Cryptocurrencies and Central Bank Digital Currencies (CBDCs)

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Abstract

The paper begins by clarifying the differences between money and cryptocurrencies. The oldest and most popular cryptocurrency, Bitcoin, is discussed in depth. Competing cryptocurrencies and the cryptocurrency markets in the US are discussed. Stablecoins, a type of cryptocurrency that has recently grown popular, are evaluated. Tether, the stablecoin that is now the most popular stablecoin in the US, is discussed in depth. Several logical and important reasons why stablecoins and other cryptocurrencies should never be used are explained.

Central bank digitized currencies (CBDC), which are like cryptocurrencies in some respects, have begun trading in a few countries. CBDCs are defined and discussed in depth. Some of the earliest CBDCs, Sweden's electronic krona, China's new digital yuan, and a few other CBDC's are introduced and evaluated. A plan for an electronic U.S. dollar that has been proposed by the Bank for International Settlements (BIS) is explained in depth.

1. Introduction

Cryptocurrencies are often called digital currencies. Over 10,000 cryptocurrencies were listed on the CoinMarketCap.com website in 2021, and the number keeps increasing.

Cryptocurrencies are also of interest to central bankers because some people try to use them instead of money.

1A. What is Money?

Monetary economics textbooks tell us that money is a means of payment that serves as a medium of exchange, a store of value, and a unit of account. To be useful, money should also be fungible and easily transportable.

Cryptocurrencies do not conform with the definition of money in several respects.

1B. Virtual Currencies

In 2012, the European Central Bank defined a virtual currency to be an unregulated, digital money that is issued and controlled by its developers. In other words, virtual currencies are used and accepted among the members of a virtual community.

2. Bitcoins

Bitcoin, the first cryptocurrency in the world, was created in 2009.

2A. Characteristics of Bitcoins

Complaint and Problem about cryptocurrencies:

- Their market prices fluctuate excessively.
- Bitcoins sometimes create profitable arbitrage opportunities by simultaneously trading at different prices.
- New investment becomes illiquid not long after it is introduced at its initial coin offering (ICO).

2B. The Bitcoin Blockchain

Bitcoin is an international decentralized digital virtual currency that works without a central bank, financial intermediary, or other third party to handle and verify the transactions. Every transaction is verified in an electronic network of nodes using cryptographic records that are maintained in a publicly distributed electronic ledger called the Bitcoin blockchain.

The Bitcoin blockchain is shared, replicated, and re-finalized every time a Bitcoin transaction occurs; this process results in what Bitcoin users like to call a “continuous consensus” among the blockchain users. This “continuous consensus” does not prevent millions of other people from disapproving of the use of Bitcoins and other cryptocurrencies.

Bitcoin computer technicians called miners compete to validate Bitcoin every transaction. Miners are paid 6.25 new Bitcoins for the proof of work they provide by verifying each new transaction in the Bitcoin blockchain. In addition to 6.25 Bitcoins for their proof of work, the miners can also receive a negotiated “transaction fee” from the Bitcoin buyer.

2C. Halving

Halving Bitcoins occurs because in 2009 the creator of Bitcoins, Satoshi Nakamoto, declared that each time another 210,000 blocks of Bitcoin were mined, the block reward given to Bitcoin miners for validating transactions should be cut in half. These halvings took place in 2013, 2017 and 2021 - - about every four years.

2D. Competing Cryptocurrencies

Every cryptocurrency is a **decentralized autonomous organization (DAO).**

A cryptocurrency named Ethereum has a DAO that handles "smart contracts." The smart contract feature permits transactions to advance in Ethereum only after certain conditions are fulfilled.

Ethereum is more complicated than Bitcoin.

Ripple XRP is a blockchain-based digital payment network that has its own cryptocurrency, named XRP. Instead of using blockchain mining, Ripple uses a consensus-gaining mechanism installed in a group of bank-owned servers to confirm transactions between the bank's clients. Ripple provides a system for making direct transfers of financial assets.

Binance Coin, Cardano, Dogecoin, Litecoin, Tron, Monero, NEO, and IOTA are other cryptocurrencies that are currently traded actively. As mentioned above, all are significantly less popular than Bitcoin and Ether.

