

De Zilveren Rijder

Ethereum investment thesis

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Introduction

The world is an extremely globalized place, and businesses are connected over the whole world. The internet made this all happen, and created an industrial revolution focused on globalization. The economy is for every country important to achieve success on a global stage. Therefore, currency cannot be ignored. In the last decade, multiple solutions were made to provide quick and cheap payments all over the world. Still, these payment are controlled by third parties. Especially after the economic crisis of 2008, the trust in these third parties declined drastically resulting in peer-to-peer currencies. Bitcoin is such a peer-to-peer currency which is build on a “blockchain”. This paper will focus on Ethereum, which is not a digital currency. However, it did build their own blockchain focused on other applications. Some knowledge about blockchain is crucial for the further understanding of this paper. Blockchain is defined as a “cryptographically secure transactional singleton machine with shared-state” (Kasireddy, 2017). Lets break this down.

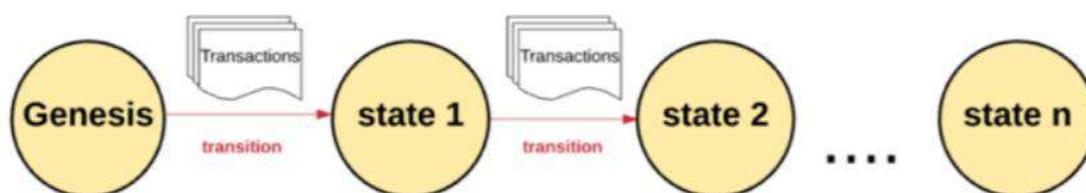
- “cryptographically secure” means that the creation of a digital currency or application is secured by complex mathematical algorithms resulting in a network that is impossible to hack. Moreover, creating fake transactions or erase transaction is not possible so it’s also highly transparent.
- “Transactional singleton machine” describes the global believe of the network. There is one network that saves all the data and is responsible for all the transactions.
- “with shared-state” is, again, focused on the transparency of the system. The overall network is a network of multiple computers resulting in one super computer. Additionally, all the transactions can be seen by every interested party.

To make the definition much more simple. In essence, the Ethereum blockchain is a public record that saves all digital transactions. Importantly, this database is not controlled by a third party and is operated by the society. Moreover, the database is maintained and secured by the society. Transactions within the Ethereum database (network) are performed with Ether, the currency of Ethereum.

Fundamental analysis

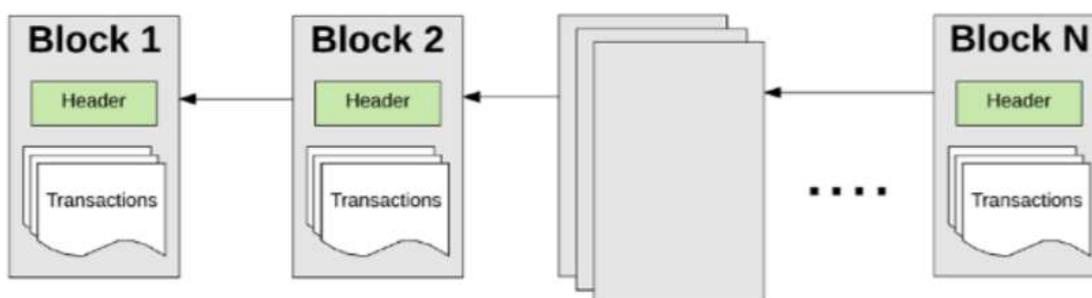
The Ethereum network is a *transaction-based level machine*. This means, in essence that it will read a series of inputs and uses these inputs to transition to a new state. The Ethereum network starts with a blank clean state, called the “genesis state”. When transactions are executed the genesis state transitions into the first state in the network. This process is visualized in Figure 1 below.

Figure 1



The current state, “state n”, of Ethereum is based on millions of transactions which are all categorized in blocks. A block consists of a series of transactions, and each block is chained together with its previous block.

