Decentralized finance: An analysis of the potential and threats to its growth

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ABSTRACT

Decentralized Finance system grew of 250% in a year and represents a Total Value Locked (TVL) of $235B as of April 6th, 2022, according to analytics firm Defillama. At the intersection between finance and blockchain technology, it offers its community the opportunity to access financial services free of intermediary. That freedom is a benefit for many populations underbanked or totally excluded from the exclusive centralized traditional financial systems as well as for investors looking for more independence. This new decentralized system is still free willing and largely unregulated which offers several opportunities but also uncountable risks. Therefore, it is important to evaluate the parameters influencing Decentralized Finance (DeFi)'s growth to forecast its future value. This analytical research paper creates a simple regression model to predict Defi's performance. For this, we would lay the foundation of DeFi(I) by analyzing the underlying technologies structuring the ecosystem, defining the principles of DeFi and comparing DeFi to the traditional financial system. We would also observe Defi performance from 2019 to April 2020 and construct a multilinear regression model to understand how inflation, Bitcoin value, gas fees prices and cybersecurity exploits impact DeFi's TVL performance (II). Finally, we would submit a study of futures events and systems such as Cyber Security Breach, Cryptocurrency Regulations, Environmental Social Governance (ESG), Central Bank Digital Currencies (CBDC) that could redefine the path to expect for DeFi's Future Performance (III).

INTRO

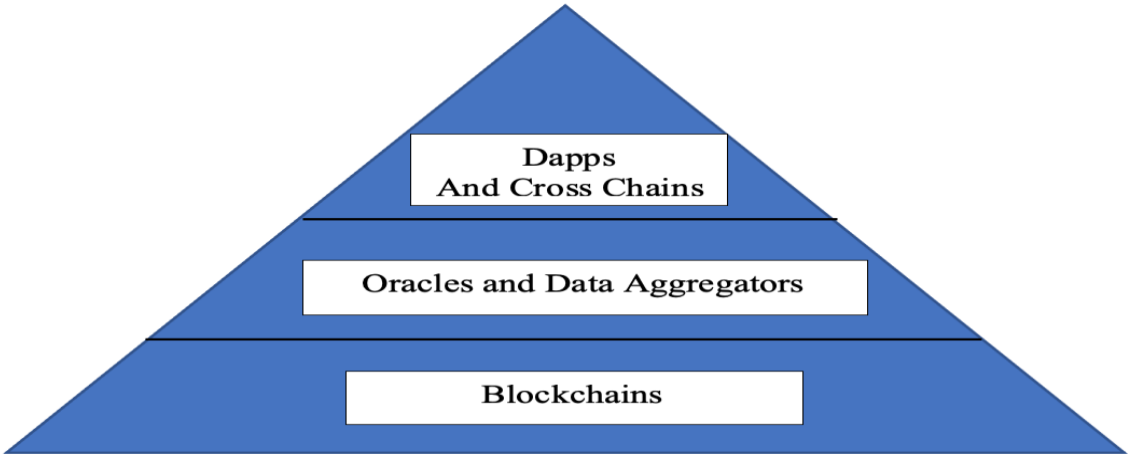
Decentralized Finance has become vernacular, and its name is often mingled with other new age denominations such as Digital Asset, Web3, Disintermediation or even Blockchain, but many don't have a clear idea of its meaning or what its promise really encompasses. Fundamentally, DeFi provides financial services. Although, those are categorized as "Decentralized" because no traditional financial system is used to provide these decentralized financial services. Instead, DeFi uses the Blockchain Technology to achieve that purpose and offering a service deemed as trustful. Financial Services are now accessible everywhere with an internet connection. Consequently, the term "decentralized" is used to differentiate DeFi with the traditional finance that operates with a centralized protocol (system of large financial intermediaries) to interact between supply and demand on the market. That shift of financial system methods and processes is important since for the first time, the party trusted to monitor the money's custody changes.

As you might understand DeFi is a utility born out of many applications offering different types of financial services totally independent from a middleman. Users can utilize those applications called Decentralized application (Dapps) to use Decentralized financial services. It is this whole ecosystem of application that we qualify as "DeFi".

I. Roots: the foundations of DeFi

A. Technology Underpining DeFi:

Figure 1. DeFi pyramidic system



Source: Laura Kouadio

DeFi industry uses Artificial intelligence, Cloud, and Distributed Networks like Blockchain as a supporting structure to produce this end-to-end self-monitored ecosystem.

Blockchains

Blockchains are a decentralized Ledgers Technology (DLT) that have no governing authority, these are the layer on which those decentralized application are created. Indeed, DeFi is a group of Decentralized Applications created by different engineers to provide financial services to users and those Dapps are built on top of Blockchains (B.Hor and al.2021). Financial services created on those app trigger transactions on the Dapp layout that would be registered on the Blockchain almost simultaneously (Figure 1). Without the existence of that blockchain technology, no Dapps would have been created and therefore no DeFi would never have existed, at least not through those conditions.

Cross-Chain and Multi-Chain Infrastructures

As many Dapps with different purpose exist (decentralized exchanges, lending platform, insurance..), many blockchains exist as well. Dapps can interact with several blockchains at same the time but blockchains interacting together is still an issue being solved essentially with cross-chain and multi-chain infrastructures. On a multi-chain effort, some blockchains are Ethereum Virtual Machine (EVM) compatible, making it very easy for them to spin up a version of existing Dapps. This include Fantom, Binance Smart Chain, and Avalanche networks. Being EVM compatible is major since Ethereum is the most used blockchain on the DeFi ecosystem, thus it attracts a substantial number of users. For the non EVM compatible blockchains, bridges platforms can connect some blockchains together and create that path needed for scalability. Cross-chain infrastructures are platforms like bridges that don't offer DeFi services but help the different blockchains to be interconnected together to let the liquidity in DeFi transit between blockchain networks. Moreover, Ethereum blockchain currently uses a Proof-of-work (POW) consensus that leads to scalability issues (high demands on the chain slower transactions process) and creates nonviable gas prices. The network is concurrently saving that issue by creating cross connections. They work on scaling to second layers (layer 2), which offer the same security to the users, without the congestion of the layer 1 blockchain and on upgrading from POW consensus to Proof-of-Stake (POS) to limit the lack of scalability and high gas fee prices. These cases help tremendously the DeFi sector to provide services to more users and scale efficiently even if many of those projects are currently on beta production.

Oracles and Data Aggregators

DeFi is also powered by third party services like Oracles and Data aggregators that serves for getting the real-world data not stored on the blockchain into Dapps and register them on chain. This is necessary for information like real time asset prices, trade data or order books. To keep the process trustful, data entering on-chain from the real world are voted on a consensus mechanism where validators agree for the most accurate data. Main oracles are Chainlink and Maker Dao. Oracle act as the interface between data from the real word and the blockchain, while Data Aggregators gather and process information received from the Oracle to fit it into the Blockchain.

B. DeFi Principles

Decentralized finance is made of several principles, but we will enumerate the most important here: DeFi aims to be Accessible, Transparent, Interoperable and Business Processes Automated.

Accessibility

Accessibility encompasses the horizontal and vertical aspect of accessibility. The horizontal aspect of Accessibility is Inclusivity. DeFi aims to allow everybody to use DeFi platforms no matter their identity or their localization in the world. To this end, price to access the platforms are lower enough to avoid discrimination of entry and Know Your Customer (KYC) process is removed to keep privacy of identity. The downside from that principle is that it could lead to Anti Money Laundering (AML) issues and other financial frauds.

Nevertheless, this presents a structural limit comparatively to traditional Finance. (C. Crenshaw, 2021) The system doesn't offer any efficient method for determining the actual identity of users. Since the market is not regulated and the identity of user is anonymous, it is difficult to know if the price of assets and the trading volume reflect organic interest or if it is the result of trading manipulation from investors: users or group of users trading collusively can have many public addresses and IP addresses to manipulate, trades, and creates bots to their advantage.

The vertical aspect of accessibility is the Scalability. Scalability of DeFi platform is the capacity to keep effectiveness and security while providing a service of quality to an exponential population of users at the same time. For instance, if several people from all over the world use a Decentralized Application simultaneously, will the Dapp be able to process the transactions as fast as before and with no error neither breach of security? This matter is still being worked on and would be greatly analyzed in the potential risks section.

Transparency

Another principle of DeFi is Transparency. Transparency in smart contracts allows anyone to review the code of a smart contract, Daap, or Network. (X. Meegan and al. 2021) That principle benefits the fast-paced ecosystem evolution: engineers find open information on how to provide the exact services and can use it to reproduce and innovate faster. The availability of the code makes it also easier for the platforms to be audited.

