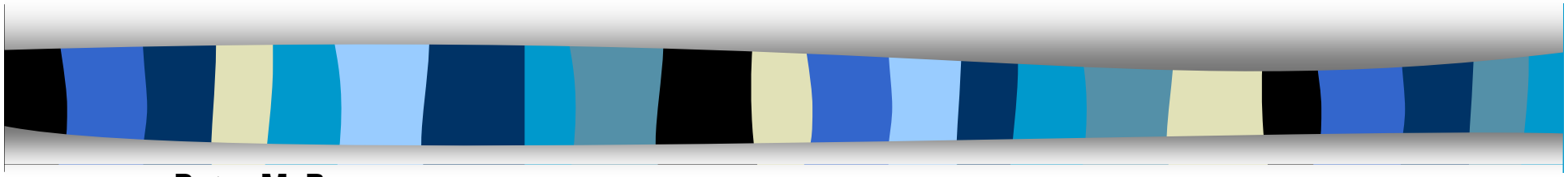
7CCSMDLC: Distributed Ledgers & Cryptocurrencies

Lecture 4: Money and e-Money



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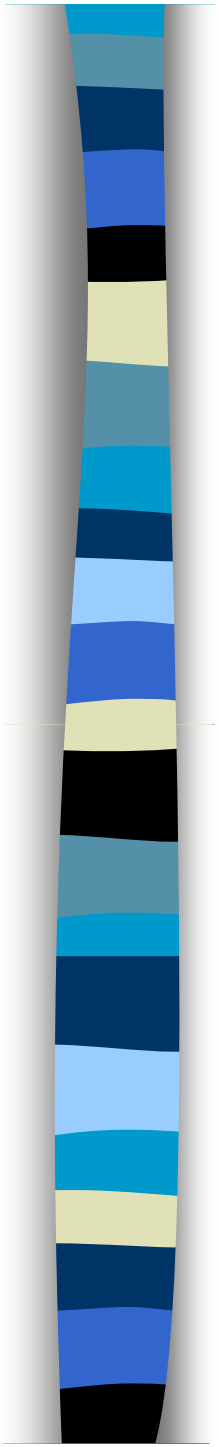
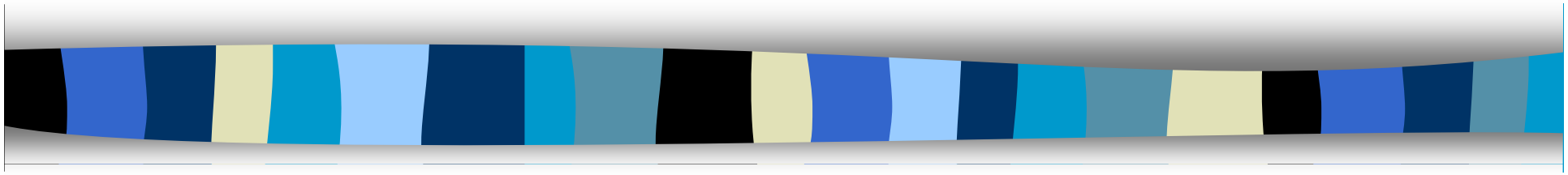


Outline

- Nature of Money
- Hyperinflation and Bubbles



Nature of Money

Rai – Yap stones

Modern definitions

- Coin
- Notes (began as IOUs)
  - In China from 7th Century
  - In Europe from 13th Century

Also?

- Traveler's Cheques
- Bank deposits on demand
- Savings deposits
- Term deposits (24 hours → years)
- Money-market deposits (commercial lending)
  - Telstra Australia superannuation example.

Legal definition of money

In English Law, two competing principles:

- Top-Down: Money is whatever the Government says it is
  - Legal Tender
- Bottom-Up: Money is whatever people accept in payment
  - Promissory notes in circulation from mid 18th century
  - Then accepted by English courts in early 19th century
- Legal Tender in UK
  - 1785: USA adopted a silver standard (later also gold)
  - 1844: Bank Charter Act: Notes fully backed by gold
  - 1914 : Germany abandoned the Gold Standard
  - Other countries subsequently (most in 1970s).

UK Legal Tender

- In UK: Coins from the Royal Mint are legal tender everywhere, with limits on transaction sizes.
  - Eg, 1p & 2p coins only count as legal tender for any amount up to 20p.
- In England & Wales: Notes issued by the Bank of England are legal tender
- In Scotland and Northern Ireland, only Royal Mint Coins are legal tender.
  - People usually accept banknotes from Bank of England, or those issued by Scottish and Northern Irish banks.
- There are laws prohibiting the printing of counterfeit & look-alike coins and notes.
  - Even supersized ones.

