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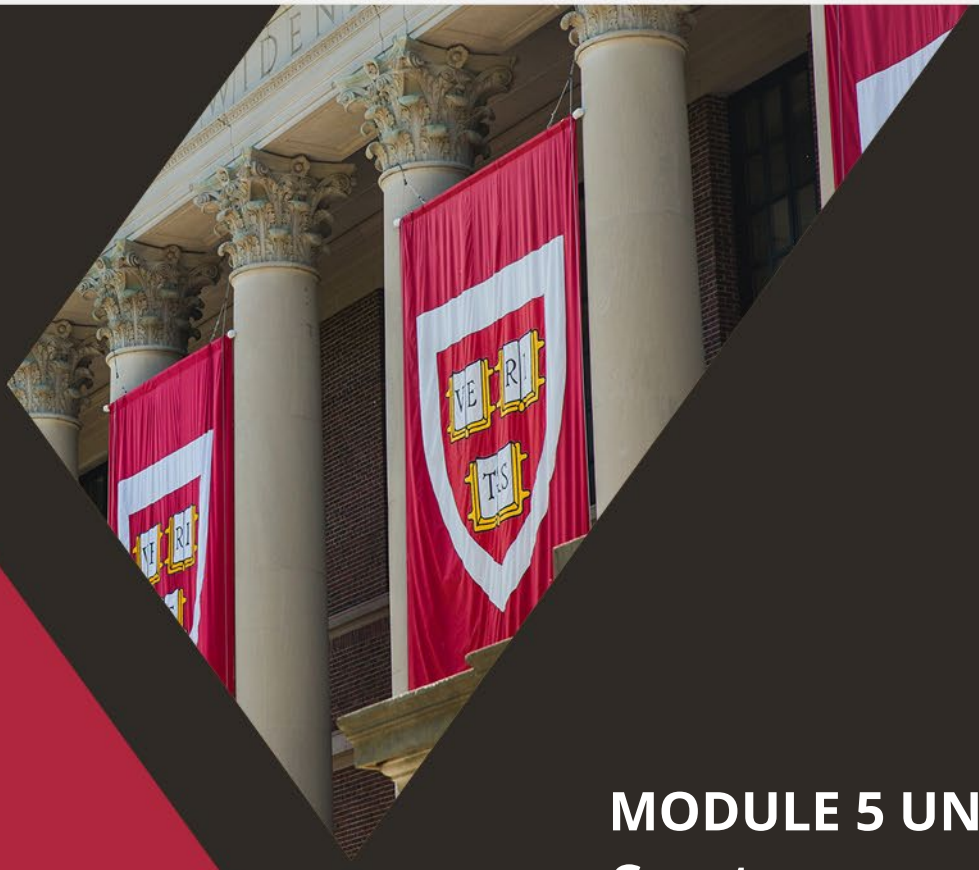

MODULE 5 UNIT 1
Cryptocurrencies and CBDs

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Learning outcomes:

LO1: Define and explain the concepts of money and cryptocurrency.

LO2: Articulate the uses of blockchain and cryptocurrency.

LO5: Distinguish between and describe use cases for blockchain, cryptocurrencies, stablecoins, and CBDCs.

1. Introduction

The exchange of money for assets has been an essential aspect of human society, and since its first uses, this nature of the exchange has evolved due to the progression of technology. In this casebook, you will explore the definition, history, and evolution of money leading up to FinTech's disruption of traditional forms of money and trading.

The casebook discusses the global adoption of bitcoin, and the emergence of central bank digital currencies (CBDCs), stablecoins, initial coin offerings (ICOs), and security token offerings (STOs). The concept of money and how it has evolved is also discussed.

2. What is money?

Money evolved because of the need to formalize traditional barter economies. Doing so made these processes more efficient and allowed for more accurate and centralized pricing systems. Today, banknotes and currency are used as a medium of exchange, which allows us to assign value to goods (Pham, 2017).

Money has three identifiable properties that allow it to function in an official capacity:

1. **Medium of exchange:** For example, national currencies such as the dollar can be used to purchase a product or service.

2. **Unit of account:** Money allows for the pricing of goods and services, which, in turn, enables goods to be classified according to a value before they can be audited.

3. **A store of value:** Money can be saved for a later date, usually without the worry of it losing its value dramatically.

(Nanda, White & Tuzikov 2017)

Engage with the poll to share your thoughts with your peers about historical items that could be considered as money.

Poll 1: Define money. (Access this casebook on the Online Campus to engage with this poll and view your peers' responses.)

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What do you define as money?
Shells
Beads
Heavy stones
All of the above

2.1 The history of money

Currencies have taken many forms throughout history, and some of the earliest forms of money included cowrie shells, wampum, and Yap stones. Cowrie shells were prized along maritime trade routes connecting Europe, Africa, Asia, and Oceania from prehistory to the 19th century for their small size and portability (Yang, 2011). Wampum or tubular shell beads that were typically stored in strings or women ornaments were used as personal adornments and an object of tribute among some North American indigenous groups. Due to their easy storage, the beads were used as a medium of exchange between indigenous groups and European settlers due to a shortage of European currency in the 17th and early 18th centuries. In fact, the beads were Massachusetts' first legal currency (Green, 2017).

Yap stones originated in Micronesia as heavy stone disks brought back to the island of Yap. One stone disk would sit in the village center and change ownership for large purchases, such as a dowry. The disks sometimes weighed as heavily as a car, so when it was traded it did not physically change hands. Instead, all community members would recognize the stone's new owner. In some cases, the giant stone disk had sunk in a shipwreck to the bottom of the sea but was still recognized and used as currency between community members even though it was last seen centuries ago (Goldstein & Kestenbaum 2010).