Interoperability

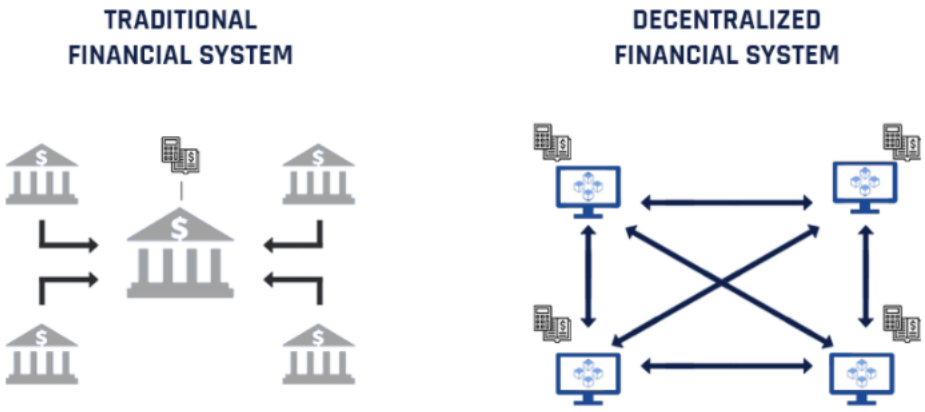
Interoperability is rooted in DeFi since Dapps on the DeFi sector creates the DeFi ecosystem altogether. Indeed, Decentralized Applications provide financial services built on top of distributed networks that have no governing authority and each Dapps is part of DeFi ecosystem. Therefore, the purpose is to make those applications interact and be connected in many aspects to enhance user interaction and increase liquidity in the sector. New protocols like bridges and layers are being created to bound major blockchains from one another.

Business Process Automated

Finally, Business Process Automated must be the most obvious principles. It allows the DeFi Industry to be totally self-operational without need for intermediation or any kind of human intervention thanks to the technology of artificial intelligence, cloud computer, DLT which are fundamental technologies of DeFi.

C. Traditional Finance System VS Decentralized Finance system

Figure 2. Traditional financial system and Decentralized financial system



Source: Stably

Traditional finance encompasses 3 core principles which are not present in DeFi ones. The system is Centralized, Regulated, and has high entry barriers.

Centralization

The traditional Finance is centralized which means that stakeholders of the market use intermediaries such as bankers, brokers, and all kind of middlemen to make both side of a market to interact with each other. All intermediary roles are regulated by the law which creates trust in the system. To incentivize the middlemen and pay for that regulation system that create trust, the services require fees to be paid by both sides of the transactions. On the opposite, Decentralized finance is built on technology. And every smart contract created are registered on a blockchain protocol that share the information of the smart contract transaction with all other computers connected to the Blockchain too. This system of shares by computer annihilates the need for an intermediary such as how it is in traditional finance, leading to disintermediation. In DeFi, people don't enter in contact with an intermediary but connect themselves to the blockchain via a

Decentralized applications that would trigger a smart contract to execute transactions between 2 public addresses or more.

Regulation

Traditional finance is monitored by rules, institutions and governments which enforces trust into the system. Investors are willing to lay their money into the market because they trust this system of regulations for protecting their assets. On the other hands, DeFi is still largely unregulated.

Exclusivity

Entry in traditional finance is very selective: Entrepreneurs that wants to create a new institution need to get all validations and reunite the right amount of money to begin a business in the sector. Same for users, the access to services is often permissioned by the amount of founds owned as well as the geographic location. For example, remittances fees between different country are greatly expensive limiting users in the amount of money to be sent out from a place to another one. Moreover, same services are not offered in every country: Many developing countries such as India cannot access long term loans or even the most trivial underbanked services. This situation wrongs them and limit their financial options.

On the contrary, DeFi is inclusive and offers to every users the same opportunities with lower fees. This promises an open financial system that could benefit people from countries with illiquid currencies or huge boundaries to financial services access due to undeveloped financial infrastructures, corrupted or unregulated field, inducing high transaction fees of all sorts to the detriment of the user. All protocol being open source, it also allows everybody able to code to enter on the DeFi sector and create a blockchain or Decentralized application to develop this new market.

II. Defi Performance

A. TVL and Market Capitalization

The metric of the DeFi's Total Value Locked is the main way to calculate the performance on the sector. It is the overall value of crypto assets deposited in a decentralized finance protocol. (B. Georges, 2022) TVL has emerged as a key metric for gauging interest in that sector of the crypto industry.

TVL includes all the coins deposited in all the functions that DeFi protocols offers like Staking, Lending or Borrowing, and acting as and Providers in Liquidity pools. TVL does not reflect the yield that these deposits are expected to earn but only exposes the current amount deposits (or collateral) of digital asset invested in DeFi. Comparatively to the market capitalization, it does not measure the market value of the Dapps neither networks.

Per the definition from Coinmarketcap: To get the current market cap, the circulating supply is multiplied by the current price while TVL is calculated by multiplying the amount of funds that are locked as collateral in the ecosystem by the current price of the assets. The increase in volume

locked in DeFi over time represents a growing confidence among the community enthusiasm for long-term potential of DeFi applications.

$$Market\ Capitalization = Circulating\ Supply\ x\ Price\ of\ Token$$

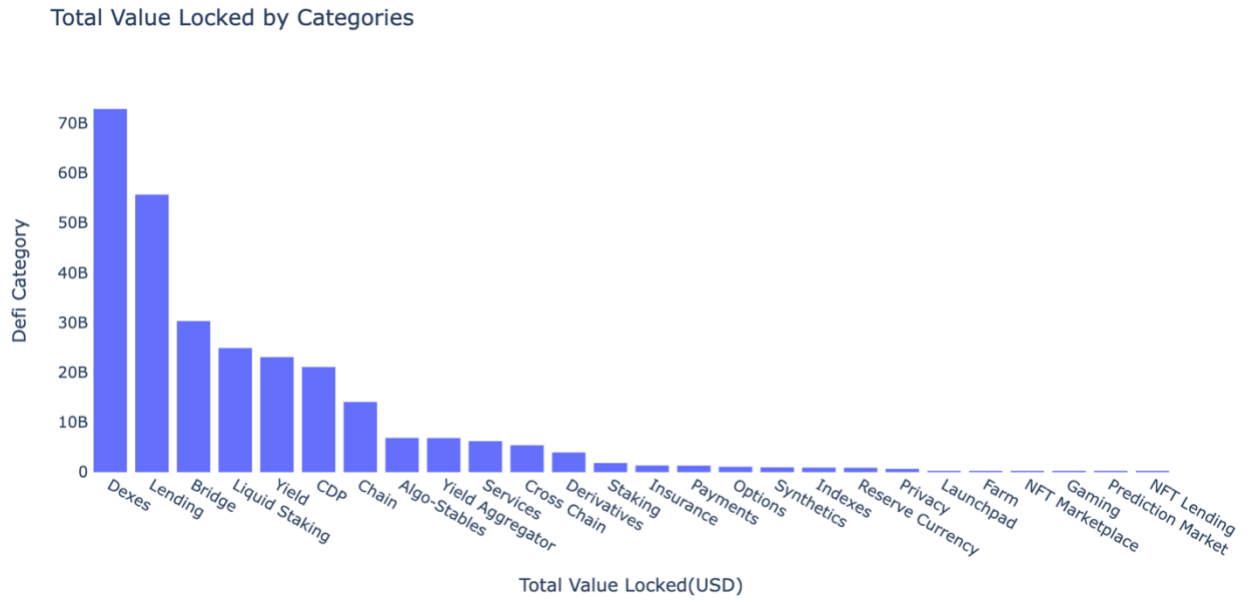
$$Total\ Value\ Locked = Funds\ deposited\ x\ Price\ of\ Token$$

B. Current state of DeFi as of April 6th, 2022

DeFi market capitalization is $168.15B according to Coinmarketcap.com on April 6th, 2022 which reveals a 13% dominance on the Crypto Currency Market.The Total Value locked in DeFi is USD 235B as of April 6th, 2022. It was USD 91.46B on April 6th, 2021, which is a rate of increase of 250% in a year according to analytics firm.

At the start of 2020, the combined TVL across all DeFi platforms was around USD 610 millions, mainly owned by Maker Dao. On April 6th, 2022, Curve is the biggest Protocol in DeFi with USD 21.25B of TVL.

