CBDC RESEARCH REPORT 2024

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We would like to express our deepest appreciation to our senior members for their exceptional leadership in guiding this research report. Their expertise, vision, and dedication have been invaluable throughout the entire process, and their contributions have played a crucial role in the success of this study.

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INTRODUCTION

EXECUTIVE SUMMARY

The future of money sees digital dominance alongside cash coexistence, with digital payments surpassing cash transactions. Enhanced security measures and convenience drive digital adoption, while cash remains a store of value. Digital payment advancements include instant settlement and expanded services, with investments shifting towards nonmonetary digital assets. Changes in cash infrastructure aim to reduce costs while maintaining coverage, with smart banknote and crowd-sourced cash networks emerging.

Digital money infrastructure evolves for instant settlement and faces challenges in security and privacy. Alternative scenarios include digital currency replacing cash, CBDC emergence, and non-sovereign currency dominance, each presenting unique challenges and opportunities for stakeholders. Then encapsulates a dynamic landscape where digital transactions reign supreme, yet cash persists as a secure store of value amid heightened security and privacy concerns. Banks transition towards API banking, embracing open approaches and expanding into non-banking services to remain competitive. Digital wallets diversify, offering control over diverse assets, while nonmonetary digital assets gain prominence as a store of value. Cash remains resilient, driven by security, privacy, and distrust in digital technologies.

However, the rise of non-monetary digital assets poses a challenge to traditional monetary systems, prompting a reevaluation of infrastructure and security measures to adapt to evolving consumer preferences and technological advancements. The evolving landscape of payment methods reveals a gradual decline in cash usage, yet specific scenarios sustain its relevance, including preferences among certain demographics and concerns over digital security. Smart banknotes and advanced payment technologies reshape transaction methods, while digital payments become ubiquitous across digital interfaces and IoT devices. Instant settlements and the emergence of nonmonetary digital assets transform transactional behavior, challenging traditional currency concepts. Centralized cash infrastructure adaptations aim for efficiency and inclusivity, incorporating digital wallets and P2P transactions. However, disruptive innovations like smart banknotes and digital-assets infrastructures pose risks to traditional systems.The evolution of digital money infrastructure introduces challenges in achieving instant settlement, potential disruptions from digital-assets infrastructures, and shifts in payment scheme intermediaries, signaling a transformation in transaction processing methods. The evolving financial landscape is witnessing a decline in cash usage, yet certain scenarios sustain its relevance, such as among the elderly and for privacy concerns.

Smart banknotes and advanced payment methods reshape transactions, while digital payments become ubiquitous across digital interfaces and IoT devices. Instant settlements and the emergence of nonmonetary digital assets transform transaction behavior, challenging traditional currency concepts. Centralized cash infrastructure adaptations aim for efficiency, yet disruptive innovations pose risks. Digital currencies, including Central Bank Digital Currencies (CBDCs), are replacing cash, offering enhanced security and convenience. However, concerns over privacy and network interruptions persist.

The emergence of non-sovereign currencies and the potential for a cashless society present both opportunities and challenges, requiring innovative solutions to adapt to an evolving financial landscape. The absence of a decentralized exchange (DEX) for Central Bank Digital Currencies (CBDCs) presents a significant barrier to their widespread adoption, hindering seamless cross-border transactions and limiting exchange options for individuals and businesses. With the potential market for CBDCs projected to reach $2 trillion by 2030, the lack of major players in the CBDC DEX market underscores its nascent stage. To address this issue, a proposed solution involves building a DEX for CBDCs, leveraging blockchain technology to enable peer-to-peer transactions and trading with other cryptocurrencies or fiat currencies. This model aims to capitalize on CBDCs' programmable nature, facilitating the development of smart contracts for complex financial transactions.

Essential features include support for multiple CBDCs, a decentralized order book, low fees, and a user-friendly interface, with revenue streams from trading fees, margin trading, and lending services.The integration of Anti-Money Laundering/Countering Financing of Terrorism (AML/CFT) technology into multilateral platforms is crucial to combat the significant risks associated with illicit finance, as highlighted by the United Nations Office on Drugs and Crime (UNODC).CBDCs hold promise in addressing these risks through distributed ledger technology (DLT), enabling more effective transaction monitoring. Additionally, CBDCs can provide financial stability during economic crises by serving as a substitute for

cryptocurrencies, reducing market volatility.Blockchain technology offers innovative solutions for refugee integration, as demonstrated by initiatives like Finland's partnership with MONI. Despite its potential, blockchain implementation faces technical and environmental challenges.