The first discovered coins originated in 2000 BCE Babylon, although standardized coinage has only been traced back to 700 BCE in the kingdom of Lydia, in modern-day Turkey (Tikkanen, n.d.). Leather and animal hides were also traded as currency in ancient Rome and 17th century Russia, leading to the use of "buck" to be slang for a dollar (Tikkanen, n.d.). China, which is often credited for the discovery of paper, also invented paper money during the 10th century (Cartwright, 2017). However, instead of retaining value in and of itself, paper currency often took the form of promissory notes that guaranteed holders a certain amount of gold, silver, or other valuables. Indirectly, this development also gave rise to banks which held gold and silver to be traded for promissory notes.

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With the rise of paper money, some countries sought to print their way out of financial crisis by creating unlimited paper currency at will. Paper fiat currency or currency produced by government fiat or decree lacked the intrinsic backing of a promissory note. With unlimited printing, the money lost all of its value and became worthless. To solve this problem, in 1821 the UK created the gold standard by which its national currency was backed by a fixed quantity of gold (Tikkanen, n.d.). In other words, a holder of a British banknote could exchange their note for a certain amount of gold. This policy constrained the issuing government's ability to print additional money to counteract economic depression. In addition, it posed international trade challenges, particularly for governments that had lower quantities of gold, as their currency would be worth less compared to other governments with currencies based on higher quantities of gold reserves. By the 1970s, many countries that had formerly maintained the gold standard decoupled their currencies from a fixed quantity of gold (Tikkanen, n.d.). consequently.

This section explored the definition of money and how money evolved from shells and stones to paper money and currencies. The rise of digital currencies has been the next evolutionary stage for what we consider money.

Explore further:

Engage with the brief history of digital currencies and consider why you think bitcoin succeeded while other digital currencies failed.

3. Bitcoin as the original peer-to-peer currency

Bitcoin was introduced in 2008 by Satoshi Nakamoto, an unidentified individual, or, possibly, a collective of individuals. Bitcoin uses a blockchain to record bitcoin possession and transactions, as such the currency does not require a trusted third party to verify transactions – a role that an issuer would play in verifying transactions on a credit card network. Blockchain's key role as a shared public ledger enabled Bitcoin to become an open and distributed peer-to-peer network through cryptographic algorithms that provides adequate security.

3.1 The mining process

Bitcoin is limited to 21 million coins. For a new coin to enter circulation, a miner must solve an extremely complex computational math problem using sophisticated hardware. Solving the problem unlocks the next 'block' of available bitcoins and the miner who first discovers the solution receives the rewards. These rewards come in the form of transaction fees or new bitcoins (O'Reilly, 2022). The mining process provides an important incentive for miners to verify bitcoin transactions on the blockchain.

The value of bitcoin is linked to scarcity. However, with this scarcity, rewards for miners halve for every 210,000 coins that are added to the block. This may end up undermining the fee advantage inherent in the blockchain system. This is because as the chain becomes longer, greater computing power is required to solve the proof of work. As rewards decrease, miners

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are paid less and may, therefore, require further incentives to continue this process (Nanda, White & Tuzikov 2017).

3.2 Bitcoin as a method of payment

There are three benefits that come from using bitcoin as a method of payment:

1. **Bitcoin transactions are transparent**: All parties in the transaction are able to view and trace payments made and received. A complete history of transactions are also permanently stored in the Bitcoin network.

2. **Bitcoin is designed to prevent counterfeiting**: This is due to the unalterable nature of the blockchain. This is another secure system that ensures that payment is built into the blockchain code (Yoffie & Woo, 2017).

3. **Bitcoin is not impacted by government monetary policy**: This is because supporters argue that the value of bitcoin is not vulnerable to inflationary pressures in the same manner as other fiat currencies that can be printed at will (Nanda, White & Tuzikov 2017).

Bitcoin can be purchased by setting up a digital wallet and trading conventional currencies for the cryptocurrency on a Bitcoin exchange. Users may send and receive bitcoin to other individuals and businesses that have digital wallets. Some exchanges, such as Coinbase, offer merchant services to enable businesses to accept bitcoins. For businesses worried about the risk of cryptocurrency exposure, the cryptocurrency exchange platforms enable merchants to quote prices and instantly cash out purchases in fiat currency while accepting bitcoin as a form of payment. Many companies also prefer bitcoin to credit cards due to the lower transaction fees, easier international payments, and reduced fraud.

3.3 Criticisms of bitcoin

Despite advantages for users, some critics have raised issues about the currency. Few countries in the world recognize bitcoin as a legal tenure of exchange, so it can be difficult to use bitcoin as a medium of exchange. Bitcoin is also non-refundable, rendering its value extremely volatile and, despite the boom in the currency in 2017, it is an unreliable method of storing value. These notable drawbacks of bitcoin undermine some of the characteristics of money. It should also be noted that although bitcoin does not have wide institutional ownership, it is growing in use.

Explore further:

Cryptocurrencies may have significant benefits. However, there are weaknesses that could threaten the use of bitcoin and other digital currency.

Bitcoin's rise to popularity is also linked to the trading of illicit goods on the dark web and on platforms such as Silk Road, which is an online portal used to trade in illegal goods until it was shut down in 2013. This led to many politicians and government officials criticizing the Bitcoin platform as being a tool for criminals with no real value as a currency. However, as the crypto-

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market exploded, illicit activity has constituted a minor share of total cryptocurrency transaction volume – only 0.15% in 2021 (Sun & Smagalla, 2022).

Additionally, proof of work requirements are time-consuming and this will only worsen as the length of the chains increase. This will lead to slower transaction speeds in comparison to payment processes over centralized systems such as Visa. In addition, the mining process requires a significant amount of computing power and associated electricity. A study estimated that Bitcoin mining alone required more energy than the annual energy usage of Norway in 2020 (Kim, 2022). Engineering a sustainable way to provide energy required to fuel cryptocurrency mining remains a challenge for the industry.

