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Ethereum Valuation

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Abstract

This study presents a four-part method for evaluating Ethereum according to "digital currency", its "payment platform", "decentralized financial services", and its "blockchain infrastructure". The valuation of each stage is conducted separately, given the distinctive nature of each element. The basic idea is that we compare these four parts to similar types of assets or systems. The bench-marking object for comparison in this paper are: Bitcoin(BTC), PayPal, bank valuation model, Fintech company and public utilities ETF. The model produced for this study will, therefore, based on the latest data, provide an approximate valuation of Ethereum.

ACKNOWLEDGMENTS

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Part I

Introduction and Conceptions

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The "Ethereum Whitepaper" was first published in 2013 by Vitalik Buterin – the founder of the project – who subsequently presented on the subject at the Bitcoin Miami conference in 2014. Vitalik revealed that Ethereum is essentially an open-source, public platform for blockchains that allows users to write smart contracts (which are able to be automatically carried out through code). ETH, the cryptocurrency of the Ethereum system, is used for point-to-point contracts through the Ethereum Virtual Machine (EVM) which is, crucially, decentralized, and executes the afore-mentioned smart contracts. This allows the cryptocurrency – which is not regulated by any overarching institution - to be transferred to wherever, whomever, and whenever it needs, immediately. Transactions and contracts carried in this system necessarily use up energy (or, "gas"), and the amount of energy thus determines the relevant transaction fee that constitutes a reimbursement for the energy used in the process of mining – as will be discussed further in the next section of this dissertation.

When he developed the concept of the "smart contract" Nick Szabo began with the format of a "vending machine" in order to explain the process of programming specific contract terminology into various systems, whereby if the correct amount of money is inserted, the desired good will be delivered. In "smart contract" terms, this means that value is contained, but will only be delivered when the appropriate terms are fulfilled on the Ethereum platform. The outcome will be consistent for all users as the smart contract is made up of a section of code that functions on the blockchain, and can subsequently allow for the decentralization of different web applications (Dapps), such as games, or the creation of virtual spaces, and cryptocurrency financial services. In founding this web applications

on blockchain technology and cryptocurrency, and through decentralization which ensures that they are not controlled by any vested interests, users are more likely to feel that they can trust Dapps. Dapps stored on Ethereum must operate through the program, in a Turing-complete programming language that enables users to create their own systems.

Despite the recent proliferation of trading platforms in the industry, Ethereum has remained popular, as it enables and facilitates blockchain innovation. As Ethereum has created an important cryptocurrency platform, further research into the platform can provide useful insights into how to ascertain the value of other cryptocurrencies developed in the future.

Ethereum is currently second only to Bitcoin in terms of its market capitalisation, and thus has demonstrated rapid growth, and has generated significant enthusiasm in the industry. As such, it is likely that Ethereum's financial worth will continue to increase.

1.2 Project structure and Aims

The main objective of this project is to construct a suitable model to evaluate Ethereum and, subsequently, to approximate the worth of Ethereum based on the most up-to-date data available.

Essentially, this project proposes the reduction of Ethereum's value to four constituent elements, and for the value of each element to be ascertained separately. The total value of the following four elements combined will, therefore, represent the overall value of Ethereum:

1) Digital currency

   Ethereum's currency, Ether (ETH), has been assigned a monetary value as a result of Ethereum's unique form of transaction and the nature of blockchain tokens. As such, on the Ethereum platform, ETH can be utilised for the following purposes:

   - To pay "Gas fees", which refers to the price of the transaction in terms of how much energy it consumes;

   - • Users can pledge ETH in order to receive other open finance digital currencies such as MakerDAO in return;

- • To purchase other tokens or collectibles within the Ethereum platform.;

- • ETH can be awarded in recompense for services rendered. Using Gitcoin on Ethereum, for instance, collaborators are compensated for their input on open source products;

2) As a payment platform

Fiat payments carried out on blockchains are becoming increasingly popular and, due to the large number of stablecoins pegged to Ethereum, the platform is being used more frequently for fiat payments. In order to make a payment using a stablecoin as currency, for example, an Ethereum user is presented with a variety of alternative methods and has a number of wallets to choose from. The competitive stablecoin market enables Ethereum to maintain high quality at a low price and, as it is programmable, transactions can be abstracted using minimal data. The use of legacy rails in the production of rewards and tokens can be a complex and costly process as they require multiple systems. Ethereum, however, can accomplish this process more quickly and effectively by using smart contract code, giving the platform a particular value in the market place.

3) Ethereum's Development Values

As a blockchain-based platform, Ethereum has been created in order to allow programmers to create Dapps and, as such, is considered an appealing platform for many developers, with a similar appeal to that of the Apple store. In particular, Ethereum's use of Turing-complete language draws developers as it can support more complex logic, including smart contracts, which are central to the platform's success. It is important to note, however, that whilst the potential for constructing arbitrarily complicated smart contracts is appealing, a higher complexity can also lead to a higher propensity for error, and a more costly "gas fee". At present, Ethereum is the basis for the majority of blockchain projects, there are more than 250,000 developers in the Ethereum community, and more than 90 percent of the top 100 projects by market capitalization are based on Ethereum according to statistics. It is thus clear that in today's market, Ethereum is particularly successful and holds considerable development value.

4) The value of equity token

Ethereum's considerable development value is thus reflected in the value of its equity tokens. This is particularly apparent given the 2017 bull run that Ether enjoyed as a result of the large number of projects using tokens on the Ethereum platform. Different from the financial services running on the blockchain, The value of this part is reflected in Ethereum as a non-financial blockchain infrastructure, such as the governance of

decentralized autonomous organization (DAO) [1].

According to these particularly valuable elements of Ethereum, we should be able to approximate the total value of Ethereum by combining the values of the following elements:

- ETH, the value of which will be deduced through comparison to BTC;

- The Ethereum platform, the value of which will be ascertained in comparison to PayPal;

- Ethereum's value as a host for financial services;

- The platform's infrastructure, which will be evaluated in comparison to utilities Exchange Traded Funds (ETFs).

For the purpose of this study, the values of ETH and BTC will be determined according to a number of key attributes of digital currencies, whereas the subsequent three elements will be valued by calculating the Price-to-Earnings (PE) ratio. The individual elements that constitute the overall value of Ethereum will all be compared to the relevant valuations (such as PE ratios) of other products and systems. The "earnings" considered in the PE ration for Ethereum will be calculated using the "gas fees" charged for transactions; this will be discussed in more detail in a dedicated chapter later in this dissertation. Essentially, though, these fees can be divided into its different usages, and subsequently, PE ratio can be used to define their weights. It is crucial that we distinguish each possible variation of a smart contract as this will allow for the precise categorization of the gas fees. In doing so, the principal aim of this study is to examine the reasons behind incorrect estimations of Ethereum and to provide a more competent model for its valuation.

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[1]DAO is a decentralized organization with no management and decision-makers. All decisions are made by the wisdom of the masses, and they are put into practice after being tested by a set of rules. Its foundation is Ethereum

CHAPTER 2

DATA DESCRIPTION

2.1 SOURCE

In order to compare Ethereum with other companies or systems by function, we need a large number of indicators and data to support it. Blockchain is an open source system, everyone can get all the information on the chain. However, due to hardware and technical limitations, we can only rely on data provided by third-party websites for comparison and analysis.

The data we use mainly comes from the website Coin Metrics. This Boston-based website was established in 2017 by Tim Rice, Nic Carter, Aleksei Nokhrin, Jacob Franek and Alexander Bich. Coin Metrics is committed to providing analysts, investors, fund managers, and researchers with on-chain and off-chain crypto asset market data, so that relevant practitioners have a deeper understanding of the trends in the crypto market. [https://www.coindesk.com/company/coin-metrics]

Coin Metrics' services mainly include network data, indexes, reference rates, visualization tools, market data feeds, a Twitter sentiment feed, among others. It also publishes a weekly newsletter "State of the Network" and in-depth reports on a range of crypto market topics.

CHAPTER 3

CONSENSUS MECHANISM

"Consensus mechanisms" (which are also referred to as "consensus algorithms") are used to come to a general agreement on the condition of the platform without recourse to a centralised power structure. The main purpose of these mechanisms is to ascertain the legitimacy of transactions and data entered into the ledger and subsequently onto the blockchain.

These mechanisms can take numerous forms when used in relation to cryptocurrencies. The forms are determined by the particular characteristics necessary in reaching consensus. In order to provide a foundation for this study, therefore, this chapter will outline three consensus mechanisms that are most commonly employed in relation to blockchains. These mechanisms are Proof of Work (POW), Proof of Stake (POS), and Delegated Proof of Stake (DPOS). The number of consensus models that have been developed to require less energy subsequent to the creation of Bitcoin can be viewed as a roof that reaching a consensus that does not necessitate excessive computational or electrical resources. In fact, interestingly, many of these models can be said to have a minimal ecological impact.

3.1 PROOF OF WORK (POW)

Ethereum currently uses a system called "Proof of Work". The POW system helps to protect Ethereum from potential economic threats, as it constitutes a consensus on the condition of the information that can enter Ethereum's blockchain.

By requiring proof of a specific amount of exertion (significant but not enough to deter users), this system prevents senseless or mal-intended actions being carried out through the use of computer power. This allows the network to block the creation of spam or

denial-of-service (DoS) attacks intended to shut down the network. This is an adaptation of Hal Finney's 2004 invention "Reusable Proofs of Work" (RPOWS) which was first applied to cryptocurrency by Bitcoin in 2009, with Finney even being the first person to receive a payment in Bitcoin. Since then, a large number of cryptocurrencies have been founded on the POW system.

Today the term "mining" is used to designate the PoW process. Within this process the individual nodes, "miners", must provide PoW (most commonly by providing a solution to a complex mathematical problem) and subsequently receive a reward once the correct answer has been ascertained. Once the answer has been identified, though, it is not difficult for others to legitimise the solution. In Bitcoin, for example, each miner must perform the SHA-256 until they reach the target number for each block. Depending on the number of zeros at the beginning of the random hash value for each block, the work needed to reach the correct hash becomes increasingly difficult. Whichever miner first guesses the target number earns the reward and the block, thus creating an automatic system for rewarding contributors to the Bitcoin network. In order to obtain the higher number of blocks, miners are motivated to improve their mining processes. By combining PoW with the longest chain rule, Bitcoin can deter those wishing to counterfeit transactions as they have created a system where the data is difficult to create, but with simple legitimisation process.

The pros and cons of PoW are thus as follows: Pros:

- Decentralization. The mechanism is decentralised and fairly rewards the rights to each block according to how valuable each miner's contribution to the system is, thus functioning on the basis of merit alone (Baur et al., 2018).

- High security. The mechanism protects against threats by ensuring that in order to attack the system, the attacker would require considerable computing power, time, and money. By making mining more worthwhile than cheating the system, Bitcoin reduce the incentive of committing fraud. At present, the probability of an attack on Bitcoin is extremely low as it would require in excess of 51 percent computing power.

Cons:

- Energy consumption. • PoW is a particularly energy-intensive process, as it requires the supercomputers behind the miners to run millions of calculations every second, which makes PoW particularly expensive. The MIT Technology Review has even estimated that the annual energy consumption Bitcoin matches that of the whole of Nigeria. As CoinDesk has highlighted, this makes PoW unsustainable in terms of energy consumption, and means that most of the PoW mining must take place in regions with lower energy prices. Furthermore, the computations necessitated by

the PoW process are, technically, futile, as they use enormous amounts of energy, and yet they have no practical applications outside of PoW, as has been highlighted by the Mathematician Andrew Tar in his article for Cointelegraph.

- Vulnerability: PoW is vulnerable to a "51 percent attack," meaning — in theory — nefarious miners could capture 51 percent of a network's computing power, gain what's termed "dominance" and manipulate the blockchain to their advantage.

- Congestion: The processing speed is too slow when waiting for multiple acknowledgements and it becomes easy for bifurcation to occur. The confirmation period of consensus for the block becomes longer (ten minutes). The maximum volume of transactions per second is seven (Visa's average transaction volume per second is more than 10,000, and the peak volume per second of Alipay is close to 90,000), which is not suitable for commercial use.

3.2 PROOF OF STAKE (POS)

PoS, however, can be described as a mechanism that allows cryptocurrency platforms to reach a distributed consensus.

The notion of "coinage" is central to our understanding of PoS, and as such should be explained before we consider PoS in more depth. "CoinAge" is calculated as the product of the number of coins held, by the length of time they held for (designated by the number of days). 100 coins that have remained in the same block for 8 days, therefore, would have a coinage of 800, but this coinage is expended when these coins are moved. As such, the quantity of coins remains constant, but the coinage returns to zero before building up again in the new location. As coinage is temporal, however, PoS is required to set a limit to prevent the uncontrolled increase of coinage when coins are continually retained.

Firstly, therefore, PoS must select a random book-keeper, which is acquired through property certification. As is the case with company shareholders, a larger stake represents a larger presence, and so miners with more coins are most likely to be selected as a book-keeper. A user's mining rights, therefore, depend on the number of coins they hold, whereby the more Bitcoin or Altcoin the node possesses, the greater the mining potential they have.

Even though a number of particularly well-known blockchains function on PoW systems, PoS was devised to resolve the significant disadvantages of the former. The benefit of PoS is that, whilst it continues to provide an incentive for those who contribute to the veri-

fication process, the process of acquiring this incentive, and the rights to the blockchain, is less costly than that of PoW. Some critics claim, however, that the lack of cost to contributors could lead to senseless and uncritical decisions to continuously update the blockchain ledgers simply in order to obtain the reward in question. Nevertheless, this system is intended to provide an alternative to the considerable energy consumption inherent to PoW, which is achieved by substituting a random selection process for the competitive process of PoW. In its most basic form, PoS employs a Follow-the-Satoshi (FTS) algorithm, whereby a random coin from the currency is selected and the node that contains this coin is awarded the chance of adding to the chain and thus receiving the reward for the block. The entire process requires extremely low levels of energy [1].

