



# ONLINE

## Cryptocurrency and Blockchain: an Introduction to Digital Currencies

Introduction and Summary

Jessica Wachter, Professor of Financial Management, Professor of Finance

# Module Goals

- More than 11 years after the distribution of Satoshi Nakamoto's famous white paper, some things are clear
  1. Cryptocurrency, and the associated technology of blockchain, has staying power
  2. Cryptocurrency is inherently a hard subject, as it combines the knowledge base of computer science, cryptography, finance, and economics
- The barrier to entry to cryptocurrency is understanding

# Helpful Background

- These lectures are designed for a listener with a background in finance
- No background in computer science is necessary (though the concepts introduced in the second module are challenging)
- The most important requirement is a strong interest in the subject

# Summary

- Module I: Basics of cryptocurrency — What is it and what are the problems it is designed to solve?
- Module II: Basics of blockchain — How does it relate to cryptocurrency? What is it and how is it used?
- Module III: Cryptocurrency as an asset class



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Course Introduction

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Introduction to Cryptocurrency

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“A fraud, worse than tulip bulbs.”

— JAMIE DIMON, JP MORGAN CEO  
SEPTEMBER 12, 2017

“Probably rat poison squared. If I could buy a five-year put on every one of the cryptocurrencies, I’d be glad to do it but I would never short a dime’s worth.”

— WARREN BUFFET, BERKSHIRE HATHAWAY CEO  
MAY 5<sup>TH</sup>, 2018



“Crypto is the mother of all scams and (now busted) bubbles; While Blockchain is the most over-hyped technology ever, no better than a spreadsheet/database.”

— TITLE OF NOURIEL ROUBINI'S CONGRESSIONAL TESTIMONY  
OCTOBER 2018

# What is Cryptocurrency?

Or...

- Is it the future of money?
- Will our grandchildren or great grandchildren be asking, “What were *you* doing when money was being created?”

# What is Cryptocurrency?

- Consider Bitcoin
  - It is not an actual coin
  - It is a unit of exchange:
    - Currently trading at \$3,772.38/ 1 bitcoin (as of Sunday 2/24, 2:47 EST)
  - The smallest unit to trade bitcoin is one satoshi, or 0.00000001 of a bitcoin

# In This Module

1. Transacting in Bitcoin
2. What exactly is currency?
3. Cash-alternatives currently in use
4. Why, then, cryptocurrency?
5. Concluding thoughts



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Transacting in Bitcoin

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# Transacting in Bitcoin

- First, you need a wallet
  - Wallet – a place to store your bitcoin credentials: namely your private key
  - Private key – a 256-bit number, expressed as a hexadecimal

E9873D79C6D87DC0FB6A5778633389F4453213303DA61F20BD67FC233AA3326

- Generated using cryptography
- When people say that they have lost their bitcoins, they mean their private key

# Transacting in Bitcoin

- No way, without the private key, to access Bitcoin
- If someone has your private key, or can infer it, then you have given them your bitcoins
- Your private key can generate your unique address (which is public)

# Transacting in Bitcoin

- Ways to transact in Bitcoin
  - Third-party software (example, Coinbase),
  - Provides the wallet and the access to a bitcoin exchange
  - Can separately choose a wallet and an exchange
  - You can buy with cash using a bitcoin ATM
    - Will then receive a hard copy of your private key, which you can transfer to a digital wallet for security and ease of transactions



# Transacting in Bitcoin

- Once you own bitcoin, you can:
  - purchase goods or services from other users of bitcoin using third party software, or directly
  - trade bitcoin back to dollars
- Bitcoin is a currency, like any other

# Transacting in Bitcoin

- Bitcoin is nothing but a currency
  - It is not:
    - a stock, which is a claim to ownership in a company
    - a treasury bill, which is a claim to the income of U.S. taxpayers
- Unless people believe that it can eventually function as a medium of exchange, in some states of the world, bitcoin has no inherent value

# Transacting in Bitcoin

- Might Bitcoin function someday, as a generalized medium of exchange?
- Some people clearly think this is impossible
- To really answer that question, we need to consider what we mean by currency

# What Exactly is Currency?

- The US dollar is fiat money
  - Legal tender for all debts public and private
- The requirement to accept dollars for private debt is by “fiat”
  - Backed by the power of the sovereign

# What Exactly is Currency?

- The fiat of the US government does not extend:
  - to private businesses accepting dollars for payment
  - to all of the transactions, both legal and illegal, that take place around the world using dollars.
- These transactions do occur, and apparently more frequently than ever.<sup>1</sup>

<sup>1</sup>See Rogoff (2014).