Figure 2



To cause a transition from one state to another, the transaction must be valid. For a transaction to become valid, it has to successfully go through the validation process called mining. The in-depth techniques of mining will be explained later in this section. Mining is, in-short, a group of computers that combines their computer resources to create a block of valid transactions. Many miners from around the world try to create and validate blocks at the same time, with the validation of blocks being done by

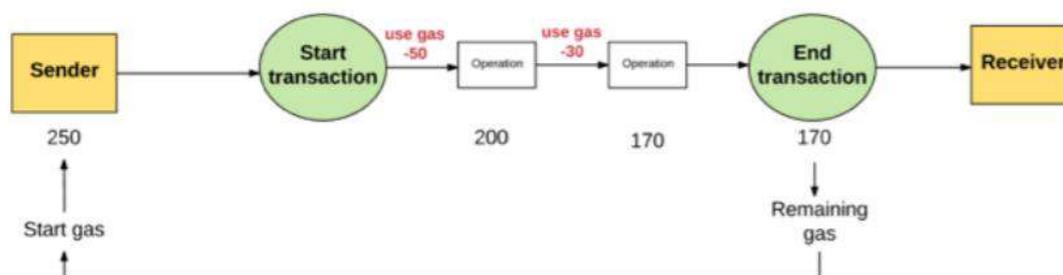
providing “mathematical proof” for submitting the block to the network. If the proof exists, then the transaction should be valid. The process of validation by mathematical proof is called **“proof of work”**. This concept is extremely important because Ethereum is currently in the transition to a **“proof of stake”** network, however, more on that later.

Transactions on the Ethereum blockchain

Performing transactions on the Ethereum blockchain is not free, a fee needs to be paid. This fee is called “Gas”. The gas price is the amount of Ether (ETH) the sender is are willing to spend on every unit of gas. With every transaction, a sender sets a gas limit and gas price. The gas price is measured in “Wei”, where 1^{18} Wei is considered one ETH. The product of the gas price and the gas limit represents the maximum amount of Wei that the sender is willing to pay for executing a transaction. Therefore, it’s necessary that the account holders stores some additional ETH in their wallets otherwise the transaction cannot be completed.

The process for a standard transaction is visualised below in Figure 3. The sender starts the transaction, and the operation begins. At the end of the operation, the total gas fee is determined and the remainder is refunded to the sender.

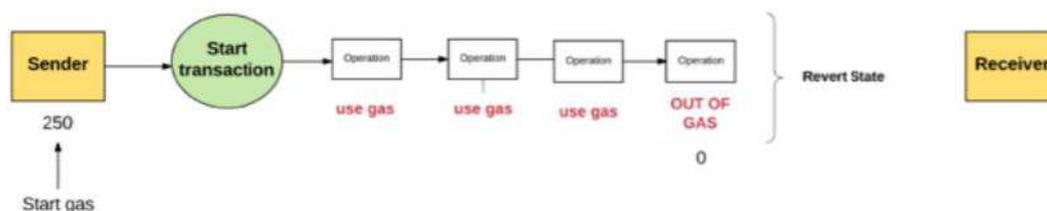
Figure 3



The second scenario is that a sender starts a transaction, but there is not enough ETH in the account to cover the transaction fee. The transaction will be stopped and any state changes that occurred are going to be revised to the original state prior to the transaction. None of the already paid gas is refunded to the

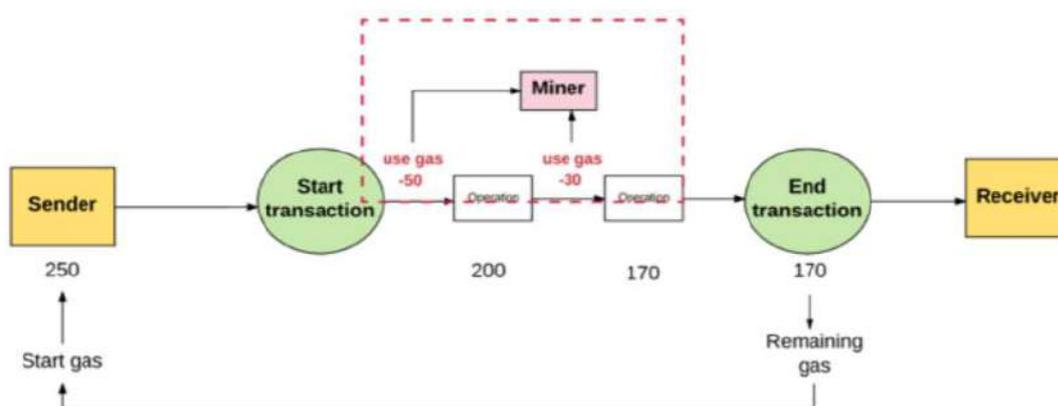
sender since this is already used during the operation process. The transaction is visualised below in Figure 4.

