



Blockchain & Money

Class 2

September 11, 2018

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

Code / architecture / market / law & norms

- 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?

medium of transition. unit of counting. state of value

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

established currency by gover. ? = legal tender

- How does Bitcoin fit within the history of money, the emergence of the Internet and failed attempts of cryptographic payment systems?

① No inherent value. But it's a societal set of norms
people are accepting it. ② Fit into history of ledgers

⑤ of scarcity

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



Image by [Bertramz](#) on Wikimedia. License: CC BY

Salt Bars - Ethiopia



Image in the public domain by [Gary Todd](#).

Cowrie Shells - Nigeria



Image by [Sandstein](#) on Wikimedia. License: CC-BY

Tally Sticks - England



Image by [Yusuke Kawasaki](#) on Wikimedia. License: CC BY

Rai Stones - Yap

Metal Money



Bronze Aes Rude - Rome

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Cooper Plate - Sweden

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Bronze Spade - China

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Minted Money



Image by [Scott Semans World Coins](#). License: CC BY.

Bronze Yuan - China



Image by [Daderot](#) on Wikimedia. License: CC0.

Silver Dekadrachm - Greece



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Gold Aureus - Rome

Paper Money

Not enough gold
Easy to use



Jiaozi Promissory Note - China



5 Pound Note - England



Continental Note – U.S.

Private Bank Notes

ICO: Initial coin offering



Australia



United States



Canada



England

Ledgers

Principal Recordings of Accounts



Proto Cuneiform
Uruk, ca 3000 B.C

1747	(1) Mr. Baily Washington Dr	1747	(2) Pers Contra Cr	Dr	Sr
July 10	To two Books 2/6	2/6	Sept 20	By a two foot Gunter 1/3	1 8
	To one D ^r Scemberg 2/6	2/6	Jan 11	By Cash paid Robert Washington 1/3	1 8
July 20	To Cash P. & Co. Drs for 500 1 Nails 1	1 8	July 10	By cash Accts 2/6	2 6
Aug 9	2 Pds of your letters 2 1/2 lbs of leather 1 pound of thread & 5 lbs small nails		Sept 9	Drma 2/6	
			Nov 3	Shows 2/6	

Personal Ledger
George Washington
1747

Ledgers

Principal Recordings of Accounts:

Economic Activity

Financial Relationships

Types of Ledgers:

Transaction vs. Balance

→ also type of crypto .

General vs. Supporting or Sub

→ commercial banks

Single Entry vs. Double Entry

asset > liability

like central
bank

Bitcoin: transaction ledger
Ethereum: balance ledger

asset - liability = capital

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



O → 10 \$ → £

signature. timestamp
payee. payor
how much.



Ledgers – Early Money



Image by [Sandstein](#) on Wikimedia. License CC-BY

Tally Sticks - England



Image by [Yusuke Kawasaki](#) on Wikimedia. License: CC BY

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

social liability

Why?



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Central Banking, Money & Ledgers