Figure 3. Total Value Locked by Category

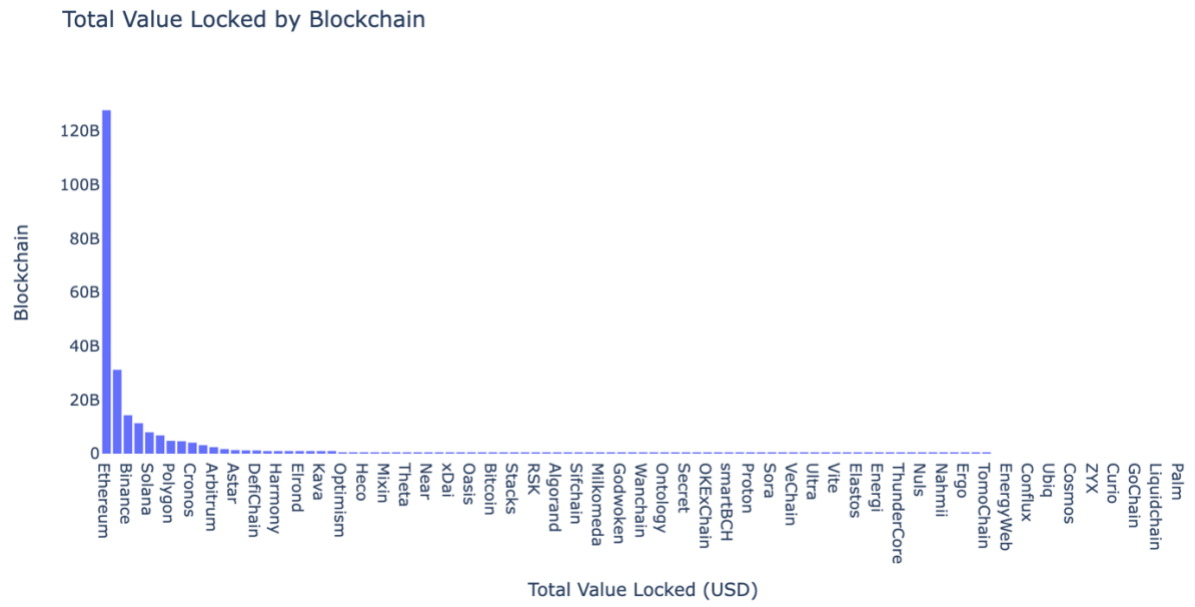


We count 27 DeFi categories as of April 6th, 2022. The outstanding ones are the Decentralized exchanges (Dexes), the Lending platform and the Bridges that sum over USD 30B Locked in their protocols. These principal categories constitute more than 50% of the DeFi Total Value Locked. Nevertheless, many categories are very new, we saw last year the infatuation that created the NFT field or even the gaming industry with its Play-to-Earn opportunities. The result of it created new

categories for DeFi. As the market is constantly moving and reinventing itself, we can expect to see new activities arise.

Source:Defillama

Figure 4. Total Value Locked by Blockchains



From a Network perspective, TVL is mainly concentrated in one notable Blockchain aggregating USD 127.7B: Ethereum. It's dominance of 43% on the Total Value Locked is tremendous and makes of it a paramount asset for the DeFi ecosystem even though other capital networks thrive too: 102 Ledgers are counted in DeFi but Ethereum, Terra, Binance, Avalanche and Solana are respectively the preeminent ones.

Source:Defillama

C. DeFi performance Analysis from April 2019 to February 28th, 2022

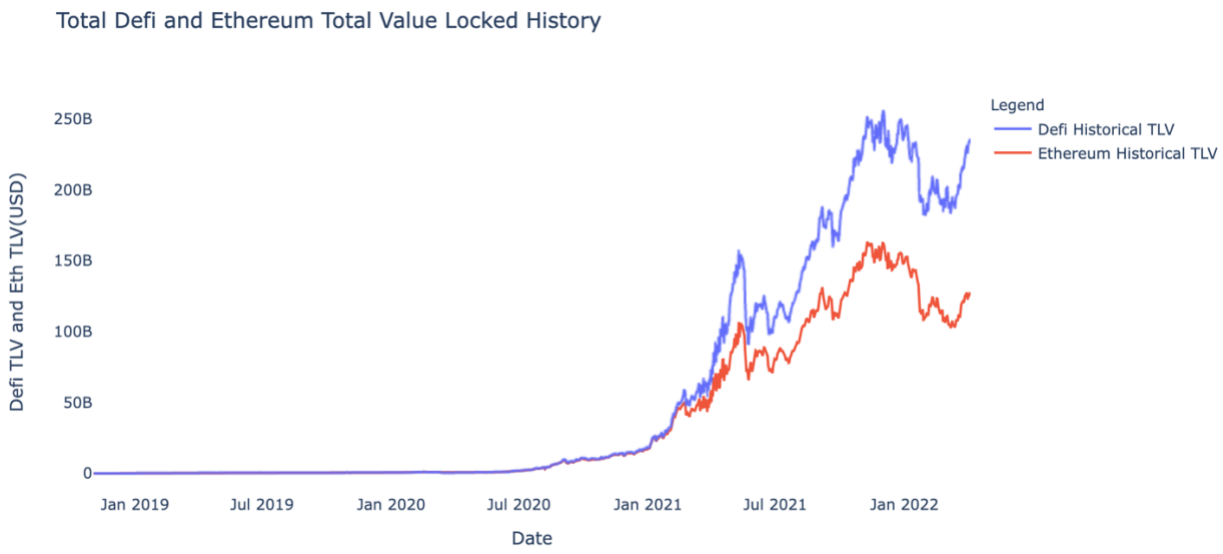
We will use a regression model to evaluate the impact of Bitcoin, Inflation, Ethereum Gas Prices, and the value lost in Exploits on DeFi's Total Value Locked performance.

We gathered the data of Bitcoin Market Capitalization from 2019 to 2022 as well as the data of DeFi TVL and Ethereum TVL for comparison. Indeeed, DeFi being part of the CryptoCurrency sector, it might be influenced by the Bitcoin Market Capitalization. We also gathered the monthly average Consumer Price Index (CPI) From 2019 to 2022. Finally, we decided to use the history of Exploits impact as well as the average daily Ethereum gas price in Gwei to check their link with DeFi overall performance.

First let's visualize what happened on the Decentralized Finance market from April 2019 to February 28th, 2022.

Ethereum and Gas fees

Figure 5: DeFi and Ethereum TVL history

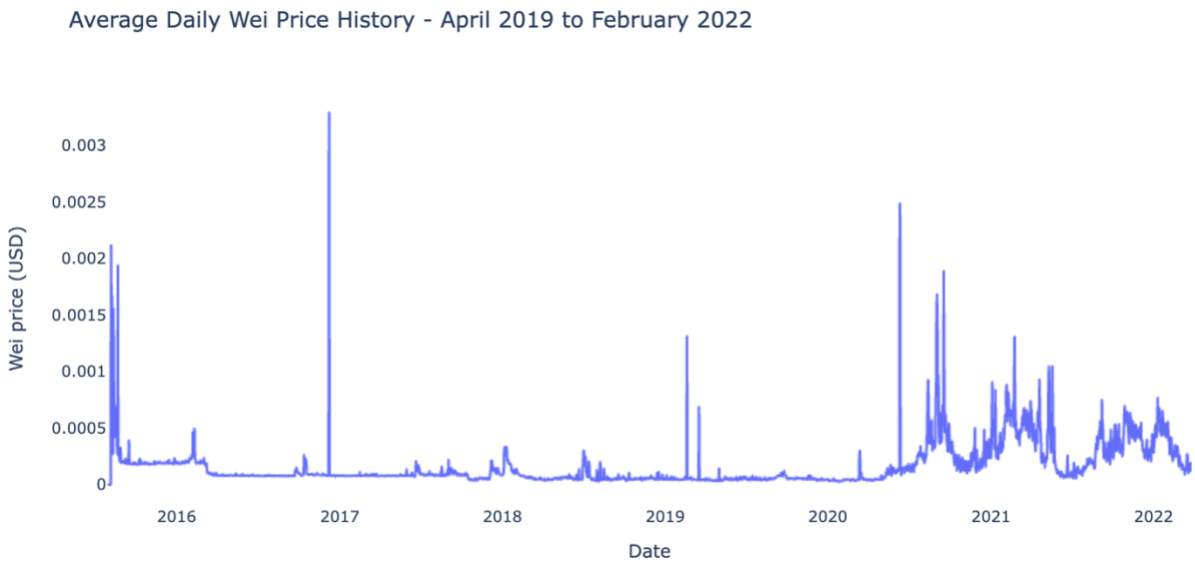


DeFi historical value began to rise during summer 2020 mainly through Ethereum network that was holding more than 90% of the TVL up until April 2021. Since then, the gap keept increasing separating the overall DeFi TVL to the Ethereum TVL even though they obviously follow the same trend. On april 6th, 2021, Ethereum own 44% of DeFi TVL. Foremost, the positive trend of those 2 metrics indicates a steady uprise trend for DeFi market but the gap widening in Ethereum share is a sign of market dynamism. New networks enter on the Market to challenge Ethereum status quo.

Source: Defillama

Ethereum's huge gas price impact user's portfolios. Those ones are tempted to invest in new blockchains, less trusted and with less liquidity but that can offer smaller transaction fees.