Figure 4



As already mentioned above, the transaction is not free; the money spent on gas is sent to the “beneficiary” address. This is typically the miners address. The miner validates the transaction and is rewarded in ETH because they make the effort to run the mathematical calculations. Typically, the miners prioritize the transactions that pay the most so with the most amount of gas. Therefore, the sender has to determine if the transaction should be prioritize or not. If so, the sender should increase the amount of gas which will result in a lower transaction time. The process of paying the miners is stated below.

Figure 5



Important updates on the Ethereum network

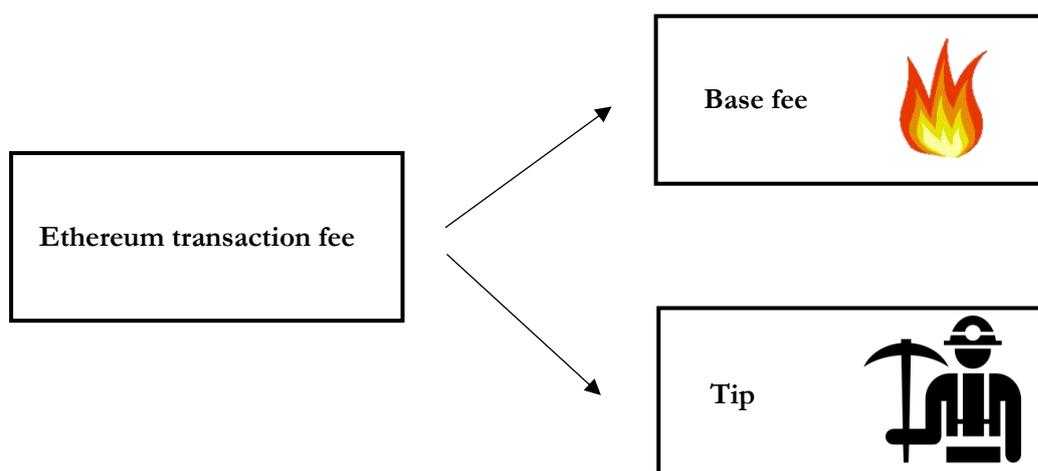
EIP-1556

The Ethereum network is constantly improved by the founders, and partnering developers. As earlier mentioned, the miners receive a reward for every valid transaction. However, the gas price increased significantly last year which became a problem. That’s why EIP-1556 was introduced. EIP-1556 is

extremely important because ETH will become **deflationary** after the implementation. This fact has a critical effect on the expected ETH price in the future.

Before the implementation of EIP-1556, the sender had to determine the amount of gas for their transaction. The determined amount of gas had impact on the transaction time, a lot of gas would result in a low transaction time; and low amount of gas in long transaction times. EIP-1556 changed this whole process. With the new EIP, users need to send transactions with a fee higher than a pre-determined base fee, along with a tip for the miner. The base fee is burned after the transaction and the tip is reserved for the miner. Burning ETH has a critical effect on the circulating supply of ETH since the amount is going to decrease. This fact has a positive effect on the ETH price according to the standard supply and demand rules.

Figure 6



Ethereum 2.0

Ethereum 2.0 is an upgrade of the already existing Ethereum blockchain. It focuses on improving the speed, efficiency and scalability of the Ethereum network.

Scalability

It is necessary that the Ethereum network can handle more transaction per second because the network is becoming more popular, and assuming even more used in the future. The initial idea was to increase the chain size in the network, however, this isn't practical because only powerful and expensive computers

can solve these transactions. Therefore, ETH2.0 upgrades the network by increasing the amount of chains in the network which also increases the security. Moreover, increasing the amount of chains reduces congestion and improves speed beyond the current 15-45 transactions per second limit. And even though there will be more chains in the network, it will actually cost less work from validators (the maintainers of the network). Validators will only need to run through their chain, and not the whole Ethereum chain. This makes the chains more lightweight, allowing Ethereum to scale and maintain decentralization.