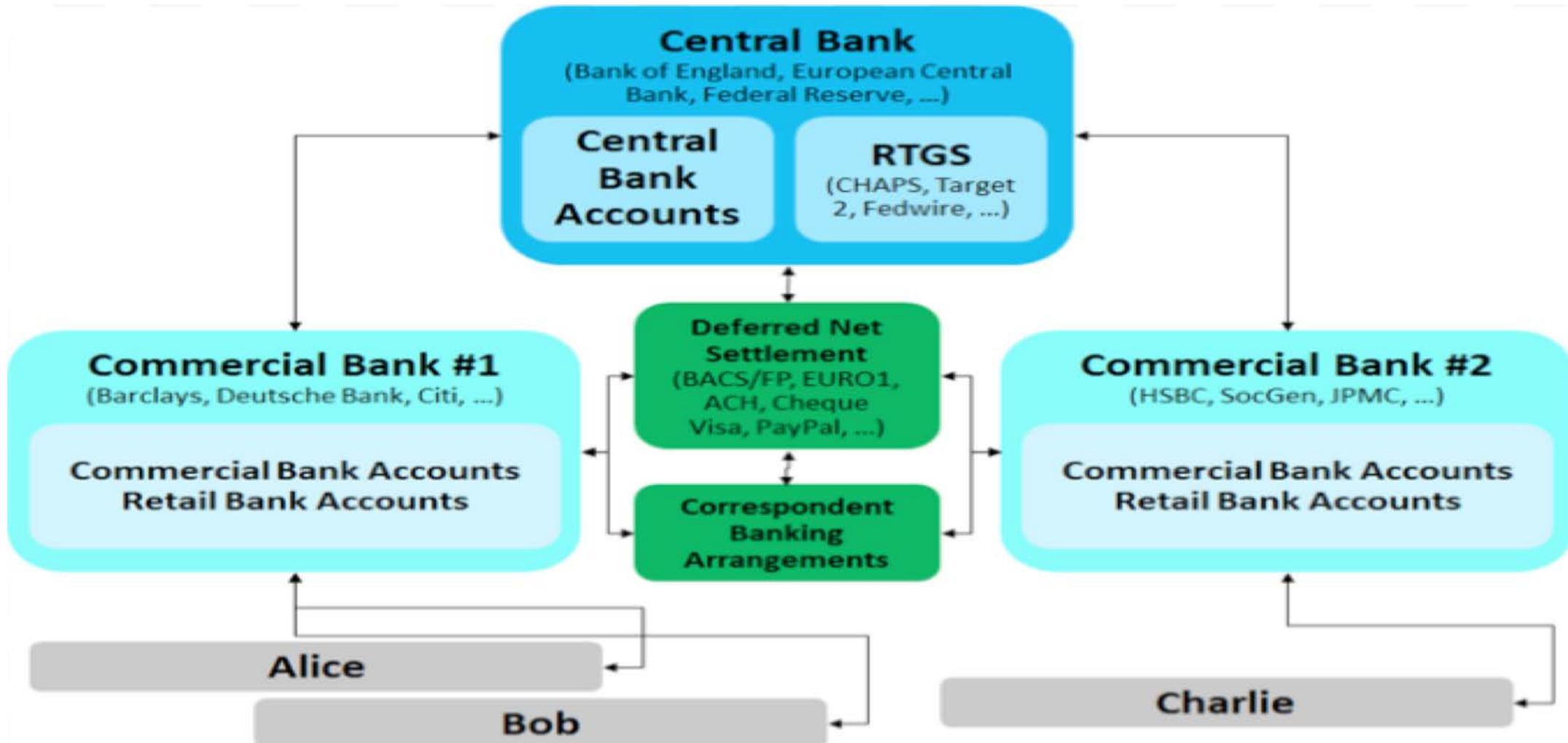
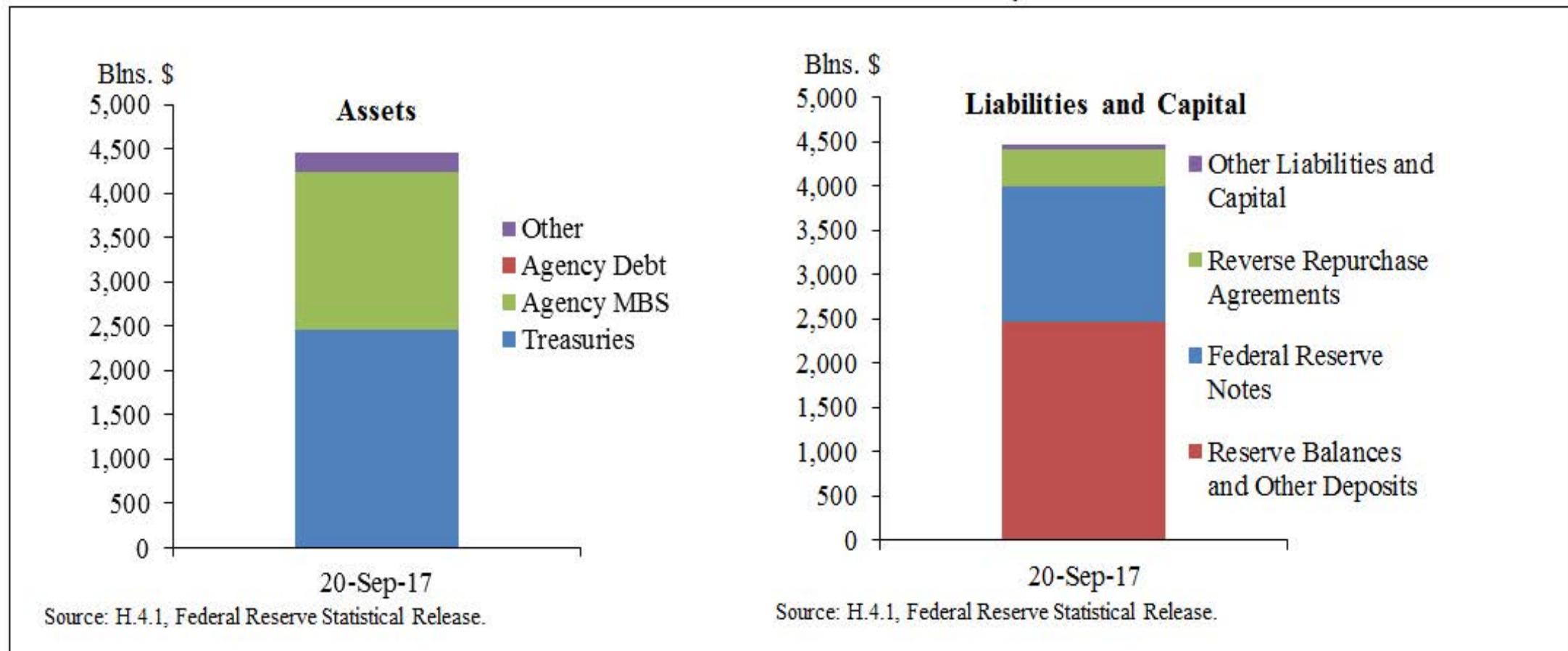


Image by Richard Gendal Brown from "Thoughts on the Future of Finance." Used with permission.