Types of money

- Commodity money
  - Money whose value arises from the intrinsic value of the material used to make it
  - Typically a metal (gold, silver, bronze)
  - Yap Rai stones
- Representative Money
  - Money whose value arises from an underlying commodity which it represents
  - A claim on a commodity, eg, “Gold Standard”
- Fiat Money
  - Money without any intrinsic value and without an underlying commodity
  - Value arises from user acceptance
    - Which may in turn arise from a legal decree asserting the money as legal tender.

Major properties of money

- As a medium of exchange
  - To save having to barter
  - To save having to find people willing to barter
- As a common measure of value and a unit of account
  - How many movie tickets are worth 1 refrigerator?
- As a store of value
  - Holds its value over time (assuming no inflation)
- As a means of anonymous payments
- As a means of deferred payments
  - I can pay you now for a good or pay you later
  - I may pay more if I pay you later for a good I receive now (due to the time value of money)
  - I may pay less to pay you now for a good I receive later.

Secondary properties of money

- Fungability
  - Notes/coins are interchangeable
  - Unlike (say) diamonds or rare stamps
- Portability
  - Unlike say houses or land
- Durability
  - Paper vs plastic notes
  - Cf: Australia's first polymer dollar notes.
- Divisibility
  - Unlike say cattle
- Verifiability
  - Need to verify authenticity
  - Use of watermarks, holograms
- Storability
  - Unlike say cattle (which eventually die)
- Not easy to counterfeit
  - Use of watermarks, holograms.

What is the value of money?

- If fiat currency, then value depends on people's willingness to accept it in payment

- This can depend on people's attitudes
  - To the government which issues it

  OR
  - To the monetary policies of the issuing authority

- If the people expect inflation, they may believe money will not keep its value
  - In high inflation, it is better to be debtor than a creditor
  - To borrow money rather than to lend it
  - They may try to convert savings into other assets.

Some definitions

Nostro vs. vostro accounts

- Bank A and Bank B do business together
  - So, Bank A has an account held at bank B
  - A calls this account its Nostro account (“Our money”)
  - And, Bank B keeps an account at Bank A
  - A calls this account B’s Vostro account (“Your money”)

Liquidity

- The speed & ease with which an asset can be turned into cash without lowering its price
  - Cash is the most liquid
  - Gold is very liquid
  - Expensive houses in London are currently not very liquid.

Standard definitions of money in Economics

- MØ = Coins and notes in circulation + Bank reserve funds (UK)
  (Called *Narrow Money*)
- MB = MØ + Coins and notes in bank vaults
  (Called *Monetary Base*)
- M1 = Coins and notes in circulation or in vaults + Travelers cheques + demand deposits + other checkable deposits
- M2 = M1 + Savings deposits + Term deposits under $100 K
- M3 = M2 + Money market funds + Longer term deposits
- MZM = M3 + All money market funds.

Issuing money

- In most countries, only a Central Bank (owned by Government) is allowed to issue money
  - Some countries also license other banks to issue currency (eg, Scotland, Hong Kong).
  - UK: Bank of England
  - USA: Federal Reserve System

- How does a Central Bank do this?
  - Minting coins
  - Printing notes
  - Putting electronic deposits into accounts of commercial banks
    - Into the Nostro accounts of the commercial banks
    - Secured against collateral (eg, land, buildings owned by the banks)
    - The banks can then lend this money on.

Monetary policy

- Most central banks now have explicit objectives, eg
  - To keep inflation below a target threshold (eg, In UK, target = 2% pa)
  - To maximize employment
  - To moderate long term interest rates

- To achieve these goals, they can influence the amount of money in the economy
  - By issuing money
  - By requiring commercial banks to lodge security funds at the central bank ("reserves")
  - By setting base interest rates ("base rate") (UK: 0.50%)
  - By depositing e-money into the nostro accounts of commercial banks ("Quantitative Easing")
  - By Open-Market Operations (OMO)
    - Buying and selling bonds
    - Which releases or withdraws money from the economy.