Security

As earlier described, Ethereum is operating from a proof-of-work method. ETH2.0 upgrades the Ethereum network to a proof-of-stake method. The transition to proof-of-stake means that the network is better secured against attacks. The proof-of-stake method requires the validators to store (stake) their ETH in the network. Validators are responsible for the same thing as miners in proof-of-work: validating transactions and creating new blocks so that all chains can agree on the state of the network. Proof-of-stake comes with a number of improvements to the proof-of-work system:

- better energy efficiency – the validators don't need to use lots of energy mining blocks
- lower barriers to entry, reduced hardware requirements – the validators don't need elite hardware to stand a chance of creating new blocks
- stronger immunity to centralization – proof-of-stake should lead to more chains in the network
- stronger support for shard chains – a key upgrade in scaling the Ethereum network

Sustainability

Currently, there is much discussion about the electricity consumption of cryptocurrencies and their effect on climate change. Therefore, the Ethereum developers decided to become greener. At this moment, Ethereum is still operating from a proof-of-work method where miners are necessary. These miners use a lot of electricity. However, ETH2.0 is upgrading the network by moving towards a network that is not secured by computing power but by staking. So, the transition to proof-of-stake will also mean that Ethereum will be much more sustainable because the electricity needed to validate transactions is lower, while still being decentralized.

To conclude, ETH2.0 is the next step for the Ethereum network. It is going to increase efficiency, security and sustainability. Moreover, Ethereum will be much easier scalable which is necessary because of the increased popularity and amount of transactions. The total upgrade is a massive project which is why the upgrade is expected to be finished in the beginning of 2022.

Applications of the Ethereum network

Smart contracts

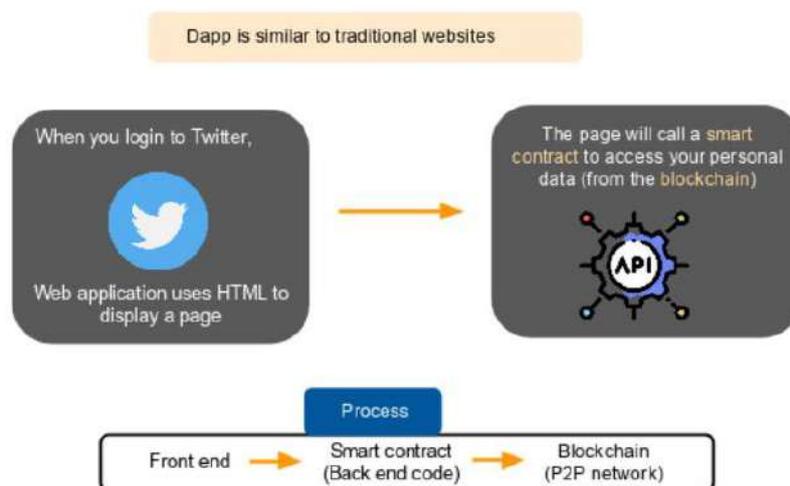
The main real-world application of the Ethereum blockchain are smart contracts. Smart contracts can change the traditional contractual way. A smart contract is a simple computer programme that facilitates the exchange of assets. This could be real estate, shares, property, etc. Anyone on the network can create such a contract if the coding language is learnt. The smart contract consist of the mutual agreements between two parties without involving a third party to oversee the transaction.

The primary feature of the smart contract is that it cannot be changed after it is executed. Moreover, if changes are done, the contract is not changed but a new one is created on top of the previous contract. So, every contract is saved in the network and the transaction is validated by anonymous parties (miners or validators). The Ethereum network is transparent about the transaction which creates trust between the parties. Once the transaction is executed successfully, the accounts of both parties are updated accordingly.

Decentralized Apps (Dapps)

Lets first sketch the process of a traditional application. When logging in into an app, for example Facebook, a web application gets displayed that is rendered using HTML. The page will call an API, which calls your personal data from a central database. The process just described can be performed without using a centralized database. Using a decentralized database increases security, and solves the problem of data leaks.