Explore further:

Read Satoshi Nakamoto's white paper on using Bitcoin as a peer-to-peer electronic cash system.

Does this mean that bitcoin can be considered as money? Engage with the poll and share your response with your fellow students.

Poll 2: Bitcoin as money. (Access this casebook on the Online Campus to engage with this poll and view your peers' responses).

Do you consider bitcoin to meet the definition of money?
Yes. Bitcoin satisfies the definition of money.
No. Bitcoin does not fulfill the definition of money.

4. Other cryptocurrencies

The number of available cryptocurrencies has grown rapidly since 2010. As of 2022, there are over 18,696 cryptocurrencies that exist globally with a market capitalization of over US$2 trillion (CoinMarketCap, n.d). These cryptocurrencies vary in terms of security protocols and uses. Ethereum, Bitcoins biggest competitor, operates as a smart contract to transfer assets and allows for a variety of applications to be built on its underlying code.

Explore further:

The ten top cryptocurrencies according to the CoinMarketCap.

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4.1 The rise of initial coin offerings

There was a massive increase in the popularity of cryptocurrency and the rise of ICOs at the end of 2016. Essentially, these coins or tokens were created by startups to raise capital. ICOs are very secure, they provide more liquidity and are more transparent than traditional finance systems. As such, ICOs enable retail investment for startups that lack access to elite networks or that are located outside of a primary venture capital hub at a lower cost than an IPO would.

ICO structures can vary drastically because of the regulatory uncertainty and decentralized nature of crypto projects. Uncertainty as to whether ICOs should be treated as tokenized investment securities or a new fundraising innovation also remains a challenge. Oftentimes, purchasing an ICO token does not give its purchaser ownership or stakeholder rights to the company, even though the token itself can be tradeable and sometimes redeemable for products and services offered by startups. In some cases, early investors in an ICO expect tokens to gain value after the cryptocurrency is launched.

However, the legality of the funding method and its potential for fraud is concerning. The US experienced a drastic increase in paid celebrity endorsements of ICOs, which resulted in celebrities, for example, DJ Khaled, getting charged with regulatory violations for failing to disclose payments to promote fraudulent ICOs (SEC, 2018). In the same year of the ICO boom, the Chinese government ruled ICOs as illegal (Yoffie & Woo, 2017). In addition to regulatory challenges, ICOs faced difficulties offering a return on investment. By June 2018, an EY (2018) report concluded that 86% of the leading ICOs of 2017 were trading below their initial listing price. This led to many questioning whether ICOs are good investments or even viable fundraising avenue.

4.2. Stablecoins

A stablecoin is a digital token that is backed by other assets such as fixed income securities, currency, or commodities such as gold. The most common form is a fiat-backed stablecoin, designed to maintain a similar level of stability as the currency it is pegged to. Some examples include USD coin (USDC) and Tether. Tokenizing USD into USDC is a three-step process, as is shown in Figure 1:

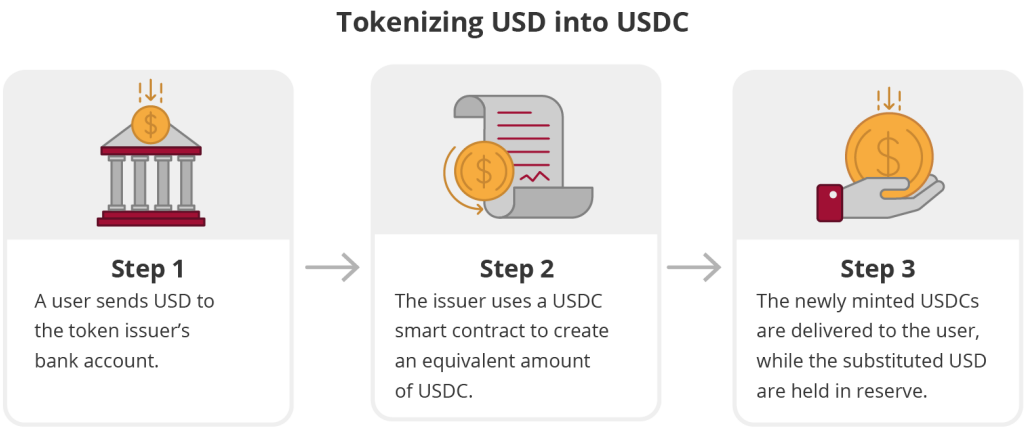

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Figure 1: Tokenizing USD into USDC. (Adapted from Cryptonews, 2022)

Redeeming USDC for USD, in other words converting USDC to US dollars, is as easy as minting the token, except the process is reversed as demonstrated in Figure 2:

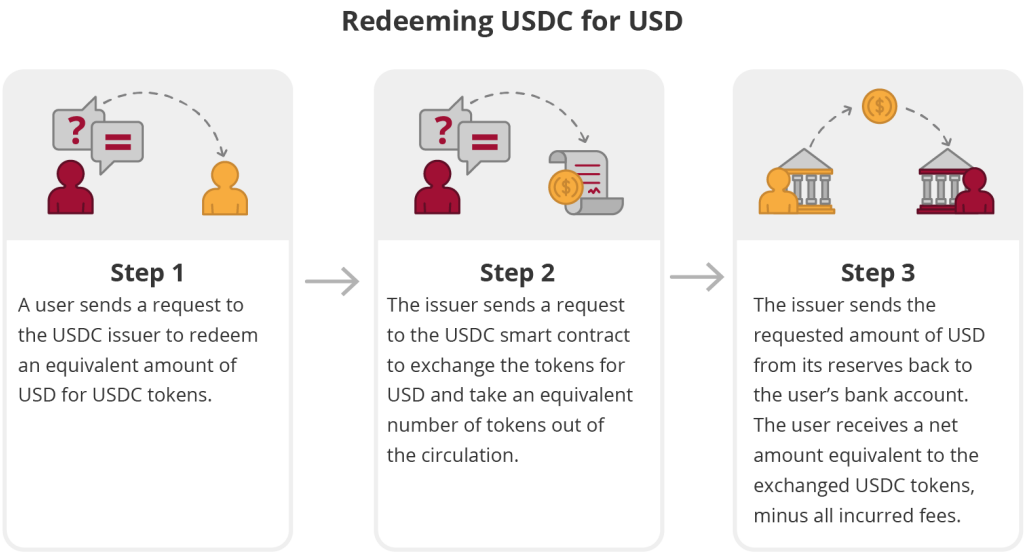

Figure 2: Redeeming USDC for USD. (Adapted from Cryptonews, 2022)

4.3. Security token offerings

A security token is a digital representation of an investment product recorded on a blockchain, which comes under the purview of securities laws (Lambert, Liebau & Roosenboom, 2021). Traditionally, a security token offered its holders the rights to equity, dividends, a share in the company's profits, voting rights, and buyback rights. An STO offers these benefits in the form of digital, tokenized shares with lower costs and higher efficiencies due to being located on a blockchain. Furthermore, fractional ownership was made more easily possible due to the efficiencies of the blockchain.

STOs developed after the bust of the ICO bubble. Whereas an ICO only offered select merchandise or other perks, STOs offered purchasers an ownership stake in the company. STOs were regulated under traditional security laws similar to stocks or bonds, which also boosted its legitimacy and investor trust over ICOs. There are four primary types of STOs (Cointelegraph, n.d.):

1. **Equity:** An equity token represents ownership of an underlying asset, similar to a traditional stock or share.

2. **Debt:** A debt token accrues interest over time, similar to how an interest rate or short-term loan accrues interest. Interest may be stable (i.e., constant over time) or variable (i.e., able to change over time, often to account for inflation).

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3. **Asset-backed tokens:** An asset-backed token correlates to ownership over a real-world asset, such as real estate or a commodity, such as a diamond. At its core, it is the digital ownership of a valuable tangible or intangible item.

4. **Utility token:** A utility token helps businesses raise capital. After the project for which the capital is raised is completed, the token may be used to purchase goods or services. Utility tokens are frequently used in ICOs, however STO utility tokens are regulated as securities. Non-STO utility tokens remain a controversial point for regulatory authorities.

5. Global adoption of cryptocurrencies

Digital currencies such as bitcoin are becoming more popular around the world. According to Phillips (2020), bitcoin is the 6th largest currency in the world, with the US dollar being the first largest traditional currency in the world. Although cryptocurrencies such as bitcoin, ether, ripple, litecoin and tether remain popular, their rates of adoption globally vary. As depicted in the figure below, Ukraine has the highest rate of adoption followed by Russia, Venezuela, China, Kenya, USA, South Africa, Nigeria, Colombia and Vietnam.

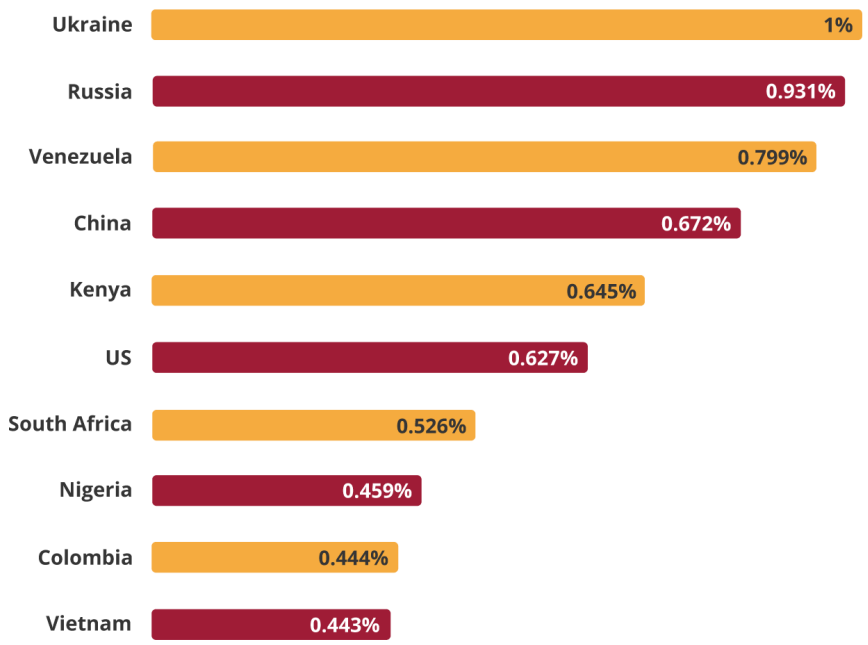

Figure 3: Global adoption index. (Adapted from Chainanalysis, 2020)

The global adoption index released by Chainanalysis' in 2020 ranks 154 countries based on their cryptocurrency adoption score. Based on the scoring, countries with the highest rates of adoption are given a score of 1 and those with lower levels of adoption are given a score of 0. The scores are based on the value of cryptocurrency received, exchanged and deposited. With Ukraine leading the adoption rate globally, the country has recorded over US$16 billion worth of cryptocurrency being sent and received (Morris, 2020). According to the global adoption

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index report (2020), many countries around the world had some level of cryptocurrency activity, with developing countries paving the way in cryptocurrency adoption. For these developing countries, high inflation rates and economic uncertainty are a reality, so the use of cryptocurrencies presents a viable alternative to protect consumers against changing inflation rates and economic turbulence. In addition, cryptocurrency adoption in developing countries has the potential to increase economic development and financial inclusion among the unbanked population.

