

The Applications of Cryptocurrency: Evidence from Ethereum

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Abstract. Cryptocurrency (e.g., Ethereum and its currency Ether) presents an opportunity to completely change the way money is transacted, which perhaps even redefines the money. On this basis, this paper will investigate and discuss the basic principles and corresponding applications of Ethereum. As a matter of fact, operating on a decentralized platform while also using the global reach of the internet, transactions can be made with little cost, without interference of intermediaries and government intervention. Besides, it will keep the personal information of the user private. In addition, according to the analysis, each user can define how they use ether as they please, e.g., using Ethereum to store assets like art and reselling them through Ethereum. However, Ethereum still has many issues to fix ranging from security risks, privacy risks, and perceived stability due to Ethereum's notorious volatility and previous illegal activities from other platforms (e.g., Bitcoin). More research is required to distinguish whether Ether can be a viable alternative that could be added to the economy or even completely replacing traditional money altogether and address the current concerns. These results shed light on guiding further exploration of cryptocurrency.

Keywords: Cryptocurrency; Ethereum; decentralized payment.

1. Introduction

In general, cryptocurrency is a novel category of payment for online trading based on blockchains techniques proposed by Nakamoto [1]. The technique is a decentralized technology distributed across many computers that manage and record transactions [2, 3]. The functions of them are similar to arcade tokens or casino chips. Contemporarily, there are more than 10,000 different cryptocurrencies traded publicly according to market research website. The total value of all bitcoins, the most popular digital currency, was about \$735 billion, down from a high of \$1.2 trillion in April. The market value of different cryptos is shown in Fig. 1.

Among various cryptos, Ethereum is one of the well-known one that possesses the second large market value. In this paper, the working mechanisms, applications as well as the risks of it will be discussed and demonstrated. The rest part of the paper is organized as follows. The Sec. 2 will introduce the working principle. Subsequently, the economic importance as well as conditions will be discussed. Afterwards the Sec. 4 will demonstrate the costs as well as benefits of the Ether. Subsequently, the functions of it will be clarified in Sec. 5 from distinguishing trading medium or value store. Later, the Sec. 6 will discuss the prospects and possible future development of e-retail payment tools of Ether. Eventually, a brief summary will be given in Sec. 7.

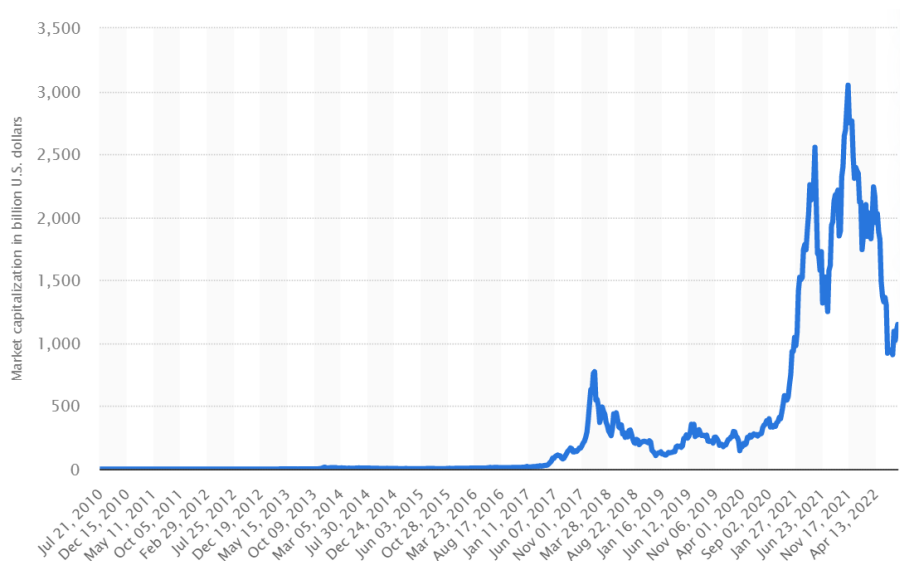


Fig. 1 The market value of crypton currency [4].

2. Descriptions of the working principle

Ethereum operates on a decentralized computer network, with Ether (ETH) as the currency [5]. This means that Ether is open to everyone and attempts to be a community based platform. According to the Ethereum official webpage, the Ethereum platform in addition to being a place to make transfer payments, it can also be a platform for safe and secure marketplace. Ether operates based on smart contracts provided by the platform, and users who own Ether can execute smart contracts through distributed Ether virtual machines.

