Ethereum vs. Bitcoin

Creighton University

Julianne Harm

Josh Obregon

Josh Stubbendick

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Objectives

We will explain the differences between Bitcoin and Ethereum, model the expected values of their respective currencies over the next five years, and detail what the future of each company will be. We will then reveal our investment strategy which will result in the greatest gains in five years' time.

Comparing Bitcoin and Ethereum

In order to choose an investment strategy between Bitcoin and Ethereum it is important to understand the characteristics that differentiate the two cryptocurrencies. Bitcoin was first released on January 3rd, 2009 while Ethereum's live blockchain was initially launched on July 30th, 2015. Both of these cryptocurrencies are exchanged by using blockchain technology. A blockchain is a public ledger of all transactions that have occurred. Blocks are added in a linear chronological order. The ledger is public because each node has the full blockchain so it cannot be falsified by a single entity. A node is any computer that is connected to the blockchain and used to execute and verify transactions (Investopedia, 2016). Although each uses blockchain technology they have different goals in mind, which can be seen through the coding protocols put in place.

Bitcoin was designed to act as a secure peer to peer decentralized payment system. Since everything is shown on the public ledger, the blockchain, you can be confident that the transaction is legitimate and the need to trust the other party is negated. Security is Bitcoin's first priority followed by speed. A Bitcoin transaction will show up in as little as one hour and is very secure due to the coding language used. Bitcoin uses C++ programming and has less than 70

specific commands that can be used. This limitation provides more security because it is much more difficult to hack the blockchain within those set commands (Demeester, 2016).

Bitcoins are put into circulation by mining. Mining is "is the process of adding transaction records to Bitcoin's public ledger of past transactions or blockchain" (Hesoid Services LLC, 2016). Miners' processing power is used to complete transactions, and as incentive to do so they are rewarded Bitcoin. The current reward is 25 Bitcoin per block; this reward halves every 210,000 blocks. The next halving is expected to take place in 2020. There will be a finite amount of Bitcoins created; the maximum is 21,000,000 (Janin, Ethereum For Investors Part I, 2015).

Bitcoin operates on a proof-of-work basis. Proof-of-work means that in order to create blocks and add them to the blockchain you must solve very complex mathematical problems. This ensures that the information was difficult and costly to make, which helps to prevent fraud and malicious activity because of the cost involved in creating the block. The proof-of-work model, while it does help to increase security and validity, does have some negative effects. First, it does not give miners an incentive to collaborate and they don't have anything at stake which means there is no consequence for malicious activity (Janin, Ethereum For Investors Part II, 2015). The second problem with proof-of-work is the amount of energy required to validate transactions. Many people consider this "wasted energy" and feel it has a negative impact on the environment. Now that we have an understanding of Bitcoin, let's look at the characteristics of Ethereum and show how it differs from Bitcoin.

Ethereum was designed to be much more than a payment system. It is "a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference." (Ethereum Foundation,

2016). Ethereum's protocol is built to allow flexibility and increase functionality to provide the ability to program many different types of smart contracts within the Ethereum system. Ethereum is written in Turing complete language, which includes seven different programming languages. We'll note that this is very different from Bitcoin, which is written in C++.

When Ethereum was launched they had an initial offering of ether (the cryptocurrency behind Ethereum). The sale of around 60 million ether resulted in raising around $18.5 million (Ethereum community, 2016). Additional ether are released via the mining process, similar to Bitcoin. The reward per block is 5 ether and remains constant, it does not halve. Also contrary to Bitcoin, Ethereum does not have a maximum total number of ether but does cap the amount released each year. Ethereum block times are currently at about 14 seconds, compared to Bitcoin's 10 minutes.

Ethereum also currently operates on a proof-of-work basis. Miners are rewarded for processing transactions and executing smart contracts, which create blocks. Ethereum is currently working towards changing to a proof-of-stake model which will change the reward system dramatically. As we discussed earlier, proof-of-work does not encourage collaboration nor does it provide any consequence for malicious behavior. Proof-of-stake will change that.

In a proof-of-stake model there will no longer be miners, but validators. There will no longer be cryptographic challenges, the difficult mathematical problems that miners must solve. Validators will be required to own ether and in order to validate a block they will be required to put their owned ether on the line to certify that a block is valid. This way, if there is malicious behavior or a validator does something invalid they will lose their stake, their owned ether.