Of late, the PoS blockchains have become increasingly popular, and have also come to rival the use of PoW blockchains. In fact, as of 2015 more than 50 PoS blockchains have been developed and, at present, PoS blockchain usage exceeds that of PoW blockchains. Most of this data refers to financial and gambling Dapps and decentralized transactions.

The pros and cons of PoS are, therefore, as follows:

Pros:

- As the process does not necessitate extensive mining processes, PoS is considered to be relatively environmentally friendly, especially compared to PoW;

- The use of random selection process creates a more equal, and less centralised structure, especially when compared to cryptocurrencies based on PoW systems. Furthermore, as PoS requires a more limited use of computation, the mining process is more accessible, and the possibility of one miner gaining a large amount of computational power and thus becoming able to manipulate the system is much less likely. Within a globalised market place, therefore, this system offers a greater level of protection.;

- • In PoW-based cryptocurrencies, the value of currencies is subject to the PoW mechanisms whereby, for example, the number of users can affect the value of the coin. PoS, on the other hand, allows for the creation of an annual interest rate, which offsets these risks and creates a more stable cryptocurrency environment.

Cons:

- PoS has a weaker credit foundation which would require the combination of both PoW and PoS mechanisms to resolve whereby currency can be awarded through PoW mining, but PoW is employed to offset the potential instability inherent in the use of PoW;

- The way in which rights are awarded in PoS requires miners to hold tokens, and so the value demanded in order to qualify for selection is quite elevated;

- Blockchains that only use a PoS mechanism are only able to issue currency by using an Initial Coin Offering (ICO). This means that some users may acquire large amounts of cheap cryptocurrency, which would create the potential for them to exploit the chain and the tokens involved.

3.3 Delegated Proof of Stake (DPOS)

Another substitute for PoW or PoS is DPoS. DPoS guarantees that all of the transactions carried out in the system are represented. DPoS was created with the intention of being a democratic form of technology, allowing users to have control over who certifies the ledger, thereby preventing centralization or inappropriate use of the blockchain. Created by the software developer Daniel Larimer (who also created BitShares and Steemit and developed EOSIO software), DPoS is designed to require less energy than PoW and to offer more protection than PoS. DPoS was first used in Larimer's open-source platform BitShares, designed to allow the network to scale more effectively than PoW and PoS can. As the verification of each block can occur without the need for excessive energy or materials, it requires a limited amount of computer power and thus can process transactions rapidly regardless of the level of the network's development. As well as BitShares, a number of noteworthy currencies have adopted DPoS, such as Lisk, Waykichain, EOS, and Steem [2].

The pros and cons of DPoS are as follows:

Pros:

- The energy consumption to maintain the network operation is minimized, and the operation of the entire chain is managed in a low-cost way, which largely solves the energy consumption problem of POW. (Short block time and low energy consumption);

- A more "decentralized" management method decentralizes the decision-making power of the blockchain network to the hands of all nodes in the entire network, which largely avoids the "holding" phenomenon that POS is prone to be manipulated by the dealer;

- A more "decentralized" management method decentralizes the decision-making power of the blockchain network to the hands of all nodes in the entire network, which largely avoids the "holding" phenomenon that POS is prone to be manipulated by the dealer;

- It has a faster confirmation speed: each block takes 10 seconds, a transaction (after 6-10 confirmations) is about 1 minute, and the cycle of a complete block only takes a few minutes. However, it takes 10 minutes to generate a block under the PoW mechanism, and several hours to complete a transaction. It takes about 1 hour to confirm a transaction under the PoS mechanism.

Cons:

- There is the potential for a small group of users to obtain majority control, especially as token holders may be less willing to take part, which can lead to the development of a relatively "weak center" or a decentralization process that is only partially successful;

- There remains a threat in that elections do not completely discount the possibility of a malicious node entering the network, and it also does not necessarily slow or hinder the process of such nodes. If the nodes that have been elected through the system's democratic process do not boast sufficient computational capabilities, they may be relatively open to potential threats. This means that the mechanism is particularly vulnerable to DoS attacks, which can result in an unstable network;

- Whereas in PoW any user with the required resources may compete for block rewards, DPoS follows a system similar to that of PoS, whereby entry is determined according to who has coin. This means that DPoS currency becomes increasingly difficult to liquify.

3.4 COMPARISION

Due to input from both Vitalik Buterin and the Ethereum users, Ethereum intends to convert from the PoW consensus mechanism to a PoS system. They have elected to do so as a result of the large amounts of energy required of the PoW mechanism, as Bitcoin is frequently criticized for its elevated electricity usage. The increasing price of energy, and the fact that energy costs must be met in non-digital currencies, have caused the devaluation of some cryptocurrencies, and growing doubt over the high energy costs of Bitcoin. It is believed that PoS will prove to be a more economical and environmentally friendly consensus mechanism for Ethereum. The reward system is also significantly different in PoS mechanisms, as anybody may become a PoW miner as the mechanism does not require a miner to already possess coins, whereas the threshold in PoS prevents those without tokens from entering the competition for block rights. In terms of security, PoW is a widely-used and therefore proven mechanism as it has already been favored by a number of large blockchains such as Bitcoin. Whist PoS allows for networks to scale more easily, providing capabilities for a much higher transaction rate than PoW, it is widely consid-

ered to offer less protection than the PoW mechanism. If plans for Ethereum to transition to PoS go ahead, the adoption of PoS in such a successful and well-developed platform could reassure other cryptocurrencies of the safety of the PoS mechanism going forward. It is, however, yet to be seen whether PoS will be successfully carried out in Ethereum and how this will continue to influence the adoption of different consensus mechanisms by blockchain platforms [3].

Moreover, Ethereum using POS is one of the foundations for us to use PE ratio valuation model in the following paper. POW uses block rewards mechanism and transaction fees to incentives miners, which cannot form deflation. In this case, earnings does not exist, as such PE valuation model cannot be used. Compared to POW,POS uses block rewards to incentives holders, and transaction fees can repurchase tokens, which may cause deflation, or at least curb inflation. It is appropriate to use PE valuation. And the biggest weakness of DPOS is the limited number of nodes and insufficient decentralization, leading to a weak ability to resist censorship. So, it is an insufficient mechanism in terms of security for a world currency.

CHAPTER 4

ETHEREUM GAS FEE

The Ethereum "gas fee" refers to the amount of fuel required to be transferred to a miner in recompense for the blockchain transaction. In Ethereum, the "gas" represents the energy needed to complete a transaction within the platform, to create smart contracts, and to store information. When a miner obtains a block, they will then use their hardware and power to process transactions and designate these transactions to the block that they add to the chain. The "gas fee" paid by users, therefore, is paid to the miner in order to offset the costs incurred in processing and verifying the transaction (such as the energy expended through computation).

These fees are charged in "gwei" which equate to 10^{-8} Ethers and can be determined according to a user-defined maximum figure, whereby miners are able to reject transactions if the gas fee is not enough for them. More complicated transactions require more work and therefore are more expensive as they require more computational power to process. If users are willing to pay a higher gas fee, however, a miner will dedicate more resources and therefore carry out a payment faster than a low-fee transaction. Although gas fees and ETH values are established by the market, prices fluctuate based on the current state of the market, and miners exert control over the price of gas [4].

Gas fee is calculated by finding the product of the gas used to process the transaction, and the current price of gas (usually set as a market average). The calculation is, therefore, as follows: [5].

$$Gas\ Fee = the\ amount\ of\ Gas\ used \times Gas\ price$$
$$= x\ gwei$$
$$= 10^{-8}x\ ETH$$

Ethereum's gas fee system resembles Bitcoin's fee system in that both reward miners financially for their contributions to developing the blockchain, and users pay higher fees for their payments to be processed more quickly. Furthermore, in both systems, the more complex the transfer, the higher the transaction fee. The primary difference between the two systems, therefore, is Ethereum's regulation of the "gas price" through the market, which prevents the inflation of gas fees by allowing for changes in the base gas price. This, therefore, prevents the changing value of ETH from drastically affecting the gas fees, as those involved in the payment process have control over the overall gas fees and so can ensure that the price of processing a payment or transfer is acceptable for the user.

4.1 EIP1559 (ETHEREUM IMPROVEMENT PROPOSAL)

However, when the transaction demand in Ethereum exceeds the block size, a mechanism is needed to allocated the resources fairly. The most common way is to allow users to bid, and the miners will prioritize transactions with high transaction fees. But users do not know other people's bids and can only rely on historical transaction fees. When network congestion occurs and transaction fees, some users can only give higher price in order to make transactions. The sharp fluctuations can cause two main problems: users will pay excessively high transaction fees and many transactions still cannot be completed with the users' expected time limit. To optimize the transaction fee mechanism, EIP-1559 is proposed [6].

Introduced in April 2019, EIP 1559 has roots going back to an August 2018 paper on Ethereum's price-auction model penned by Ethereum co-founder Vitalik Buterin. The EIP itself was co-authored by Buterin, in addition to Ethereum developers Eric Conner, Rick Dudley, Matthew Slipper and Ian Norden.

4.1.1 ALGORITHMIC GAS ESTIMATION: 'THE MARKET-RATE FOR GAS'

Using a system that is comparable to Bitcoin's difficulty adjustment, EIP 1559 increases or decreases a number, 'BASEFEE', based on the current levels of congestion on Ethereum.

If Ethereum is greater than 50% utilized, BASEFEE automatically increases; if it is less than 50% utilized, BASEFEE decreases.

BASEFEE attempts to generate "the market rate" for gas prices, natively on Ethereum. While we can see the typical rates that are being paid on websites like EthGasStation.Info, or Etherscan's Gas Price Tracker, these are 3rd party gas-market estimations. Additionally, they also do not illustrate the level of overpayment for gas fees. BASEFEE formalizes the "going market rate" for block-inclusion, removing the need for each and every wallets to generate their own individual gas estimation strategies. This will allow users to just press "Send Transaction", and not have to be presented with 'gas'.

When it comes to getting your transaction through quickly, users can still "jump the line" by paying a 'tip' to the validators. This 'tip' serves the purpose that gas-auction does in today's version of Ethereum; by ordering transaction inclusion based on tip size. Those that 'tip' higher get served first. The Tip is what is paid to validators.

"In times of high network usage, a user can ensure that their transaction is included sooner by including a larger tip along with the BASEFEE amount. Meanwhile, users who are not in a hurry can set a maximum fee that they're willing to pay. The protocol will then wait for the BASEFEE to drop below this number before confirming their transaction." — Eric Conner

4.1.2 Burning BASEFEE Burns ETH

BASEFEE is BURNT. No-one receives BASEFEE. "Burning this is important because it prevents miners from manipulating the fee in order to extract more fees from users. It also ensures that only ETH can ever be used to pay for transactions on Ethereum, cementing the economic value of ETH within the Ethereum platform." — Eric Conner

Burning BASEFEE removes the ability for validators to manipulate the fee market for their benefit. It also 'locks-in' Ether as the native currency of Ethereum, as it should be. No other currency on Ethereum can be used to pay for transactions. This is comparable to a nation-state demanding that only their native currency be legal tender.

4.1.3 Burning ETH = Paying the Network

Burning BASEFEE pays everyone, equally. Whether you are Staking your ETH, or have it inside of MakerDAO, Uniswap, Augur, in your wallet, in a game, BASEFEE is paid to your ETH. If you hold ETH, you receive BASEFEE indirectly.

This is similar to how MKR holders receive the Stability Fee in MakerDAO; the SF burns MKR from the interest payments of those with debt to MakerDAO. If you hold MKR, your share of MKR is increasing due to the burning of MKR that isn't yours.

By burning ETH, all Ethereum stakeholders benefit. EIP 1559 is solves a "tragedy of the commons" problem in Ethereum, by paying for one's externalities by adding to the scarcity of Ether.

After staking, holding Ether and keeping it off the secondary market is the second-best way to add to the security of Ethereum. BASEFEE is the mechanism to which these Ethereum stakeholders benefit from the growth of Ethereum at large. When the U.S. government pulls in more revenue from taxes, it spends more. When Ethereum pulls in more revenue from gas fees, it issues a stock-buyback.

4.2 BURNING BASEFEE IS PAYING FOR FUTURE SECURITY

Every day that Ethereum runs, BASEFEE will remove more and more ETH from the supply. The BASEFEE amount that Ethereum could have paid directly to validators, instead is being paid to 'Future Ethereum'. The ability to attack Ethereum 2.0 will be a function of how much ETH is available for purchase on the secondary markets. If there is high ETH supply on the market, then buying enough to attack Ethereum is less expensive. If there is low ETH supply on the secondary market, then the price is higher, and attacking Ethereum requires much more capital.

By adding to the scarcity of Ethereum today, Ethereum's security tomorrow is secured.

Chapter 5

Initial Coin Offering

ICO refers to a method for acquiring money through cryptocurrencies and essentially stems from Initial Public Offerings and the process of taking private corporations public. Whereas IPO is primarily concerned with profit and corporate behavior, thus requiring regulation from a number of agencies, limitations that vary from country to country, dividends and equity, ICO is more focused on the actions of a community. As such, the same regulations and valuations through dividends and equity are more difficult to apply to ICOs. Securities agencies, therefore, have no oversight of ICOs, and the development of an effective and cooperative community is managed from within. ICO essentially allows for the accrual of funds for cryptocurrencies and blockchains, as digital tokens hold a particular market value, and can be traded for fiat currency. This process assists in providing solid financial backing for developers. ICO can be used to obtain tokens from a variety of blockchains, of which the most popular are currently Ethereum (ETH) and BitShares (BTS).