A smart contract is a computer program that allows users to create their own rules for ownership. Users can implement Ether transactions through smart contracts. Ether implements a distributed and permanently kept ledger called blocks where all transactions are recorded and traceable through a distributed ledger which is called a blockchain that is used to manage and track the currency. Users of Ether use private and public key pairs provided by the Elliptic Curve Digital Signature Algorithm (or be known as ECDSA) in order to ensure the security of transactions [6]. A sketch of the procedure for ETH payments is illustrated in Fig. 2 [7].

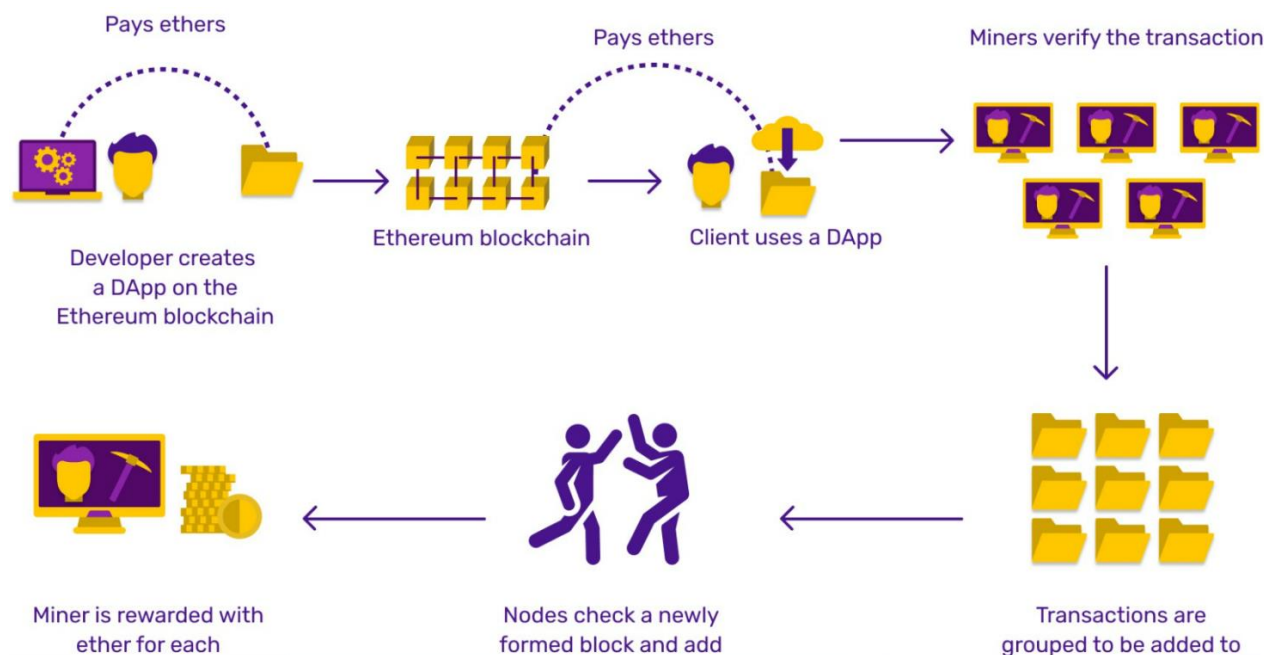


Fig. 2 A sketch of the ETH working process [7].

3. Economically important terms and conditions for consumers and businesses

For ETH consumers and businesses, the factor that most affects its widespread use is security, as it was reported that a hacker once stole \$60 million by attacking an Ethereum-based venture capital fund [8]. Without guaranteed security of transactions, users will gradually reject this type of transaction. All users of Ether can execute smart contracts, so hackers can steal other people's property by attacking smart contracts. Other cryptocurrencies such as the famous Bitcoin has been involved in illegal actions and transactions making the adoption of cryptocurrencies questionable as certain activities such as tax-evasion or contraband is undesirable [9]. In contrast with investing in stock which is a fraction of ownership in a business, Ethereum depends entirely on its investors' expectations. The only thing that increases its price is the positive anticipation of other currency holders. Depending on the expectation in the market, Ethereum can be extremely volatile, it carries great potential profits, but also great risk. Similar to other major cryptocurrencies, the enduring value available in Ethereum is still questionable, and the unstableness restricts its widespread adoption to some degrees. Another issue presented is the social perception of owning such assets. Generally, cryptocurrencies are still considered novelties and not commonplace making individuals feeling uncertain about whether to own them [9].