Since 2020, Chainanalysis has identified several more trends in global adoption emerge. Firstly, the adoption of cryptocurrencies has increased significantly worldwide. The global adoption of cryptocurrencies has escalated by more than 2300% since the third quarter of 2019 and by more than 881% in 2021 (Chainanalysis, 2021). Secondly, the adoption of cryptocurrencies in developing markets is increasing, particularly in Kenya, Nigeria, Vietnam and Venezuela. This is mostly because cryptocurrency transactions on peer-to-peer (P2P) platforms are increasing. Lastly, since 2020, China and the US have dropped in their global adoption rankings, ranking 13th and 8th respectively in 2021, largely due to the decrease in P2P transactions and trading in these countries (Chainanalysis, 2021).

Explore further:

Experts have debated whether cryptocurrency adoption among developing nations has the potential to bolster economic development. Professor Philipp Sandner, the head of Frankfurt School Blockchain Center, explains how cryptocurrencies may support the growth of developing countries. In addition, the article by Prof. Eswar Prasad of Cornell University, provides a look at the risks of cryptocurrencies for increasing financial instability and wealth inequality.

Which viewpoint do you agree with most? Consider what makes cryptocurrencies a better substitute for a reserve currency such as USD or EUR.

5.1 Central bank digital currencies

A CBDC is the digital form of a country's fiat currency issued by its central bank. As a new form of money, a CBDC would be used by individuals and institutions to settle payments without the need to physically transfer cash. As discussed in Module 1, the use of cash has steadily declined in many regions of the world, while digital payments have expanded in scope and access. A digital currency issued by central banks offer the opportunity to expand the digital payments revolution into government-sanctioned forms of currency themselves.

In Video 1, Christian Kameir, a managing partner at Sustany Capital, a blockchain venture fund, discusses CBDCs. Christian provides an overview of CBDCs by looking at CBDC trends and the difficulty surrounding the adoption of CBDCs globally.

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Video 1: Kameir discusses CBDCs trends and adoption challenges globally. (Access this casebook on the Online Campus to engage with this video and download its transcript.)

Today, central banks issue two forms of money and support a third form. Firstly, they guarantee physical cash. For example, if you look at a US banknote, along the top you will see the words "Federal Reserve Note" as a guarantee that it is a legal tender. Secondly, central banks issue electronic deposits in accounts housed at the central bank, known as reserves or settlement balances by which interbank and cross-border transactions may be settled. Third, central banks support private money, which are housed in commercial bank deposits. A CBDC would represent a new type of money supported by central banks.

There are two forms of CBDCs: wholesale and retail or general purpose. Wholesale variants would keep access to a certain group of users, such as commercial banks and other large financial institutions. On the other hand, a general purpose CBDC would be widely accessible for everyday users to obtain. The tradeoff between wholesale and general purpose CBDCs may be clarified by considering the traditional role of central-bank accounts and the availability of cash. A wholesale CBDC would maintain the limited access approach where holdings are limited to banks and certain other financial or public institutions. Essentially, a general purpose CBDC would preserve this access, whereas a wholesale CBDC would require users to keep their currencies in a wallet or other accounts maintained by a commercial entity.

A variety of design choices are being considered by governments and other issuing authorities because CBDCs are still in early stages of development, including:

- **Access:** Should the CBDC be widely accessible or restricted?
- **Anonymity:** Should the CBDC be completely anonymous or fully transparent, and to whom?
- **Availability:** Should the CBDC be available for transactions only during business hours or 24/7?

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- **Interest bearing:** Should the CBDC bear interest for its holders?

(Cœuré & Loh, 2018)

The Bank for International Settlements (BIS) operates as a bank for central banks. It was established in Basel, Switzerland in 1930 and is co-owned by 63 central banks globally. It does not have accounts for individuals or governments but serves central banks of the countries that are members with BIS. The BIS has suggested three foundational principles for central banks that are considering CBDCs:

1. **Do no harm:** When central banks supply new forms of money, these currencies should simultaneously fulfil public policy objectives while also allowing a bank to retain its financial stability, among other mandates.

2. **Coexistence:** Central banks and their varied currencies should coexist in a manner that supports public policy objectives. Public demands for cash should be met, and robust private money, such as commercial bank accounts, should not be affected by different types of central bank money.

3. **Innovation and efficiency:** Governments should recognize the role played by both public and private sectors in the promotion of payment services. There is a need for the provision of payment services that are safe, accessible, and efficient by both entities. The competition between these sectors also acts as a driver for continued innovation, which can lead to further efficiencies in a jurisdictions payment system. Efficient and reliable payment systems can prevent economic and consumer harm, as users may be less likely to adopt unsafe currencies, thereby avoiding economic harm, and damaging monetary and financial stability.

(BIS, 2020:10)

Figure 4 highlights the core characteristics of CBDC.