5.1 The shortfalls of BTC blockchain

General computational commands including conditional statements and loops that enable a system to examine, validate, and react to submitted payments are at the heart of ICO. This coding, however, must become part of the particular blockchain that is constructing the ICO. In general terms, it is significantly easier to construct new applications and currencies on Ethereum than on Bitcoin.

As Bitcoin was initially established as a currency network, it is relatively simple to create a BTC wallet for ICO. Despite this initial simplicity, however, it then becomes extremely complex to develop a program that is capable of computing and delivering tokens within

this wallet. This means that a broader, more generic program state is required to more effectively develop an ICO contract. Furthermore, as Bitcoin cannot contain programming loops, it is not Turing-complete, and thus incapable of guaranteeing a response to any given problem (allowing for sufficient resources and time to complete the problem). The choice not to allow loops within the Bitcoin system was taken in order to prevent DoS attacks, in which an attacker could potentially inundate the system and prevent it from being able to provide its intended service. An attacker could do so by instructing a validator to perform a computation that contains an indefinite loop. Whilst loops represent a potential vulnerability in the system, however, the inability to perform computational loops can prevent the successful execution of the ICO, as loops allow data to be computed multiple times and are also important to the validation process. ICO also requires a faster block time than BTC can offer, as a lengthy transaction will result in further lags in later stages in the ICO.

5.2 The benefits of Ethereum in terms of ICOs.

In Ethereum, however, the form of the blockchain is altered to comprise multiple program states that contain the essential transaction ledgers and also provide for the implementation of smart contracts. These, in turn, provide the capacity for the automatic computation of existing funds, as well as the validation and completion of transactions and the delivery of newly created tokens beyond the initial crowd-funding stage. Moreover, unlike BTC, Ethereum's "gas" mechanism allows the system to be Turing-complete whilst avoiding the risk of endless loops and DoS threats, as each transaction can only consume the specific amount of "gas" that has been provided for the transaction, and once this is depleted, the protocol ends the computation. As such, ICO is less vulnerable to DoS attacks in Ethereum than in Bitcoin. This level of safety is maintained even with the increased efficiency and speed of the platform compared to BTC.

The measures discussed above aimed at reducing instability Ethereum, combined with its open-source nature, make Ethereum one of the simplest platforms in terms of the supply of tokens. Directions for supplying ERC20 tokens, for example, can be accomplished in a single click of the mouse, which means that stakeholders can use digital currencies from their online environments to fund their programs by transferring them into non-digital legal tender.

Using blockchains allows users to process trading contracts by entering them into the platform as smart contracts, thus converting them into digital assets. This is similar, for

example, to the way in which people working in the property market may choose to process a housing contract on the Internet as a faster alternative to the rigmarole of dealing with agents and background checks. By converting a property asset onto the Ethereum platform, therefore, the sale process is further facilitated, reaching a much wider audience much more quickly.

Transferring real-world assets into blockchain tokens in this manner requires a particular kind of ICO, often referred to as a security token offering (STO) in order to separate them from ICOs more generally which can generate further varieties of the token. STOs, therefore, create tokens that stand for material possessions – shares in real companies, property, investments – and can subsequently be sold or exchanged. STOs and ICOs alike, however, are predominantly supplied as smart contracts, before the specific value of the token in question transitions into investment consensus in line with any relevant regulations or limitations that are applied in the nation-state in question.

Creating an ICO in the relevant virtual currency draws the market's attention to the token in question, enabling a quicker fundraising process. This entails a certain level of technical difficulty, though, which has resulted in the majority of ICOs appearing first as Initial Token Offerings (ITOs) in the form of Ethereum tokens. In the secondary market, however, ICOs, ITOs, and IPOs tend to follow similar paths, but ICOs remain an appropriate method to gain increased exposure to potentially large investments at an early stage through blockchain companies and groups. It should be noted, nonetheless, that the process of converting assets into digital tokens is not only useful for those involved in blockchains, but also for a wide variety of real-world businesses, investors, or traders as it provides a wider scope and greater exposure in the fundraising stages. At present, Ethereum is the most popular way for users to connect physical assets to digital currencies, but this is, as yet, a relatively new and constantly unfolding system.

Part II

Valuation

CHAPTER 6

DIGITAL CURRENCY

This section aims to estimate the value of Ether (ETH), which can be regarded as the cryptocurrency of the Ethereum network [7]. According to ethereum.org, it also can be considered as fuel on Ethereum network for applications. Instead of applying the absolute valuation model, we compare ETH to BTC and calculate the relative value. In this case, an latest estimated price of ETH can be obtained according to the real BTC price.

This section aims to estimate the value of ETH, which is the cryptocurrency of the Ethereum network [7]. According to ethereum.org, ETH can also be considered as fuel on the Ethereum network for applications. Instead of applying the absolute valuation model, for the purpose of this study we will compare ETH to BTC and subsequently calculate its relative value. This study will thus ultimately provide the latest estimated price of ETH, which will be acquired relative to the real BTC price.

6.1   BITCOIN (BTC) AND ETH

BTC, created in 2019, and is currently the largest cryptocurrency according to market capitalisation. Well-known for being the first example of cryptocurrency, it has become a popular and relatively successful currency. Furthermore, Bitcoin has also inspired a large number of subsequent projects in the blockchain space, including Ethereum, which has the second-largest market capitalization amongst cryptocurrencies; only marginally less than Bitcoin. Although the market capitalization of ETH is smaller, it has significantly wider fields of application [8]. As the most popular two cryptocurrencies, the BTC and ETH are frequently compared, and have been proven to share a number of common attributes, including the fact that they are both digital currencies stored in cryptocurrency wallets, and that they both use blockchain distributed ledgers [9].

6.2 ESTIMATION

Valuation models in the traditional finance market include: discounted cash flow method, capital asset pricing method, comparative valuation and so on. These models, however, are not suitable for the digital currency network as they fundamentally assume a mature financial market, whereas the digital currency market is based on a relatively new decentralised network structure, and does not rely on the concepts of companies or cash-flow as the traditional markets do. As such, we cannot apply traditional indicators and valuation models directly to ETH and BTC in this study. Instead, it is necessary to combine the structural characteristics of blockchain with the characteristics of digital currency to conduct the valuation.

For digital currency valuation, there are, however, a number of more commonly used models, for example, using Network-Value-to-Transaction (NVT) ratio, Metcalf's law, Log-Periodic Power Law Singularity model and mining model [10]. Further analysis has revealed that the key indicators for the purpose of this study are on-chain transaction volume, the number of active users, and mining costs. Moreover, because of the characteristics of blockchain technology, Metcalf's law, which details network effect, is applied to the valuation system. This paper thus focusses on NVT ratio and Metcalf's law in order to estimate the value of ETH compared to BTC.

6.2.1 NVT RATIO

NVT ratio, originally proposed by Willy Woo, is an indicator intended to determine the deviation of the digital currency price from the fundamentals. Its core idea is based on Price- to-Earning (PE) ratio in tradition financial companies. At its core, it stems from the use of PE ratios in traditional finance companies and is used to describe the relationship between market capitalisation and transaction volumes [11]. If we regard digital currency networks as companies and transaction volume as the company's (the network's) cash flow, NVT ratio can be calculated according to the following formula:

$$NVT\ Ratio = \frac{Network\ value}{Daily\ Transaction\ Volume}$$

Transaction volume in NVT ratio only takes on-chain transactions into account. A high NVT ration thus indicates that the network valuation of a certain cryptocurrency exceeds

the value being transferred on the network. NVT ratio can be used to identify whether a digital cryptocurrency is over- or under-valued [12].

In order to eliminate noise in the data and generate a clearer trend within the graph, we have used a 30-days exponentially weighted moving average (EWMA) of the transaction volume as denominator for the NVT ratio.

$$vol\_30_t = c(\lambda) \sum_{k=1}^{30} \lambda^k vol_{t-k+1}$$

In the above formula, vol_t stands for the transaction volume on day t and c is a normalising constant that regulates the total volume. vol_30 is the 30-day EWMA of the transaction volume through the blockchain (in USD). It therefore follows that:

$$adjusted\ NVT\ Ratio\ = \frac{Network\ Value}{vol\_30}$$

By definition, NVT ratio can also be calculated as follows [13]:

$$
\begin{aligned}
NVT\ ratio &= \frac{Network\ Value}{Transaction\ Volume} \\
&= \frac{Market\ Cap}{Transaction\ Volume} \\
&= \frac{Token\ supply\ \times\ Token\ price}{Transaction\ Volume} \\
&= \frac{1}{Token\ Velocity}
\end{aligned}
$$

Buterin adopts the exchange equation for application to a token economy. According to his definition:

$$H = \frac{M \times C}{vol}$$

where:

- M is the total money supply (or the total number of tokens)

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- C is token price

- vol is transaction volume

- H = 1/ Velocity

Consequently, token velocity can by calculated by dividing the total transaction volume by the average network value. The equation above, however, shows that the limitation of NVT ratio is that it assumes the value of cryptocurrency is derived from token velocity, but ignores the use of cryptocurrency as a store of value. If we assume, therefore, that BTC and ETH exhibit the same token velocity, then it follows that they will also have the same NVT ration. As such, the transaction volume ratio is equal to the relative value of ETH and BTC.
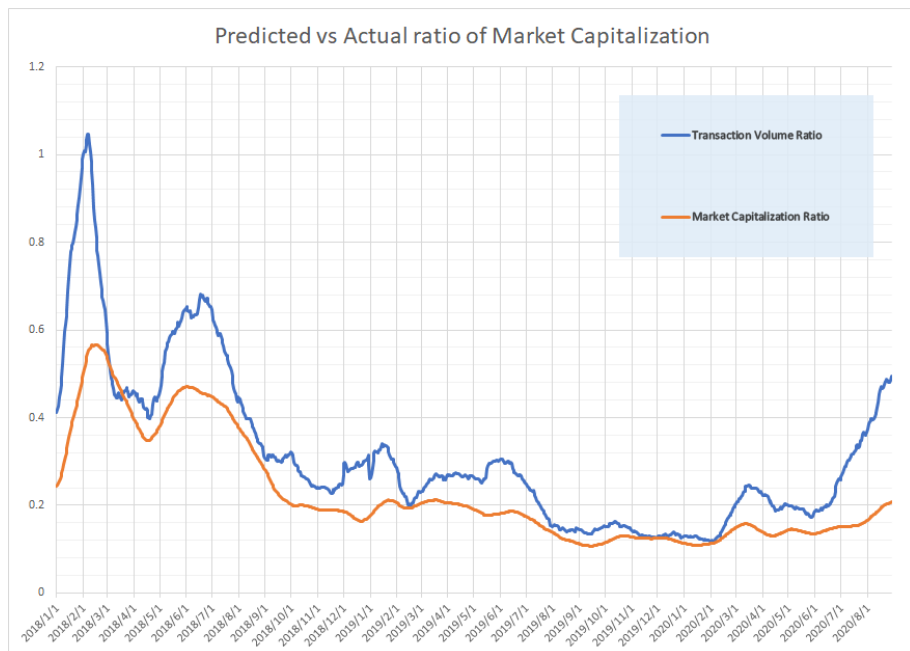
Figure 6.1: *Predicted us Actual Ratio of Market Capitalization*

6.2.2 Metcalf's Law

According to Metcalf's Law, the value of a network is proportional to the square of its quantity of active users. The number of active users, also known as the number of active addresses, is the sum total of unique addresses active in a particular network either as senders or receivers, ensuring that individual addresses are not double counted in cases where they have been previously active. According to Metcalf's Law, $networkvalue(V)$ can be calculated as follows:

$$V = K \times N^2$$

In this case, K is the value coefficient and N is the number of active addresses.

Since the initial elaboration of Metcalf's law, a number of variations have been developed, such as $N \times lnN$ (as opposed to $K \times N^2$) that are also used to provide network value estimations. As the growth curve created by $K \times N^2$ is the steepest, however, this formula will provide the most conservative value.

In order to calculate the relative value between ETH and BTC using Metcalf's Law, we must assume that both currencies have the same "K" values. The relative value is therefore the ratio of the square of the number of active users in the Ethereum and BTC blockchains.

