



THE GRAINGER COLLEGE OF ENGINEERING
SIEBEL SCHOOL OF COMPUTING AND DATA SCIENCE

CS 521

Technological Foundations of Blockchain and Cryptocurrency

Grigore Rosu

Topic 1 – Short History of Money

I ILLINOIS



Thanks!

To Professors

David Tse (Stanford)

Sriram Viswanath (UT Austin)

Sreeram Kannan (UW – now at EigenLayer)

Non Metal Money

I



Salt Bars - Ethiopia

500 BCE - For centuries



Cowrie Shells - Nigeria

13th century BCE - Until 20th century!



Tally Sticks - England

20,000 years? 11th-14th c. Abolished 1834



Rai Stones - Yap, Micronesia

Until 20th century - 2000+ y.o. "ledger"

Metal Money

I



Bronze Aes Rude - Rome
8th-4th c. BCE - Ancient Italy



Copper Plate - Sweden
17th-18th century



Bronze Spade - China
10th-2nd c. BCE - Zhou dyn. Abolished 221 BCE

Minted Money

I



Bronze Yuan - China
Tang Dynasty (618-907 CE)



Silver Dekadrachm - Greece
5th century BCE



Gold Aureus - Rome
1st century BCE - 4th century CE

Paper Money



Jiaozi Promissory Note - China

11th century CE - Song Dynasty



5 Pound Note - England

1793 - Bank of England



Continental Note - U.S.

1779 - \$55 Dollars

Private Bank Notes

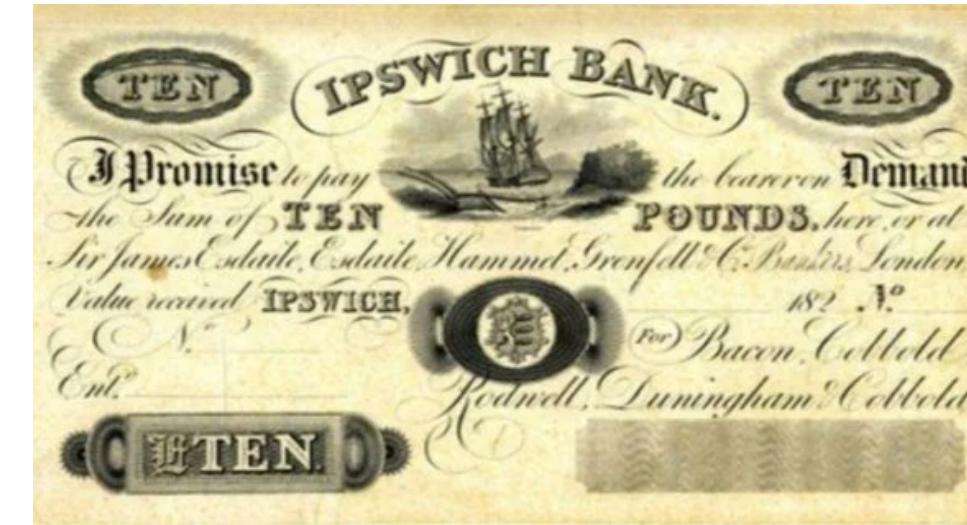
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Australia - Commercial Banking Co. of Sydney



Canada - Bank of Prince Edward Island



United States - Ipswich Bank



England - Godley Bank

Ledgers

Principal Recordings of Accounts



Proto Cuneiform Uruk, ca 3000 B.C

1717	1 st Mr. Baily Washington Dr	1741	2 nd Pers. Contra . Cr	L	S	D
July 10	To two Books: - - - - 2/6 - - - -	2 6	Sept 25 By at two for Gunters	1/3	0	1 8
	To one Dr. Scromberg 2/6	2 6	Jan 11 By Cash paid Robert Washington 1/3	0	2	8
July 20	To Cash P. M. Lewis for 500, Stalls	1 - 0	July 16 By Cash received	2/6		2 6
1753	2 Pcs of upper Letter 2 Tires Total Letter		Sept 9 By 1/2 Dr. Brown			
Aug 1	1 Pound of Thread & 56. Halliards		Nov 3 By 3 P. C. Boys show			