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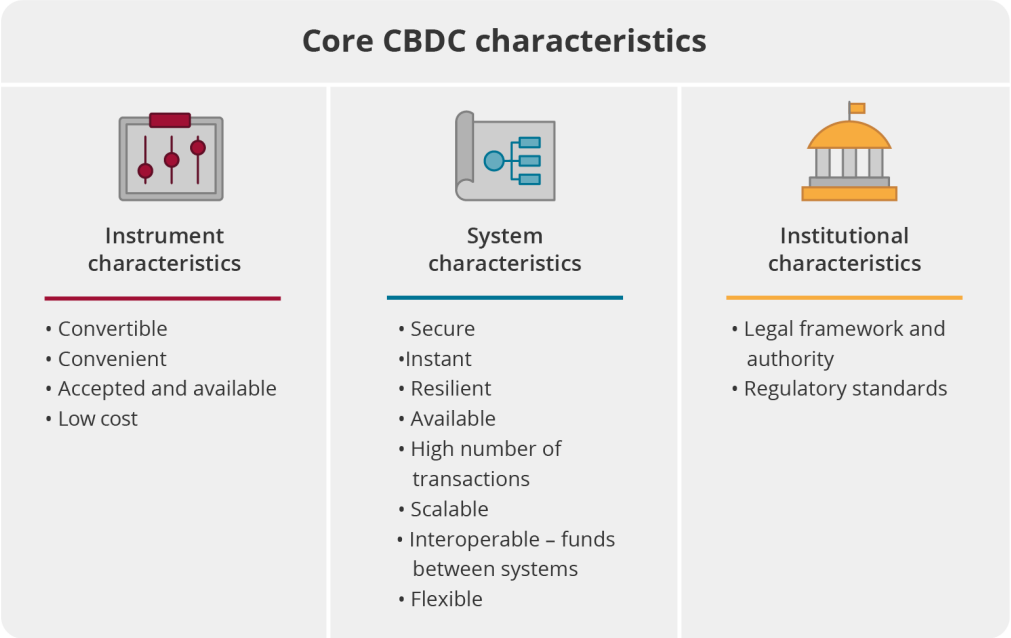

Figure 4: Core CBD characteristics. (Adapted from Bank for International Settlements, 2022)

Explore further:

The Atlantic Council CBDC tracker is a useful tool to ascertain the status of CBDC development in several countries.

The application of CBDCs in many countries also poses a knowledge gap challenge for different age groups.

5.2 Digital yuan

The People's Republic of China's (PRC) central bank digital currency, the digital yuan or e-CNY, was first publicly piloted in November 2020. The e-CNY remains in the pilot stage with multiple pilots ongoing across many Chinese cities.

The People's Bank of China (PBOC), its central bank, had two interrelated goals with launching the e-CNY: to create a digital currency that could compete with other digital currencies, such as cryptocurrencies and stablecoins and to provide a cash-like, low-cost digital payment system accessible to all (Deutche Bank, 2021). While the bank itself is responsible for issuing and disposing of the currency, it has partnered with select commercial banks for distribution and management.

The e-CNY is a retail currency that has linked with the PRC's digital currency electronic payments project, a digital payments and processing network run by the PBOC. The public and authorized commercial banks and payment institutions that meet certain compliance standards, including anti-money laundering and regulatory risk management, may participate in the e-CNY payments system. It is designed to complement the physical yuan rather than to

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replace it (Working Group on E-CNY Research and Development of the People's Bank of China, 2021).

The implementation of the e-CNY could allow large Chinese banks to gain access into a tech firm dominated section of business and to transform the country's digital privacy protection. If successful, the e-CNY could provide evidence that CBDCs are achievable, and as a result, increase the efforts of other central banks in developing their digital currencies (Deutsche Bank, 2021).

Explore further:

The first time that visitors could use the e-CNY was at the 2022 Beijing Winter Olympics by exchanging their bank bills for digital yuan. In addition, China has digital currency efforts and its blockchain initiatives is set to create economic opportunity for the foreseeable future.

5.3 eNaira

Nigeria became the first African country to launch its digital currency, eNaira, in October 2021. Users can access the currency via a phone app, online banking, or a mobile phone call and user data is protected and anonymous to all except the Central Bank of Nigeria (CBN), which monitors payments to prevent illicit uses of funds.

The Nigerian government expects that the launch of the CBDC would increase Nigeria's GDP by US$29 billion over the next decade, as the eNaira can be used for retail purchases, to move money to and from bank accounts, and to transfer money to a linked bank account (Kedem, 2021). Figure 5 illustrates the design principles of the eNaira, which speaks to the need for inclusion, innovation, efficiency, resilience and being proudly Nigerian.

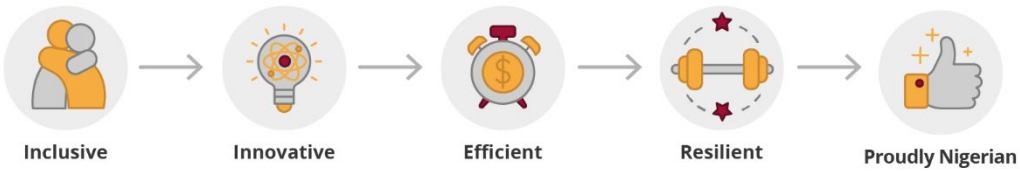

Figure 5: eNaira design principles. (Adapted from eNaira Design Paper, 2021).

The eNaira is intended to improve the Naira's accessibility, encourage financial inclusion, reduce payment processing costs, enable direct welfare payments to Nigerian citizens, increase government tax and revenue collection efforts, and improve cross-border payment efficiencies.

Explore further:

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In his keynote address at the eNaira launch, Professor Cohen expands on the launch and development of Nigeria's first digital currency.

5.4 El Salvador & Bitcoin

In June 2021, El Salvador was the first country to implement the adoption of bitcoin as an official form of currency exchange. There were several reasons for this. For one, a large segment of the population is dependent on money being transferred from outside the country and the cost of these transfers from the US is often 30–50% of the value of the transfer. In addition, the collection of physical money has its own difficulties and costs and with 70% of the country's population being unbanked, the adoption of bitcoin could decrease the percentage of underbanked people and provide more access to financial services and it could also decrease how much El Salvador relies on the US dollar. The World Bank and the International Monetary Fund (IMF) were critical to the adoption of Bitcoin currency in the country. Initially, the World Bank rejected the country's request for assistance based on concerns surrounding environmental issues and transparency (PWC, 2021).

One of the core concerns with Bitcoin is its costly network transactions, which El Salvador tried to mitigate using the Lightning Network – a second layer payment protocol that has been built on top of the Bitcoin blockchain and is operated through a Government Exchanger. This solution allows for more efficiency in using Bitcoin's currency and gets rid of the complexities and expensive fees in the Bitcoin market (PWC, 2021).

