Class 2 Overview

• Survey Question Results
• Today’s Readings & Study Questions
• History of Money
• Ledgers
• Fiat Currency, Central Banking & Credit Cards
• Role of Money
• Early Cryptographic Digital Money
• Digital & Mobile Payments
• The Riddle Remained
• Class 3 Readings & Study Questions
• Conclusions
Survey Results: What you wish to learn?

Technological Understanding
• Understand Blockchain Technology (18)
• Understand the ecosystem around blockchain (ICOs, currencies, etc.) (2)
• Be able to have an educated discussion about blockchain and money (2)
• Benefits, risks, challenges and next steps of blockchain (2)

Application
• Understand blockchain applications (16)
• Learn to apply blockchain to personal venture or area of interest (8)
• Think about new applications for blockchain (3)
• Factors to consider to start a blockchain company (2)
• Application to the developing world (leapfrog past infrastructure deficiencies) (2)
Survey Results: What you wish to learn?

Impact
• Understand blockchain impacts on internet, business, and finance (disruption) (9)
• Implications in people’s lives (2)

Regulation
• How will regulation and public policy change and need to change (4)
• Learning about regulations (2)

Market & Money
• Make money (5)
• Investing (2)
• Trends and top influencers in the market (2)
Survey Results: What you wish to learn?

Miscellaneous
• Assess how realistic it is for blockchain to upend traditional systems
• Specific blockchain startup success/failure stories and why
• Get a startup idea
• Application to international trade supply chains
• When to use and when not to use
• How blockchain can improve financial system
• Explore how it can be used to create a stable economic system
• Assets tokenization
• Understand how cryptocurrencies fit into monetary base of countries
• Learn the history and development of cryptocurrency
• Absorb as much as possible (no prior knowledge)
• Anecdotes from Prof Gensler’s past
• Understand “Hyperbitcoinization”
Class 2 (9/11): Study Questions

• What do the roles and characteristics of money mean historically and in today’s digital economy?

• What is fiat currency, what are its ledgers and how it fits within the history of money?

• How does Bitcoin fit within the history of money, the emergence of the Internet and failed attempts of cryptographic payment systems?
Class 2 (9/11): Readings

• ‘Conflict reigns over the history and origins of money’ Science News
• ‘A Brief History of Money’ IEEE Spectrum
• ‘What is Money? An Artist’s Make and Take’ Wall Street Journal video
• ‘A Brief History of Ledgers’ LLFOURN, Medium
• ‘Bitcoin and Cryptocurrency Technologies, Preface — The Long Road to Bitcoin’ Clark (pages 3 – 21)
• ‘Bitcoin P2P e-cash paper’ Nakamoto (cover e-mail only)
Non Metal Money

Salt Bars - Ethiopia

Image by Bertramz on Wikimedia. License: CC BY

Cowrie Shells - Nigeria

Image in the public domain by Gary Todd.

Tally Sticks - England

Image by Sandstein on Wikimedia. License: CC-BY

Rai Stones - Yap

Image by Yusuke Kawasaki on Wikimedia. License: CC BY
Metal Money

Bronze Aes Rude - Rome
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Cooper Plate - Sweden
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Bronze Spade - China
Image by Mary Harrsch on flickr. License CC BY-NC-SA
Minted Money

Bronze Yuan - China

Silver Dekadrachm - Greece

Gold Aureus - Rome
Paper Money

Jiaozi Promissory Note - China

5 Pound Note - England

Continental Note – U.S.

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Private Bank Notes

Australia

United States

Canada

England

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Ledgers

Principal Recordings of Accounts

Proto Cuneiform
Uruk, ca 3000 B.C

Personal Ledger
George Washington
1747

Images are in the public domain.
Ledgers

Principal Recordings of Accounts:

- Economic Activity
- Financial Relationships

Types of Ledgers:

- Transaction vs. Balance
- General vs. Supporting or Sub
- Single Entry vs. Double Entry
Characteristics of Good Ledgers

• Immutable, Consistency
• Timestamped
• Ownership
• Accuracy
• Description of Transaction
• Comprehensive
Payment Systems

A Method to Amend & Record Changes in Ledgers for Money
Deposits & Negotiable Orders
Ledgers – Early Money

Tally Sticks - England

Rai Stones - Yap
Fiat Currency

• Social & Economic Consensus

• Represented by Central Bank Liabilities & Commercial Bank Deposits

• Relies upon System of Ledgers
  Integrated into Fractional Banking System

• Accepted for Taxes

• Notes & Coins are Legal Tender for All Debts Public & Private

• Unique Tax Treatment
Central Banking, Money & Ledgers

Image by Richard Gendal Brown from "Thoughts on the Future of Finance." Used with permission.
Central Banking, Money & Ledgers