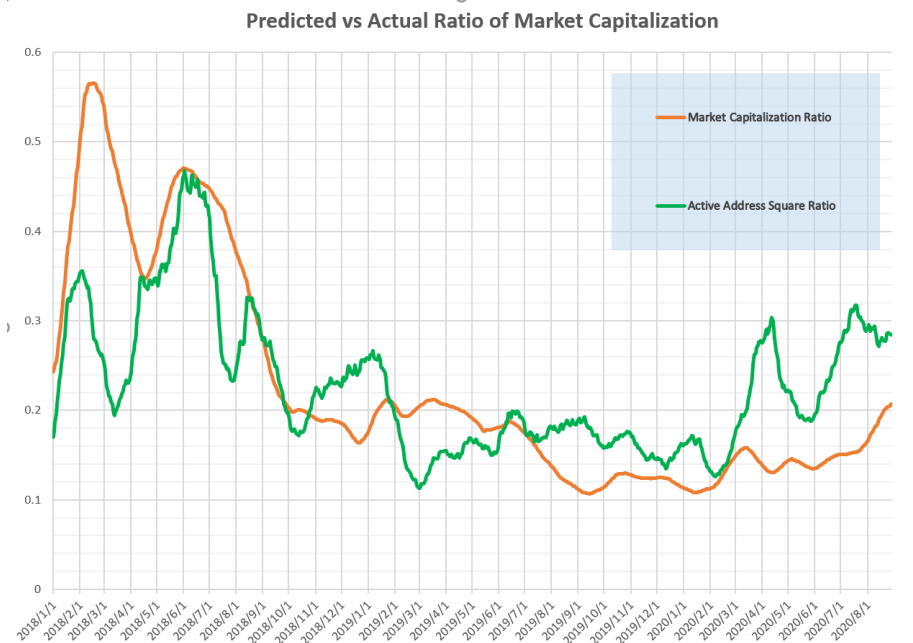
Figure 6.2: *Predicted vs Actual Ratio of Market Capitalization*

6.3 RESULTS

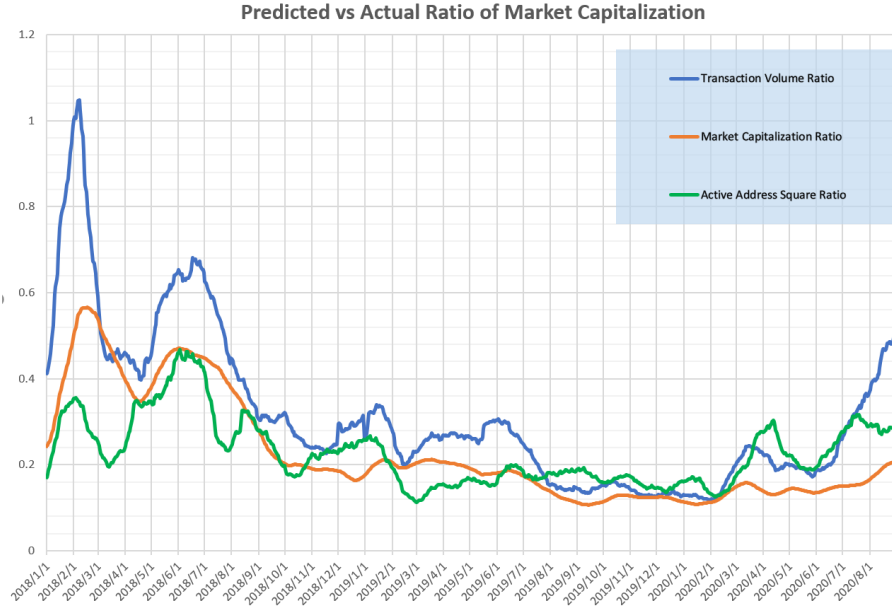Combining the two calculations above provides us with the following graph:

Figure 6.3: *Predicted vs Actual Ratio of Market Capitalization*

In general terms, the blue and green lines represent the upper and lower boundaries of the estimation respectively. On 30th June 2020, the relative values of ETH and BTC ranged from 0.18 to 0.27. The real relative market cap is approximate 0.15. This comparison the estimated ration with the actual relative ratio therefore demonstrates that, relative to BTC, ETH has, in fact, been undervalued.

In order to obtain a more conservative result, we then chose the smaller relative value of ETH to BTC (0.23) as our estimate result for the following calculation:

$$V_{DigitalCurrency} = \frac{BTC \; Market \; Cap \times estimated \; relative \; value}{number \; of \; ETH}$$

According to the latest data, the market capitalization of BTC was USD 216.14 billion, leading to an approximate estimated ETH price of USD 442.28.

6.4 BACK TEST

To validate the robustness of the valuation model, we carried out back testing based on historical data. Back testing is a general method for checking how accurately a strategy or a model would have done. We enter the historical data into the valuation model to see

how well the estimated results match the current known data. A well-conducted back test can lead to a positive result and assures that the model is dependable. The assumption of back testing is that past performance can predict future performance.

Based on historical data, we perform NVT ratio Method and Metcalf's law Method mentioned above, respectively. To get a conservative result, we choose the smaller value as our estimated price. The following graph shows the real price of ETH and the estimated price of ETH based on the valuation model.
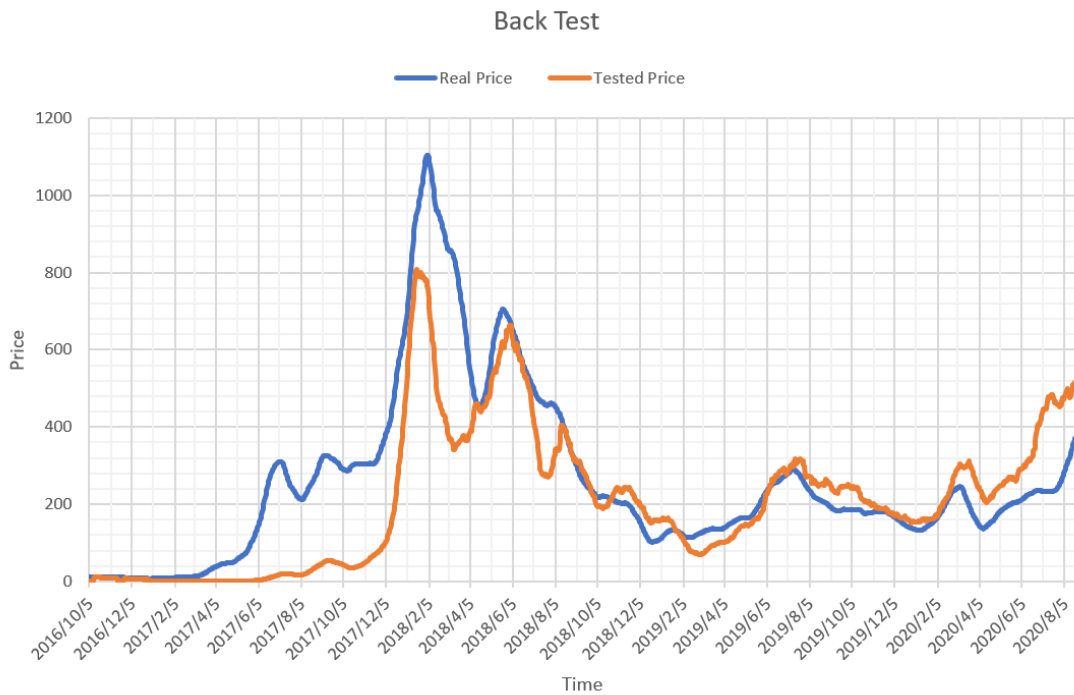

Figure 6.4: *Back test*

According to the graph, it can be observed that these two lines show similar trend. However, it can be seen that there is time lag, especially from January 2018 to May 2018 and from July 2019 to now. It can be explained by that the market needs time to response. Before 2019, the estimated price is generally lower than the real price, while now the situation is opposite. We hold the opinion that the price of ETH is undervalued, it will maintain the growth trend. Overall, the similar trend of real price and tested price indicates that the model is effective to some extent. However, since we only use the price of BTC to do the back test and exclude the following three parts which will be introduced below, the estimated value from the test will be lower than the final estimated price of ETH. As such, we pay more attention to the trend of these two lines rather than the exact estimated number. We can still draw a conclusion that ETH is currently underestimated.

CHAPTER 7

PAYMENT PLATFORM

Due to the growing strength of Ethereum-based stablecoins, Ethereum can be viewed as a fiat currency payment platform. The majority of Tether (USDT) tokens, which are worth over USD 6 billion, are built on Ethereum blockchain. Some other stablecoins with the biggest market capitalization, including PAX and USDC, are also of the ERC-20 variety. Then there's Dai, the first ever decentralized and uncensorable digital dollar.

7.1 THE DEVELOPMENT OF STABLECOINS

7.1.1 MARKET CAPITALIZATION

Since the beginning of 2020, the market capitalization of stablecoins has been continued to grow exceeding USD 11 billion, and there is still a continuing upward trend.

In this aspect, Ethereum is very similar to PayPal. Based on the total amount of money held in customers' accounts, which is USD 13 billion, PayPal could be the 21st largest bank in the US if it decided to make this unlikely move and transition into an actual bank [14].
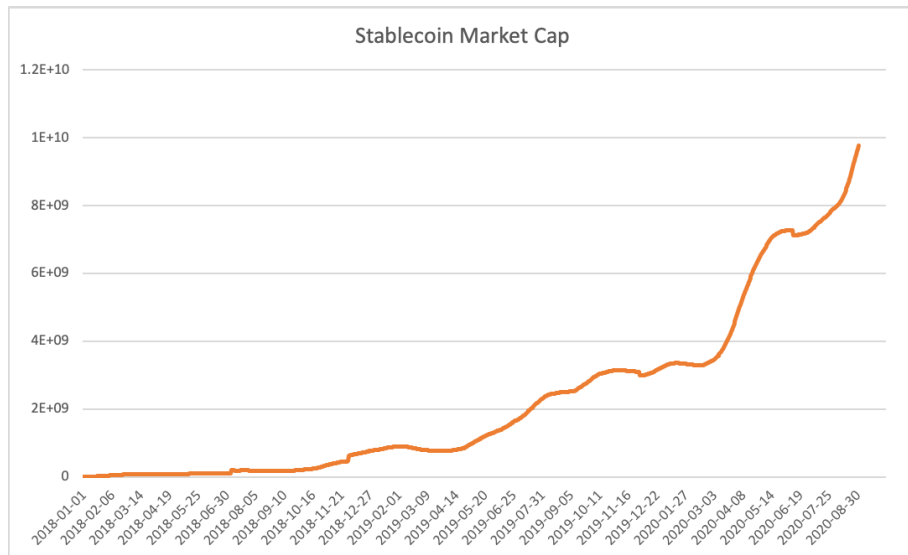
Figure 7.1: *Stablecoin Market Capitalization*

7.1.2 DAILY VOLUME

The daily volume of stablecoins in Ethereum has continued to climb since the beginning of 2018. Daily volume peaked at around USD 1.8 billion in June 2020. We expect the daily volume to continue rising, consistent with the curve's trend. On the other side, PayPal's net payment volume amounted to USD 190.57 billion in the first quarter of 2020. That is, PayPal's daily payment volume is USD 2.08 billion on average, which is close to the figure of stablecoins in Ethereum blockchain.

Figure 7.2: *Stablecoin Daily Volume*

At present, Ethereum's charging model depends more on the congestion of the network. This means that Ethereum captures value from the number of transactions while PayPal captures the value in the transaction volume. Since their transaction volumes are similar,

it is interesting to see whether Ethereum will capture value from the transaction volume in the future.

7.1.3 DAILY TRANSACTION NUMBER

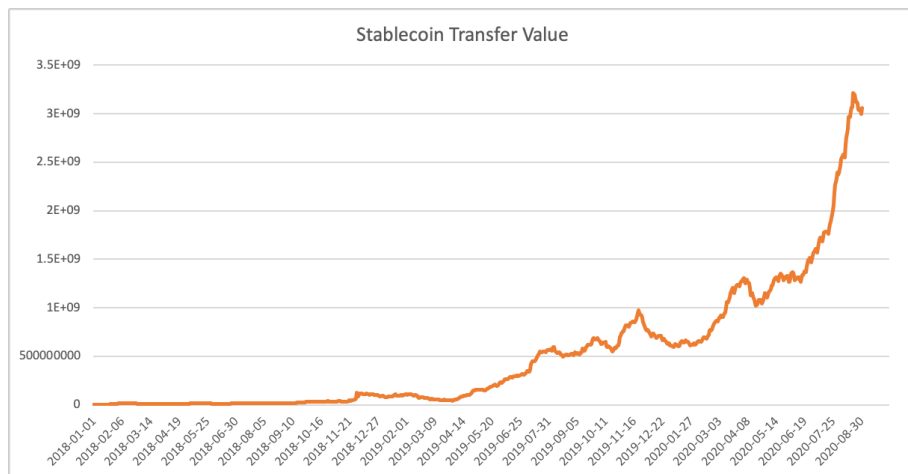The daily transaction number of stablecoins rose to around 130,000 in the third quarter of 2019, then dropped down half to 60,000 in the fourth quarter of 2019. From this year, it has continuously climbed to 220,000 now. The rapid increase of daily transaction number in 2020 can be attributed to the rapid doubling of the market capitalization. On the PayPal side, the USD 190.57 billion [1] net payment volume was generated through the over 3.26 billion [2] transactions which PayPal processed in the first quarter of 2020. That is 35.7 million transactions daily during that period, which is much larger than the transaction number of stablecoins. But from another perspective, PayPal's single transaction volume is smaller than Ethereum's.
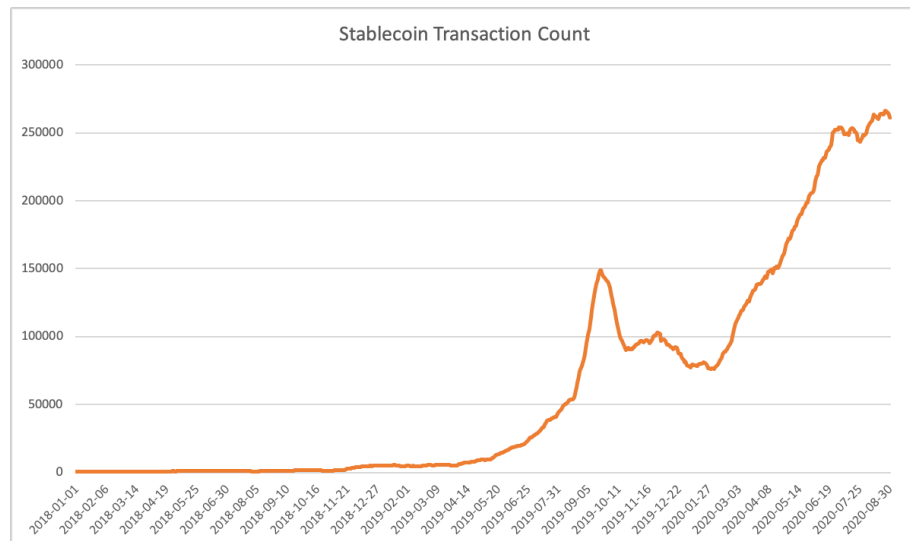
Figure 7.3: *Stablecoin Daily Transaction*

7.1.4 ACTIVE USERS

The trend of daily active address of stablecoin is very similar with that of the daily transaction number. A pair of sharp increases occurred in the daily active addresses of stablecoins between January 2018 and April 2020. As the figure below indicates, the upward trend is almost vertical. At present, the second rise in stablecoins is still ongoing from this year, and it is currently approaching 160,000. Then we can know that the average number of daily stablecoin transactions is 1.375 per active user. As we know, PayPal has currently 325 million active users [3], which are all registered accounts that successfully

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[1] Data source: Statista

[2] Data source: Statista

[3] Data source: Statista

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sent or received at least one payment or payment reversal through the PayPal system or Bill Me Later accounts that are currently able to transact and that received a statement within the last 12 months. Besides, PayPal transaction volume data from the end of last year shows the average number of yearly PayPal transactions is 36.9 per active user [4], that is 0.101 daily. Then we can obtain the number of PayPal daily active users is roughly 32.9 million.