Personal Ledger

George Washington

1747

Ledgers

- Principal Recordings of Accounts
- Economic Activity
- Financial Relationships
- Types of Ledgers
 - Transaction vs Balance
 - General vs Supporting or Subsidiary or just Sub
 - Single Entry vs. Double Entry

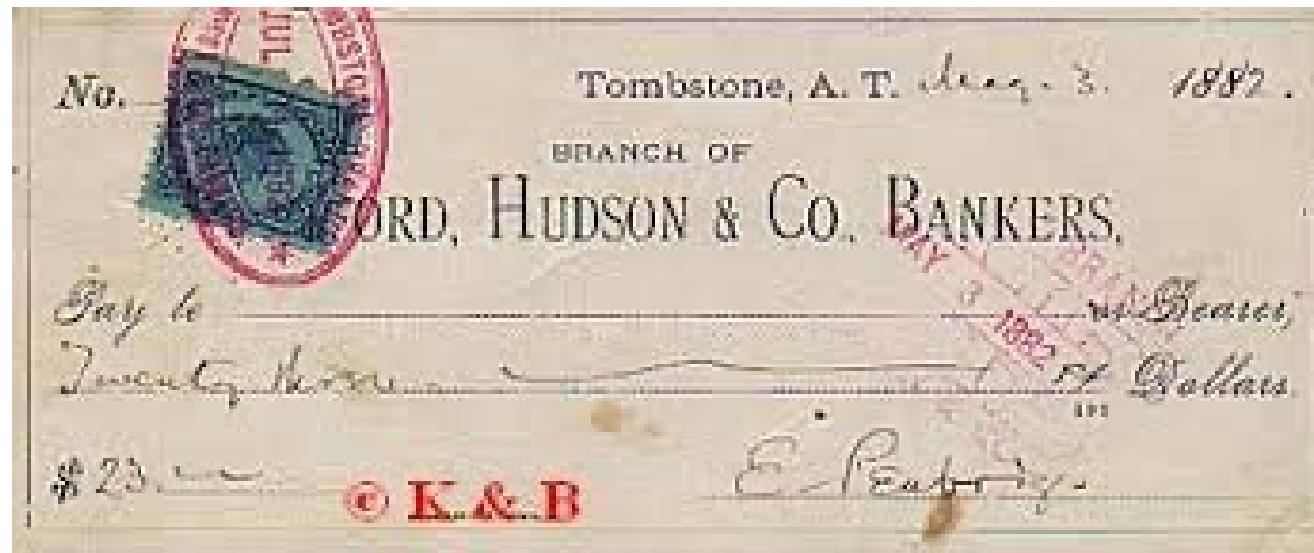
Good Ledgers

- Immutable
- Consistency
- Timestamped
- Ownership
- Accuracy
- Description of Transaction
- Comprehensive

Payment System

A Method to Amend & Record Changes in Ledgers for Money

Deposits & Negotiable Orders



Ledgers – Early Money



Image by [Sandsteir](#) 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



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Central Banking, Money & Ledgers