Figure 6: Ethereum Gwei Price History



These transaction fees on Ethereum platform, commonly denoted as Gwei represent the among of gas fees to be paid to perform activity on the chain. The Ethereum token is called Ether and is denoted by ETH. One Gwei is the same as 0.000000 001 ETH. For example, if a transaction cost is 0.000000020 ETH, you would say that the cost was 20 Gwei.Our chart is denoted in Wei, wich represent 1,000,000,000 Gwei. According to the chart those fees are very volatile. They slightly increased since May 2020, corresponding with the losses in Ethereum TVL'share to the benefit of other Chains.

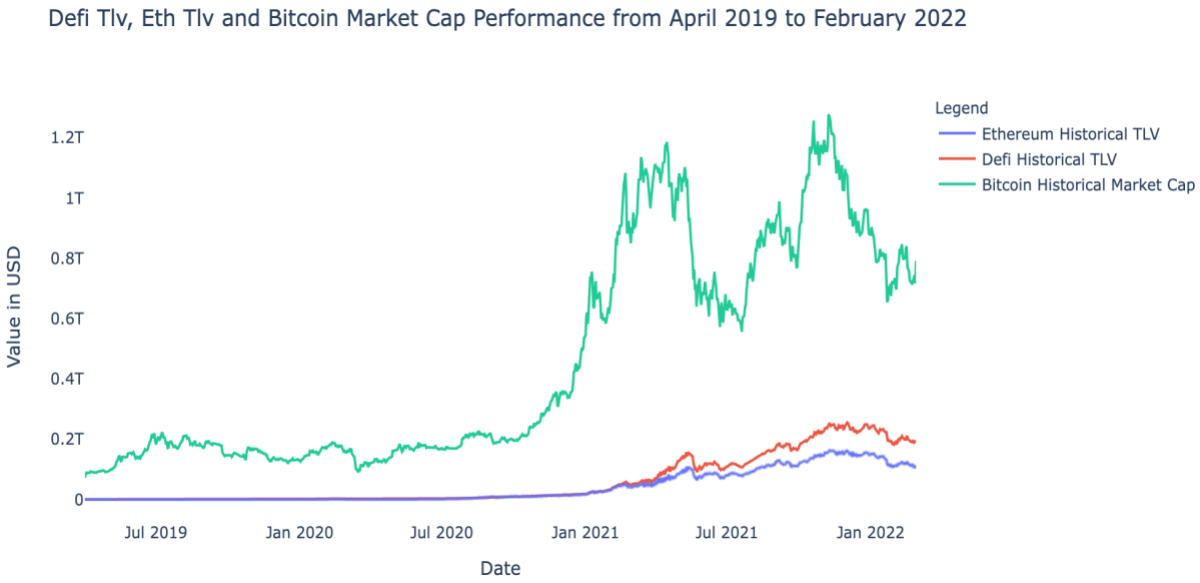
Source: Etherscan.Io

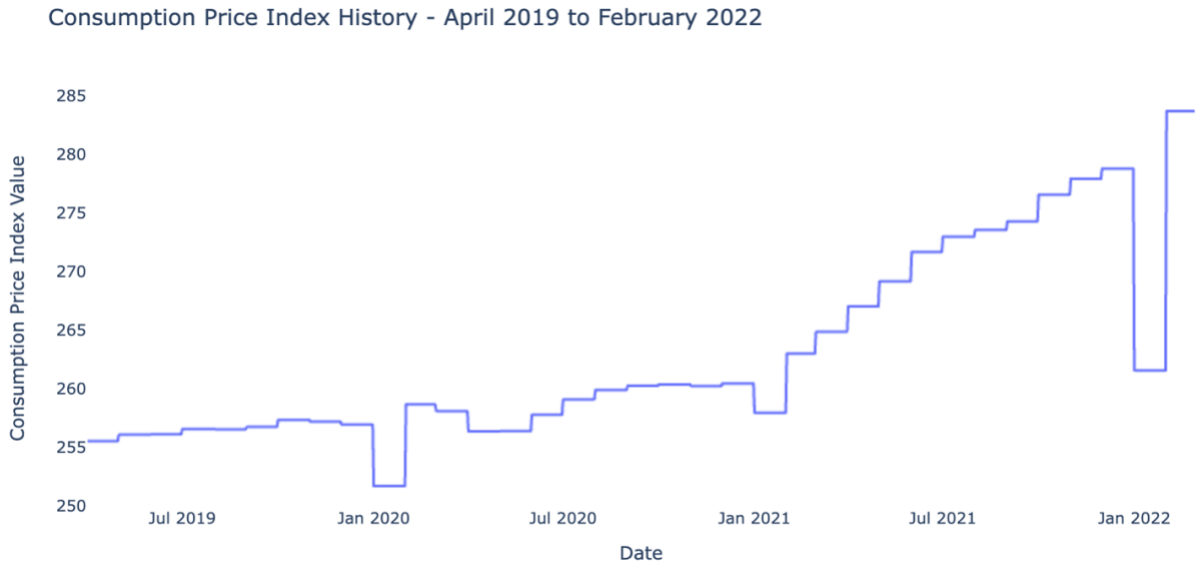
Ethereum network fees more than tripled between October 2020 and March 2021. These transaction fees were very low up until 2020, when the Ethereum network started to cope with increasing amounts and complex transactions. This coincided with the growing importance of Decentralized Finance, with more services essentially putting more strain on the cryptocurrencys network. Today's Ethereum fees represent more than 80% of the fees in Defi according to cryptofees.info. Besides, Ethereum Proof-of-Work consensus requires a lot of carbon usage which refrain institutional investors bounded by Environmental Social Governance (ESG) ethic from investing.

Cryptocurrency Impact and Inflation

Bitcoin market capitalization and Inflation index are also factors that could have impacted DeFi's TVL. Bitcoin being the biggest cryptocurrency asset, its volatility leads the entire cryptocurrency market of which DeFi tokens and coins are part of. That makes of it a paramount variable for the decentralized finance market too. The cryptocurrency market abides by external factors such as the inflation rate. Thus, comparing Bitcoin Market capitalization history as well as the history of CPI (base 100 in year 1984) to DeFi TVL performance would allow us to get an understanding of their impact on Defi's TVL.

Figure 7 and 8: Bitcoin History and Inflation History



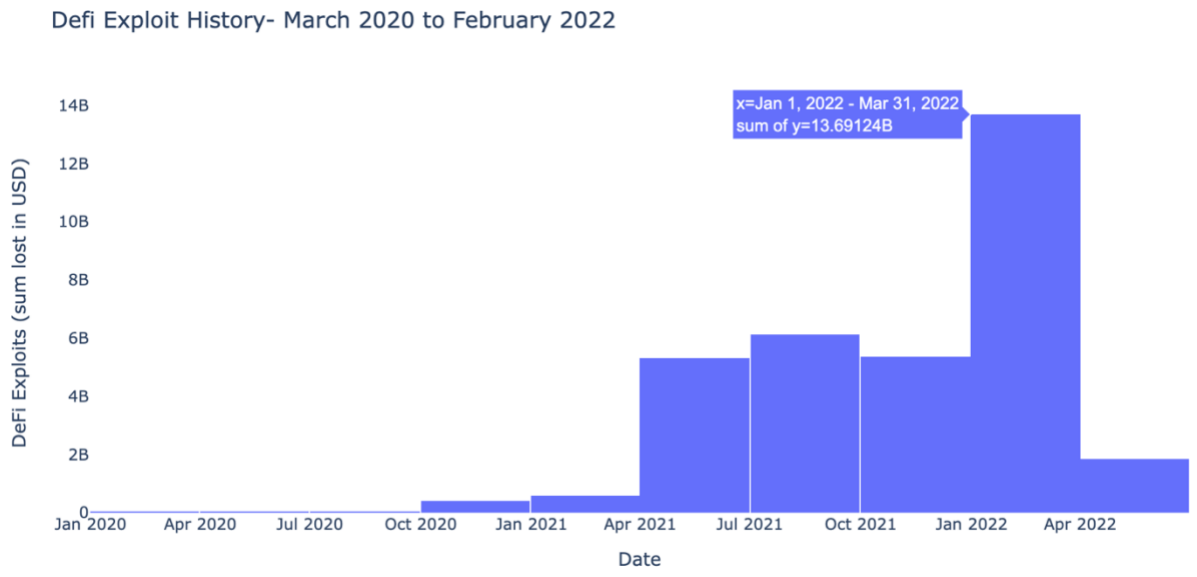


We immediately recognize a trend between the four variables (DeFi TVL, Ethereum TVL, Bitcoin Market Capitalization and the CPI). January 2020, July 2020, January 2021, and January 2022 are months that registered a regression in CPI rate and indicated a dump in the market prices metrics. This let us believe they are correlated. July 2021 is an anomaly in that case, showing a contradictory trend.