Another difference will be the method of reward. Instead of rewarding miners for creating blocks validators will earn a transaction fee for each transaction and smart contract they validate. This will be much more energy efficient and will put a focus on bandwidth rather than hashrate (number of calculations per second). It will also help to put focus on collaboration rather than competition because the faster everyone can reach consensus (which is necessary to complete a block) the more transactions they'll be able to complete, resulting in higher profits (Janin, Ethereum For Investors Part II, 2015). The parties that want the transaction or smart contract executed will also pay a fee (called the gas price) in order to have it completed and added to the blockchain.

In summary, there are many differences that make Bitcoin and Ethereum distinct from one another. We do not believe that they have an inverse relationship, meaning when one increases in value, the other decreases; they can coexist as they are working towards different goals. Bitcoin is striving to provide fast and secure transactions while Ethereum is focusing on much more. As more and more smart contracts and decentralized applications are built Ethereum's popularity and profitability will increase. Although both are volatile at this point, ether is so new that it is difficult to predict where it will go. We believe that both of these cryptocurrencies have benefits and will see an increase in value going forward.

The Future of Bitcoin and Ether

As we look to the future, we expect Bitcoin to continue to make strides to become an accepted currency worldwide. According to Coinbase, one of the largest Bitcoin exchanges, around 20 percent of activity on its network was payment related rather than speculative

investment in January 2016 (Metz, 2016). While that percentage may seem small, it is growing as Bitcoin becomes more accepted as a currency.

One thing the public expects from a currency is being able to easily spend it. Bitcoin made strides in that area when Coinbase introduced the country's first bitcoin debit card. The company reported that more than 7,500 people signed up for the card within two months of its launch (Metz, 2016). In addition to making it easier for users to spend their Bitcoin, it will also help push more businesses to accept Bitcoin. By accepting Bitcoin outright, they can benefit from lower service fees than from the Bitcoin debit card.

In April 2016, another important step toward the legitimacy of Bitcoin occurred when Bitstamp, a Bitcoin exchange, was granted a payment institution license in Luxembourg. This license allows Bitstamp to operate in all European Union countries under the EU's "passport" program. According to the exchange's cofounder and chief executive Nejc Kodrič, "'[w]e believe that this is stability-inducing — that people will see this as a sign of Bitcoin going mainstream'" (Shin, 2016). The recognition of Bitcoin as a true currency by European governments will only encourage more people to utilize it. This will increase demand and therefore the currency's value.

In addition to being used as a currency, Bitcoin's blockchain technology is being utilized in other ways. "[A] group of tech and finance giants—IBM, Intel, Cisco, the London Stock Exchange Group, JP Morgan, Wells Fargo, and others—teamed up to create Hyperledger, an open source project inspired by Bitcoin that the companies hope will one day provide a more secure and reliable way of trading stocks and other assets" (Finley, 2016). For example, IBM says that disputes over tax rates or incorrect shipments take an average of 40 days to resolve today. With Hyperledger, the hope is this process can be streamlined (2016). Such large,

reputable companies utilizing Bitcoin's blockchain technology will help to increase the currency's acceptance.

Due to these factors, we anticipate Bitcoin moving into a period of greater stability and adoption as a currency. This will continue to result in growth, but not at the breakneck speed of earlier years. However, it will not have the volatility of its infancy either.

On the contrary, the future of the currency ether depends upon Ethereum's technology being used. Ethereum made great strides in having its technology accepted as the blockchain standard when Microsoft Azure started offering it as a service in November 2015. Microsoft indicated it chose Ethereum over Bitcoin because "[w]hile a platform like Bitcoin has many great uses specifically as a Cryptocurrency, Ethereum provides the flexibility and extensibility many of our customers were looking for" (Gray, 2015). By offering Ethereum as part of Azure, Microsoft is making the technology available to far more users than would otherwise use it. This will help to spur further innovations.

One industry that is already developing many uses for Ethereum is the Internet of Things (IoT). For example, the Ethereum computer could unlock doors when someone rents an office or apartment space (Tual, 2016). As more and more devices are connected to the Internet, the ability for them to interact with one another by using Ethereum's smart contracts becomes ever more valuable. In fact, IBM believes that blockchain technology is key to the success of IoT. In a time when over a billion devices could be connected to the internet, "the blockchain is the framework facilitating transaction processing and coordination among interacting devices. Each manages its own roles and behavior, resulting in an 'Internet of Decentralized, Autonomous Things' – and thus the democratization of the digital world" (IBM Institute for Business Value,

2015). Ethereum has a better technological foundation than Bitcoin does to take advantage of these needs.