BINANCE [BNB]

CARDANO

litecoin

TRON

MONERO

NEO
smart economy

IOTA

3. Cryptocurrency Markets

The market for Bitcoins seems to be flourishing. The number of Bitcoin transactions reached nearly 10 million per month during 2018 and they continue increasing. The price of a Bitcoin went from less than a penny for a single coin in 2009 to over $65,00 in 2021. Bitcoin's price did not rise smoothly. And after trading at $3,300 in December 2018 Bitcoin's price rose to $63,729 early in 2021. Gains like these stimulate the interest of many buyers that have FOMO (fear of missing out).

3A. The Coinbase Exchange

- On April 14, 2021, the first cryptocurrency exchange in the US to have its ownership shares listed on NASDAQ began trading publicly. Shares in Coinbase Exchange began trading at $328 per share (ticker: COIN), but that price was reduced to $274 by May 4, 2021 as investors began to recall past relevant news.
- Coinbase Exchange typically charges its retail traders several transactions fees. If you buy $1,000 of Bitcoin in the US, for instance, you will pay a flat fee of 2.99 percent, or $29.90. In addition, Coinbase adds a fee of one-half of one percent to the transaction to bring the sub-total to 3.49 percent, or $34.90. Furthermore, if you pay with a credit card a one percent fee, or $10 will be added to bring the total fee to 4.49 percent, or $44.90.

3B. Uniswap Created in 2020

- Decentralized exchanges, nicknamed DEXes, are peer-to-peer networks that swap digital tokens.
- Uniswap, the first DEX, was created in 2020 by 27-year-old Hayden Adams while he was between jobs. Uniswap provides a way for computers to talk to each other.
- No central bank or other third party decides who will be allowed to trade or what tokens may be traded. Furthermore, DEXes do not require their traders to give their digital tokens to the DEX before they can trade.

3C. Central Banks

- The Federal Reserve, or, the Fed, is the monetary authority for the US. It controls the money supply, interest rates, inflation, the credit markets, all banks and clears the checks for the banking system.
- The Fed does not allow any US banks to accept deposits or execute transactions involving silver, gold, cryptocurrencies or any other commodities.
- The Peoples Bank of China (PBOC) is the Chinese government's monetary authority. In 2021 the PBOC completely outlawed all cryptocurrencies and any activities related to cryptocurrencies throughout China.

4. The History of Stablecoins

- An improved cryptocurrency called stablecoins was created to address issues accompanying the numerous uncollateralized cryptocurrencies.
- The first **stablecoin**, Nubits, was introduced in 2014. Initially, Nubits (ticker: NBT) were considered to be safe and their prices hardly fluctuated at all. People thought Nubits were safe because their advertisements said they were backed (collateralized) by US dollars.
- Unfortunately, Nubit's collateral could not be verified and, as a result, they were selling for only 32 cents per US dollar in early 2021.

4A. Tether

- Tether (ticker: USDT) is the most popular blockchain-based stablecoin.
- Tether's initial coin offering (ICO) was a crowdfunding issue of tokens that was managed by the issuer, Tether Limited.
- Tether Limited claimed that every Tether token was backed by one US dollar. At the same time, Tether Limited announced that Tether buyers had no contractual rights to their underlying collateral of US dollars. Surprisingly, this latter declaration did not cause the initial market price of Tethers to plunge below $1. The market price of Tethers remained very close to $1 for about a year after they were issued.
- But, in 2016 the market price of the Tether began to wobble. In more recent years the Tether's market price fluctuated between $1.06 and 92 cents.

4B. Tether’s Problems

- An additional problem for Tether Limited occurred in 2018-2019.
- Two different cryptocurrency exchanges named Bitfinex and Tether Limited were both owned and operated by iFinex Inc. Although Tether was issued in the US, iFinex is headquartered in Hong Kong and registered in the British Virgin Islands. Many people are confused by these complicated international arrangements.
- In 2019 the New York Attorney General’s office alleged that in mid-2018 Bitfinex lost $850 million and secretly used funds taken from Tether to cover the resulting shortfall. This well-documented allegation further tainted Tether’s reputation. Customers' money has been stolen or lost in several incidents and, as a result, like the other uncollateralized cryptocurrencies, Bitfinex, Tether, and iFinex have never been permitted to transact with any US commercial bank.

4C. Gemini Trust

- **Gemini Trust** brokers and deals in a selection of different cryptocurrencies.
- In addition to making markets in various cryptocurrencies, the Gemini Trust also issues a stablecoin of its own called the **Gemini dollar**.
- The Gemini Trust operates at a higher level of security and professionalism than most other cryptocurrency exchanges.
- Gemini complies with both the New York state and the US digital asset regulations and consumer protection laws. As a result of these legal operating standards, Gemini Trust was able to obtain Federal Deposit Insurance Corporation (FDIC) insurance for the US dollar (but not Gemini dollar) accounts of its clients.