This means that in terms of active users, although stablecoin is growing very fast, there is still a huge gap between Ethereum and PayPal. But we can also notice that the users of stablecoin are more active than PayPal's.
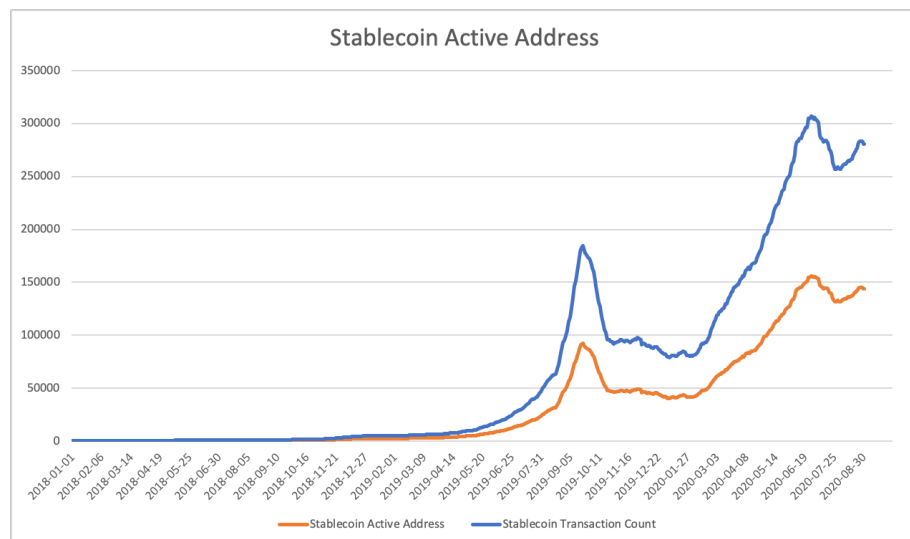
Figure 7.4: *Stablecoin Daily Transaction vs DAA*

7.1.5 USDT

It is worth noting that the size of USDT accounts for more than 80% of stablecoins. Tether has been trying to control not to rely too much on Ethereum, and when Ethereum is congested, transaction speed will decrease and transaction fees will increase. Therefore, Tether also tried to issue USDT in large quantities on other smart contract platforms, such as Tron. This also inspired us to compare data from different platforms for analysis.

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[4]Data source: Nasdaq
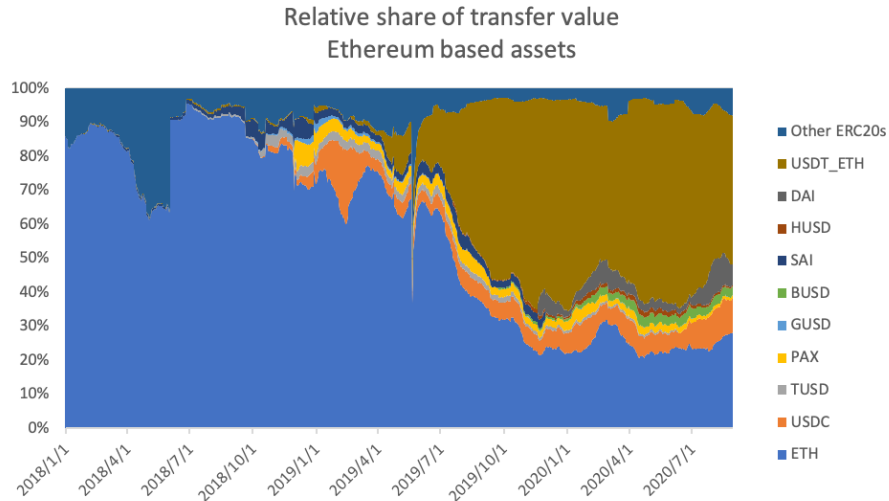
Figure 7.5: *Data Source: Coin Metrics and Glassnode Studio*

Since the end of April 2020, USDT has been further issued on the Tron network. While USDT was issued on the Tron network, it did not continue to issue on the Ethereum network.

We judge that USDT's choice of additional issuance in the Tron network is not unrelated to the performance limitations of the Ethereum chain. The continuous issuance of USDT in the Ethereum network has put a certain pressure on the Ethereum network. The number of daily transactions on the chain has accounted for more than 20 percent of the total daily transactions on the Ethereum chain in the past month. Similar to the overflow of USDT from Bitcoin Omini, USDT will overflow from the Ethereum network to other encrypted networks in the case of performance limitations.

The USDT in the Tron network currently exceeds 1.8 billion, surpassing the Bitcoin network to become the second largest USDT issuance chain. What we are concerned about is whether the additional issuance of USDT in the Tron network increases its use, what is the use of USDT in the Tron network, and how it differs from its use in the Ethereum network.
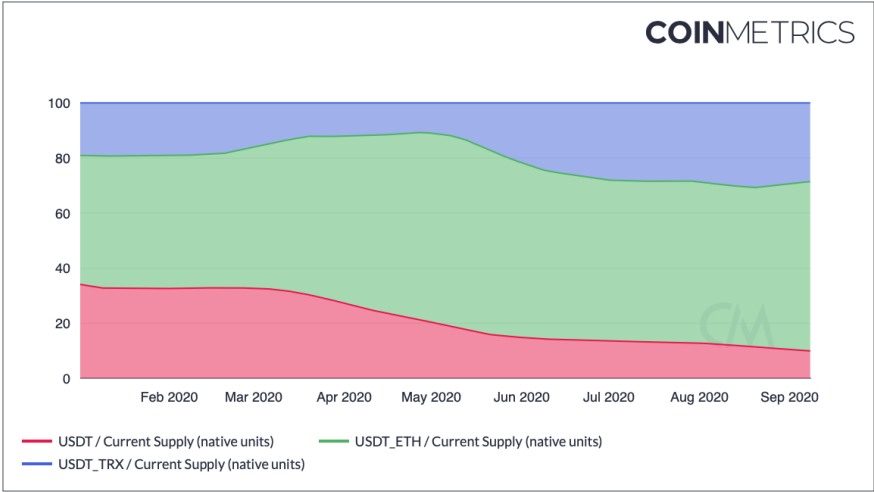
Figure 7.6: *USDT issued on different chains*
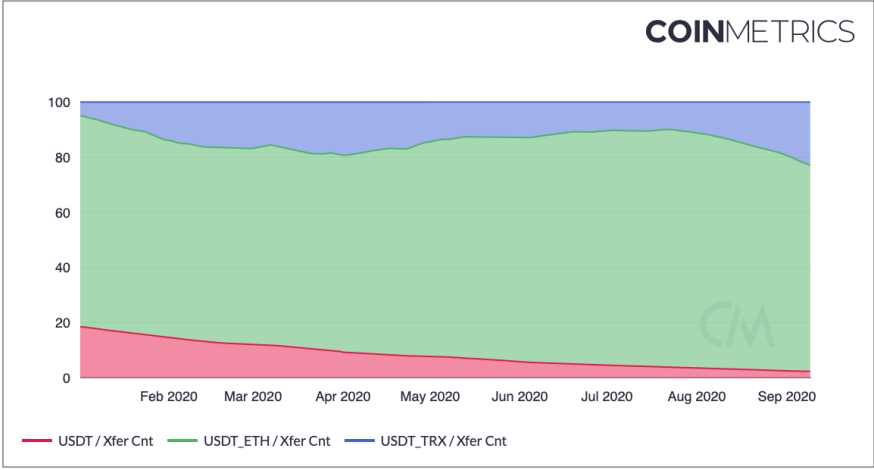
Figure 7.7: *USDT transaction number on different chains*
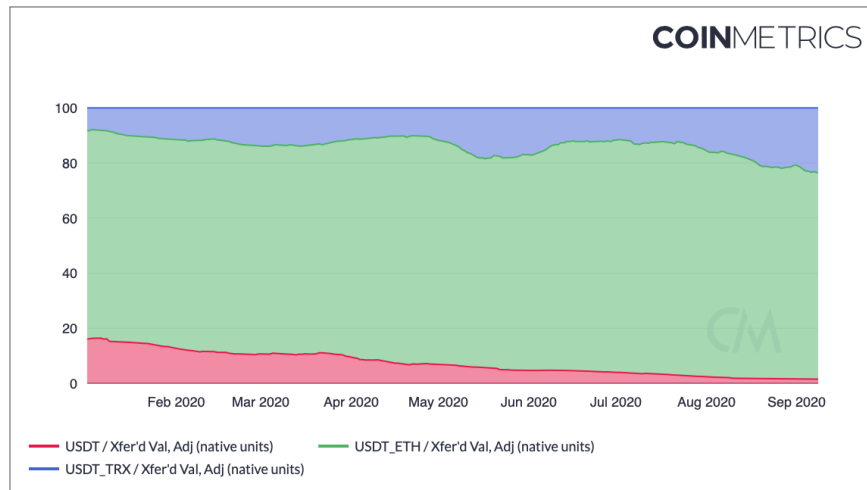
Figure 7.8: *USDT volume on different chains*

The transaction number and volume of USDT on Ethereum increased synchronously with the issuance scale, while the transaction number and volume of USDT on Tron did not follow the growth of the issuance scale well. This shows that stablecoins can only be adopted and fully used by the public if they are issued on Ethereum.

7.2 Transaction fee

Most of PayPal's profits come from transaction fees, which can be calculated with the formula [5]:

PayPal Fees per transaction $= 5.4\% \times TotalFee + 0.30$USD

This fee is the common benefit of shareholders of PayPal. But on Ethereum blockchain, people only need to pay the fee to the miner which is very low compared to PayPal.

7.3 Dollarization

There's a simple feedback loop that powers cryptocurrency systems. Users find a certain type of blockspace desirable, so they acquire the native unit to transact. They also pay fees in those native units. That reservation demand (holding a native unit for a nonzero time period) is a source of buying pressure. The appreciation in the native unit in turn feeds back into security (and optionally, pools of capital like developer funds) as security is generally a function of issuance and unit price. As security and hence settlement assurances increase, the blockspace becomes more attractive. In a proof of stake world, this is simplified: security is presumed to be a function of market cap. If you can induce

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[5]Source: Official website of PayPal

transactors to buy, hold, and use the native unit for long term contracts or settlement collateral, that demand should be manifested in price, making the system more secure. Stablecoins puncture that somewhat. Not only do they potentially replace demand for the native unit as a settlement medium, they also force transactors to juggle multiple currencies—one for actual payments, the other for paying fees. Imagine sending a bank wire and being asked to honor the USD 10 wire fee in the form of shares of your bank's stock. You would probably just prefer to pay the fee in dollars.

There are exceptions, though. Dai is collateralized by Ether on the backend, so even when employed as a transactional unit, it still manifests reservation demand for Ether. Dai has slightly compromised on this vision of liability-free collateral by introducing USDC, BAT, and Wrapped Bitcoin into the collateral mix, however. For now, the most prominent transactional medium (measured in dollar terms) on Ethereum is Tether, which is backed by dollars in a network of offshore banks. While the Dai approach is far more elegant in terms of maintaining the feedback loop of "transactional demand - reservation demand - security - transactional demand", Dai accounts for a relatively small fraction of the stablecoin market. Even certain DeFi use cases that began as the exclusive purview of Dai have begun to be serviced by the more pedestrian, dollar-backed USDC. Dollar-backed stablecoins are simply cheaper to issue. While Ether-backed stablecoins promise a harmonious vision of stable transactional units while retaining the native unit as collateral, it appears that generic fiat-backed stablecoins have the upper hand for now.

It is helpful to think about the problem in the context of nation-states managing their own currencies. They deal with very similar problems: how to enforce a local monopoly for their sovereign currency and ensure it holds its value. Sometimes these states fail in that task and suffer currency substitution on the part of their citizens; this is referred to as dollarization. You might say that, just as in Venezuela, the Kingdom of Ethereum is being threatened with dollarization right now. The question is whether Ethereum has the toolkit to resist this phenomenon or, at least, to de-fang it.