4. The costs and benefits for individuals to use the Ether

The main cost of Ether is the time cost and GAS cost, and the most important benefit is the decentralized platform. Extending blocks of Ether requires a lot of miners' time, and users need to execute smart contracts when performing transactions and other operations, and the execution of smart contracts requires GAS as "fuel", which is the GAS cost of Ether.

The advantage of using Ether is that transactions can be made on a decentralized platform, no longer needing to trust intermediaries, low transaction costs and high efficiency [10]. Traditional forms of money require certain financial institutions and infrastructure for circulation however with cryptocurrency, the creation, maintenance, and employment of workers is a lot fewer and easier to work with than traditional physical currency [11]. Another benefit is that transactions can be done at a lower cost as the infrastructure is already in place since the internet is global and the government does not need to intervene [12]. It can potentially mean users have a lower cost barrier of entry and do not have to worry about government bureaucracy or intermediaries [11].

However, some say the digital infrastructure is actually a potential added cost. If one institution wants to make an international transfer, there may be an increased need of intermediation and monitoring [6]. In addition, while the internet is global and anyone can access it, the governments and users that may potentially use the service may be untrustworthy thereby leading to the global system being compromised. This may lead to an increase in mistrust in the financial institution cryptocurrency is trying to uphold thereby reducing the stability of the system.

For many individuals, Ethereum has another benefit of being highly liquid [13]. Many people who currently use Ethereum are exploring putting their assets into Ethereum, while some financial assets like money, others have put their works of art into Ether tokens which can help individuals make money [14]. However, just like bitcoin, ether is also subject to volatility, meaning its value can change rapidly and unexpectedly. This makes it hard for people to consider investing in Ethereum if the platform has high volatility. One benefit of using Ethereum is that Individuals can exchange the currency without the need for a bank or other third-party intermediary, and the lack of a central bank means the transaction of Ethereum is almost anonymous, even if it is outright on the blockchain [11].

5. Functions: Medium of exchange or store value

Laura et al. evaluated the function of Ether as a medium of exchange by first converting a currency into Ether and then exchanging Ether for another currency [14]. They found that Ether has low transaction costs and can break geographical restrictions, so it can be used as a proper medium of

exchange. In terms of benefits, most of the currencies except the Japanese yen can be exchanged, by using cryptocurrency without paying an exchange fee, thus creating added value for the consumer. Since Ether can be used as a payment method just as credit or debit cards, it can play a role as a decent or average of exchange, besides that market participants can also enjoy its low cost of transaction along with the absence of geographical restrictions.

In addition, due to the economic benefits assessed when researching currency exchange with intermediaries, in most cases, users of Ether will experience tangible benefits in the procession of exchange when giving a valuation of currencies no matter whether their countries are developed or developing. Regarding Levulyte and Sapkauskiene's research in 2021 [15], for Ether's unit-of-account feature, the authors aimed to evaluate the intra-day, intra-month and intra-year price deviations to check whether they differ significantly from legal tender or demonstrate a stable trend over time. According to the results, developed country currencies have the smallest daily deviations while Ether has larger daily deviations. The standard deviation for Ether is also larger, indicating high volatility and consequently an increased risk for Ether.

The monthly price fluctuations also show similar fluctuations to the daily trends, with the monthly volatility of Ether being high. Not only is the change in the daily closing price evaluated, but also the volatility of the day - the range between the lowest and highest daily prices. The data shows Ether having larger volatility, with a particularly strong trend of price fluctuations and a smaller tendency for fiat currencies.

As for the calculation of annual indicators, the results show a similar trend to daily and monthly fluctuations. In general, Ether has exhibited large price fluctuations in the short term and the long term, making it impossible to use Ether as a unit of account. Exchange rates are fluctuating for all types of currency, but apparently, daily fluctuations in the price of cryptocurrencies are more intense than traditional currencies, this creates some barrier accompanied with a sense of insecurity when evaluating it as a store of value [15]. As a consequence, Ether is often rejected as a means of storing value owing to its large daily price fluctuations.

6. Prospects and possible future development of e-retail payment tools

Cryptocurrencies including Ethereum present an opportunity for increased efficiency for the movement of money and assets. However, central banks and countries also have lots of costs to consider as the platform is still new and could present many issues for anyone looking to use the platform. In terms of countries, the positive influence of the growing e-payment on the amount of consumption and general GDP is more obvious in countries which have significant levels of shadow economy, indicating that e-payment and other similar technologies could be in a vital position in shadow economy transformation [16]. To be specific, for euro-zone countries, tax revenues have increased, probably because they are collected more efficiently. It suggests that electronic payment systems may play a higher role in stimulating and promoting economic activity, or in revealing or changing the shadow economy.