4D. Three Types of Stablecoins

Cryptocurrencies can be sorted into three different categories:

- Stablecoins Claiming to be and Collateralized by Fiat Money
- Cryptocurrencies Collateralized by Other Cryptocurrencies
- Uncollateralized Stablecoins

4D.i. Stablecoins Claiming to be and Collateralized by Fiat Money

Some of the most popular stablecoins that were supposed to be collateralized by US dollars are Tether (USDT), US Dollar Coin (USDC), TrueUSD (TUSD), StableUSD, Dai (DAI) and the Gemini dollar (GUSD):

- **US Dollar Coin (USDC)** is currently one of the more popular stablecoins in the US. USDC is Ethereum-based and claims to have a value that is in a one-to-one ratio with the US dollar.
- TrueUSD are backed by the US dollar. TrueUSD claims to regularly undergo third-party audits to ensure ethical practices are followed.
- StableUSD is backed by the U.S. dollar and is designed to work across different blockchain protocols that include Ethereum and Stellar.
- **Dai** (DAI) is a US dollar pegged decentralized stablecoin built on the Ethereum blockchain. **DAI** tokens are also collateralized by other cryptocurrencies. DAI's one-to-one US dollar price peg is supposed to be maintained through automatic pricing mechanisms built into its smart contracts.

4D.ii. Cryptocurrencies Collateralized by Other Cryptocurrencies

- Each **BitShares** coin, issued by BitUSD, claims to be worth one US dollar apiece. In fact, the BitUSD has at least 100 percent of its own outstanding cryptocurrency backed by BitShares core currency, BTS.

- Havven issues **Nomin.** The value of havvens comes from transaction fees generated from nomin transactions that are paid into the portfolio of havvens. The value of nomins is supposed to be kept stable by the havven owners, who are supposed to be incentivized to manage the supply of havvens propitiously.

4D.iii. Uncollateralized Stablecoins

- After a short run, Basis shut down in December 2018.
- Carbon is another uncollateralized stablecoin that is supposed to operate like Basis.
- The USDVault stablecoin is pegged one-to-one to the USD. It is supposed to be backed by either gold bullion stored in Swiss vaults or US dollars. USDVault takes a novel approach to maintaining stability.

The founders of all cryptocurrencies do not provide clear, audited explanations of their plans. Furthermore, their plans have turned out to be largely untrue. The value of all of these cryptocurrencies seems to be very small and not a bit promising.

5. Weighting the Use of Cryptocurrencies and/or Stablecoins

- A criminal's "dirty money" could easily be hidden by making a speculative investment in cryptocurrencies. Cryptocurrencies' "privacy" is the single most popular feature that attracts criminals to invest in cryptocurrencies.
- **Money has a very useful memory**. The privacy of cryptocurrency transactions conceals much valuable information that should not be hidden.

- **Significant environmental damage**. Bitcoins, Ethers and many other cryptocurrencies are based on a blockchain technologies that employ miners to verify their transactions. The mining that verifies the cryptocurrencies wastes a massive amount of costly electricity that is created by electricity generators that burn oxygen and create carbon dioxide. The Cambridge Center for Alternative Finance (CCAF) estimates the amount of electricity used by cryptocurrency miners to process the world's Bitcoin transactions has a market value approximately equal to the energy draw of small countries like Malaysia or Sweden.

- **Fake transactions**. Many of the cryptocurrency trades that are reported do not involve trades that actually occurred.
- **Law-abiding investors frightened**. The privacy surrounding cryptocurrencies attracts criminals and scares away law-abiding investors who would prefer to have transparent transactions that generate paper trails which can be audited and protected by police.
- **Fundamentally unstable**. The concept underlying stablecoins involves bad governance. If a private entity issues a stablecoin and is responsible for maintaining the collateral needed to collateralize the stablecoin, that manager has continual economic incentives to under-collateralize the stablecoin and/or to invest the collateral in risky assets or both.

- **An essential governmental function**. In 1960 Milton Friedman made a statement that is still relevant today. He said: "Something like a moderately stable monetary framework seems an essential prerequisite for the effective operation of a private market economy. It is dubious that the market can by itself provide such a framework. Hence, the function of providing one is an essential governmental function on a par with provision of a stable legal framework."