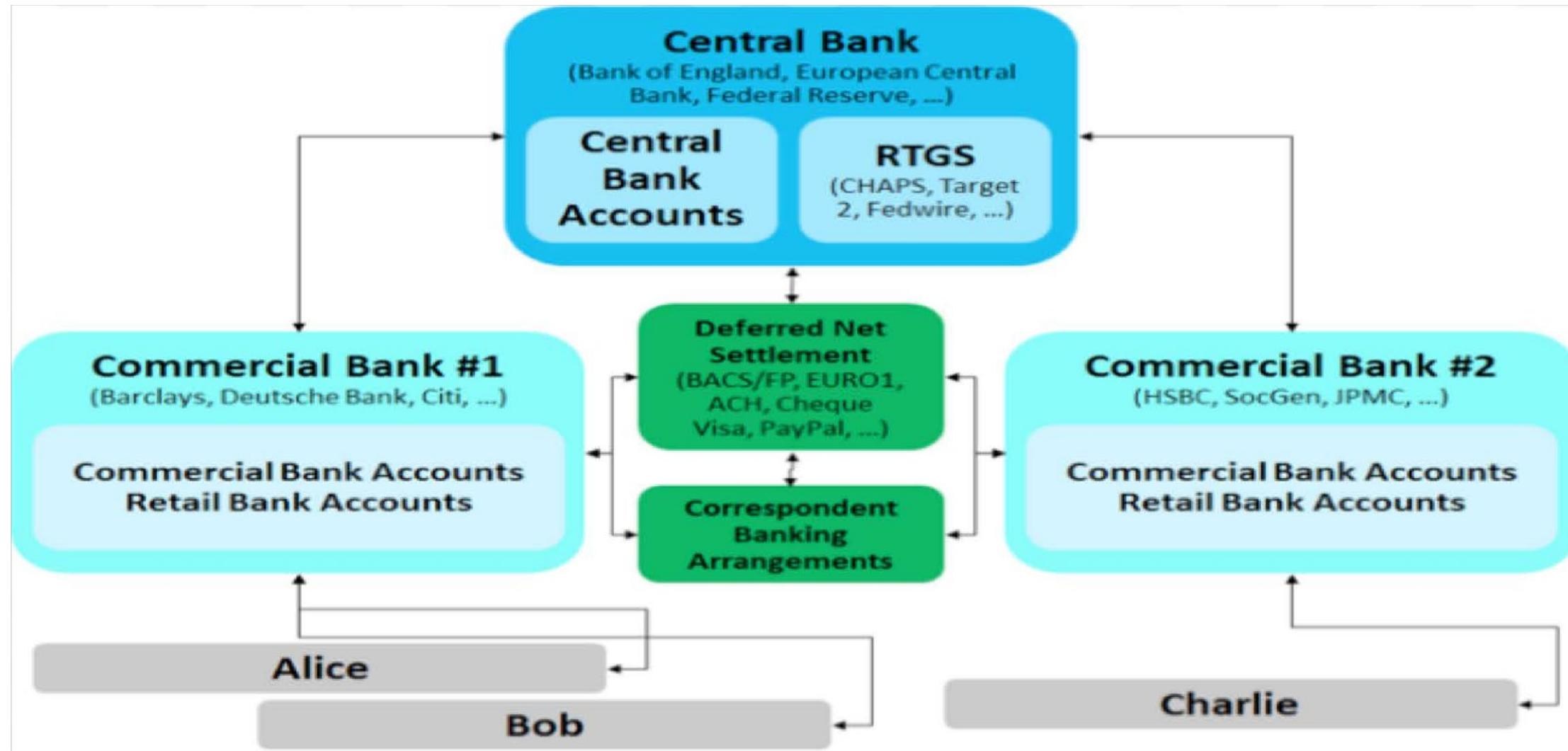
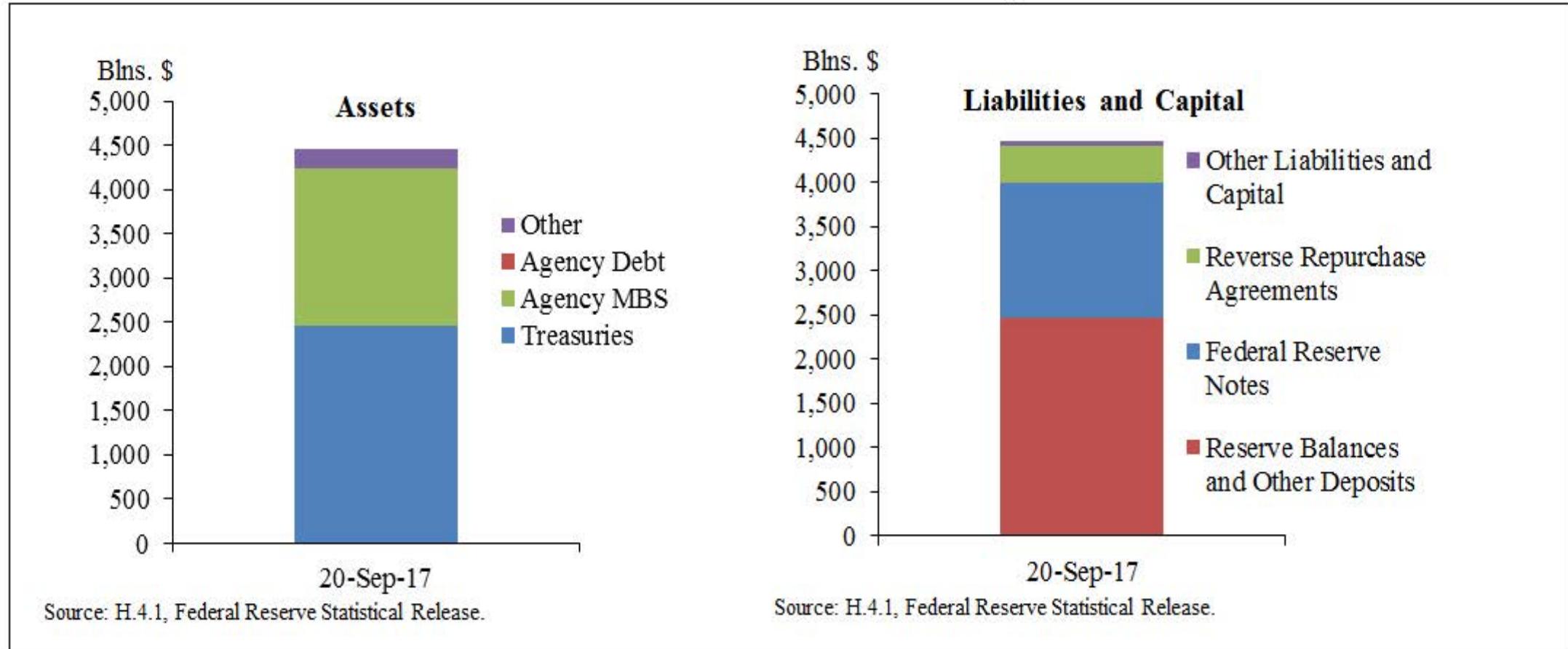