Ethereum has many uses in the financial services industry as well. Nearly every bank currently uses SWIFT messaging to securely process transactions, but Ethereum smart contracts could cause this network to become archaic (Trivedi, 2016). Distributed ledgers could settle accounts more quickly and save banks, and therefore consumers, up to $20 billion a year (The great chain of being sure about things, 2015). This would also help to protect banks from the unethical actions of employees and the subsequent bad press.

There are risks with Ethereum's smart contracts as well. While smart contracts do not require consumers to trust each other, they do require them to trust the code. "[I]f code is law, so are bugs in the code—and correcting them may itself mean a breach of contract" (Not-so-clever contracts, 2016). While smart contracts are set up to be unchanging and trustworthy, they still ultimately are created by humans who are capable of error.

However, if Ethereum's smart contracts are utilized to the extent that we believe they will be, its currency Ether will be used more frequently as well and its value will subsequently increase. While the future of Ether is more uncertain than the future of Bitcoin, the potential gains are also much greater.

Source: blockchain.info, retrieved 10/12/16

Recommended Investment Strategy

The strategy we want to put in place for our investment is to limit our exposure to the downside risks associated with Ethereum but still be able to capture the upside potential. The future of Ethereum is all dependent on the progress of the smart contracts while Bitcoin's blockchain technology is very established. Therefore, our recommended structure for the $1,000,000 investment is to invest $700,000 into Bitcoin and $300,000 into Ethereum. Based on the last 12 months of return data for Ethereum and Bitcoin, we feel that the 70/30 investment is the max amount of risk we are willing to accept with Ethereum, where we can limit our risk with Ethereum but still have the upside to make a significant return(Figure 2).

Figure 2: Standard Deviation of Portfolio

Proportion of Ethereum	Variance of Portfolio	Portfolio Standard Deviation
0	0.022099282	14.87%
0.1	0.018875527	13.74%
0.2	0.03239462	18.00%
0.3	0.062656559	25.03%
0.4	0.109661344	33.12%
0.5	0.173408976	41.64%
0.6	0.253899455	50.39%
0.7	0.35113278	59.26%
0.8	0.465108952	68.20%
0.9	0.595827971	77.19%
1	0.743289837	86.21%

Projected Returns of the 5 Year Investment

The first step in projecting the return on our 5-year investment was to estimate the future annual growth rates for both Ethereum and Bitcoin. We believe that if Ethereum achieves their goals for the technology they could experience the same success that Bitcoin experienced early, and will have an annual growth rate 136.50% which was Bitcoin's compounded annual growth rate during the five years after one year of traded. As for Bitcoin we are estimating a very conservative annual growth rate of 10%; as we Figure 1 demonstrates, Bitcoin's number of daily transactions has been steadily increasing over the past year, but we believe that these daily transactions may start to slow down if Ethereum achieves their goal. Another factor that leads to the conservative growth rate, is our expectation that Ethereum will people able to capitalize on the smart contract technology, and this could ultimately cut into Bitcoin's market cap and swing the favor in Ethereum's direction. Based on our growth assumptions we project that one Ether

will be worth $868.52 and one Bitcoin will be worth $988.74 at the end of the five year period(Figure 3).

Projected Prices

	ETH	BTC
Current Price	$11.74	$613.93
Year 1	$27.76	$675.32
Year 2	$65.66	$742.86
Year 3	$155.29	$817.14
Year 4	$367.25	$898.85
Year 5	$868.52	$988.74

Assuming our recommended investment structure and projected future prices, our 5-year $1,000,000 investment will yield a total value of $22,321,145.06 or a return of 2232% (Figure 4).

Figure 4: Projected Value

Return on Investment

Conclusion

Although Ethereum and Bitcoin may have similar aspects the two currencies are very different in regards to the use and future of the two digital assets. While the future of Ethereum is uncertain there is an attractive investment opportunity to capture the potential gains of the technology. As for Bitcoin, there is still room for growth and value, but it will not be at the volatile rate it experienced in the beginning years.

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