Figure 7



Decentralized finance (DeFi)

The traditional finance system can be seen as outdated, tightly controlled and held together by decades of old infrastructure and processes. DeFi is an alternative open and global financial system built for everyone that has access to the internet. DeFi uses cryptocurrencies and smart contracts to provide services that don't need intermediaries. In today's financial world, financial institutions act as guarantors of transactions. This gives these institutions immense power because the money flows through them. Plus billions of people around the world can't even access a bank account. In DeFi, the smart contract replaces the traditional financial institutions. Moreover, the contracts are public for anyone to inspect and evaluated. This means worse coded contracts will often come under community scrutiny pretty quickly. Based on this explanation, there are several reasons why the Ethereum network is the perfect foundation for DeFi.

- No one owns Ethereum or the smart contract that lives on the network
- DeFi products are programmed with the same language as the Ethereum coding language
- Tokens and cryptocurrencies are build on the Ethereum network
- Ethereum allows complete financial freedom

The DeFi structure on the Ethereum network can be seen in layers:

1. The blockchain – Ethereum contains the transaction history of accounts
2. The assets – ETH and other tokens / cryptocurrencies
3. The protocols – the smart contract that provide the functionality of borrowing / lending
4. The applications – the products we use to manage and access the protocols

The DeFi infrastructure does improve the current financial system. However, it brings more responsibility to the users since they are in charge of their own decisions and security. On the other hand, DeFi has the potential to solve current problems in the financial system. The problems that exist today are for example: financial institutions can block from getting paid, money transfers can take days (especially country-to-country) and there is a high premium to financial services because intermediary institutions need their cut. A comparison between DeFi and the current financial system is given below.

DeFi	Traditional finance
You hold your money.	Your money is held by companies.
You control where your money goes and how it's spent.	You have to trust companies not to mismanage your money, like lend to risky borrowers.
Transfers of funds happen in minutes.	Payments can take days due to manual processes.
Transaction activity is pseudonymous.	Financial activity is tightly coupled with your identity.
DeFi is open to anyone.	You must apply to use financial services.
The markets are always open.	Markets close because employees need breaks.
It's built on transparency – anyone can look at a product's data and inspect how the system works.	Financial institutions are closed books: you can't ask to see their loan history, a record of their managed assets, and so on.

Other applications

Health application

Ethereum has the potential to completely revolutionize the health-care system. All hospitals around the world have the potential to store, access and share their patient's records. This is a key factor in developing new vaccines for viral outbreaks, or even preventing them in the first hand. You can go to a doctor in Thailand for a check-up when you are on holidays and to a hospital in New York when you are

back home again, and both will have the same information about you. Additionally, imagine that data captured by a smartwatch is automatically shared with every hospital. In this way, patterns could be found in medical conditions like heart attacks and strokes, and you could be warned before it happens.

Politics

The Ethereum network could be used as a voting system. Last year, there were some accusations that Biden altered the results, however, this could never be checked because of physical voting. Ethereum makes altering results impossible since nobody has complete control over the network and every change is logged and visible.

Storing data

Companies like Dropbox or Microsoft store huge amount of data in so-called server farms. A server farm is basically a building where hundreds of servers are that are used to store information. The problem with server farms is that the company concentrates a large fraction of its storage capacity on a single location. Therefore, the company can suffer substantial losses if it is destroyed by a natural disaster or a terrorist attack. The solution is a decentralized server where the data is stored in hundreds or even thousands of computers. Blockchain technology can be used to encrypt and quickly transfer data between millions of servers.

Logistics

Smart contracts can be used in the logistics and shipping sector. Incorporating Ethereum in shipping helps with the tracking of cargo and prevents goods from being misplaced or counterfeited. Ethereum provides the provenance and tracking framework for any asset required in a typical supply chain.

NFT's

NFT's are held on the Ethereum blockchain and afford artists and content creators a unique opportunity to monetize their wares. For example, artists no longer have to rely on galleries or auction houses to sell their art. Instead, the artist can sell it directly to the consumer as an NFT, which also lets them keep more

of the profits. In addition, artists can program in royalties so they'll receive a percentage of sales whenever their art is sold to a new owner. This is an attractive feature as artists generally do not receive future proceeds after their art is first sold. An NFT is created, or "minted" from digital objects that represent both tangible and intangible items, including:

- Art
- GIFs
- Videos and sports highlights
- Collectibles
- Designer sneakers
- Music

Even tweets count as a NFT. Twitter co-founder Jack Dorsey sold his first ever tweet as an NFT for more than \$2.9 million.