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

Credit Cards

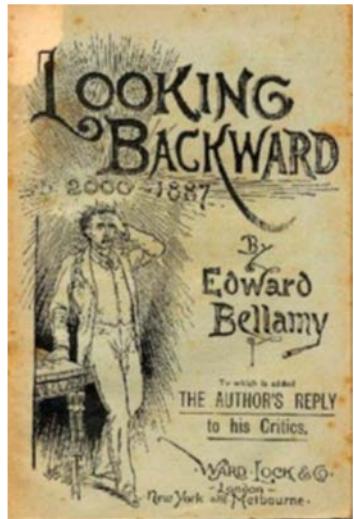


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Term 'Credit Card'
Edward Bellamy's
Science Fiction
'Looking Backward'
1887



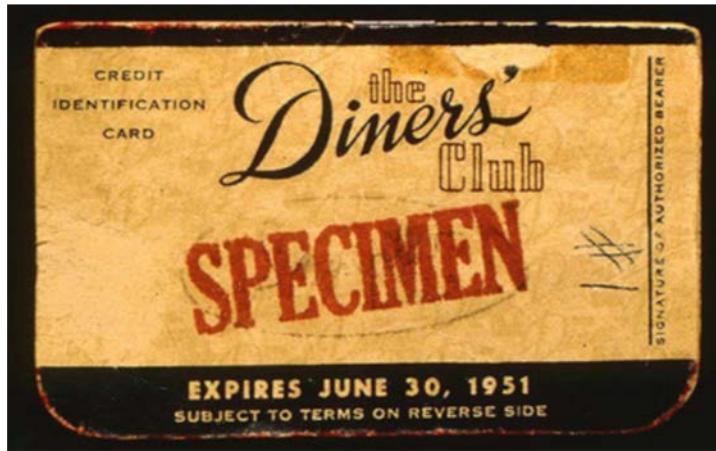
Charge Plates &
Credit Coins
Late 1880s – 1960s