6. New Competition for The US Dollar

- In 2021 the US dollar is the world's most popular currency, between 80 and 90 percent of all international trade is denominated in US dollars.
- Some of the monetary instruments that might compete with the US dollar in the years ahead are reviewed below.

6A. Sweden's Forthcoming e-Krona

- Sweden's central bank, the Riksbank, is preparing a new digital currency called the e-krona.
- The e-krona will perform all the tasks of the paper krona but in a digitized fashion. Sweden welcomes the US dollar and cryptocurrencies to compete with the e-krona.
- The e-krona will be controlled by Sweden's central bank. Not a decentralized currency and, therefore, not a cryptocurrency.

6B. “Zuck Bucks”

- In 2018 Mark Zuckerberg proposed introducing a new stablecoin named Diem (previously Libra).
- Diem is not tied to a single country; this proposed global currency is supposed to be usable by people and businesses around the world.
- Mr. Zuckerberg planned on issuing Diem through his social network, Facebook, and/or his metaverse named Meta.

7. The Forthcoming FedNow Service

- The Federal Reserve is now developing a new superior technology called “FedNow.”
- The Federal Reserve’s forthcoming **FedNow** Service will enable individuals and businesses in the US to send bank-to-bank payments almost instantly.
- Processing with payment integrity and data security 24x7x365, including weekends and holidays.
- End-of-day balances will be reported through the Federal Reserve accounting records on the same day as the money transfer.

8. Developing A Central Bank Digitized Currency (CBDC)

This section suggests the development of a central bank digitized currency (CBDC) is the paradigm shift app that can provide a solid basis for a national or, perhaps, even a world-wide monetary system.