Therefore, it is beneficial for the government to promote e-retail payment. According to Ref. [16], new technologies such as DLT and mobile computing have not significantly changed the specifics of making central bank accounts available to the public. By contrast, these same technologies may have changed the central bank's trade-offs in providing token-based systems. It is unexpected that this change will not come through changes in the efficiency or risk of the token system. Instead, the fundamental change will be that new technology like online payment software or websites could allow central banks or regulators to increase competition in the market for payment services at the wholesale and retail levels, making large companies able to finish the trade in a faster and safer way. By offering a token-based system to a wider range of participants, including individuals but most likely new financial firms, the central bank could increase competition and spur innovation.

While this has been possible before, by opening up high-value payment systems to non-traditional financial institutions, new technology makes it a real possibility for central banks to enter this space.

Thus, it is believed that electronic payment methods can indeed bring more convenience to banks and increase the likelihood of transactions. Canada is one of the seven most developed economies in the world with a mature distributed ledger technology. The central bank of Canada (BOC, the Bank Of Canada) has a great autonomy in monetary policy. BOC launched the Jasper project to study the feasibility and the cost and benefits of distributed ledger technology.

In the first phase of the Jasper project, BOC built a proof-of-concept system for payment settlement in which the Ethernet platform was invoked to increase resilience [17]. The cost of Ether is mainly due to the investment in the development of new technologies and the investment in large-scale computing power. The decentralized Ethereum uses peer-to-peer transactions, which no longer requires the participation of trust intermediaries and cumbersome reconciliation operations, optimizing the transaction process and improving transaction efficiency. The transaction records of Ether are permanently kept, which provides great convenience to improve the transparency of transfers and trace the source and destination of funds.

The introduction of blockchain technology facilitates the upgrade of financial infrastructure and provides greater profit returns for all users, which can attract more investment, promote the financial upgrade and drive Canada's economic development. Meanwhile, the diversity of the blockchain ecosystem determines the diversity of the corresponding risks, which could be used by criminals for money laundering, fraud or other criminal acts. In the process of introducing blockchain technology, the central bank has to promote the innovation of the technology on the one hand; on the other hand, the central bank has to ensure the stability of the existing payment system, hence the central bank has to strike a good balance between these two aspects [15]. The widespread use of blockchain will complicate the regulatory environment and require matching regulatory mechanisms, which is a huge potential systemic risk. Despite the risks, Canada can minimize them by taking certain measures. For example, the practice of blockchain technology has been gradually optimized to form a sound regulatory strategy to match it. The electronic retail payment instrument requires strong connections with private sectors and individuals. Once private accounts are involved in frequent transactions, the burden of management and record-keeping becomes extremely large.

However, the verification of different identities of a large sum of individuals is not the comparative advantage of the central bank. Addressing the problems of identification can be costly for the central bank to set up an e-money system based on accounts. Even though DLT, blockchain, and mobile computing technologies create a chance for the central bank to build up a distributed system of accounts that tracks and updates records, the central bank still has to take the liability. Despite the comparative disadvantage in retail payment sectors, commercial banks and private institutions tend to be more customer-focused than government sectors, as part of the government body, the central bank may face low customer satisfaction when involving transactions with the public.

Combining the viewpoints and studies of many scholars, we can find that many questions have not been answered. The most important of these is the impact on the industrial organization of payment service providers, especially banks. There is still a lot of work to be done on the quantitative implications of the central bank's new token system for bank deposits and loans. However, it is worth noting that almost all scholars believe that the advantages of opening the electronic payment industry outweigh the disadvantages, despite the uncertainties. Hence, Canada's economy remains robust after the pandemic, as electronic retail payment tools have been used in most entertainment, business, food and beverage services and areas [17].

7. Summary

In conclusion, this paper discusses the feasibility and develop routine for applications of Ethereum. Specifically, the development of the cryptocurrency market and working principle of Ethereum based on blockchains are introduced and clarified. Subsequently, the economic usage, costs and benefits as well as the functions are demonstrated clearly. Moreover, the current shortcomings and prospects are

proposed accordingly. In the future, it is feasible to witness the wide-range applications of the Ether. Overall, these results offer a guideline for implementation of the cryptocurrency in real life.

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