Risks for Ethereum

Regulatory risks

Regulators have difficulties with the kind of information decentralized applications (Dapps) and proof-of-stake blockchains (ETH2.0) do and do not collect about their users. Normally, the Dapps don't collect personal data, however regulators want them to. In December 2020, the U.S. Financial Crimes Enforcement Network (FinCEN), a unit of the Treasury Department, proposed rules affecting banks and money services companies as well as cryptocurrency exchanges. Exchanges would have to collect names and home addresses for the owners of private cryptocurrency receiving more than \$3,000 in cryptocurrencies in a day. Such rules could have a huge impact on the users of the blockchain network, and the decentralized apps.

Technological risks

Ethereum is heading to Ethereum 2.0 which is a massive change and upgrade for the network. This means that a lot of coding needs to be done and because of the ambitious goals there is a high probability of bugs and failures. Bugs and failures have impact on the performance of the Ethereum network which

impacts the reputation of Ethereum. So, the developers should take into account that bugs and failures will result in reputation loss.

Competition

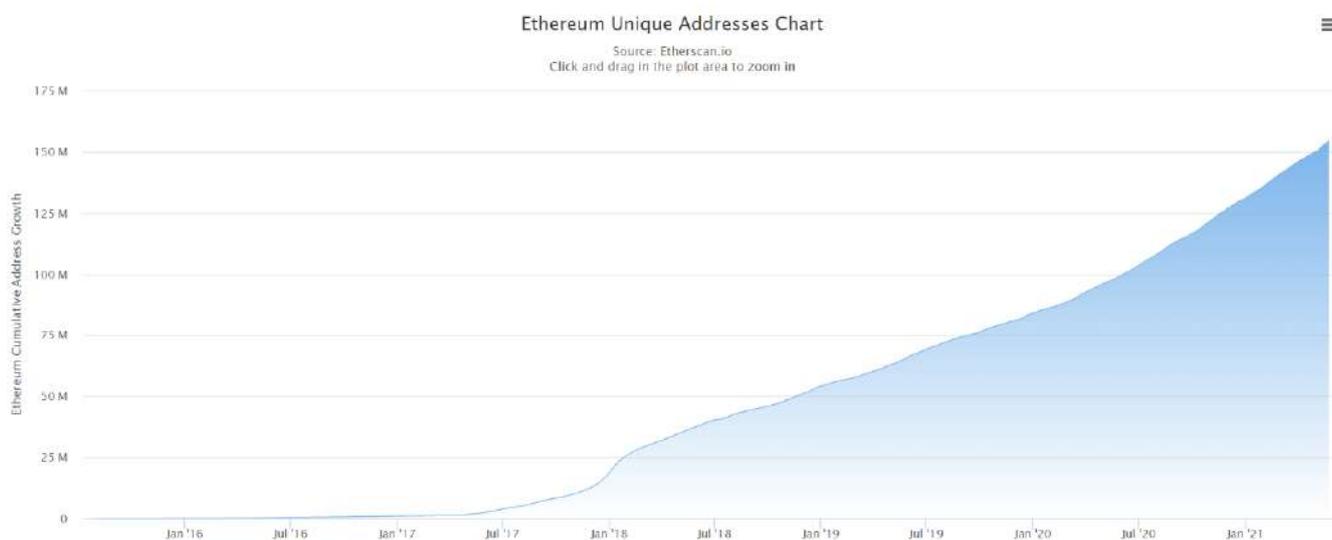
There are a lot of different cryptocurrencies that can have the same purpose as Ethereum. However, the size of Ethereum is a massive barrier for competitors. Moreover, Ethereum is consistently improving their system which means that chances of a better alternative are low.

Valuation of Ethereum

The price of Ethereum is changing rapidly, up and down, because of the young age of the cryptocurrency market. This volatility is why a lot of investors are scared to step in.

It can be argued that Ethereum is still in their development phase due to the drastic changes of ETH2.0. This could mean that if the platform is fully up and running the demand for the product could increase significantly. Moreover, the demand already increased drastically in the last years which is concluded out of the figure below. The figure concentrates on the cumulative address growth in the last years. Given the fact that Ethereum becomes deflationary and the demand is rising, according to the supply and demand rules the price of Ethereum should rise.