Source: Data.Nasdaq.com and Bureau of Labor and Statistics

Exploits

Figure 9: DeFi exploits history



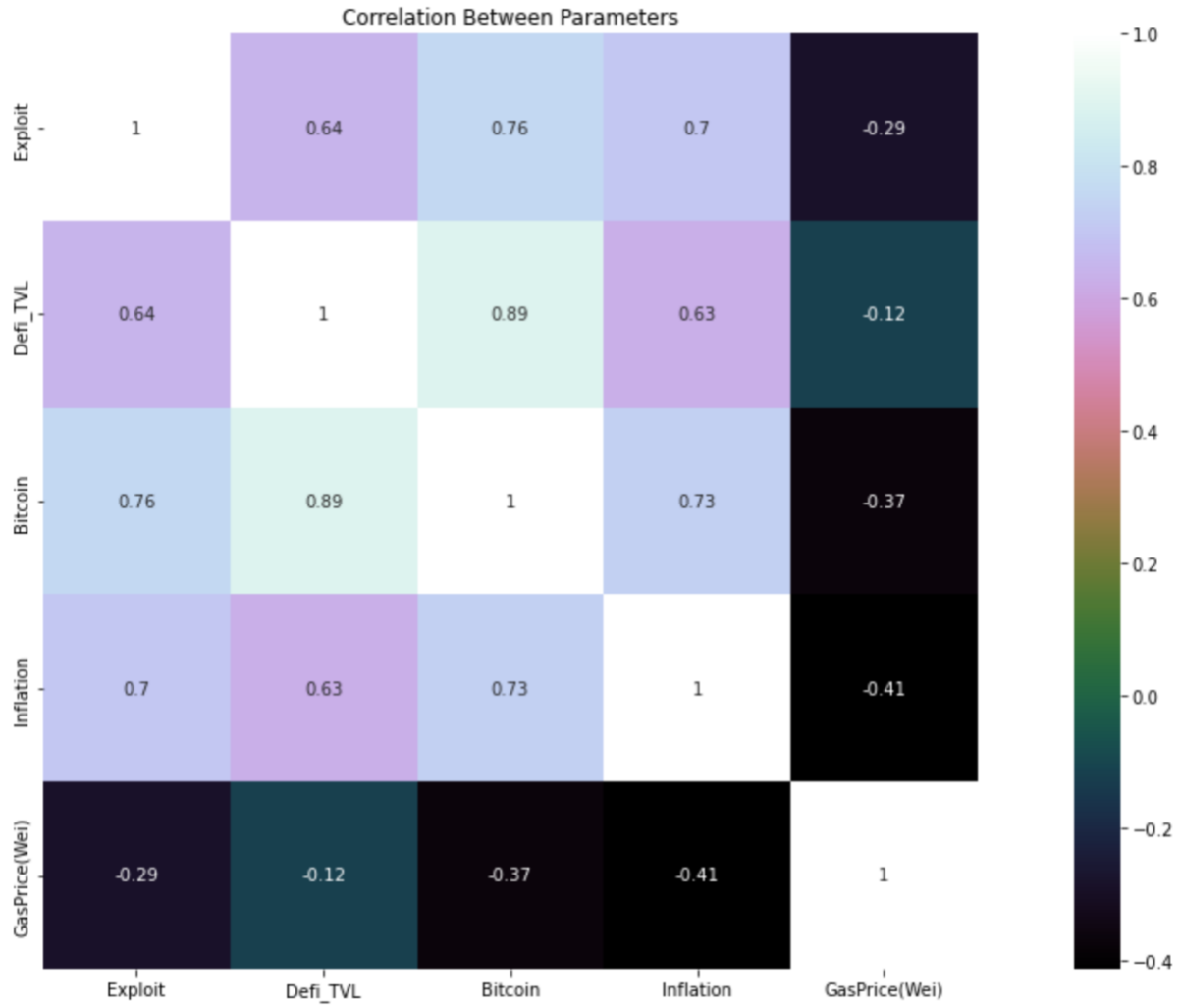
The rise in value of DeFi protocols has made the reward for successful exploits. More than $13.69B as of April 6th, 2022, has been stolen by DeFi attackers in exploit, scams and hacks according to theblockcrypto.com. The largest DeFi exploits happened to Axie Infinity Ronin's Chain that got stolen $625m in March 2022. As the hacks keep increasing it is obvious that this situation can worsen in the future if DeFi doesn't better mitigate this risk.

Source: theblockcrypto

D. Multiple Linear Regression Model

A regression model will be used to evaluate how much each variable explains the Total Value Locked in DeFi. Although Ethereum has been visualized, we will not integrate it in our model for multicollinearity avoidance with Bitcoin Market Cap variable. The multiple regression equation would describe how the dependent variable DeFi TVL (y) is related to the independent variables (x). Here is the data used:

Figure 10: Correlation Chart between variables of the model



As expected, Bitcoin is strongly correlated to DeFi TVL. Inflation and Exploits variables plays their role too even though it is weird to see the exploit value positively correlated to the TVL but the Gas Price value seems off, certainly because of its small values and the light variance in its distribution comparatively to the other variables. We will keep it in the model to avoid overfitting the model too much, which could fail to predict future reliably.

Source: Author's Github

We will use the OSL of Least Squares method of Regression that is used to develop an estimated multiple regression equation: the method uses sample data to provide the values of $b_0, b_1, b_2, \ldots b_n$ that minimize the sum of squared residuals to better fit the data.

$$\min \sum_{i=1}^{n} (y_i - \hat{y}_i)^2 = \min \sum_{i=1}^{n} (y_i - b_0 - b_1 x_1 - \cdots - b_q x_q)^2 = \min \sum_{i=1}^{n} e_i^2,$$

Estimated multiple linear regression:

For $\hat{y}$ = Dependent Variable and $b_0, b_1, b_2, \dots, b_n$=Estimates, the multiple regression equation describes how the mean value of y is related to $x_1, x_2, \dots x_n$.

$$\hat{y} = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5$$

$$\hat{y} = DeFi\ Total\ Value\ Locked$$

$b_0 = Constant,$ $x_1 = Timestamp,$ $x_2 = Exploit,$
$x_3 = Bitcoin\ MCap,$ $x_4 = Inflation,$ $x_5 = GasPrice\ (Wei)$

Implementation:

$$\widehat{Defi\ Total\ Value\ Locked} =$$

$$b_0 + b_1 Timestamp + b_2 Exploit + b_3 Bitcoin\ Mcap + b_4 Inflation\ Rate + b_5 GasPrice(Wei)$$

Model Results:

OLS Regression Results			
Dep. Variable:	Defi_Tlv	**R-squared:**	0.823
Model:	OLS	**Adj. R-squared:**	0.812
Method:	Least Squares	**F-statistic:**	76.58
Date:	Tue, 05 Apr 2022	**Prob (F-statistic):**	4.52e-24
Time:	04:27:16	**Log-Likelihood:**	-1298.1
No. Observations:	71	**AIC:**	2606.
Df Residuals:	66	**BIC:**	2618.
Df Model:	4		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
Timestamp	163.0875	5758.061	0.028	0.977	-1.13e+04	1.17e+04

Exploit	-0.0142	0.010	-1.448	0.152	-0.034	0.005
Bitcoin	0.0021	0.000	11.892	0.000	0.002	0.002
Inflation	1.963e+05	1.66e+07	0.012	0.991	-3.3e+07	3.34e+07
GasPrice(Wei)	1.725e+10	7.11e+09	2.426	0.018	3.05e+09	3.15e+10

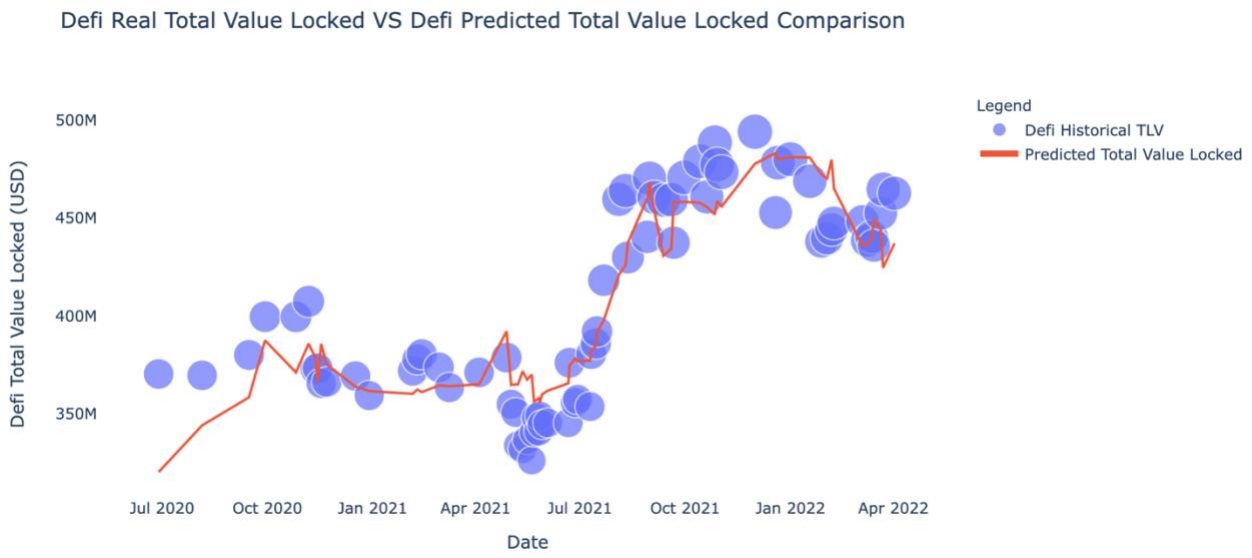
Omnibus:	1.433	**Durbin-Watson:**	0.728
Prob(Omnibus):	0.488	**Jarque-Bera (JB):**	1.188
Skew:	0.112	**Prob(JB):**	0.552
Kurtosis:	2.407	**Cond. No.**	3.22e+14