Panel 1: Assets and Liabilities Today

Note: As of 9/5/18, Treasuries $2.3, MBS $1.7, Federal Reserve Notes $1.6, Bank Reserves $1.9 & Treasury Reserves $0.3

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Credit Cards

Term ‘Credit Card’
Edward Bellamy’s
Science Fiction
‘Looking Backward’
1887

Charge Plates &
Credit Coins
Late 1880s – 1960s

First Bank Card
Charge-It
First National Bank
Brooklyn, 1946

Merchant Credit Cards
Late 1920s – 2000s

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Credit Cards

First General Merchant Card
Diners’ Club
1949

American Express
First Plastic Card
1959

Bank of America
First General Purpose
Credit Card
1966
Credit Card Processing

Slide Card Imprinter
1950s

Visa Imprinter
1979

Payment Terminal
2018

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Role of Money

Medium of Exchange

Store of Value

Unit of Account
Characteristics of Money

• Durable

• Portable

• Divisible

• Uniform/Fungible
  (Crawfurd v. Royal Bank 1749)

• Acceptable

• Stable - Limited supply - Hard to Counterfeit
Design of Money

• Token vs. Account Based

• Physical vs. Digital

• Private Sector vs. Central Bank

• Widely Accessible vs. Wholesale
The Money Flower

Digital

Central bank issued

Token-based

Widely accessible

CB reserves and settlement accounts

Bank deposits

CB accounts (general purpose)

CB digital tokens (wholesale only)

CB digital tokens (general purpose)

Cash

Private digital tokens (wholesale only)

Private digital tokens (general purpose)

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Early Cryptographic Digital Currencies ... All Failed

• DigiCash (David Chaum) – 1989
• Mondex (National Westminster Bank) - 1993
• CyberCash (Lynch, Melton, Crocker & Wilson) – 1994
• E-gold (Gold & Silver Reserve) – 1996
• Hashcash (Adam Back) – 1997
• Bit Gold (Nick Szabo) – 1998
• B-Money (Wei Dai) - 1998
• Lucre (Ben Laurie) – 1999
Why did Early Digital Currencies Fail?

• Merchant adoption

• Centralization

• Double spending

• Consensus
The Riddle Remained

How to move value peer-to-peer without any trusted central intermediary
Bitcoin: A Peer-to-Peer Electronic Cash System

• From: Satoshi Nakamoto <satoshi <at> vistomail.com>
  Subject: Bitcoin P2P e-cash paper
  Newsgroups: gmane.comp.encryption.general
  Date: Friday 31st October 2008 18:10:00 UTC

• “I've been working on a new electronic cash system that's fully peer-to-peer, with no trusted third party.”
A new layer?: Programmable transactions

- Ethernet - 1974
- TCP/IP - 1974
- HTTP - 1990
- SSL / TLS - 1996
- Bitcoin - 2009

PayPal - 1998
Amazon - 1995
Cisco - 1984
3Com - 1979
Class 3 (9/13): Study Questions

• What are the design features – cryptography, append-only timestamped blocks, distributed consensus algorithms, and networking - of Bitcoin, the first use case for blockchain technology?

• What are cryptographic hash functions, asymmetric cryptography and digital signatures? How are they utilized to help make blockchain technology verifiable and immutable?

• What is the double-spending problem and how it is addressed by blockchain technology?
Class 3 (9/13): Readings

• ‘Bitcoin: A Peer-to-Peer Electronic Cash System’ Nakamoto

• ‘Blockchain Technology Overview’ NIST (pages 9 – 23, sections 1 & 2)

• ‘Blockchain 101 – A Visual Demo’ Brownworth
Conclusions

• Money is a Social & Economic Consensus
• Fiat Money is but the Current Lead in a long Evolution of Money

• Fiat Currency has had Challenges & Instabilities as well

• Ledgers are a method for Recording Economic Activity & Financial Relationships
• Central Banking and Financial Sector are built upon a series of Ledgers

• We now Live in an Electronic Currency Age
• Many Efforts have been made at Cryptographic Digital Currencies

• Nakamoto’s ‘Bitcoin: A Peer to Peer Electronic Cash System’ paper & related Blockchain Technology will be studied in the context of the long history of Money & Ledgers