Image by Richard Gendal Brown from "Thoughts on the Future of Finance." Used with permission.

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

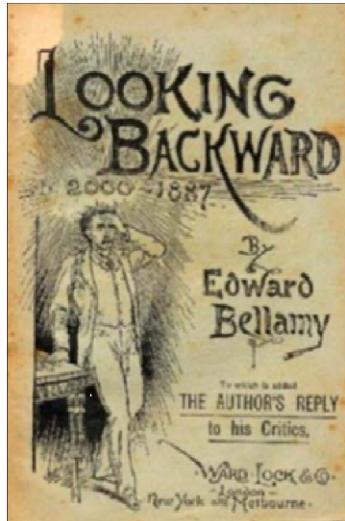


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Term 'Credit Card'
Edward Bellamy's
Science Fiction
'Looking Backward'
1887



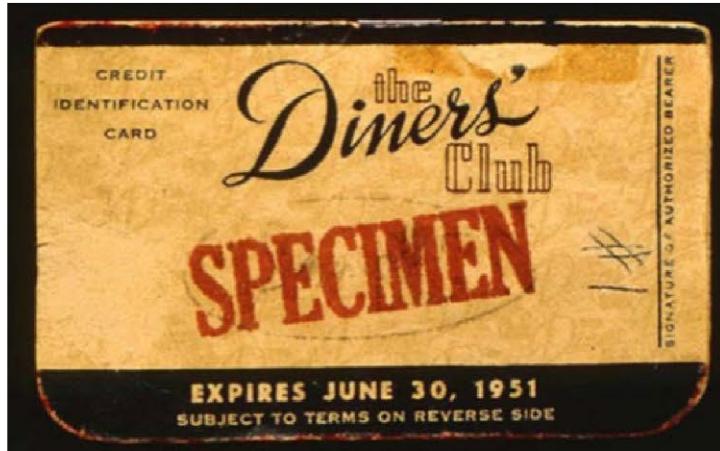
Charge Plates &
Credit Coins
Late 1880s – 1960s



