



Digital Currency – Bitcoin to CBDC

May 10, 2022
Peter Tapling, PTap Advisory, LLC

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Where Did Blockchain Come From?



- 2008 white paper published under the name Satoshi Nakamoto
- **Bitcoin: A Peer-to-Peer Electronic Cash System**
 - "A purely peer-to-peer version of electronic cash [that] would allow online payments to be sent directly from one party to another without going through a financial institution."
 - You can find the paper here: <https://bitcoin.org/bitcoin.pdf>
- The word "blockchain" doesn't appear in the paper!

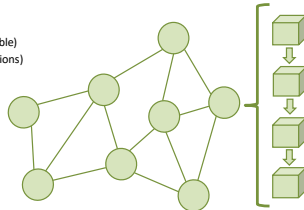
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What Characteristics Make Blockchain Special?

- Shared authority (greater trust)
- Immutable (transactions are unchangeable)
- Consensus (agreement on valid transactions)
- Economic balance (value provided to all participants)
- Every project has a white paper describing the effort
 - Most are public

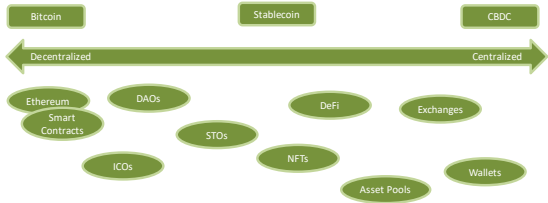


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Rapid Evolution of Digital Ledger



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Bitcoin vs Ethereum

Bitcoin

- Launched 2009
- Created as alternative to national currencies
- Medium of exchange
- Store of value

Ethereum

- Launched 2015
- Open-ended decentralized software platform
 - Immutable
 - Smart contracts
 - Decentralize application (dApp) platform

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Distributed Workflows

- Smart contracts enable consistent logic to be performed across an entire ecosystem
 - Introduced by the Ethereum protocol
- The logic is of a familiar form –


```
if <this>, then <that>
```

 - but it is embedded in the distributed network and enables automation across participants
- Contrast this to two companies who use different general ledgers to represent a payment between them
- Like traditional contracts, smart contracts:
 - Articulate an agreement
 - Among participants
 - Subject to specific terms
- NOTE: A smart contract is not a "contract" in a legal sense
 - It is software that implements a workflow between participants

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Derivatives

- Securitized Token Offering (STO)
 - Token represents an ownership stake in an asset, e.g. a building
- Decentralized Finance (DeFi)
 - Use of blockchain to offer traditional bank services such as loans
 - Requires “staking” (essentially a deposit)
- Distributed Autonomous Organization (DAO)
- Non-Fungible Tokens (NFT)
 - Unique; indivisible



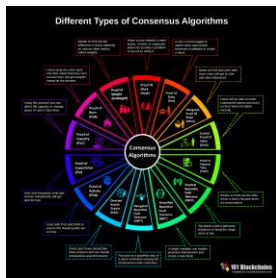
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Consensus Models

- “Agreement” between parties can vary greatly based on how they are related
- How much trust exists between the parties?
- What is the purpose of consensus?
- Many different “weights” to consensus models
 - Bitcoin uses “Proof of Work” (PoW) consensus which is very computationally intensive



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Brief History of Value Exchange

- Value exchange through out history has relied on a medium the then-society deemed valuable
 - Systems of barter relied on “local” value
 - Coins of precious metal are familiar
- Rai stones of the Island of Yap
 - Value was conveyed on a stone based on size, craftsmanship, and lore of the stone
- What about your miles and points?



Photo credit: Wikipedia. https://upload.wikimedia.org/wikipedia/commons/4/42/279796a_Stone_Coin%2C_Raiho_Museum.jpg

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Is There Interest in Cryptocurrency?

- There are 19,071 digital currencies*
 - On this day, the global crypto market cap is \$1,838,270,537,668*
 - Beyond Bitcoin and Ether you also have of “Bob’s Repair”, “Small Love Potion” and “Beer Money”
- Each currency typically has a whitepaper which outlines the objectives, operation and governance of the project
- Value in a cryptocurrency scheme is determined by the participants in the system

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Purely Public Value Can Be Scary

- Volatility discourages use for standard financial products
- Confirmation times for some consensus models create “intra transaction” risk
 - BTC transactions can take 50 minutes to confirm



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Enter the “Stablecoin”

- A “stablecoin” is a digital asset which offers price stability and is (typically) backed by reserve assets
 - Stablecoins rely on centralization of some form
- Think of these as the “money market funds” of digital currency
 - Some popular stablecoins (coin name – market cap* – reserve asset)
 - Tether – \$85,738,682,623 – USD
 - USD Coin – \$49,886,854,882 – USD
 - Stasis Euro – \$ 133,834,392 – EUR
 - PAX Gold – \$ 622,191,435 – Gold
- Diem (f.k.a. Libra) was designed as a stablecoin

854% increase since Aug 30, 2020!!