Aside: Sharing information about policy decisions

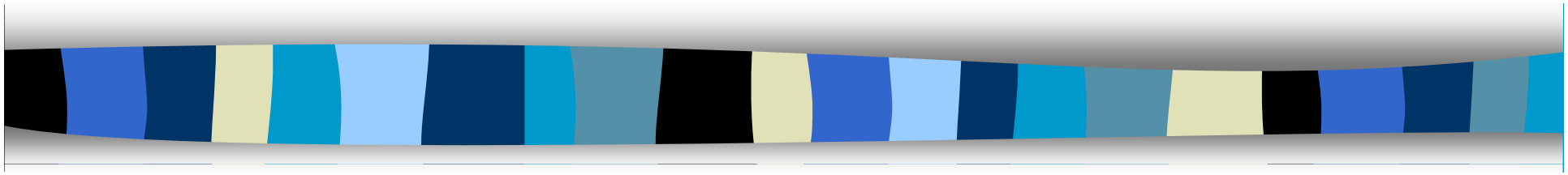
- Standard wisdom in Economics is that more information is better for all
  - So, the Bank of England publishes minutes of meetings of the Monetary Policy Committee.

Not the case for other parts of Government

Example: Petrol chaos in UK in March 2012

- Tanker drivers planned a strike in 1 months time
- Minister of Transport suggested that car-drivers should fill up their petrol tanks ahead of time
- Massive queues at petrol stations THAT EVENING
  - Traffic chaos, queues, gridlock, petrol shortages
  - Predicting a *potential* shortage of petrol led to an *actual* shortage of petrol
- Government is now very careful

about what information it releases.



Hyperinflation and Bubbles

Inflation and Hyperinflation

- If banks issue too much money (or make lending too easy), then
  - There is more money available than goods to be purchased (at least in the short-term)
  - The price of goods rises (because demand for them exceeds supply)
  - The average price of goods rises, and so we get inflation
    - The rate of increase of prices per unit time.
- There is no upper limit on the level of inflation
- Hyperinflation: When inflation rate exceeds 50% per month.

Example of Hyperinflation – Weimer Germany

- Germany (Wiemar Republic) 1918-1924
  - Following defeat in World War I
- Causes:
  - Government borrowing to pay for war (instead of taxes)
  - Reparations (1/3 of deficit 1920-1923, ¼ of exports)
  - Uncontrolled printing of money (Gold standard replaced in 1914)

- Resolution: November 1923 – New Rentenmark introduced.

50 trillion marks note 1923

Example of Hyperinflation – Zimbabwe

- Late 1990s – 2009
- Peak inflation estimate: 80 billion percent in November 2008

- Proximate cause – Government spending to finance ZNA troops in the Democratic Republic of the Congo (Zaire/Congo-Kinshasa)

- Presumed cause – Economic incompetence by Government
  - But: The policy further enriched the richest 10K people
  - Anyone with foreign currency could turn it into millions by repeated forex transactions

Zimbabwe Hyperinflation — Resolution

- Adoption of US dollar in 2009 by Cohabitation Government of National Unity (2009—2013).

- Return of ZANU (PF) to power in late 2013 led to:
  - 2014: Bond coins
  - 2016: Bond notes

- *"Legal Tender Near Money"*
  - Backed by USD reserve funds
  - Used to pay civil servants.

What are functions of cryptocurrencies?

As with any currency, a cryptocurrency may be useful as:

- A medium of exchange
- A common measure of value and a unit of account
- A store of value
- A means of anonymous payments
- A means of deferred payments

However

- Its usefulness for buying & selling real-world goods & services will be inversely proportional to its stability.

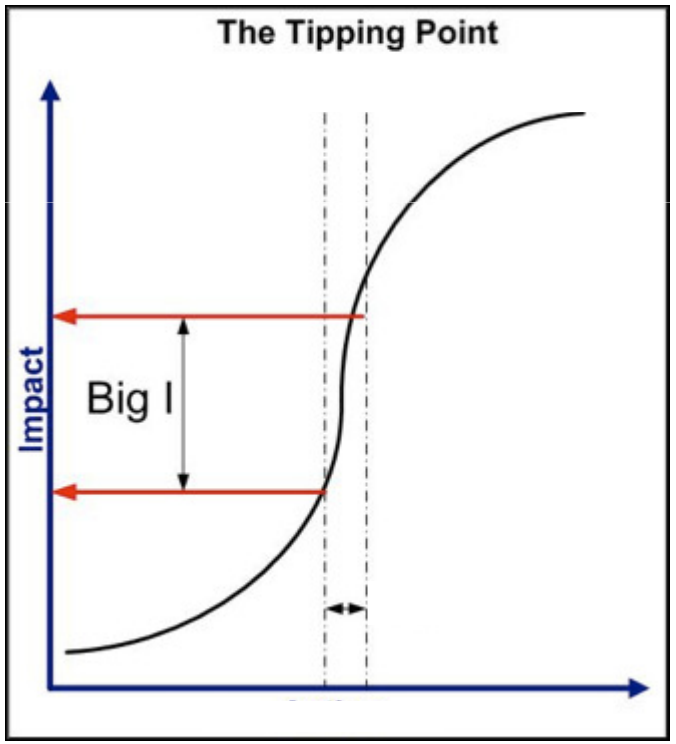
- As a store of value, a cryptocurrency may be particularly valuable for people moving assets across national borders.