There are substantial risks involved as well, namely the fluctuating value of bitcoin. El Salvador created a new digital wallet for citizens, installed over 200 new cash machines, and presented the adoption of bitcoin to increase economic profitability and provide jobs. Bitcoin Beach, the coastal town of El Zonte, adopted bitcoin to run the local economy. However, throughout the country, there were contrasting opinions about the advantages of it for economic growth. Shortly after, many business owners in Bitcoin Beach went back to trading in cash, as they were losing money as a result of the constant fluctuations in Bitcoin's value (Brigida & Schwartz, 2022).

In January 2020, the IMF advised El Salvador to take back its adoption of bitcoin as a legal tender, reminding Nayib Bukele, the president of El Salvador, about the risks of bankruptcy. However, the government has expressed unease about the possibility of bitcoin and decentralized payments increasing the drug economy in the country (Taylor, 2022).

Does the adoption of bitcoin as a medium of exchange place it within the description of money?

5.5 Project Dunbar & BIS

One of the primary challenges facing the development of CBDCs is the matter of cross-border transactions.

Historically, cross-border payments were intermediated by a payment provider, usually in the form of an international bank, government, or other financial institutions. These aforementioned institutions would form partnerships with financial or government bodies in

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different countries, enabling them to process payments beyond their borders. Instead of transferring a domestic currency or commodities such as gold overseas, the intermediating bank would credit an account in one jurisdiction and debit the corresponding amount in a different jurisdiction that they don't have access to. For instance, when a user in Brazil makes a payment to a merchant in Argentina, their respective financial institutions would find another institution with a presence in both countries to settle the payments. This is typically a lengthy and costly process.

With the advent of CBDCs, governments have explored the possibility of launching a new intermediary platform across multiple CBDCs that could offer cross-border payments quicker and at a lower cost. Project Dunbar, a collaborative experiment between Singapore, Australia, Malaysia, and South Africa successfully developed a working prototype that resolved three major challenges in access, jurisdictional boundaries, and governance:

1. **Access**: The project tested the feasibility of multiple correspondent banks relying on a single platform for cross-border payments.

2. **Jurisdictional boundaries**: The project investigated how to simplify payment processes across multiple regulatory jurisdictions.

3. **Governance**: The project further examined how multiple central banks could work together while ensuring national security concerns that could arise from shared payments infrastructure. It sought to optimize universality and autonomy to ensure representation across its diverse stakeholders, as well as equitable and fair collective decisions.

Project Dunbar's exploratory phase identified three primary themes of future challenges to tackle: policy, business, and technology. It also noted that there is more to discover as the project continues to move forward (BIS, 2022:30).

6. Conclusion

In a relatively short period of time, cryptocurrencies evolved from an obscure form of exchange into a global phenomenon. This casebook explained the possible applications of cryptocurrencies, their benefits and potential drawbacks as a means of exchange, and the implementation of digital currencies across the globe. It also looked at how central bank digital currencies work, the rates of adoption globally, and challenges for their implementation. In particular, it focused on how Nigeria and the PRC have adopted digital currencies of their own and how these CBDCs function globally and within each country's local context.

This practice quiz that follows will assess your understanding of the functionality of the different cryptocurrencies discussed so far.

7. Bibliography

Allayannis, G. & Fernstrom, A. 2017. *An introduction to blockchain*. Charlottesville, VA: Darden Business Publishing.

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BBC. 2020. IMF urges El Salvador to remove bitcoin as legal tender. *BBC news*. 26 January. Available: https://www.bbc.com/news/world-latin-america-60135552 [2022, April 8].

BIS. n.d. *About BIS - overview*. Available: https://www.bis.org/about/index.htm?m=1001 [2022, April 8].

BIS. 2020*. Central bank digital currencies: foundational principles and core features*. Available: https://www.bis.org/publ/othp33.htm.[2022, April 8].

BIS. 2022. *Project Dunbar: international settlements using multi-CBDCs.* Available: https://www.bis.org/publ/othp47.htm#:~:text=Project%20Dunbar%20explores%20how%20a,design%20approaches%20to%20address%20them. [2022, April 8].

Brigida, A. C. & Schwartz, L. 2022. *Six months in, El Salvador's bitcoin gamble is crumbling.* Available: https://restofworld.org/2022/el-salvador-bitcoin/ [2022, April 8].

Cartwright, M. 2017. *Paper in ancient China*. Available: https://www.worldhistory.org/article/1120/paper-in-ancient-china/ [2022, July 5].

CFI. n.d. *Bank for International Settlements (BIS).* Available: https://corporatefinanceinstitute.com/resources/knowledge/finance/bank-for-international-settlements-bis/ [2022, April 8].

Chainanalysis. 2020. *The 2020 geography of cryptocurrency report*. Available: https://go.chainalysis.com/rs/503-FAP-074/images/2020-Geography-of-Crypto.pdf [2020, 23 September].

Chainanalysis. 2021. *The 2021 global crypto adoption index: worldwide adoption jumps over 880% with p2p platforms driving cryptocurrency usage in emerging markets.* Available: https://blog.chainalysis.com/reports/2021-global-crypto-adoption-index/ [2022, April 11].

Cœuré, B. & Loh, J. 2018. Central bank digital currencies. Available: https://www.bis.org/cpmi/publ/d174.htm [2022, April 8].

CoinLore. 2018. *Cryptocurrency list*. Available: https://www.coinlore.com/all_coins. [2018, December 3].

CoinMarketCap, n.d. *All Cryptocurrencies*. Available: https://coinmarketcap.com/all/views/all/ [2020, 23 September].

