to the connections that exist between the values that are generated by the DeFi protocols and the other components that explain the phenomenon, the only link that was demonstrated was the bilateral link for the variable gross merchandise volume. With the assistance of this form of data analysis, it is possible to gain a better understanding of the correlations that exist between the variables.

There is a correlation between rising TVLs for DeFi protocols and greater liquidity, popularity, and simultaneous use, which is an indication that DeFi projects are successful. An increase in TVL is indicative of a bigger capital investment to DeFi protocols, which ultimately results in significant benefits and revenue for individuals who are involved in these protocols when they are implemented. On the other hand, smaller TVLs suggest that there is less money (liquidity pools) accessible, which results in lesser revenues being generated by the protocol. In addition, we carried out a quick panel regression analysis by making use of the fixed effects model specifications, ordinary least squares (OLS), and evaluating the link between the values of the DeFi protocols and the other components that were being investigated. There are the results of the FE model definition that are presented in Table 7. The findings of the OLS model specification were found to be inferior to those of the FE specification, as demonstrated by the F-test (F = 713.02, df1 = 19, df2 = 3174, p-value < 0.000000000000022; alternative hypothesis: considerable effects). As a result, we have removed the OLS model specification from our analysis from further consideration. On each and every variable, a log transformation was performed. The logarithmic transformation of the model's variables has a number of important advantages that should not be overlooked. Unit changes between the response and explanatory variables are frequently included in regression models that do not include transformation. This means that a change of one unit in one variable corresponds to a change of one unit in the other variable. By taking the logarithm of either one of the variables or both of them, the situation gets transformed from a change in units to a change in percentages.

Table 7. Panel regression model with fixed effects.

Predictor	Estimat	Std. Error	(-Value	PIPM)
Total Value Locked	0.388630	0.0102634	37.8655	<0.0000000000000022
Protocol Revenue	-	0.0047426	-4.0793	0.00004628 ***
Total Revenue	0.016803	0.0041144	4.0841	0.00004534 ***
Gross merchandise	0.175771	0.0103339	17.0092	<0.0000000000000022
Inflation factor	-	0.0017573	-	<0.0000000000000022
Total Sum of Squares:	13815			
Residual Sum of	75.903			
R^2/R^2 adjusted	0.45293/0.44897			

A number of tests were carried out in order to validate the robustness and dependability of the model in relation to the assumptions that were used in the modelling process. In instance, the Breusch-Pagan LM test of independence demonstrates that the model does not exhibit any cross-sectional dependency (chi2(171) = 191.56, Pr = 0.1344). In terms of heteroskedasticity, the modified Wald test confirms that there was no heteroskedasticity problem in the model (Prob > chi2 > 0.05 [chi2 (19) = 27.09, Prob > chi2 = 0.10257]). This is due to the fact that the optimal model specification ended up having fixed effects. There was an analysis of stationarity performed using Fisher's test. Under the null hypothesis (H0: which states that all panels include unit roots), this test makes the assumption that all series are non-stationary. On the other hand, the alternative hypothesis suggests that at least one of the series in the panel is stationary. We reject the null hypothesis (H0) since the p-value is less than 0.05, which indicates that the data are consistent with stationarity (inverse chi-square(60) P = 91.6689, p-value = 0.0052). When it comes to the study of the cointegration test, it is generally accepted that when time series are non-stationary, researchers conduct cointegration tests in order to determine whether or not they have a consistent link over an extended period of time.

Due to the fact that we are working with data that has already been modified and the model is stationary, it is not essential to conduct a cointegration test study. Further, the F-test of overall significance reveals that the independent factors (jointly) account for the variation in the dependent variable, which is the values of the DeFi protocols. This is demonstrated by the fact that the F-test was performed. To put it another way, a regression model is superior to a model that does not include any independent variables in its analysis of the data. The F-test is used to determine the overall significance of the multiple regression that was performed. This is accomplished

by determining whether or not the independent factors are responsible for any variance in the dependent variable, which is the values of the DeFi protocols. In addition, it is essential to take into consideration that the goodness of fit (Adjusted R2=0.44897) indicates that the explanatory (exogenous) factors are responsible for more than 45 percent of the variability in the values of the DeFi protocols (endogenous variable), which is in line with a robust model.

Taking into consideration the data, it is possible to assert that TVL, Total Revenue, and Gross Merchandise Volume have a beneficial impact on the values of DeFi processes. When it comes to these variables, every single estimate of the beta coefficient is positive and demonstrates statistical significance. Noting that the variable TVL has the greatest influence on the values of DeFi protocols is something that ought to be spoken about. In light of the fact that we are utilising proxies to improve the performance of the DeFi protocol, these results make perfect sense. The reason for this is because the values of specific DeFi protocols are enhanced by additional resources, which means that higher valuations are indicated with regard to these protocols. Due to the fact that the TVL symbolises the worth of money that is deposited into the smart contracts of these protocols, higher values often equate to higher valuations for these protocols. On the other hand, the total sales value and the gross merchandise volume are equivalent to one another. There are several types of DeFi protocols, each of which has a different relevance. The total trading volume for decentralised exchanges, the total borrowing volume for lending protocols, and the overall trading volume of their product for asset management are all included in this. A total revenue is calculated by adding together all of the fees that users of the DeFi protocol have paid. Because it is computed throughout a certain time period, the fees that are paid on a particular day correspond to the entire amount of money that was earned on that particular day.

On the other hand, there is a plausible explanation for the inverse relationship that exists between the revenue of the protocol and the inflation factor, as well as the values of the DeFi protocols. Given that the money created by the protocol is identical to the revenue that is distributed to owners of DeFi tokens, this is the reason why this is the case. Consequently, when compared to the dividends that are distributed to shareholders by a publicly listed company, the money generated by the protocol makes perfect sense. The amount of money that is paid out is comparable to the amount of capital that is flowing out of a DeFi protocol. On the other hand, the inflation component is a representation of the dilution of the values; in other words, it is comparable to the issuance of extra shares in traditional organisations. Even for a typical equity corporation, an increase in the number of shares that are currently in circulation often has a detrimental impact on the price of the company.

CONCLUSION

Smart contracts are used to enable transactions in place of financial intermediaries and centralised authority in a more modern financial ecosystem known as "decentralised finance." This ecosystem is founded on blockchain technology and employs smart contracts to conduct transactions. Ethereum was the first cryptocurrency ever created, and its creation provided the framework for the fast expansion of decentralised finance. Information technology investments stretch back to the 1880s. Decentralised finance offers all of the roles and functions that are associated with centralised finance. These include the fundamental services such as stablecoins, decentralised exchanges, lending and borrowing, derivatives, insurance, and asset management. Additionally, it offers additional services related to decentralised finance such as fair lotteries, prediction markets, and decentralised gaming. The advantages of decentralised finance include, but are not limited to, interoperability, borderlessness, openness, transparency, innovation, decentralisation, efficiency, and other advantages.

There are a variety of risks and negatives associated with decentralised finance (DeFi) due to the nature of the technology itself. These include the potential for money laundering, severe volatility, stablecoin run, unstoppability, irreversibility, lack of transparency, and pseudonymity and unstoppability. Since it was first established, decentralised finance has had substantial expansion in terms of both its market share and its user population, and it is projected that this expansion will continue in the next years. However, emerging nations have made significant progress in this field, but the United States and Europe do not have a decentralised finance (DeFi) emergence or development trend. In light of the fact that information technology and innovation are the key forces behind the expansion of DeFi, it is projected that this pattern of fast expansion will continue.

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