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Early Digital Currency Efforts in Financial Services

- Central banks have investigated for clearing and settlement
 - E.g. Project Jasper in Canada
 - <https://www.payments.ca/industry-info/our-research/project-jasper>
- JPM Coin is “a digital coin representing a fiat currency”
 - Value exchange is “intra-bank” between reserve accounts
 - Between JPMC entities and institutional customers
 - <https://www.jpmorgan.com/global/news/digital-coin-payments>
- Digital Dollar Project launched to explore a true CBDC in the United States
 - <https://www.digitaldollarproject.org>
- OCC Interpretive Letter 1174
 - “A bank may validate, store, and record payments transactions by serving as a node on an INVN and use INVNs and related stablecoins to carry out other bank-permissible payment activities, consistent with applicable law and safe and sound banking practices.” <https://www.occ.gov/news-issuances/interim-final-interpretive-letters/2021-11-19-1174.pdf>

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What Is Fiat?

- “Fiat money is a currency (a medium of exchange) established as money, often by government regulation, but that does not have intrinsic value.”¹
- “The Federal Reserve Board is the issuing authority for Federal Reserve notes and ensures that there is enough cash in circulation to meet the public’s demand.”²
- Central banks control the basis of value exchange within their jurisdiction
- There is no “central bank standard” for behavior
 - Compare US, China, Venezuela
- Regulation and authorization equates money with notes and coins

¹ - Wikipedia: https://en.wikipedia.org/wiki/Fiat_money
² - Federal Reserve: <https://www.federalreserve.org/about-us/press-room/press-releases/2021-08-10-01>

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What Is Digital Money?



¹ - Federal Reserve: <https://www.federalreserve.org/about-us/press-room/press-releases/2021-08-10-01>
² - Statista: <https://www.statista.com/statistics/1091111/total-assets-of-financial-institutions-in-the-us/>

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What is a CBDC?

"... a CBDC is a digital form of central bank money that is different from balances in traditional reserve or settlement accounts ..."

By Central Bank Digital Currency, March 2021 <https://www.bankofengland.co.uk/cbdc/>

Central bank digital currency (CBDC) is the digital form of fiat money. The present concept of CBDCs was directly inspired by Bitcoin, but CBDC is different from virtual currency and cryptocurrency, which are not issued by the state and lack the legal tender status declared by the government. Proposed implementations may not even use any sort of distributed ledger.

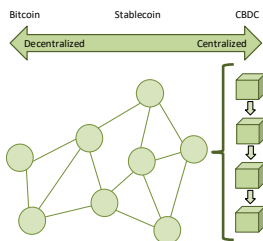
By VCC <https://www.bankofengland.co.uk/cbdc/>

- Note distinction between "digital" and "crypto"
- Central bank maintains control over setting currency value
 - Legal tender
- What will change with a CBDC?
 - Crypto requires a change in thinking about the **distribution** of money, not the **structure** of it

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A Spectrum of Options

- The objectives of Bitcoin are not the same as the objectives of a Central Bank Digital Currency
- What does it mean for a central bank to issue a digital currency?
- The benefits of non-central-bank virtual currencies come at a cost:
 - AML/KYC, Travel Rule responsibility?
 - Who does customer service?
 - Transactional exposure?



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First CBDC is Live and Growing



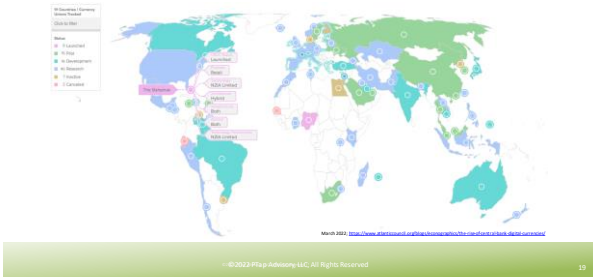
Mastercard Research
Mastercard and Island Pay Launch World's First Central Bank Digital Currency-Linked Card

October, Oct 2021 <https://www.centralbankofbahamas.com/news/central-bank-digital-currency>

Mastercard, Feb. 2021 <https://www.mastercard.com/press/2021/02/02-mastercard-launches-worlds-first-cbdc-linked-card>

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Central Banks Are At Different Stages of Consideration



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Abundance of Activity in the US

- President’s Working Group Report on Stablecoins¹
- Fed Board research paper²
- Fed Boston Project Hamilton³
- Executive Order on Digital Assets⁴



Money and Payments: The U.S. Dollar in the Age of Digital Transformation
January 2022



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Executive Order – Six Objectives

| | | |
|---|--|--|
| We must protect consumers, investors, and businesses in the United States. | We must protect United States and global financial stability and mitigate systemic risk. | We must mitigate the illicit finance and national security risks posed by misuse of digital assets. |
| We must reinforce United States leadership in the global financial system and in technological and economic competitiveness, including through the responsible development of payment innovations and digital assets. | We must promote access to safe and affordable financial services. | We must support technological advances that promote responsible development and use of digital assets. |

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Where Will the CBDC Apply?

- Retail vs. Wholesale
- Interoperability between CBDCs and Traditional Money
- Trade "at par"
- Interest?
- Interoperability
- How is it minted?
- Solving counterfeit
- Solving double spend
- Pure blockchain DLT? Is "distributed" even necessary?



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World Economic Forum "Issue Areas"



- WEF Digital Currency Governance Consortium developed model offers areas of consideration
 - Paper has a primary focus on financial inclusion

- Issue areas highlight considerations

Technology
vs.
Policy
vs.
Features

World Economic Forum, February 2021, "Issue for 2021 delivery plan"

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So, Have I Raised Any Questions?



Peter Tapling, Managing Director
PTap Advisory, LLC
peter@ptapadvisory.com
+1-847-226-2038

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