Merchant Credit Cards
Late 1920s – 2000s

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

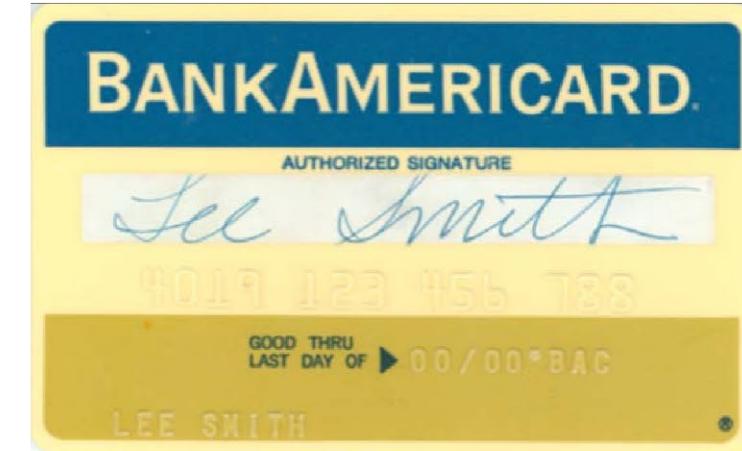
Credit Cards



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



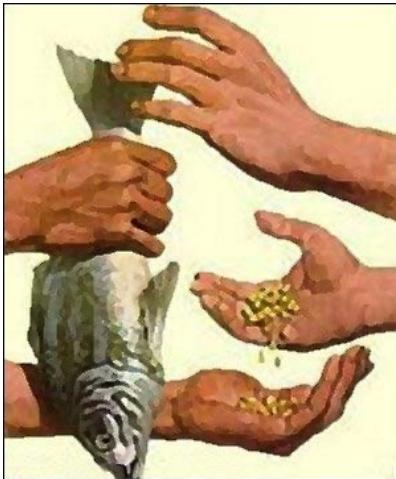
Visa Imprinter
1979



Payment Terminal
2018

V_{TPE}

Role of Money



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Medium of Exchange



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Store of Value

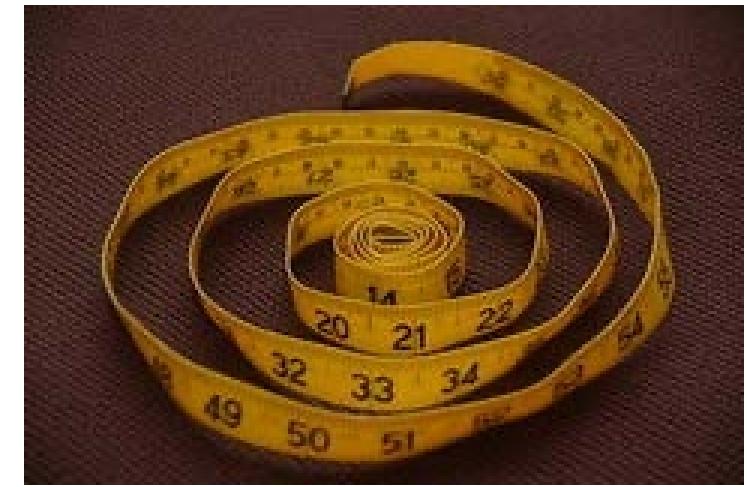


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Unit of Account

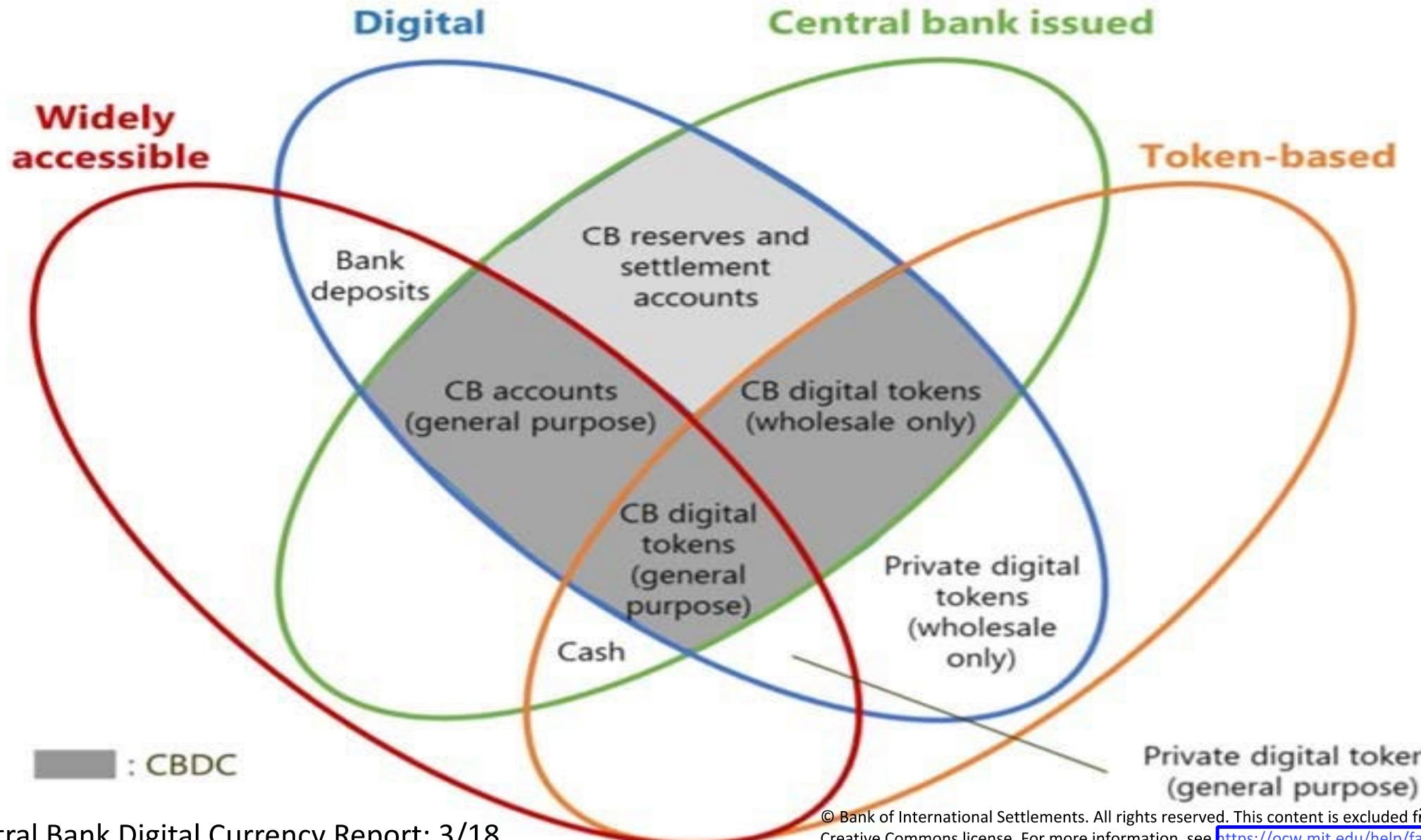
Characteristics of Money

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

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

- 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

Double Spend attack

- A simple attack:
 - When one person can use the same coin multiple times to buy things
- Easily solved with a centralized system
- Much harder when decentralized

Digital & Mobile Payments



1998



1999



2003



2007



Mobile App

2011



Google Wallet

2011



微信支付
WeChat Pay

2013



2014

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

???



PayPal

1998



1995



1984



1979