Cointelegraph. n.d. *STO 101: A beginner's guide on launching a security token offering*. Available: https://cointelegraph.com/funding-for-beginners/sto-101-a-beginners-guide-on-launching-a-security-token-offering [2022, April 8].

Cryptonews, 2022. USD Coin. Available: https://cryptonews.com/coins/usd-coin/#:~:text=Tokenizing%20USD%20into%20USDC%20is,dollars%20are%20held%20in%20reserve. [2022. April 8]

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Deutsche Bank. 2021. *Digital yuan: what is it and how does it work?* Available: https://www.db.com/news/detail/20210714-digital-yuan-what-is-it-and-how-does-it-work [2022, April 8].

eNaira Design Paper, 2021. Design paper. Available: https://enaira.gov.ng/about/design [2022, April 8].

EY. 2018. *EY study: Initial coin offerings (ICOs): the Class of 2017 - one year later.* Available https://www.ey.com/en_gl/news/2018/10/i-c-o-portfolio-is-down-by-sixty-six-percent-in-the-first-half-according-to-ey-study [2022, April 8].

George, L. 2021. *Nigeria launches eNaira amid hope, scepticism - and plenty of uncertainty.* Available: https://www.reuters.com/technology/nigeria-launches-enaira-amid-hope-scepticism-plenty-uncertainty-2021-10-25/ [2022, April 8].

Goldstein, J. & Kestenbaum, D. 2010. *The island of stone money*. Available: https://www.npr.org/sections/money/2011/02/15/131934618/the-island-of-stone-money [2022, April 8].

Green, C. 2017. Wampum was Massachusetts' first legal currency. *JSTOR Daily*. 23 November. Available: https://daily.jstor.org/wampum-was-massachusetts-first-legal-currency/ [2022, April 8].

Kauflin, J. 2018. Where did the money go? Inside the big crypto ICOs of 2017. *Forbes*. 29 October. Available: https://www.forbes.com/sites/jeffkauflin/2018/10/29/where-did-the-money-go-inside-the-big-crypto-icos-of-2017/ [2022, April 8].

Kedem, S. 2021. Nigeria launches eNaira – Africa's first digital currency. *African Business*. 28 October. Available: https://african.business/2021/10/finance-services/nigeria-gears-up-for-enaira/ [2022, April 8].

Kim, P. 2022. The environmental impacts of cryptocurrency mining explained. *Insider*. 17 March. Available: https://www.businessinsider.com/personal-finance/cryptocurrency-environmental-impact [2022, April 8].

Lambert, T., Liebau, D. & Roosenboom, P. 2021. Security token offerings. *Social Science Research Network*. Available: https://doi.org/10.2139/ssrn.3634626 [2022, April 8].

Mearian L. 2018. *Delaware to test blockchain-based filing system*. Available: https://www.computerworld.com/article/3289484/blockchain/delaware-to-test-blockchain-based-business-filing-system.html [2018, December 3].

Morris, D. 2020. Eastern Europe leads the world in cryptocurrency adoption—legal and otherwise. *Fortune*. 14 September. Available: https://fortune.com/2020/09/14/cryptocurrency-adoption-eastern-europe-ukraine-russia-crypto/ [2020, 23 September].

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All Rights Reserved

Nanda, R. White, R. & Tuzikov, A. 2017. Blockchain, cryptocurrencies and digital Assets. *Harvard Business School*. November 2017. (Revised November 2018.)

O'Reilly Media. 2022. Chapter 8 mining and consensus. Available: https://www.oreilly.com/library/view/mastering-bitcoin/9781491902639/ch08.html [2022, 13 July].

Pham P. 2017. What is money? *Forbes*. 20 November. https://www.forbes.com/sites/peterpham/2017/11/20/what-is-money/#236f1bb816ea [2018, December 3].

Phillips, D., & Roberts, D. 2021. Bitcoin is 3rd largest world currency: Deutsche. Available: https://decrypt.co/39425/bitcoin-is-now-the-6th-largest-world-currency [2020, 23 September].

PWC. 2021. *El Salvador's law: a meaningful test for Bitcoin*. Available: https://www.pwc.com/gx/en/financial-services/pdf/el-salvadors-law-a-meaningful-test-for-bitcoin.pdf [2022, April 2].

Sun, M. & Smagalla, D. 2022. Cryptocurrency-based crime hit a record $14 Billion in 2021. *Wall Street Journal*. 06 January. Available: https://www.wsj.com/articles/cryptocurrency-based-crime-hit-a-record-14-billion-in-2021-11641500073 [2022, April 8].

Taylor, L. 2022. *El Salvador's bitcoin experiment makes tech tourists happy but the locals are not convinced*. Available: https://www.abc.net.au/news/2022-04-04/el-salvador-bitcoin-experiment-cryptocurrency-legal-tender/100928650 [2022, April 8].

Tikkanen, A. n.d. *A brief (and fascinating) history of money*. Available: https://www.britannica.com/story/a-brief-and-fascinating-history-of-money [2022, April 4].

U.S Securities and Exchange Commission (SEC). 2018. *Two Celebrities charged with unlawfully touting coin offerings*. Available: https://www.sec.gov/news/press-release/2018-268 [2022, April 8].

Working Group on E-CNY Research and Development of the People's Bank of China. 2021. Progress of Research & Development of E-CNY in China. People's Bank of China. http://www.pbc.gov.cn/en/3688110/3688172/4157443/4293696/20210716145846 91871.pdf [2022, April 8].

Yang, B. 2011. The rise and fall of cowrie shells: the Asian story. *Journal of World History*. 22(1): 1-25. DOI: 10.1353/jwh.2011.0011 [2022, April 28].

Yoffie, B.D. & Woo, A.K. 2017. Note on Blockchain and Bitcoin, 2017. *Harvard Business School*. 01 November.

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