Model Predicted:

$$\widehat{Defi\ Total\ Value\ Locked} = 581{,}594{,}813 + 163.087\ Timestamp - 0.014\ Exploit + 0.002\ Bitcoin\ Mcap + 424{,}669\ Inflation\ Rate + 17{,}388\ GasPrice(Wei)$$

Model is explaining 82% of the Total DeFi value according to statsmodel library and the model parameters. Exploits happened to be negatively correlated to DeFi and it makes more sense.

Figure 11: Multi linear regression prediction



From the graph we see that the predicted value's trend is quite close to the actual scatter point describing the actual value. Therefore, we can say that the date, the number of exploits, the bitcoin market capitalization value, the inflation rate as well as the gas price are parameters explaining the Total value Locked for DeFi.

Source: Author's Github

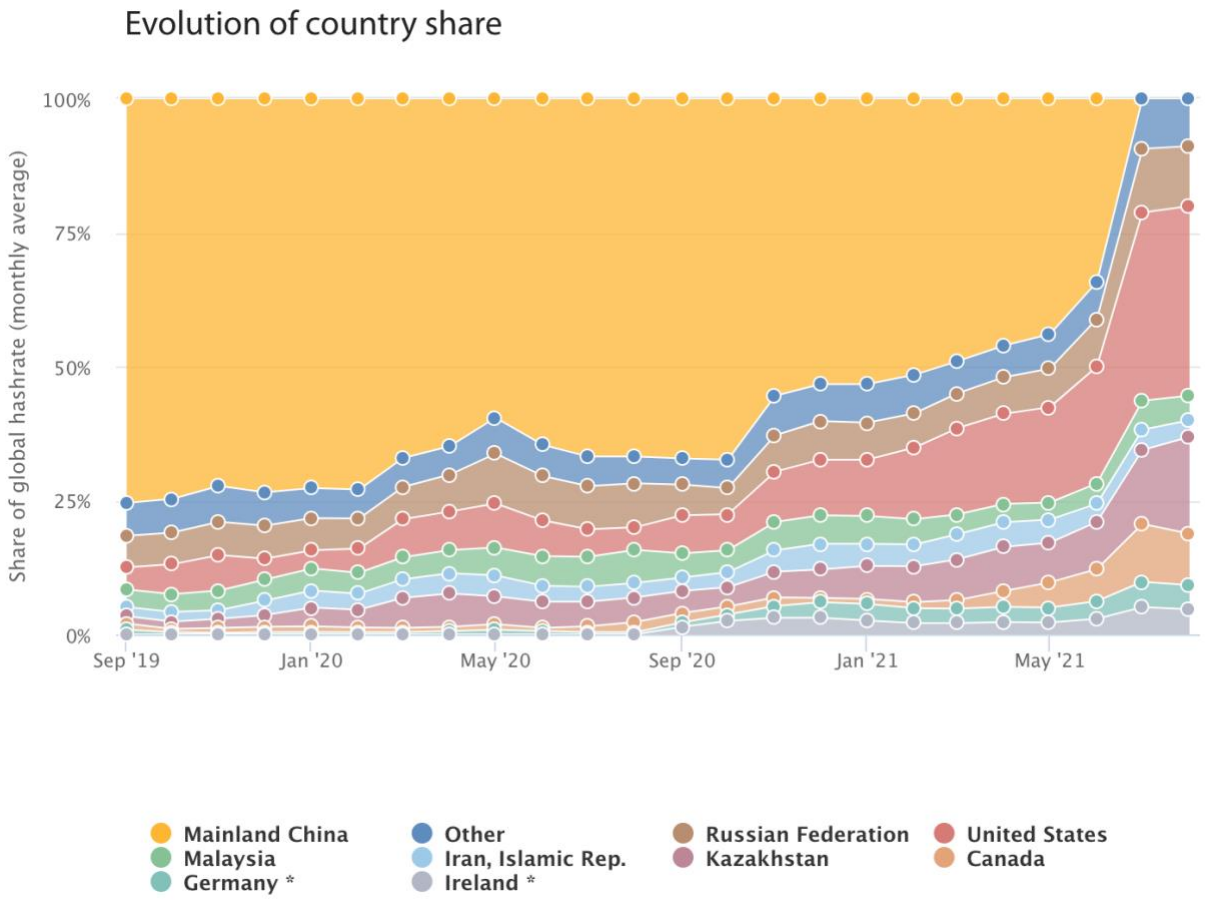
The regulation factors

18% is not explained by the model. That gap remaining can be related to non-numerical data that affected the market in 2021 such as Regulation and Environmental Social Governance (ESG) concerns.

In Mai 2020, China government declared they would ban the Cryptocurrency mining definitively from its country. According to M.Sigalos 2021, Beijing made it clear that crypto mining stands in the way of its aggressive climate targets, as it pushes to achieve carbon neutrality by 2060. Besides, the government also argue that it opens the door to financial crime.

Unfortunately, this led to a huge crash of the Bitcoin price that created a domino effect on the crypto market in general.

Figure 12: Cambridge Bitcoin Electric Consumption Index by Country



75.5% of the mining shares were occurring from IP addresses located in China before the announcement. Today, this figures average zero percent for China.

The graph unveils also the new importance of Kazakhstan in the bitcoin ecosystem as they own 13.1% of the mining space (network hash rate) which makes of them the second largest share older behind the United States of America (35.5%) as of April 2022, according to the Cambridge Center for Alternative Finance. This revelation urges to keep an eye on the political regulation in place in the country.

Source: ccaf.io

III. The future of DEFI: Opportunities & Risks

DeFi is at its infancy and will develop itself even more in the next time but will surely encounter many challenges. Before it becomes widely accepted and used, the sector needs to abide by the politic establishment. Cybersecurity and Tech Innovation, Environmental issues, Monetary policy, Crypto regulations, and CBDCs are topics that would be addressed to define future of DeFi.

A. Cybersecurity

DeFi TVL trend showed that despite the drawbacks, the sector intends to keep thriving to innovate and always offer better services to its users. To continuing performing, Decentralized Finance must equip itself against hacking risk occurrence.

First, it is of primary importance to recreate an environment of safety to limit exploits. The value lost to hacks and exploits crossed the billion-dollar in late 2021, making it clear that meaningful security remains a challenge for the industry. The proliferation of hasty forks, unaudited deployments, and outright scams led to hundreds of millions of dollars of unnecessary losses. Certik Auditor 's State of DeFi Security Report 2021 declared that Centralization issues were the common attack vector. Auditors came across 286 discrete centralization risks throughout the 1,737 audits performed in 2021. Centralization is antithetical to DeFi and poses major security risks as single points of failure can be exploited by dedicated hackers and malicious insiders alike. This underscores the importance of decentralization and highlights the fact that many projects still have work to do to reach this goal. Especially now that we saw the bound between exploits and DeFi.

The creation of multi-channel and cross channels can also be a risk for DeFi especially because of their poor code. The EVM is an important aspect of the cross-chain model that allows other networks to communicate with Ethereum. So far: four major EVM-compatible blockchains: Avalanche Contract Chain (C-Chain), Binance Smart Chain (BSC), Fantom and Polygon. The creation of rollups (zero-knowledge and optimistic roll-ups) or Layer 2 protocols, which enter in relationship with Layer 1 blockchains, promise lower transaction fees and faster transactions while leveraging the security of the underlying base layer. In addition, with Polkadot and the Cosmos Inter-Blockchain Communication Protocol (IBC), there are efforts to establish a network of different blockchains capable of communicating with each other. Finally, interoperability between different blockchain ecosystems through bridges and cross-chain protocols is also being worked on diligently. Theses technologic improvements are a path toward a more user-friendly ecosystem that promote user adoption. Nevertheless, it still represents a risk to develop an even more complex environment creating more breaches from new service processes like Bridges. DeFi needs to be cautious to protect digital assets locked on their platforms. Indeed, the Ethereum Blockchain creator V. Buterin explained in a reddit post the reason why he believes the cross-chain can bring more damaging hacks than hacks happening on Layer 1 or layer 2 networks; As Bridges channels are not fully backed by any Blockchain consensus, they cannot retrieve users' money if they get hacked, which make them vulnerable. On the contrary when the that same attack occurs on a blockchain, it would just have invalidated the transaction but at least the value of our money would not be lost.