Merchant Credit Cards
Late 1920s – 2000s

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

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



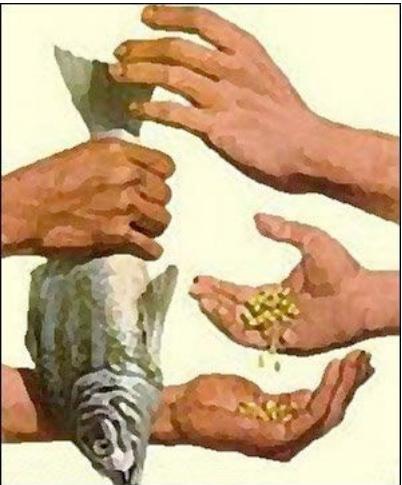
Visa Imprinter
1979



Payment Terminal
2018

V_{TPE}

Role of Money



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Medium of Exchange



Store of Value

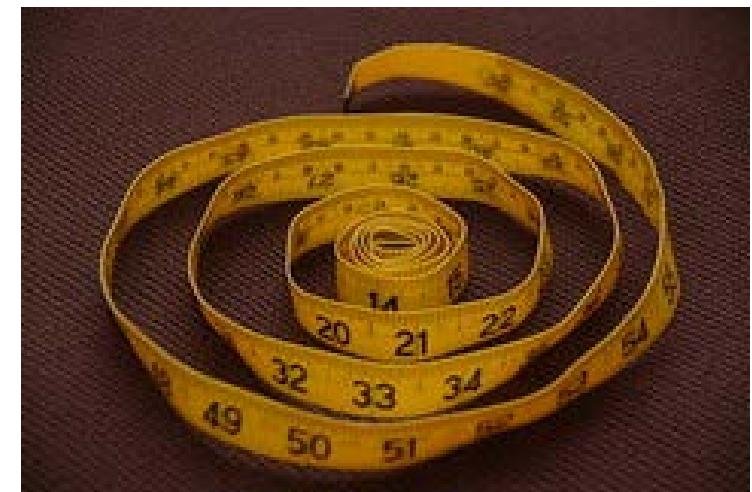


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Unit of Account

Characteristics of Money

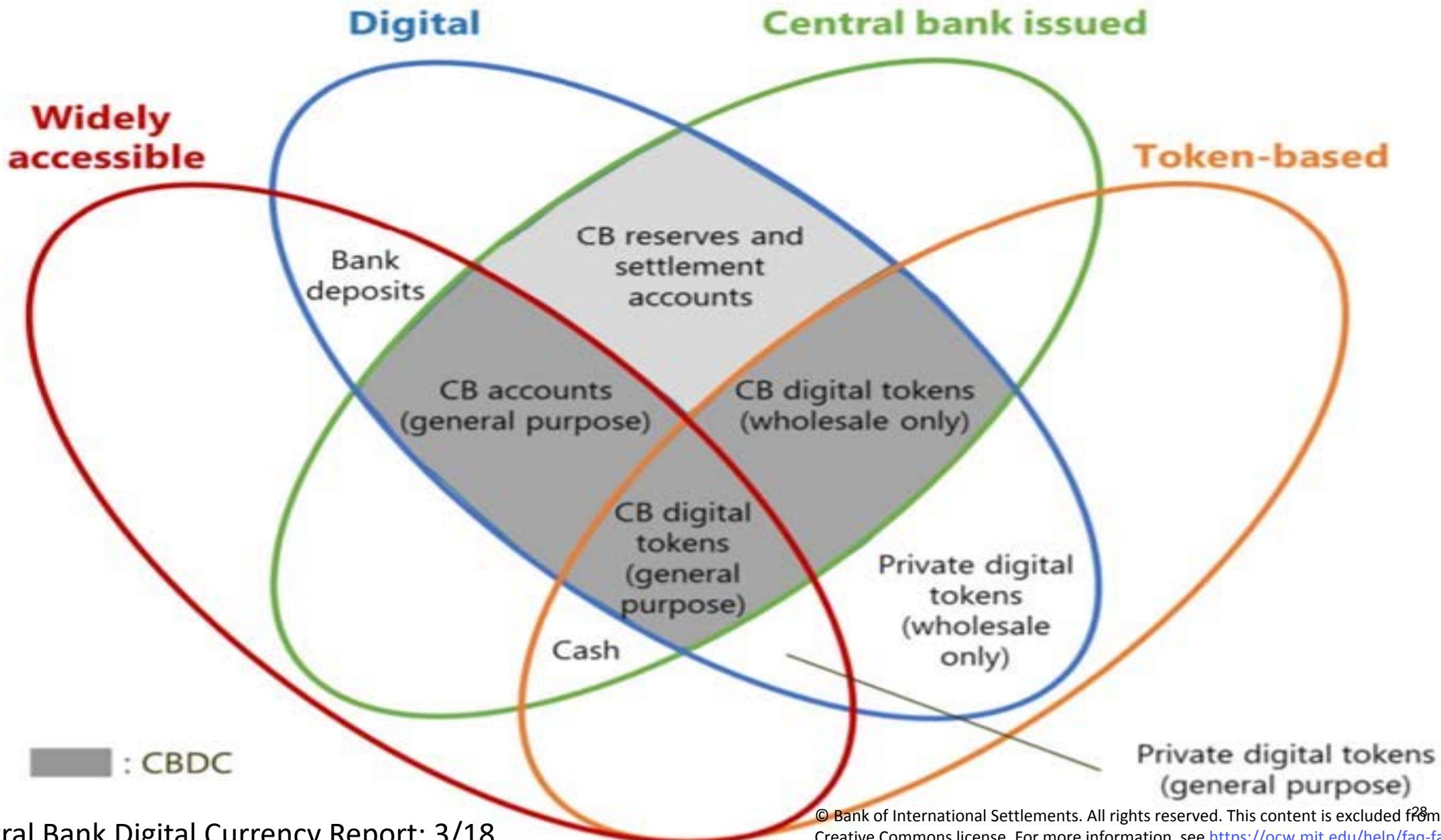
- Durable
- Portable
- Divisible
- Uniform/Fungible
(Crawfurd v. Royal Bank 1749)
- Acceptable
- Stable - Limited supply - Hard to Counterfeit

→ Hand to mine (Bitcoin)

Design of Money

- Token vs. Account Based
- Physical vs. Digital
- Private Sector vs. Central Bank
- Widely Accessible vs. Wholesale

The Money Flower



Early Cryptographic Digital Currencies ... All Failed

why ?

- 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

① rely on central authority
② Don't accepted by everyone
③ Double spend problem

Why did Early Digital Currencies Fail?

- Merchant adoption
- Centralization
- Double spending
- Consensus

Digital & Mobile Payments



1998



1999



2003



2007



Mobile App

2011



2011



2013



2014

Where's the ~~stored~~ stored value?

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



- 2009

SSL / TLS - 1996

HTTP- 1990

TCP/IP - 1974

Ethernet - 1974

???



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



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