As the local sovereign authority, Ethereum (the protocol) endows Ether (the monetary unit) with certain privileges, the same way the US government gives the dollar privileges. Let's briefly consider what gives the dollar its strength. It is a conjunction of both explicit privileges and emergent properties which result from systems the US guarantees and maintains.

The dollar's explicit privileges include:

- The fact that it's the sole currency that the Treasury will accept for tax payments

- Legal tender laws which define Federal Reserve notes effectively as a valid and legal medium in which to settle debts and pay for things

- The creation by the US government of tax liabilities, forcing businesses and individuals to acquire or retain dollars to pay taxes (if they turn a profit / make sufficient income)

- The dollar's exemption from capital gains taxes owing to appreciation in the currency, unlike foreign currencies

There are also some emergent features which backstop the value of the dollar:

- The US government will only accept dollars in exchange for Treasury bills, widely considered the safest form of government debt.

- Buying securities domiciled in the US like stocks or bonds requires dollars

- More generally, the US is the effective guarantor of the post-WWII western system of international commerce, causing the dollar to be a settlement medium for trade, both within the US and internationally

- The US maintains longstanding arrangements with countries like Saudi Arabia in which they agree to denominate the sale of oil in dollars, and in exchange receive protection and military assistance from the US

- The dollar tends to be more reliable and stable than other currencies, so it is held as a means of preserving purchasing power, even outside the US

Contrary to popular belief, there's nothing actually stopping Americans from using another currency as a transactional medium, except for the fact that it would be really inefficient, would entail exposure to frictions like capital gains taxes, and transactors would eventually have to acquire dollars for tax purposes anyway. Zeroing in on taxation as the sole driver of the dollar's value (as many individuals do, when posed the question), is somewhat reductive. While the US does endow the dollar with certain explicit qualities, you could say what it really does is cultivate an environment where it's generally a good idea to hold dollars. These factors combine to create a very strong reservation demand for the dollar, both within the US and abroad.

It's also worth mentioning that some countries impose capital controls to prevent their currencies floating on the open market. Instead, they tune the demand side of the equation by effectively prohibiting their citizens from exiting the currency for another. It goes without saying that cryptocurrencies, lacking a government or military, do not have the means to enforce anything resembling capital controls. To the contrary, they are globalized, largely frictionless, and highly portable.

How does Ethereum stack up? It's not a nation-state and lacks the ability to directly intervene in the economy the way a government might. Moreover it's inextricably linked to the crypto markets and cannot prevent the free flow of capital. The rise of crypto-fiat

can't exactly be impeded through capital controls. Nevertheless, Ethereum can endow Ether with certain privileges. Borrowing from these common arguments for why Ether will hold value, let's start with Ether's explicit privileges:

- Ether is the default unit for fee payments, and fees are mandatory in order to send a transaction

- Ether payments are 'discounted' relative to tokens: sending ETH requires 21,000 gas whereas tokens require 40,000+ gas

- A portion of fees paid in Ether will likely be burned (if EIP-1559 is accepted)

Ether's emergent features are as follows:

- Ether is collateral in contracts on Ethereum and a settlement medium for intra-protocol applications (like Maker etc.)

- A significant fraction of Ether may be locked up when proof of stake emerges

- Ether is the reserve currency for token issuance on the platform (like ICOs) and more generally, as a base currency (alongside Bitcoin) for the crypto market at large

- Ether is an object of speculation; some people take a position just for the sake of it

To briefly address the less compelling arguments: While many altcoins trade against ETH, their dominant pairs are BTC and increasingly USDT. Speculation alone isn't a sufficient source of reservation demand at equilibrium, and its presence doesn't yield any useful analysis. And locking up coins through PoS doesn't guarantee their appreciation—it is always possible that you have a low-velocity tranche of locked coins with transactors using the remaining non-locked Ether on a short term, as-needed basis. Consider that masternode coins like Dash weren't spared price depreciation, even though a significant fraction of supply was inert in masternodes.

The most compelling arguments for Ether's long term value, in our view, boil down to Ether as a necessary asset for fees, and Ethereum's ability to keep Ether valuable is similar capacity to that of the US and the dollar. The task is to cultivate an environment where it's generally a good idea to hold and use ETH.

7.4 A CONSERVATIVE ESTIMATE

We can note that the market value of PayPal is almost the same as Bitcoin's recently, and its static PE ratio is 93.84 . PE ratio is the ratio of stock price divided by earnings per share. It is applied here for the fact that the income of transaction fees on Ethereum is equivalent to the profit of PayPal. This is because Ethereum directly transfers this part of the benefits to the coin holders as there are no operating cost bear by them.

Analogy to PayPal and Ethereum as a payment platform, we can roughly calculate its valuation in US dollars. Using the product of stablecoin's annualized gas fee and PayPal's price-earnings ratio, a rough estimate of USD 12.79 billion can be obtained:

$$V_{PaymentPlatform} = \textit{Gas Fee of Stablecoin(30 days)} \times \textit{12 month} \times \textit{PE ratio of PayPal}$$
$$= \textit{Annualized Gas fee of Stablecoin} \times \textit{PE ratio of PayPal}$$

Here we use the 30 days gas fee of Tether USD and USDC from the leaderboard, which worth USD 11.16 million.

This is a conservative estimate because the growth rate of stablecoins payments are much higher than PayPal. Although some Ethereum business indicators are similar to PayPal, it is still not easy to perform a perfect valuation. The reason for this is that the development of stablecoins has not increased the benefits of ETH holders. Recently, stablecoins experienced explosive growth, reaching almost USD 11 billion. However, the market valuation has not reflected this yet. So, the further question relates to the issue is that whether the development of stablecoin business can change the final valuation of Ethereum.

CHAPTER 8

DECENTRALIZED FINANCIAL SERVICES

This section evaluates Ethereum as a financial services platform. Decentralised finance (Defi), also known as open-finance, refers to a set of financial services and applications based on blockchain technology. Compared to traditional financial services, Defi brings many benefits by using smart contracts and distributed systems [15]. Currently, almost all Defi projects are constructed on Ethereum because Ethereum has a relatively mature smart contract platform, ETH assets with stable market capitalisation and a large number of cognitive users. For our valuation of Defi, we use two different methods to compare Defi to bank and internet finance companies. In order to produce a conservative estimated value, we will then select the smaller result obtained from the two methods [16].

From a technical point of view, blockchain is a kind of underlying infrastructure, and its application range is very wide. In this part, we focus on its financial application. Defi running on blockchain have high security requirements. The financial industry is the most sensitive to security. Traditional supervision attempts to eliminate financial risks by various means. It is a passive defensive mechanism. The blockchain-based financial supervision infrastructure allows regulators to set up an open "fault tolerance". The structure and mechanism, and require many participants to conduct activities under this set structure, mutual supervision and control. Even if a small number of participants do not abide by the "rules of the game", a consensus mechanism based on the overall situation will enable the majority of participants to immediately discover this situation and automatically report, correct and punish [17]. The outstanding security issues of smart contracts have become the biggest challenge for the Defi industry. But security solutions also bring a brighter picture to Defi.

For valuation of Defi, we use two different methods and compare it to bank and internet

finance company for each method.

8.1 METHOD 1: PE VALUATION MODEL

PE ratios are used in the non-digital financial sector to identify the value of capital assets. This can be used in the valuation of Defi, using a calculation of the protocol's profit, achieved through transparent means. This ratio can be used to show how an asset is evaluated in the marketplace in terms of its income [18]. Compared to traditional banks, however, Defi's PE ratio is extremely high, which distorts the findings by causing a significant underestimation. In order to resolve this issue, Defi will be contrasted instead with a Fintech company.

Fintech companies and Defi share a common goal in striving for greater accessibility in the financial sector, as they both channel resources into making it easier to enter into financial agreements and making these deals more effective and less prone to mistakes. They do vary, however, in the fact that Defi is reliant on open source platforms that are decentralized, as opposed to Fintech which is a much wider sector that is controlled centrally. To some extent, Defi applications can be counted as Fintech, which is a term used to designate financial technologies arising as alternatives to traditional banking. Whilst developments in this industry have achieved some success, with systems such as PayPal greatly improving the accessibility of financial services, this progress has not resulted in quite as much widespread change as was originally thought. Banks and other financial institutions have largely continued to operate in the same way they always have, and many of the restrictions in financial services have remained. How Defi differs from Fintech as a whole, however, is that the former can be programmed and its contracts can be verified, which is achieved using smart contracts rather than individual finance workers, thus becoming a much cheaper process and enabling Dapps to run independently. As such, the scope of Defi is much wider than that of most Fintech, as standard.

Despite these differences, for the purpose of this study, Defi is considered comparable to Fintech companies, allowing us to use PE ratios as indicators of estimated value. Using data obtained from China Securities Index Company Limited, this study focuses on A-share listed companies related to payment, finance, investment, insurance, financial information, and other internet finance-related stocks, as a sample that can be considered reflective of the overall performance of Internet finance companies. The average PE ratio is used as the estimated PE ratio used in the valuation (112 approximately). According to ETH gas station, the 30-days gas fee in Defi is 19.81 million USD. Using the following

formula, therefore, the value of Defi can be estimated at 26.62 billion dollars, according to the PE ratio valuation model:

$$V_{DefiService} = Gas\ fee\ in\ Defi\ (30\ days)\ \times 12 \times\ estimated\ PE\ ratio$$
$$= Annualized\ gas\ fee\ in\ Defi \times estimated\ PE\ ratio$$

8.2 Method 2: PB valuation model

Currently, the three largest functions of Defi are:

- The issuance of stablecoins;

- The provision of peer-to-peer lending and borrowing platforms;

- The facilitation of financial instruments such as decentralised exchanges (DEX), tokenization platforms and so on.

[15]

In each case, the elements are similar to those one would find in a bank, such as borrowing, lending, and transactions. Furthermore, banks also issue their own financial assets.

Consequently, we have elected to compare Defi to the bank valuation model and, to this end, the following tables provide indicators of a number of regional banks' exchange-traded funds (ETF).

	Price/Earning (PE)	Price/Book (PB)	Price/Sale (PS)
KRE	9.87	0.81	2.24
IAT	10.12	0.90	2.37
KBWR	10.25	0.86	2.60
QABA	11.09	0.94	2.79

Table 8.1: *PE/PB/PS ratios of regional banks' ETF*

KRE: SPDR KBW Regional Banking ETF
IAT: iShares U.S. Regional Banks ETF
KBWR: Invesco KBW Regional Banking ETF
QABA: First Trust NASDAQ ABA Community Bank ETF

We have thus calculated the mean PB ratio from the indicators in the above table and

selected the estimated PB ratio of 0.9.

Here we chose to use the Price-to-Book (PB) ratio Valuation method for the valuation. PB ratios are calculated by comparing a company's market value – its share price multiplied by the number of outstanding shares – to its book value – the company's net assets. PB is more suitable for asset-heavy industries or companies, or situations where a company's revenue and profits are largely dependent on assets and is most typically used in bank valuations.

Defi's net assets refer to the wealth of token-holders, measured in the total value of Defi tokens. The market cap of tokens is regarded as similar to a bank's net assets. The sum of Defi tokens' market capitalization is around 8.85 billion. Using the PB valuation model, therefore, the estimated value of Defi is approximately 7.97 billion.

$$V_{DefiService} = Sum\ of\ DeFi\ tokens'\ Market\ value\ \times\ estimated\ PB\ ratio$$

8.3 RESULTS

In order to generate a reasonable result, we have chosen to calculate the mean estimated value of the two results from two mentioned methods above , which leaves us with a figure of 17.29 billion for this part of the valuation.

CHAPTER 9

BLOCKCHAIN INFRASTRUCTURE

9.1 PRICE VS BLOCK-SPACE FEES

From the perspective of gas fee, ETH is undervalued compared to BTC. The following two graphs show the price (represented by the blue line) and block-space fee (represented by the orange line) of both BTC and ETH.
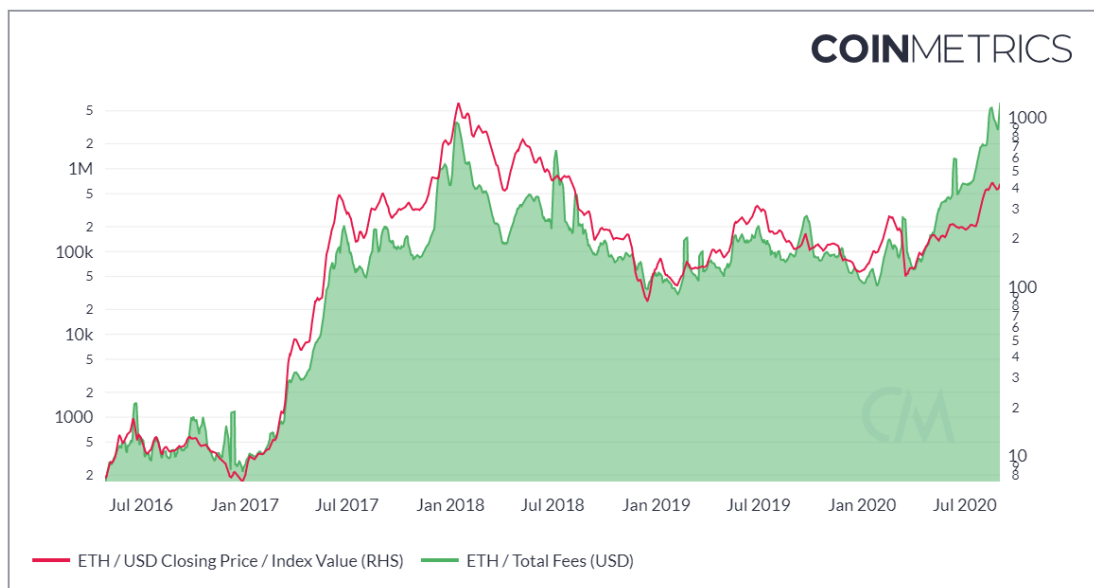