Nevertheless, its adoption signifies a transformative shift in leveraging technology for social good, particularly in refugee assistance and financial inclusion. Central banks globally are exploring various models for CBDC implementation, emphasizing the importance of public-private sector collaboration in fostering innovation and widespread adoption.

LITERATURE REVIEW

In this report on the future of money, significant changes are anticipated in how we view and use cash. Digital payments are becoming deeply integrated into everyday activities, expanding from ride-hailing to vacation bookings. The rise of diverse digital currencies, like Facebook's Libra and Bitcoin, is reshaping the concept of money beyond traditional forms. Central banks are contemplating their own digital currencies in response. However, escalating cyber threats and geopolitical tensions pose risks to the financial system. The report aims to guide decision-makers by exploring potential scenarios and highlighting the abstract value money creates for individuals and society. It stresses the need to think beyond current structures and definitions to anticipate the future of money effectively.
Money infrastructure creates value for individuals and society by fulfilling essential roles:-

Protecting and Securing Money:-
It establishes money as a 'store of value' by securely storing physical and digital money, using physical vaults for coins, banknotes, and digital vaults for digital accounts and ledgers. Ensures authorized access through security measures like pin codes, biometrics, and two-factor authentication. Safely moves money from one place to another, historically from horse carriages to armored trucks for physical money and via digital ledgers for digital money.

Facilitating Exchanges of Value:-
Enables the use of money as a 'medium of exchange' by securely transferring money from one entity to another, issuing banknotes, and providing user-friendly interfaces for accessing and controlling money in vaults. Operates digital communication channels (payment schemes) connecting digital interfaces to various custodians, vaults, and ledgers, forming a comprehensive digital platform for money transactions. Essentially, the money infrastructure ensures the security and seamless movement of money, both physically and digitally, allowing it to function effectively as store of value and a medium of exchange for individuals and society.

SUMMARY OF SCENARIOS

In the most likely scenario presented:-
Digital Dominance and Cash Coexistence:-
Digital payments surpass cash as the primary medium for transactions, offering enhanced convenience across various digital interfaces and IoT devices. Cash remains popular as a 'store of value' despite a 40-60% reduction in overall cash holdings, mainly due to a significant decline (40-70%) in its use as a means of payment.

Digital Payment Advancements:-
Instant settlement of digital payments becomes the norm, with banks opening their interfaces to third parties, expanding services beyond banking, and eliminating physical payment cards. Investment in nonmonetary digital assets rises, replacing digital money as a 'store of value,' while more people regularly use nonmonetary digital assets for transactions.

Changes in Cash Infrastructure:-
Cash infrastructure adapts to reduce operational costs while maintaining geographic coverage, leading to a 30-40% decrease in ATMs and the integration of crowd-sourced (P2P, P2M) cash networks, especially in rural areas. Smart-banknote and crowd-sourced cash infrastructures promise efficient coverage at lower costs, potentially disrupting traditional cash infrastructures.

Digital Money Infrastructure Evolution:-
Digital money infrastructure settles instantly, is programmable, and may face disruption by digital-assets ledger infrastructure, enabling direct programming linked to digital money. National/regional money infrastructures emerge in response to concerns about reliance on global players, aiming for interoperability while operating independently.

Digital Infrastructure Challenges:-
Security and privacy expectations rise significantly, driven by cyber threats and public awareness of data

breaches, potentially leading to fundamental rebuilds of underlying internet architecture for secure communication. In this scenario, digital payments surge ahead, reshaping transaction methods, while cash remains resilient as a value-holding entity. Changes in infrastructure, both cash and digital, aim for efficiency, security, and adaptation to evolving technological landscapes.
Alternative Scenario:- Digital Currency Replaces Cash

Shift to Digital Currency:-
Cash holdings plummet by 80%, with digital means overtaking cash as the primary 'medium of payment' and also replacing it as a secure 'store of value'.People may exhibit reduced concerns regarding the security, privacy, and bankruptcy risks associated.with digital currency, fostering its widespread acceptance.