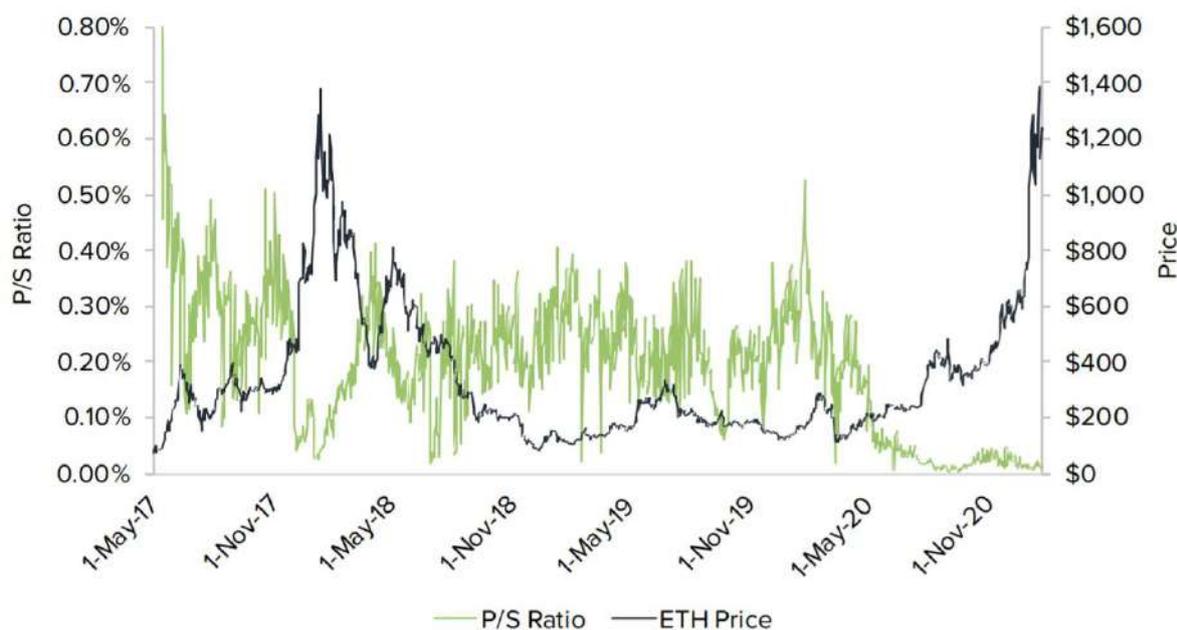
Figure 8



The difficulty of valuing Ethereum comes from the lack of cashflows, and the impossibility of valuing the underlying asset. Therefore, one model is discussed that indicates if Ethereum is undervalued or overvalued and two **opinions** are discussed below.

First, Grayscale constructed a model that uses the standard price-to-sales model to determine whether a cryptocurrency is undervalued or overvalued. In the case of Ethereum, price-to-sales is seen as the transaction costs related to the price of Ethereum. The figure below illustrates this relationship, a lower price-to-sales ratio indicates that Ethereum may be undervalued. As can be concluded out of the figure below, Ethereum can be considered undervalued.

Figure 9



Secondly, an expert panel discussed Ethereum on the 13th of March this year. The expert panel consist of 35 well-respected experts in the cryptocurrency market. The average price-prediction was \$19,842 in 2025, and 51 percent of the attendees said that Ethereum, and not Bitcoin, would be the most important digital asset by 2022. The predictions were most of the time based on the developments and upgrades of the network. As an example, senior lecturer Dr Iwa Salami of University of East London gave an end-of-

2025 forecast close to the panel average of \$20,000. She said the following: “Decentralised finance, which is so far building an alternative financial system that is more accessible and democratised, is largely built through decentralised applications on the Ethereum network” (Salami, 2021)

Lastly, an ex-analysts of the well known investment fund Ark Investment valued Ethereum based on the DeFi application. The ex-analysts is James Wang and mentioned the following: “If Ethereum captures one percent of the total revenues of the global financial system, it should be valued at \$40,000” (Wang, 2021). He also mentioned that this is only based on one real-life case, not incorporating the other real-world applications.

In my opinion, it is not possible to give a justified price prediction based on facts because Ethereum is still in the beginning phase of adoption. It is the believe in Ethereum, and the applications of Ethereum in the future that drives the price at this moment.

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