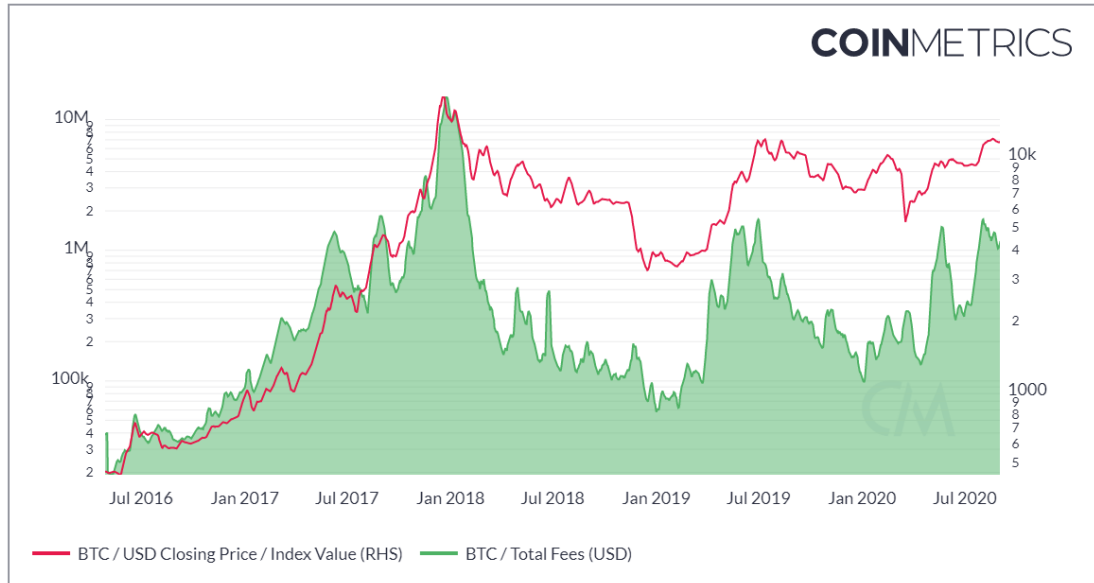Figure 9.1: *ETH Block-space Fee vs ETH Price*

Figure 9.2: *BTC Block-space Fee vs BTC Price*

The first graph shows that, where ETH is concerned, there is a high correlation between unit price and block-space fees. The latest data, however, shows that block-space fees rise faster than ETH prices. In this case, ETH prices are predicted to increase and block-space fees to decrease. It is thus expected that the popularity of Ethereum will continue to drive the price of ETH upward. Moreover, the increasing demand for ETH is predicted not only to catch up with the demand for Ethereum block space, but also to exceed the latter.

The second graph, showing BTC prices against block-space fees, indicates that the increase in the demand for BTC exceeds the demand for block space, which means BTC has already established reserve currency status. Although Ethereum has not shown the same trend yet, we believe that this premium phenomenon will occur in the near future, and ETH will thus be recognized as a value reserve asset in the coming years [19].

9.2 ESTIMATION

The last section of this paper will consider in more depth Ethereum's IT infrastructure, which provides the underlying services to the blockchain.

To value Ethereum as a smart contract platform, it will be compared with utilities exchange traded fund (ETF) based on their similar charging mechanisms. Utilities mainly include public transportation, telecommunications, the provision of energy (electricity,

gas, water, etc.), waste treatment and so on. The fees for these services are typically calculated according the amount of resources and labour consumed by the services. Similarly, on Ethereum, there is an ERC20 token gas fee, where the gas fee depends on how much gas in consumed in the transaction. As such, both charging models are based on how much resources are consumed.

We therefore selected 40 Utilities ETFs from Yahoo finance and calculate their mean PE ratio, which is equal to approximately 30.

Symbol	Name	PE Ratio
AEE	Ameren Corporation	23.01
FE	FirstEnergy Corp.	23.02
FTS	Fortis Inc.	23.06
ES	Eversource Energy	24.34
MGEE	MGE Energy, Inc.	24.84
WEC	WEC Energy Group, Inc.	25.3
XEL	Xcel Energy Inc.	25.76
NWN	Northwest Natural Holding Company	26.28
DUK	Duke Energy Corporation	28.49
MSEX	Middlesex Water Company	30.71
AWR	American States Water Company	33.6
CWCO	Consolidated Water Co. Ltd.	34.3
YORW	The York Water Company	36.33
NEE	NextEra Energy, Inc.	38.61
AWK	American Water Works Company, Inc.	40
ORA	Ormat Technologies, Inc.	41.03
SJIU	South Jersey Industries, Inc. CORP UNITS	43.55
SR	Spire Inc.	50.32
CWEN-A	Clearway Energy, Inc.	52.72
HNP	Huaneng Power International, Inc.	52.84
CWEN	Clearway Energy, Inc.	55.19
CWT	California Water Service Group	57.63
DCUE	Dominion Energy, Inc.	57.97
AES	The AES Corporation	63.03
WTRU	Aqua America, Inc.	63.65

Figure 9.3: *PE ratios of Utilities*

According to the latest data, the 30-days gas fee excluding stablecoins and Defi is around 11.85 million. The estimated value is calculated as follows:

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$$V_{BlockchainInfra} = \textit{Gas fee excluding stablecoins and Defi(30 days)} \times 12 \times \textit{estimated PE ratio}$$

$$= \textit{Annualized gas fee excluding stablecoins and Defi} \times \textit{estimated PE ratio}$$

Therefore, the estimated value is approximate 5.69 billion USD.

Part III

Conclusion and Discussion

Chapter 10

Conclusion

This paper presented a four-part valuation of different aspects of the Ethereum platform. Overall, we can get an approximate value of Ethereum, which is the sum of the four parts above in valuation (Digital Currency, Payment Platform, Defi and Blockchain Infrastructure). The formula to calculate the valuation of each part can be written as:

1:

$$V_{DigitalCurrency} = \frac{BTC\ Market\ Cap \times estimated\ relative\ value}{number\ of\ ETH}$$

2:

$$V_{PaymentPlatform} = Annualized\ Gas\ fee\ of\ Stablecoin \times PE\ ratio\ of\ PayPal$$

3:

$$V_{DefiService} = \text{mean(result from PE and PB valuation)}$$

4:

$$V_{BlockchainInfra} = Annualized\ gas\ fee\ excluding\ stablecoins\ and\ Defi \times estimated\ PE\ ratio$$

The first part uses the number of active address and transaction volume of ETH and BTC to calculate a range of the relative value, and we choose the average value to calculate the result (USD 49.71 billion). In the second part, we compare PayPal to Ethereum as a fiat currency payment platform. Its value is about USD 12.79 billion. The value of third part is approximate USD 17.29 billion. The last part gets an estimated value (USD 5.69 biilion). The estimated value of Ethereum is USD 85.48 billion according to this paper,

and each ETH is approximate USD 756.46.

CHAPTER 11

DISCUSSION

This paper has, therefore determined the value of the four principal elements of Ethereum; its digital currency, its value as a platform for financial transactions, its financial services, and the infrastructure of its blockchain.

In the first instance, ETH was valued according to the success of Bitcoin, which heralded the new era of cryptocurrencies, providing, for the first time, a digitally managed financial system that is not regulated by a central authority. Ethereum has aimed to build upon the success of Bitcoin's initial innovation by expanding the use of blockchain technology within digital finances. As such, they developed a platform that enables the use of smart contracts and the development of Dapps, all of which are based on the currency unit ETH. As ETH developed, however, it inevitably entered into competition with Bitcoin, which is the principal reason behind our use of BTC for comparison in our valuation process[9].

As Ethereum grew, it also became the chosen platform for an increasing number of stablecoins, thus evolving into a fiat payment platform, which has had a significant effect on the value of the network. This is due to the way in which the augmentation of stablecoins leads to a rise in transactions of fiat currencies, attracting increasing user traffic, and driving up the volume of transactions processed on the platform, all of which contribute to the appreciation of ETH. The research, therefore, suggests that "fiat currency on the blockchain" will eventually evolve into a popular and, to all intents and purposes, "mainstream" option. This study has found that profits in this sector have made it possible for more stablecoins to be built and prosper through the Ethereum network. Furthermore, this development is also supported by Ethereum's financial services and infrastructure, all of which, combined, indicate that the platform is likely to surpass PayPal [20].

The next section of this paper found that Ethereum's value – in as much as it serves the purpose of a network providing for automatic operations for a variety of financial companies – can be identified through Defi, as the success of Defi is intimately connected to Ethereum's accessibility and ability to scale [21].

Moreover, ERC20 tokens are shown to be an effective indication of the worth of Ethereum according to its infrastructure.

These factors, therefore, lead to the conclusion that the method for evaluated devised over the course of this study will provide an appropriate estimated value of Ethereum.

11.1 Defi PE ratio Analysis

In order to evaluate a protocol's earnings, we can apply PE ratio, whereby a high PE ratio indicates that an asset has either been over-valued or is expected to grow significantly. PE ratio can also be applied in Defi to compare tokenised protocols to their relative peers[18].

The Defi protocols and their earning mechanisms are as follows: [18].

- 0x - Liquidity protocol - Market fees are distributed to ZRX tokenholders/liquidity providers.

- Aave - Money markets protocol - A portion of the interest accrued is distributed to LEND tokenholders via burns.

- Augur - Derivatives protocol - Fees from prediction markets are distributed to REP tokenholders for participation.

- Bancor - Liquidity protocol - A portion of trading fees are distributed to BNT liquidity providers.

- Compound -Money markets protocol - Accrued interest is distributed to an insurance reserve.

- dYdX - Liquidity protocol for margin trading - Trading fees are distributed to the parent company.

- Kyber - Liquidity protocol - A portion of trading fees are distributed to KNC tokenholders via token burns or dividends for governance participation (Katalyst Upgrade).

- Maker - Stability protocol - Interest accrued on the outstanding Dai is distributed to MKR holders in the form of token burns.

- Nexus Mutual - Derivatives protocol - Premiums earned from selling covers

- Synthetix - Derivatives protocol - Trading fees are distributed to SNX stakers for minting Synths.

- Uniswap - Liquidity protocol- Trading fees are distributed to Uniswap liquidity providers.

In more general terms, when the usage of a protocol increases, the earnings will increase, which means the underlying tokens are more valuable to prospective investors. As crypto assets are, in general, less mature, however, valuations may be distorted by speculation. As a result, there is a certain potential for the increase of a protocol's value to be informed by investor speculation which, in turn, leads to an increase in usage, whereby a larger number of users generate higher usage protocols.

The table below shows the PE ratios of eight protocols:

	Ox	Aave	Augur	Bancor	Kyber	Maker	Nexus Mutual	Synthetix
PE ratio	6935	74	16761	56	80	243	89	141

Table 11.1: *PE protocols*

Ox and Augur have higher PE ratios than the other protocols (6935 and 16761; respectively), which is an extremely unlikely value in traditional finance terms. These higher figures may indicate that investors expect a higher rate of growth in liquidity and derivative protocols[18].

11.2 Defi valuation by number of users

In addition to providing an estimated value, the total number of users is also a good metric with which to evaluate Defi adoption. In order to determine whether Defi reaches mainstream adoption, will consider how many ordinary people are using this product as opposed to the billions of dollars that are locked into smart contracts. The following graphs illustrate both the total number of Defi users, and the quantity of new Defi users, both of which are increasing exponentially over time, with the total number of users approaching 250 thousand.
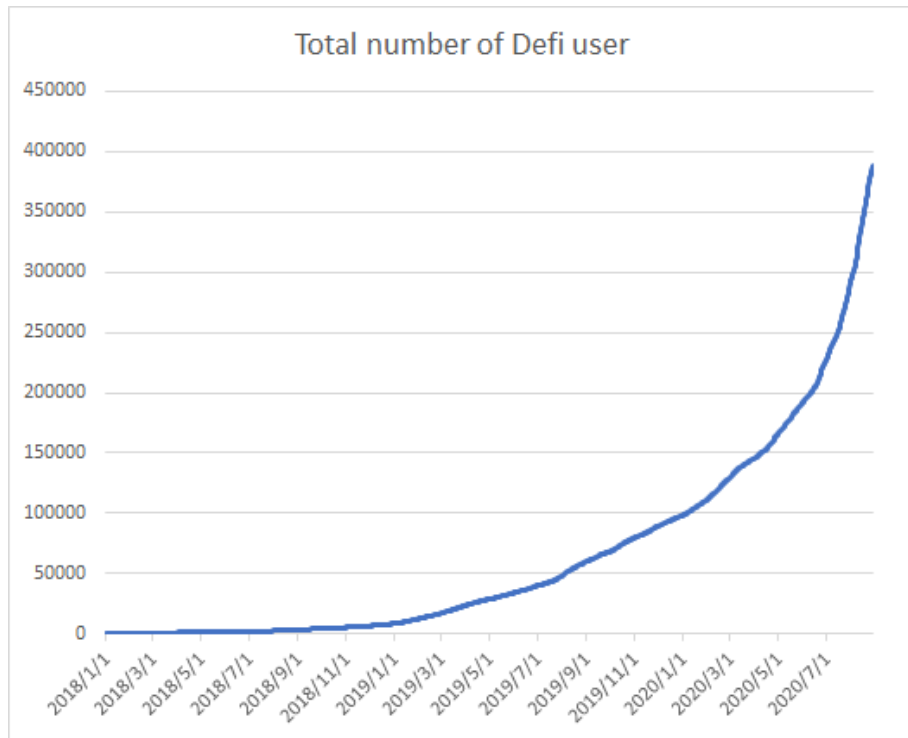
Figure 11.1: *Total number of Defi user*

Although currently the Defi market is relatively small, it is expected that it will reach a million users by March 2021, and 10 million users by May 2022[22].