Government Intervention:-
Governments might actively discourage cash holding by implementing policies. For instance, businesses may be required to increase prices for transactions using cash while decreasing the purchasing power of cash in relation to digital currency units.

Impact on Money Infrastructure:-
The significant decline in cash usage intensifies pressure on cash infrastructure to drastically reduce costs while ensuring widespread geographic coverage, forcing it to become highly efficient. In this scenario, digital currency overtakes cash in both transactional and value-holding capacities. Governments may implement measures to dissuade cash usage, accelerating the transition toward a predominantly digital currency-driven economy. The cash infrastructure faces considerable challenges to adapt to this swift and substantial decline in cash usage.

Alternative Scenario:- Central Bank Digital Currency (CBDC) Emergence

CBDC Adoption:-
Individuals have the option to hold digital currency directly issued by the central bank, known as 'central bank digital currency' (CBDC). This offers people the choice of holding their digital currency in either a central bank account or a commercial bank account. The availability of CBDC may lead to a decline in cash usage as individuals no longer face the risk of commercial bank bankruptcies while holding digital currencies.
Money Infrastructure Transformation:-
Central banks might establish their digital ledger systems (CB-account infrastructure) or opt to utilize third-party digital ledgers for managing CBDC. In this scenario, the rise of CBDC grants individuals access to digital currency directly issued by central banks, providing an alternative to traditional cash and potentially reducing reliance on commercial banks. Central banks may take charge by establishing their digital ledger systems or collaborating with third-party ledgers to manage the CBDC infrastructure.
Alternative Scenario:- Nonsovereign Currency Dominance

Currency Shift:-
Non-sovereign currencies replace traditional sovereign currencies and their central banks. Non-sovereign currencies become the prevailing form of money.

Infrastructure Adaptation:-
New non-sovereign issuers leverage existing money infrastructures for trust, scalability, and economies of scale. They may build upon established systems for rapid scaling and reliability.
Alternative Scenario:- Emergence of a Cashless Society
Cash Elimination:-
Cash disappears entirely, establishing a cashless society. Government enforcement drives this transition, eliminating concerns over digital currency's security, privacy, resilience to commercial banks. Central banks may take charge by establishing their digital ledger systems or collaborating with third-party ledgers to manage the CBDC infrastructure.
Alternative Scenario:- Non-sovereign Currency Dominance
Currency Shift:- Non-sovereign currencies replace traditional sovereign currencies and their central banks. Non-sovereign currencies become the prevailing form of money.
Infrastructure Adaptation:- New non-sovereign issuers leverage existing money infrastructures for trust, scalability, and economies of scale. They may build upon established systems for rapid scaling and reliability.
Alternative Scenario:- Emergence of a Cashless Society
Cash Elimination:-
Cash disappears entirely, establishing a cashless society. Government enforcement drives this transition, eliminating concerns over digital currency's security, privacy, resilience to cyberattacks, and bankruptcy risks, eradicating preferences for cash in any situation.
Money Infrastructure Transformation:-
A 'digital cash' infrastructure replaces the former 'physical cash' infrastructure. Some remnants of physical cash infrastructure remain for enhancing security and control over digital currencies. For instance, ATMs repurposed for offline two-factor authentication using uniquely-identifiable tangible pieces. Physical banknotes and vaults repurposed for storing uniquely-identifiable paper or non-digital private keys for cold storage. In this scenario, a government-led initiative leads to a complete eradication of cash, paving the way for a society dependent entirely on digital transactions. While physical cash infrastructure diminishes, remnants are repurposed for enhancing security measures in the digital realm.

Moneyless Society Emergence:-
End of Money Concept:- 'Money' ceases to exist as no asset fulfills criteria for classification. Money infrastructures remain relevant, but demand and exchanges for formerly monetary assets decline significantly.

Bitcoin Dominance
Crypto Takeover:-
Decentralized digital currencies like Bitcoin and Ether dominate, replacing central-bank-issued currencies as the primary forms of money.
Infrastructure Framework:-
Permissionless distributed ledgers serve as the foundation for securely storing and transferring digital money. Third-party digital interfaces (e.g., digital wallets) and payment systems operate as decentralized applications (DApps) built atop these ledgers. Cash might persist if uniquely identifiable real-world objects exist, even in a trustless entity scenario.