B. Environmental Social Governance

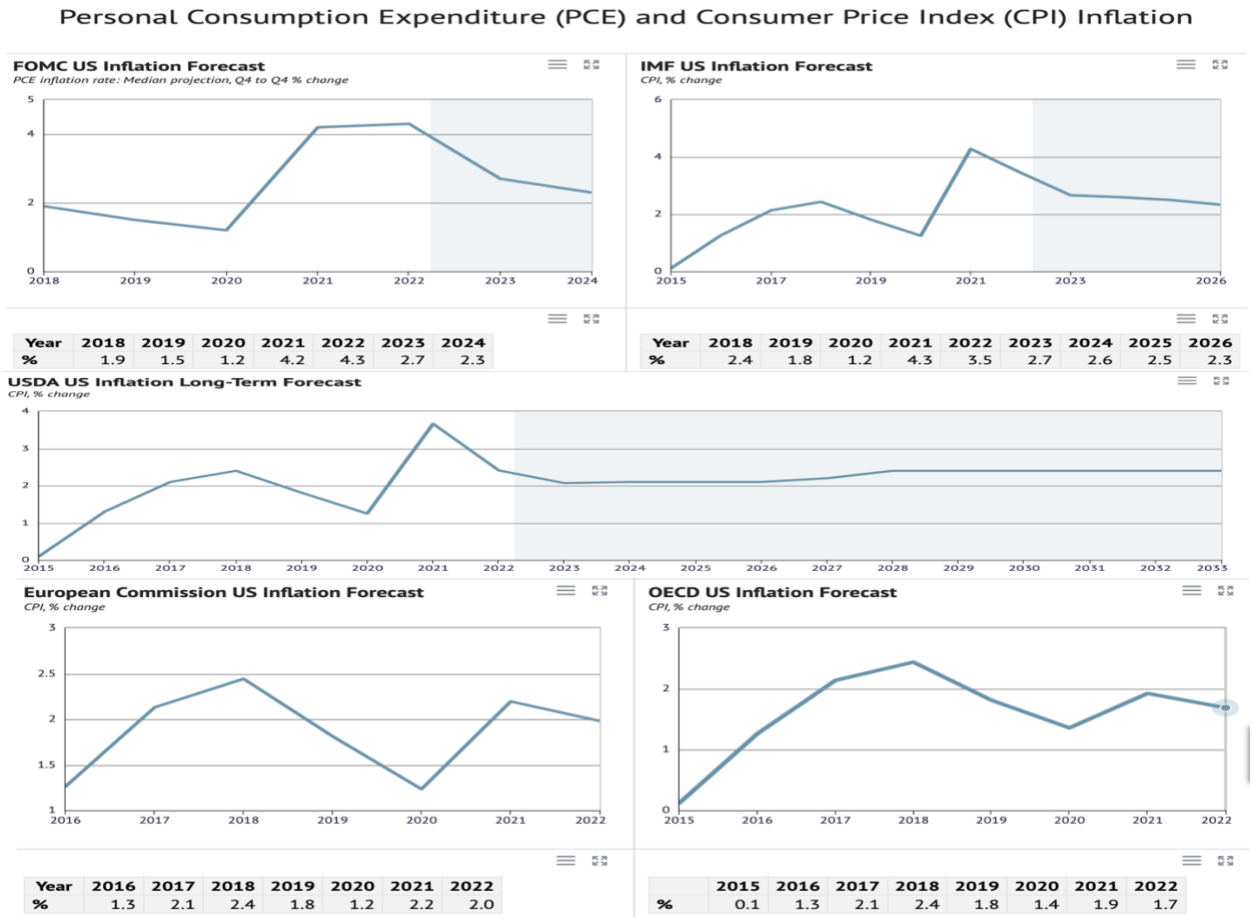
Ethereum's transition from POW to POS consensus can be a growth opportunity for DeFi future performance. Ethereum has a high carbon footprint due to POW method, which creates debates

about the legitimacy of investing in the blockchain and in DeFi in general. This ESG concern is major notably for investors trying to avoid environmental risk but compliance risk from their respective governmental institutions. For instance, Tesla that announced in May 2021 that it will no longer accept Bitcoin over climate concerns. Once major Cryptocurrencies such as Bitcoin and Ethereum would be safer for the environment, more investors would be interested in their value. When Ethereum transitions to POS, a powerful hardware would not be needed to create the transaction on the network, making that blockchain eco-friendly and opening the door to high value investors such as VC, hedge fund, Dao, private equity to increase the market capitalization of that coin and lead to a greater DeFi influence. Moreover, transaction fees on the channel would be less expensive and therefore would lead to enlarge the community usage.

C. The Inflation

As seen in our regression model, DeFi reacts to inflation fluctuations. Therefore, inflation's trend would certainly impact DeFi Total Value performance in the future. The price of Inflation has been anomaly high these last two year mainly because of the global covid outbreak but the prices have been predicted by many authorities to go back to its normal state.

Figure 13: IMF, FOMC, European Commission, OECD and USDA's Inflation Prediction



Year	2018	2019	2020	2021	2022	2023	2024
%	1.9	1.5	1.2	4.2	4.3	2.7	2.3

Year	2018	2019	2020	2021	2022	2023	2024	2025	2026
%	2.4	1.8	1.2	4.3	3.5	2.7	2.6	2.5	2.3

Year	2016	2017	2018	2019	2020	2021	2022
%	1.3	2.1	2.4	1.8	1.2	2.2	2.0

	2015	2016	2017	2018	2019	2020	2021	2022
%	0.1	1.3	2.1	2.4	1.8	1.4	1.9	1.7

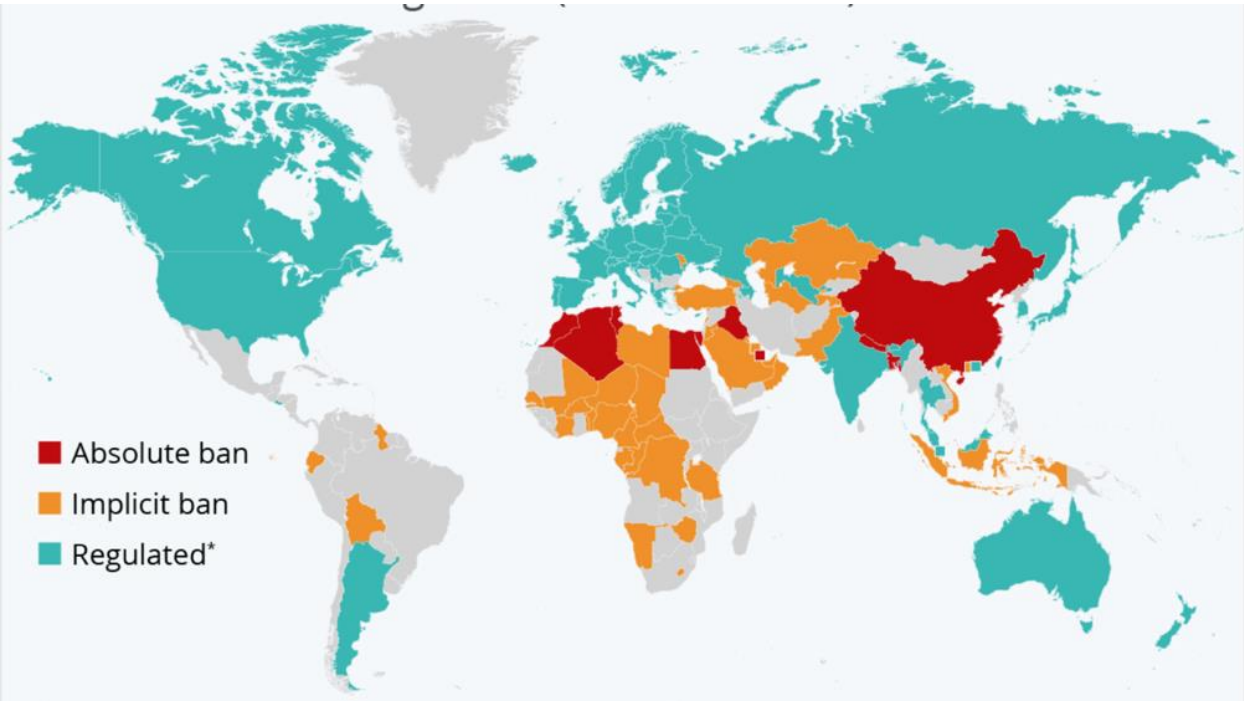
Indeed, according to the Inflation prediction aggregator Knoema the IMF, The FOMC, the European Commission and the OECD and the USDA, put the US CPI inflation within the range of 1.69% to 4.30% percent in 2022 and around 2.5% in 2023. Almost all agencies predicted that CPI inflation will decrease in 2022 compared to 2021. According to the regressor model that we used, that change would lower the increase of DeFi TVL.