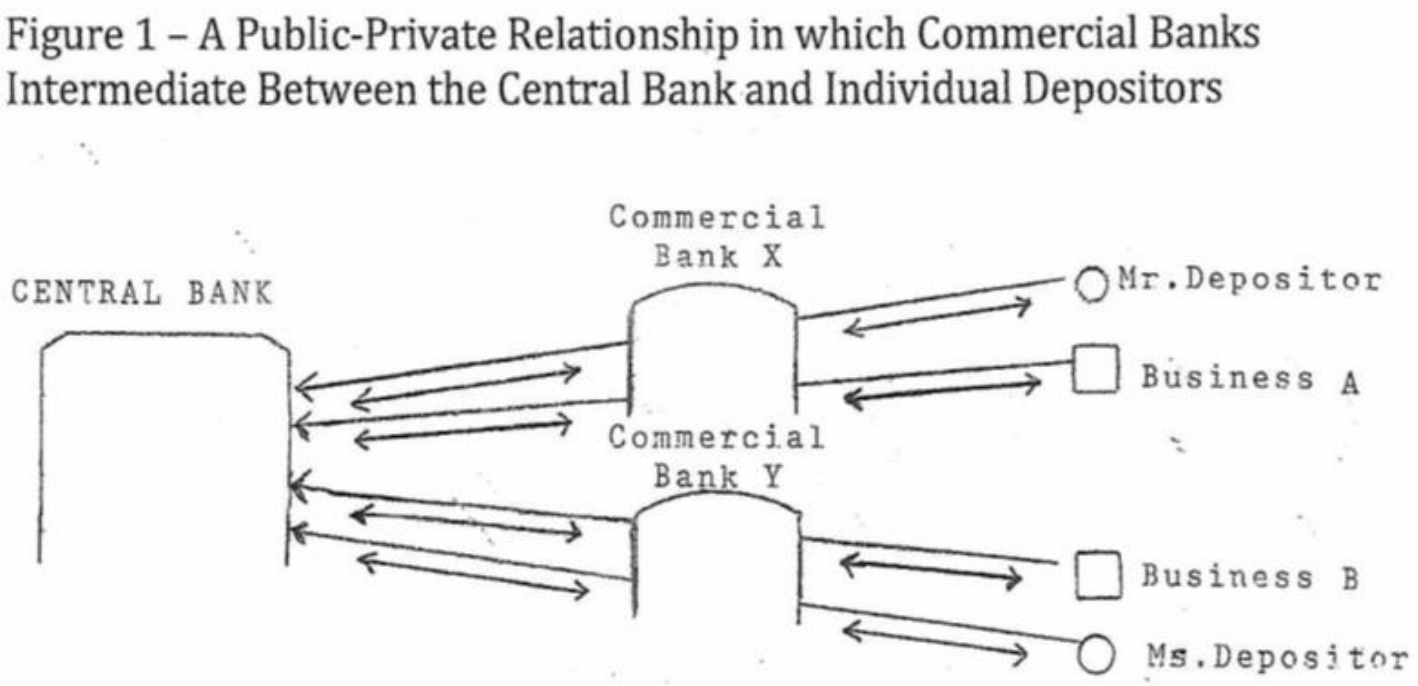
8A. The Fundamentals of CBDCs

- In addition to the Federal Reserve's forthcoming FedNow Service, other CBDC systems include The United Payment Interface (UPI) in India, CoDi in Mexico, PIX in Brazil and dozens of others.
- The US currently has the world's best monetary system:
- **Checking accounts**. The US has a large, sophisticated financial system that allows millions of people and businesses to purchase safe checking account services from thousands of competing banks and write checks that can be cashed at any other US bank.
- **Commercial banks**. The US has a mature financial intermediary system of 6,500 banks that each provide checking accounts for their depositors, make loans to those who wish to borrow and accept checks from other banks for deposit into the designated customer's checking account.
- **Central Bank**. The US has a stable, well-known and widely trusted central banking system, the Federal Reserve System, or more simply, The Fed.

8B. New Responsibilities for the Financial Intermediaries

The US Federal Reserve System, the US Comptroller of the Currency, and the US Treasury continually interact with the Bank for International Settlements (BIS), the European Central Bank, the United Nations, the Organization for Economic Co-operation and Development (OECD), and other organizations around the world are working to develop a CBDC for the US that will gain acceptance by the world's other democratic nations.

Figure 1 – A Public-Private Relationship in which Commercial Banks Intermediate Between the Central Bank and Individual Depositors

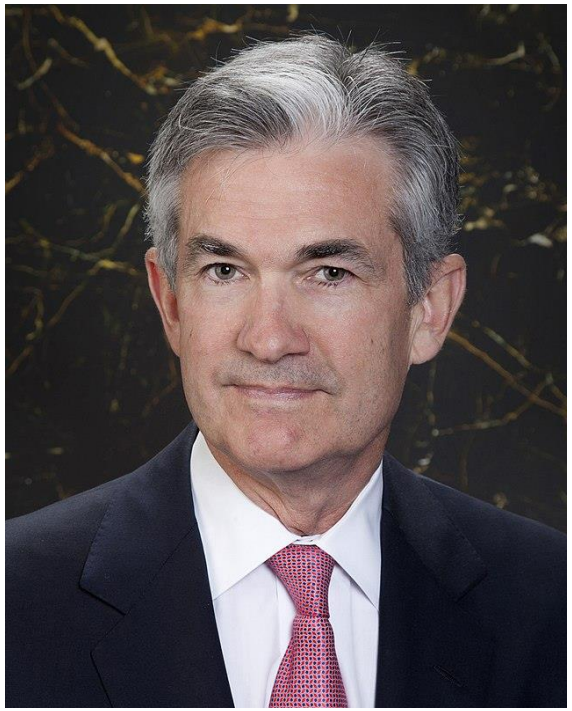


8C. Privacy in a Cashless Society

In a cashless society, peoples' privacy would be greatly diminished.

As a result, many believe that paper money should continue to be used. Paper money and coins can coexist peacefully with a well-designed CBDC, and can also keep a CBDC from being undermined by competing cryptocurrencies.

8D. More About Cryptocurrencies



In 2021 Jerome Powell, Chairman of the Federal Reserve, said “You wouldn't need stablecoins, you wouldn't need cryptocurrencies if you had a digital US currency.”

8E. China's Digital Yuan

In July 2021 China’s central bank, the People's Bank of China (PBOC), released its first white paper explaining that it was calling on China’s two private-sector pioneers, Alibaba Group Company and Tencent Holdings Ltd., to help the PBOC develop a state-operated digital currency, the e-Yuan.

9. Concluding Remarks

None of the thousands of uncollateralized cryptocurrencies can be converted into cash (liquidated for US dollars) in a stable liquid market that charges transactions fees of less than five percent. Furthermore, most cryptocurrencies are not traded actively. For these reasons few, if any, of the uncollateralized cryptocurrencies are suitable replacements for the US dollar or other popular fiat currencies (such as the Euro or Japanese yen).