Who are the users of cryptocurrencies?

- Criminals and people laundering money
- Governments & people evading international sanctions
  - eg, DPRK, Iran, Russia
- People in countries with capital export controls, hyperinflation or with high levels of corruption
  - eg, Zimbabwe, Venezuela, Indonesia
- Anyone having a need for money for any legal or illegal purpose
- Investors - People purchasing the cryptocurrency to sell it later
  - ie, to take advantage of any rise in its value.

Why interest in cryptocurrencies during 2017?

- Increased use by rogue states (eg, DPRK)
- Use of digital cryptocurrencies for some other application
  - Eg, Initial Coin Offers (ICOs)
- A tipping point of users
- Herd behaviours.



Herd behaviours

- Copying others

- Pump & dump scams
  - Scammer buys shares (or crytocurrency) & promotes it to others
  - As others buy in, the price rises
  - Scammer sells at a higher price than he/she paid

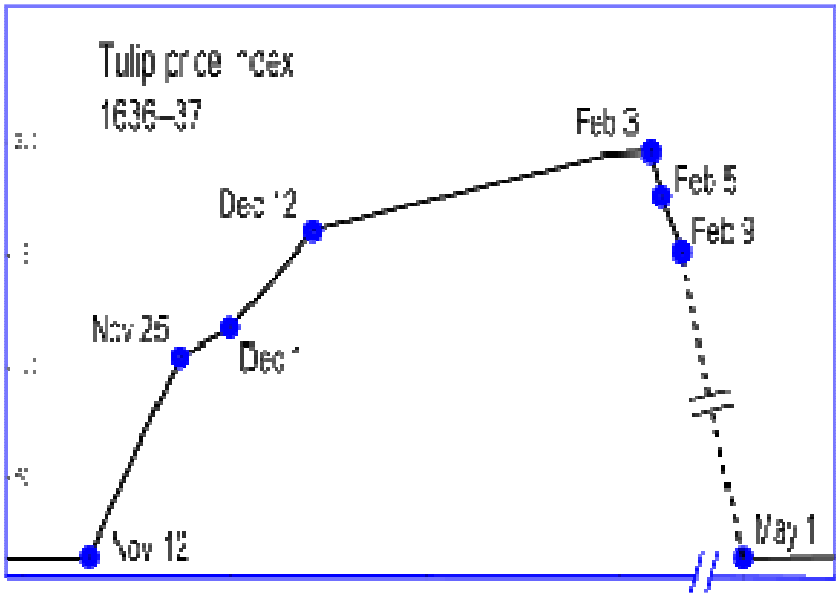
- Ponzi schemes
  - Scammer solicits investment in a fund, promising fast & high returns
  - Early investors receive returns paid from investments by later investors
  - Such a scam must always end, due to world population being finite
  - Example: Bernie Madoff
    - November 2008
    - US$64.8 billion / 4,800 clients.

Bubbles

- Dutch Tulip Bubble (1636-1637)
- South Sea Bubble (1720)
  - Companies in England doing business in South East Asia
  - Share price rose from £100 to £1000
  - Feverish interest
  - One company that successfully raised funds:
    - *"A company for carrying out an undertaking of great advantage, but nobody to know what it is."*
- Various 19th Century bank runs & crashes
- Dotcom Crash (2000).

Dutch Tulip Bubble

- 1636-1637
- Buying and selling of rare tulip bulbs
- Peak price paid for a bulb:
  - "the Viceroy"
  - Price offered 3,000 - 4,200 guilders
  - Typical skilled salary: 300 guilders pa.