Source: Knoema

D. Crypto Regulations

The regulation aspect is the variable that could create the biggest impact on DeFi. It would redefine the rules of investment and deposits of collateral in Dapps. Fear uncertainty and doubt results from not knowing whether a country would one day release a regulation in favor or in disfavor of DeFi.

Figure 14: Global States of Cryptocurrency Regulation by Country



Many Countries already declared themselves favorable to the crypto currency adoption such as El Salvador where Bitcoin has been declared official currency since 2021 by populist president N. Bukele. On the other hand, China decided to outlaw cryptocurrencies according to the Law Library of Congress, 9 other countries decided to forbid access to the Crypto currency market from their citizen by totally banning it.

Source: Library of Congress

On a US focus, we are waiting for the Lummis bill to be enacted. That regulation would govern the cryptocurrency market, protect the crypto investors and even regulate the stable coins. As federal bill, it would be overseen by the Security and Exchange Commission as well as the Commodity Futures Trading Commission.

The bill created by Ron Wyden and Cynthia Lummis senators advocating for innovation could be auspicious for the crypto stakeholders but result of it would depend on its final version adopted by the senate.

"Digital assets are here to stay in our financial system and the decisions we make now will have impacts far into the future," Senator Lummis said. "We need to be fostering innovation, not stifling it, if we are going to maintain America's position as the global financial leader. I'm proud to introduce this bipartisan bill to ensure that our tax system reflects the realities of digital assets and distributed ledger technology."

Regarding the European Union, the Market in Crypto-Asset (MiCA) regulation is currently in creation by the parliamentarian Stefan Berger. According to the European Parliament, the initiative aims to support innovation and fair competition by creating a framework for the issuance, and provision of services related to crypto assets. In addition, it aims to ensure a high level of consumer and investor protection and market integrity in the crypto-asset markets, as well as addresses financial stability and monetary policy risks that could arise from a wide use of crypto-assets and DLT-based solutions in financial markets.

All these regulations happened during 2021 or are currently on the blink of happening. It premises many changes that could propel DeFi ecosystem to a faster maturation by leading to less volatility in the market and a steadier increase but also reinsure investors now that the market is regulated.

E. CBDC

Last but not least, many countries got inspired by the blockchain technology and plan to creates a new type of token based digital money called Central Bank Digital Assets (CBDC). This would be an alternative payment pegged on sovereign currencies to the already existing current card and bank base payment system.

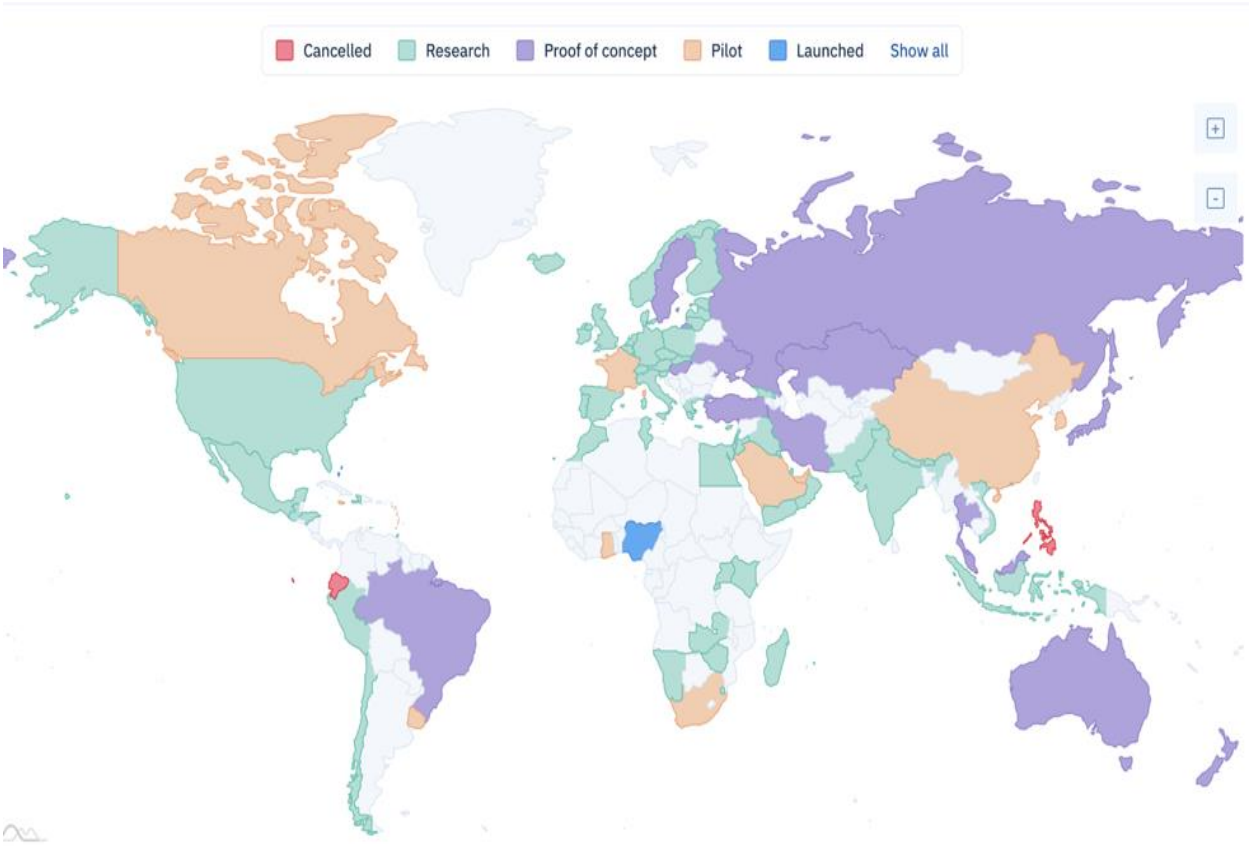
According to Citi Bank report on FUTURE OF MONEY Crypto, CBDCs and 21st Century Cash (2021), government token could improve targeting of monetary and fiscal policy, promotes inclusion and universality, reduce cost especially for remittances transfer costs, and improve efficiency in domestic payments. Moreover, comparatively to the Decentralized Finance, it improves management of financial crime risks and informal economy.

Only Bahamas and Nigeria have created their CBDC. The Central Bank of Nigeria (CBN) launched the eNaira in 2021. That CBDC is a liability of the CBN. It also uses the blockchain technology and is stored in digital wallets. It can be used for payment transactions, and it can be transferred digitally to anyone in the world with an eNaira wallet (J.Ree, 2021). However, the eNaira features stringent access right controlled by the central bank. Moreover, unlike crypto

assets, the eNaira is not a financial asset in itself but a digital form of a national currency and draws its value from the physical naira, to which it is pegged at parity.

Biggest world economy like China started developing its Digital Currency Electronic Payment (DCEP) CBDC in 2014 and tested a pilot in 2020. We expect China's sprint to a cashless society will drive DCEP adoption for retail use within five years. USA with the Diem and European Union with the digital Euro still are on a state of research so far.

Figure 15: Central Bank Digital Currencies Status – April 2022



As seen on the chart, CBDC is still at its genesis and will be an impactful innovation in the traditional financial system. The future tokenized and account-based money, centralized and decentralized systems, will all co-exist which might greatly impact DeFi performance in the future.

Source: https://cbdctracker.org/

IV. Conclusion

DeFi offers many good opportunities to its users but like every revolution as its commencement, it hurt itself to decisive interrogations for it future. The concerns discussed before such as security, ESG, inflation, and technologic evolution would determine the exact Total Value Locked that we could expect in DeFi for the next years. The sector increased of more than 250% in two year and that phenomenon can potentially continue to increase as such until regulation and new monetary systems entry arise, but it would certainly reduce its rate of increase after those events unfold. That would be a sign of market stability, with less volatility, more security and a regulation frame well established to protect its users. Moreover, we can prepare ourselves to attend an unprecedented financial system shift as for the first time ever, the world would experience, the traditional financial system, the decentralized financial system, and the government's digital money.

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