# What Exactly is Currency?

- The self-fulfilling equilibrium:
  - Everyone agrees to take US dollars because they believe that everyone will take US dollars
  - Rests on the following fundamentals:
    1. Dollars can pay taxes and discharge debt
    2. The rule of law
- Bottom line: what makes a currency a currency are the common beliefs of the individual users

# What Exactly is Currency?

- Directly using cash is sufficiently cumbersome that a profitable industry has arisen to allow us to avoid it
  - Nearly all merchants accept Visa and Mastercard
  - Most merchants accept 4 major credit cards: those two plus Discover and American Express
    - Very costly for the merchants due to a fee that can be over 2% of the transactions
    - By law, they are not allowed to offer a discount for cash
      - These cards are very profitable for the credit card companies
      - They are nice for consumers because consumers receive (tax-free) benefits

# What Exactly is Currency?

- Customers demand these cards, so merchants lose business if they do not accept them
- Merchants are not allowed to price discriminate, which implies that these card companies form an oligopoly



# Cash Alternatives

- Centralized intermediary
  - Transactions are still done in terms of dollars
  - But the credit card company keeps track of the accounts and verifies the legitimacy of the transaction
  - Maintains a *centralized ledger*
- Credit cards avoid keeping track of which customers' checks are good and which are not
- Allows internet transactions when you don't know the customer on the other side

# Summary

- Bitcoin is a currency like any other
- Can function as a medium of exchange or a store of value
- In the U.S. we already have a medium of exchange – dollars
- The functionality of dollars as a medium of exchange is through common beliefs
- A profitable industry of centralized intermediaries has grown up to facilitate dollar transactions without the direct use of the currency



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### Why Cryptocurrency?

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# Why Cryptocurrency?

- Bitcoin allows:
  - online transactions (and offline transactions without cash)
  - any transaction for which a credit card is used could be a Bitcoin transaction
- It accomplishes this while still being decentralized

# Why Cryptocurrency?

- Reason 1: A centralized intermediary has a lot of power
  - Should we worry about the potential for abuse given the near-monopoly power of intermediaries?
    - These companies might tamper with this ledger, perhaps to punish enemies or reward friends
  - Probably not: it is very profitable to be a centralized intermediary (*franchise value*)

# Why Cryptocurrency?

- Reason 2: You do not like centralized intermediaries for philosophical reasons
  - i.e. you are an extreme libertarian or perhaps an anarchist
  - Most likely will not lead to widespread adoption

# Why Cryptocurrency?

- Reason 3: You need to hide from the centralized intermediary because you are engaged in some activity you do not want the government to know about
  - Perhaps you do not trust the government, or you are doing something specifically against the law
  - A solid reason to use Bitcoin

# Why Cryptocurrency?

- Multiple equilibria for Bitcoin
  1. No one uses it, ever, so it is worth zero
  2. Used by a narrow group (this seems to prevail currently)
  3. Is a dominant medium of exchange



# Why Cryptocurrency?

- There may be a deeper reason behind the appeal of cryptocurrency
  - What if dollars themselves were to become untrustworthy?
    - The value of the dollar rests (in part) in the hands of the Federal Reserve
    - The Federal Reserve is in principle independent
    - The President of the United States is also the commander-in-chief
    - The value also depends on everyone's expectations

# Why Cryptocurrency?

- Two problems from relying on fiat money
  1. What if there was, say, 5% inflation?
    - Because of the fiat, investors need to hold cash for transaction purposes
    - If there is inflation, those dollars erode in value
    - Similar to a tax in that the government gets to spend the extra money it prints
    - Having a competitor to dollars, residents are not trapped by the seigniorage

# Why Cryptocurrency?

- Two problems from relying on fiat money:
  1. What happens should the currency become truly unstable
    - Weimer Republic 1921–1923
    - Venezuela 2016–present
  2. What happens should the currency become truly unstable
- Bitcoin is designed (to some extent) with protections against problems 1 & 2

# Summary

- Bitcoin is a currency like any other
  - Not recognized as legal tender by any sovereign, zero is always a possible answer to the question: what is its value?
  - Depends on whether it can be used as a medium of exchange
  - Or whether people believe it can be used as a medium of exchange
  - Or whether people believe that people believe it can be used as a medium of exchange

# Summary

- Bitcoin derives its potential value from two sources
  - Ease of transactions without relying on a centralized intermediary
  - Currency that is not prone to manipulation by a central bank
- Will Bitcoin remain a niche product, or might it be widely adopted?
  - It is not enough to have advantages; there must be a critical mass of users who see these advantages as important



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