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## Lecture 6: Improving on Bitcoin

Hello and welcome to your sixth lecture, Improving on Bitcoin where we will talk about Ethereum.

In this lecture you will learn:

- What is Ethereum?
- What does Ethereum do?
- What are Smart Contracts?
- Economics of Ethereum vs. Bitcoin

As of August 2017, Ethereum was the second largest cryptocurrency by market cap. It has consistently showed market dominance as a smart contracts platform.

So what is Ethereum?

You can think of it as “Bitcoin you can program.”

It has a vision of being a worldwide distributed supercomputer that anyone can use.

Ethereum is an open-source public distributed computing platform.

Ethereum features a “smart contract” scripting language.

This scripting language is “Turing-complete” which means it can do the same computations as any other computer.

The smart contracts run in what is called the Ethereum Virtual Machine. The machine is made up of all the miners supporting the network.

The Ethereum network provides a cryptocurrency token called “Ether”

The network also features “gas” to allocate resources on the network.

Ether can be spent on computational tasks or on transaction fees through the “gas” functionality. Ether is a functional token that gives the user access to the EVM which is different from Bitcoin which is just a currency.

So what exactly is a smart contract?

We will demonstrate using an example contract called the Soda Machine Contract.

This contract is very simple. Deposit .01 ETH and you get a soda. The code for the contract may look like the following. Bear in mind that this code is not solidity which is what the Ethereum network runs on, but the idea is the same.

With the soda machine, there is an implicit contract. You trust that the soda machine will give you soda. Using the Ethereum soda machine, there is no trust since you know that you will get the soda.

With Ethereum, there is no trust or centralized machine.

Your contract gets executed exactly as it is written.

This means that you have to be extremely careful to write your contract correctly since bugs can cost you a lot of money!

Smart contracts enable a whole new class of applications called Dapp or Decentralized Applications.

Dapps can't be stopped by any third-party and are 100% transparent.

Gas that is consumed to run Dapps get paid back to the miners giving miners a financial incentive to help support and secure the network like Bitcoin.

What are a few applications that are possible with smart contracts?

The most common application of Ethereum is the ERC20 token standard. Anyone can create and issue their own token using ERC20 smart contract.

Decentralized exchanges are also possible.

You can have exchanges with no central party holding the funds.

Decentralized governance is also possible.

You can have a secure voting and governance structure that is completely transparent.

You can also create ownership and financial structures that run on smart contracts.

This essentially creates blockchain based companies.

Smart contracts have many applications in many sectors that still haven't been fully researched or explored. The door is wide open to innovation!

Here are some fast facts about Ethereum. This data is as of August 2017. We can use the same economic analysis that we did with Bitcoin on Ethereum.

With Ethereum there is no capped supply. There is a fixed issuance per block which is currently 3 ETH, but there isn't a hard upper limit like there is in Bitcoin.

The current supply is around 93.88 million. There are significantly more Ether than Bitcoin meaning if Ether commands the same valuation or market cap that Bitcoin does, its price will be lower.

The block time is much lower in Ethereum with each block coming in roughly every 20 seconds.

The algorithm that Ethereum runs on is Ethash. This algorithm is different from SHA-256 and doesn't require specialized hardware to be efficiently mined.

The emission rate is fixed in perpetuity, but some planned hard forks may decrease the emission rate and slow down inflation.

Despite being based on the ideas of Bitcoin, Ethereum has vastly different specification and functionality making the economic analysis different.

Ethereum, however, solves many of Bitcoin's problems. Ethereum can handle 2 to 2.5 times as many transactions per second as Bitcoin can.

Bitcoin is estimated to be around 7-10 transactions per second where Ethereum is around 15-20 transactions per second.

Ethereum has a full scripting language and use cases outside of being a store of value and a currency.

Faster block times means that you can get confirmations of payment quicker.

Ethereum's 20 seconds is much faster than the 10 minutes it takes for 1 confirmation in Bitcoin.

Ethereum hasn't reached the same level of adoption that Bitcoin has and its brand is not as widely recognized. Bitcoin also has a "first-mover" advantage which has contributed to its higher valuation.

But, that being said, Ethereum derives its value much different than Bitcoin. Ether has more value than simply the fact that everyone believes it has value. Ether has a functional value on the Ethereum network. If you want to run a smart contract, you need to use Ether and miners are willing to accept Ether to run smart contracts.

And this concludes this lecture "Improving on Bitcoin". In the next lecture we will talk more about how Ethereum and Bitcoin stack up and how you can use general analysis techniques to analyze any token. Thanks and we hope you found this lecture helpful!