11.3 ETH AS A STORE OF VALUE

Assets that retain their values are frequently referred to as a store of value [18]. These stores predominantly provide an asset with continuous buying power going forward, such as, for example, gold (which is often considered the most enduring form), cash, or financial capital. Bonds and other assets that collect interest are also considered as stores of value, as they are reliable and legally secure. The ability to trade currency for other forms of value or services also means that it is considered a superior kind of store of value.

As far as internet-based currencies are concerned, however, a token is perceived as having a high worth depending on whether users perceive them as stores of value in the same way that currency is. The research presented above suggests that Adjusted Transaction Volume (ATV) is reflective of this user perception, and the results therefore indicate that, in these terms, it is a long way from its maximum value.

The following two graphs shows the price and daily ATV of BTC and ETH, respectively.It is obvious can be found that the price of BTC and ETH are highly correlated with their

daily ATV, respectively. When the price arrives the peak value, daily ATV reaches its maximum value as well. As such, these two graphs can explain to a certain extent why the current price of BTC is less than a half of its peak price and the current price of ETH is less than 30 percent of its maximum price.
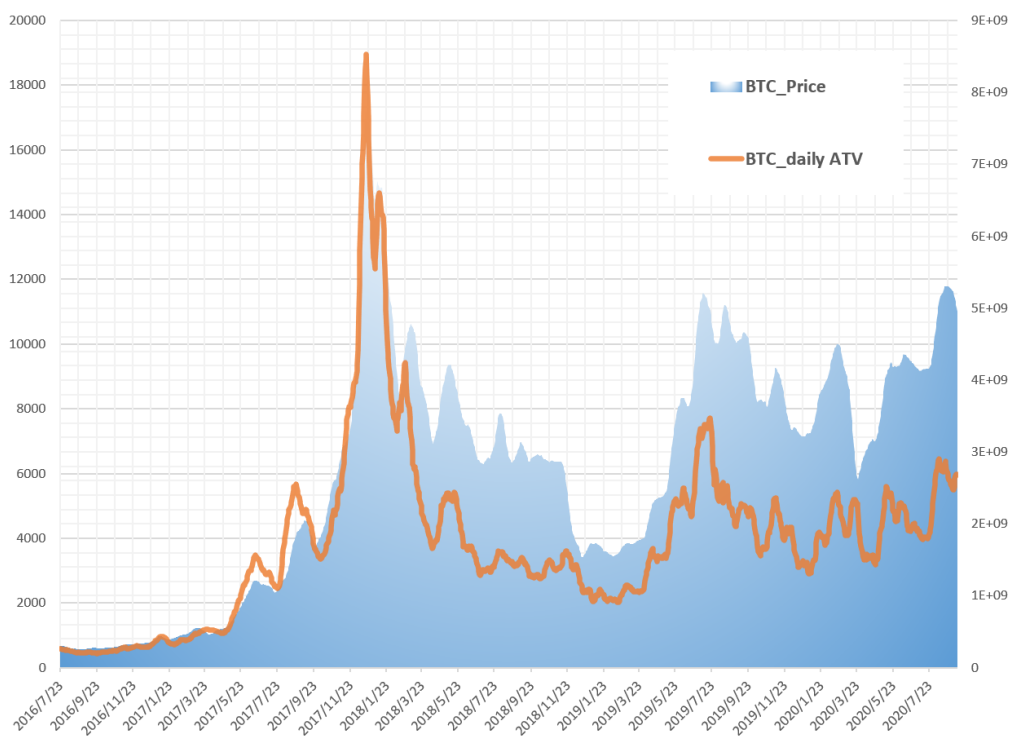

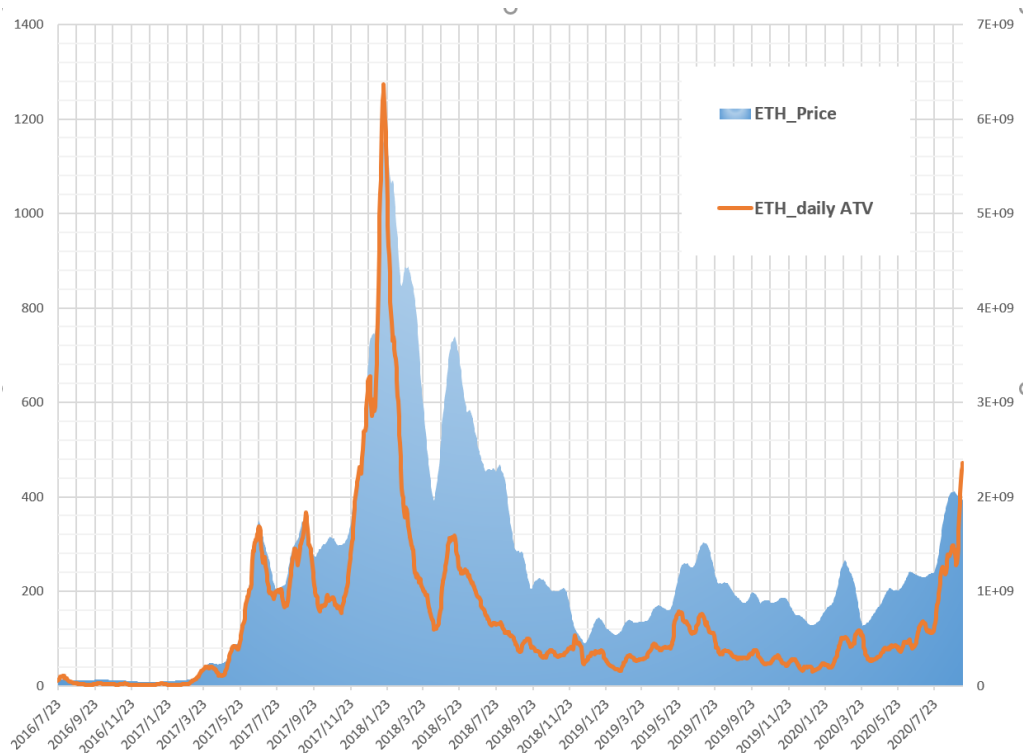Figure 11.2: *Price vs Daily ATV of BTC*

Figure 11.3: *Price vs Daily ATV of ETH*

The earlier examinations of the value of Ethereum's digital currency and infrastructure have plainly indicated that Ethereum has in the past been undervalued in both USD and BTC. The key reason is that ETH has not obtained the premium as a store of value, i.e. a reserve currency premium. It is believed that the value will ultimately be attributed to the only and dominant currency as a store of value [23]. This study, however, has examined in more depth the elements of Ethereum that can contribute to its status as a store of value by analyzing, for example, its policy on issuance in comparison with the first and more well-known blockchain, Bitcoin. It is, nonetheless, important to recognize that there are multiple components, such as protection and permanence, that, combined, exert a profound influence on whether ETH can be treated as a store of value.

The limited maximum supply of BTC is 21 million, of which approximately 17.5 million BTC have been issued. As a result of a potential loss of up to 3 million BTC shortly after the creation of BTC, the maximum provision of Bitcoin could, of course, be quite a lot lower than 21 million. Furthermore, the policy regulating this currency has remained static. ETH, on the other hand, does not limit the number of units that can be issued and does not rest on particular currency policy. The relatively stable low level of ETH issued is influential where the block awards can sustain the network even without a fee market. Whilst this does not, on its own, make ETH superior to BTC, it does suggest that Ethereum is attempting to increase its status as a store of value by reducing inflation

of ETH [23].

In the event that ETH receives recognition as a premium store of value, it is likely that it will become more valuable. At its best, ETH was equal to non-digital currency, when it was positioned as a negotiating asset for ICOs, with ETH as the primary currency for transactions involving a particularly high level of capital. At present, however, ETH is predominantly used in gas fees, although Defi has begun to increase the standing of ETH as a store of value. The large number of stablecoins based on Ethereum, though, may ultimately counteract the necessity of ETH as a reserve currency to some extent.

11.4 "Ethereum killer"

There are so called "Ethereum killers", however, they have not made a great success in Ethereum. For example, Enterprise Operation System (EOS) is one of the most powerful infrastructures for decentralized applications. EOS is a blockchain-based, decentralized system that enables the development, hosting, and execution of commercial-scale decentralized applications on its platform [24] . Take EOS as an example, we will explain the reason why these so called "Ethereum killer" have not made a difference [25].

11.4.1 EOS versus Ethereum

EOS can be seen as a challenge to the Ethereum's dominant position in the market as it appears to home in on the disadvantages of Ethereum's platform. The development of Bitcoin sparked a buzz around blockchains, prompting numerous other systems to emerge including some of the most successful platforms, including Ethereum. Ethereum has since developed to occupy a position at the core of the cryptocurrency market, and this is often treated as a representative of the whole sector. This prime position in the market, however, establishes Ethereum as an important target, and also the focus of many investigations and attacks, as many aims to shine a light on the problems and inner workings of the platform. There is evidently competitiveness between EOS and Ethereum as they aim towards the same objective. They both aim to facilitate the production of decentralized apps on their platform.

Having been launched as early as 2015 and developed around the initial concept of a decentralized network capable of supporting smart contracts, however, Ethereum is much older than EOS, and thus the two have developed in different contexts, relying on different infrastructures and occupying different positions in the markets. A large number of companies, for example, have become affiliated with the Ethereum community in the

pursuit of more secure transactions, thus contributing to the important information on the blockchain. EOS, as a much more recently developed system, adopts the same form, and yet many experts have claimed that novelty gives EOS an advantage as it allows them more opportunities to take advantage of technological developments and achieve a higher transaction rate. These predictions are, of course, thus far unproven, as, at this present moment, the only information available to us is the objectives stated by EOS. Even though the launch of EOS created a buzz, we are yet to witness any material proof as to whether they are likely to achieve their aims. Furthermore, the two platforms are also developed with different users in mind, as Ethereum was developed primarily for the purpose of enabling the production of financial Dapps using smart contracts.

11.4.2 Is EOS "Ethereum Killer"?

EOS is occasionally referred to by "Ethereum killer" as it appears to strike at Ethereum's weaker points, which include the ability to scale, user interface, and performance in relation to recent technological developments. For example, EOS proposes the use of DPoS, which is considered superior to Ethereum's current PoW consensus mechanism. DPoS, a newer mechanism, as it allows users to elect those processing validation requests and thus securing the platform, and each elected miner is then rewarded with the rights of the following block in the chain. This mechanism, as discussed earlier in the paper, is widely considered to be more effective than PoS as, firstly, it does not require the time and effort of classic mining and, secondly, the process as a whole is more egalitarian, as validators are not selected according to the number of coins they hold.

The comparison is particularly clear when one considers the transaction rates of each platform. Whilst Ethereum can only handle up to fifteen transactions in a second, EOS claim to have the capability to process a thousand per second. In order to limit the effects of bugs, therefore, EOS has devised the following possible precautions for coping with suspect programming:

- User accounts may be frozen, through a democratic process whereby 15/21 block producers must form a consensus, it is possible to prevent specific accounts from completing further actions within the system, thus limiting the number of resources that a bug has access to within the platform, and avoiding any further consequences.

- By the same democratic process, they can rewrite applications or contracts. In this case, it is possible that users may not agree with changes, which is accounted for in the democratic structure of EOS as users can vote to substitute producers, thus

ensuring that the producers are representative of the majority community sentiment.

Even with these precautions in place, however, should a bug reach the platform's immutable code, it could cause significant problems requiring the expensive process of moving everything to a new contract [26].

Like Ethereum, EOS is based on smart contracts. Unlike Ethereum, however, there is no transaction fee as long as the platform has what it needs to perform the transaction. Large transfers, however, have thus far proven to be compatible with over 12 cryptocurrency wallets and over a hundred environmentally friendly programs. Despite demonstrating innovative technology and processes, however, it is yet to overtake Ethereum.

In 2018 Tether created an adaptation of USDT that can be used on Ethereum. Whilst more transactions USDT transactions continue to be performed on Omini, Omini has an incredibly low confirmation speed of around thirty minutes, which has led some users to try Ethereum's USDT. In this case, Ethereum's higher transaction speed and lower gas fee is particularly attractive to users. This year, using ERC-20 tokens, USDT is becoming increasingly popular on Ethereum, and other stablecoins are beginning to follow suit (including PAX, BUSD, USDK, HUSD and DAI). EOS, however, is less effective if you wish to use USDT. Although Tether is not compatible with the EOS platform, the process is relatively complex, and still requires the use of ERC-20 tokens for recharges.

Where Dapps are concerned, EOS has employed high numbers of lottery applications which have resulted in the blockchain becoming inundated with disingenuous transactions that have consequently driven prices up resulting in negative user experience for genuine users. The main aim of the platform should not, therefore, be to achieve as high a number of transactions and Dapps and possible but should rather be to create an environment in which sustainable, good quality can be developed by effective project teams.

Overall, the valuation process detailed above can, therefore, be used to identify the most appropriate indicators. Furthermore, these indicators along with other factors described in the course of this study suggest that the reason behind the so-called "Ethereum killers'" failure to surpass Ethereum is not related to transaction rates or innovative technology, but is rather a result of their relative paucity of genuine users, a low volume of transactions, and the ability to hold and exchange value.

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