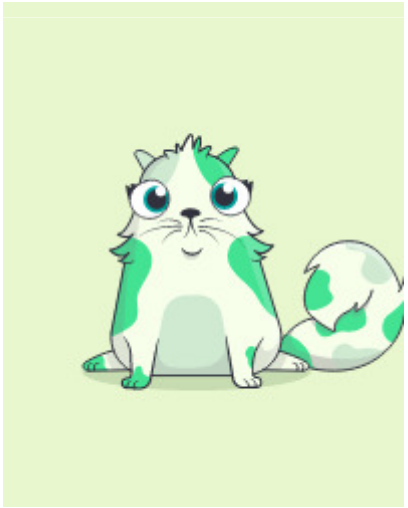
Dotcom Bubble

- Late 1990s to 2000
- Investors were interest in any company engaged in e-commerce
  - Initial Public Offers (IPOs)
  - Typically required a working prototype system
  - Revenues not essential
- NASDAQ Composite Index peaked on 10 March 2000
  - Fell almost 80% over next 30 months
- FBI Investigation
- “Irrational Exuberance”
  - People excited by some new investment.

Cryptokitties

- Started December 2017
  - App running on Ethereum blockchain
- Buying, breeding and selling digital images of cats
  - Breeding rates slow down over time

- Caused serious congestion on Ethereum
  - Over $6.7 million spent in week 1
  - Peak price (Week 1): $114,481.59 (in ETH)
  - Highest price to date: $ 170K



- But showed that non-fungible assets could be traded on Ethereum.

Genesis Cat

How do we value a cryptocurrency?

Supply-side:

- Is the supply fixed
  - Bitcoin: Supply fixed at 21 million
- Can the supply be altered easily?
  - For BTC, new Bitcoins are issued according to an algorithm
- Is the supply under the control of the community or of a smaller group?
  - For Bitcoin, change to the supply algorithm would require a fork (and thus community agreement)
  - Not the case for all cryptocurrencies.

Example: Tether coin

- Launched in 2014, as a blockchain platform and cryptocurrency that allows currencies to be tokenized.
- Fixed conversion rate: 1 Tether = 1 USD
- Claims to be backed by reserves held in USD
  - No independent proof that these exist
  - If reserves exist, they may be otherwise encumbered
  - Initially, offered to redeem tethers for USD (now suspended)
- Supply has suddenly increased several times
- Other suspect aspects
    - eg, relationship to Bitfinex exchange.

Valuing a crypto-currency (2)

Demand side

- Is there an underlying application that would create a demand?
  - For example, tokens for a babysitting club.
- If there is an underlying application, what is the demand likely to be?
  - In Short Run and in Long Term
  - Are there similar or competing tokens?
- Is there any demand from investors (or likely to be)?

Balance between supply and demand?

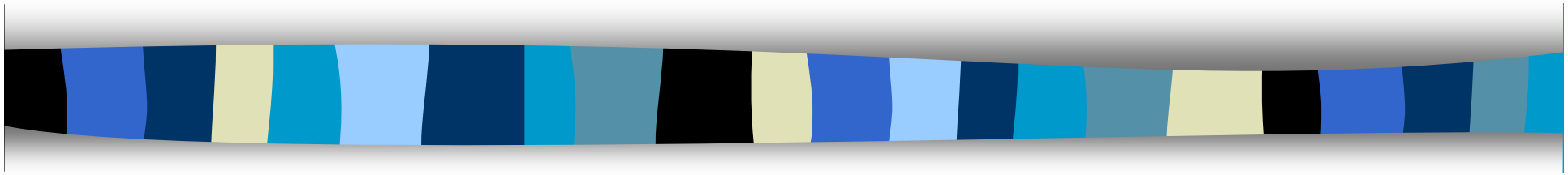
- How do supply and demand match up?
- What are the prices of other, similar cryptocurrencies?

Valuation of cryptocurrencies

It is still early days, so we are still trying to understand this.

- What is the “true” value of Bitcoin?
- Does the notion of “true value” even make sense when there is no underlying or fundamental value?
- Does the notion of “true value” even make sense for any product or service?

Thank you!



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Exercises

1. Find a list of the current top 10 cryptocurrencies, and identity the unique features (if any) of each currency.
2. What percentage of the total market value of these Top 10 does each currency have? Is that market share justified?
3. What is the total number of coins planned to be issued for each of these crypto-currencies? What percent of the total coins for each currency have already been issued?