Fundamental Changes in Business Operations:-
Digital payments are surpassing cash by 40-70%, gaining convenience through expanded digital interfaces and automated payments from connected devices. Digital money competes with cash as a secure store of value, reducing concerns about security and privacy with digital assets. Banks introduce APIs for third-party digital payments, challenging traditional banking relationships, while payment cards transition to digital IDs and nonmonetary digital assets gain acceptance. Expectations rise for instant, fee-free digital transactions, extending to transfers of nonmonetary digital assets. Cash infrastructure requires lower costs but full geographic coverage, facing disruption from crowd-sourced solutions and advanced smart banknotes, offering heightened security, privacy, and programmability.

Strategic Actions:-
Prioritize cost-effective cash infrastructure with wide coverage, considering disruptive crowd-based solutions and innovative smart banknotes. Adapt to the programmability and competitive advantages of digital money infrastructure, emphasizing trustworthiness in security and privacy. Develop infrastructure for bank-account portability and API banking to facilitate seamless transitions between service providers. Consider engagement in national payment schemes to establish independent yet interoperable money infrastructure.
Possible Strategic Moves:-
Centrally Operate Cash Infrastructure:-
Enhance efficiency by operating the national cash infrastructure as a utility, leveraging economies of scale.
Explore Crowd-Sourced Cash Infrastructures:-
Investigate crowd-sourced cash systems to boost efficiency and convenience, potentially disrupting legacy infrastructures.
Investigate Smart Banknotes:-
Explore the potential of smart banknotes to enhance efficiency and disrupt traditional cash systems.
Develop Bank-Account Portability Infrastructure:-
Build infrastructure for seamless transitions between digital service providers by ensuring portable bank accounts.
Establish API Banking Infrastructure:-
Develop the necessary infrastructure for API banking, allowing embedded finance and third-party integration.

Set Up a National Payment Scheme:-
Consider establishing independent yet interoperable national/regional money infrastructure.
Build or Operate Digital-Assets Ledger Infrastructure:-

Explore different types of digital-ledger systems, preparing for potential shifts to permissionless distributed ledgers.
Investigate Secure Financial Data Communication:-
Explore secure Internet infrastructure for financial data communication amid rising cyber risks.
Explore Resilient Payment Infrastructures:-
Investigate payment systems resilient to blackouts and network interruptions, crucial for both digital and cash economies.
Develop Resilient Digital Currencies:-
Explore robust digital currencies that operate during blackout or loss of digital ledger, potentially utilizing P2P connectivity and ambient-energy harvesting.
Support Nonsovereign Currency Issuers:-
Collaborate with nonsovereign entities to issue currencies, leveraging existing infrastructures and preventing potential disruption if sovereign currencies decline.
Digital Rules — But Cash Persists in a Fragmented World
Likelihood of Occurrence:- Most Likely

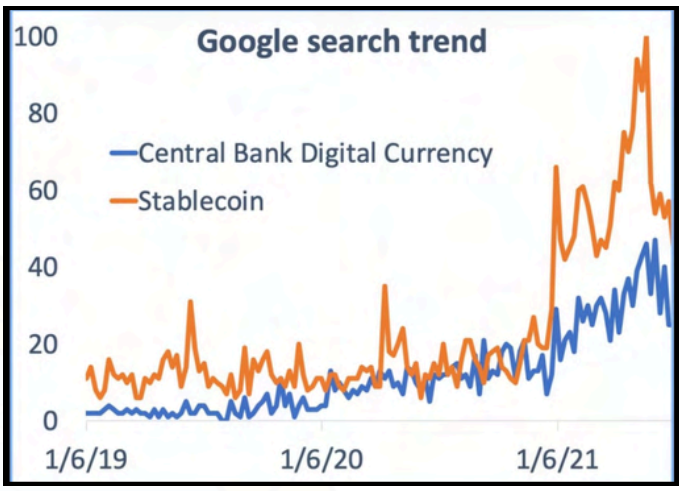
WHAT IS CBDC

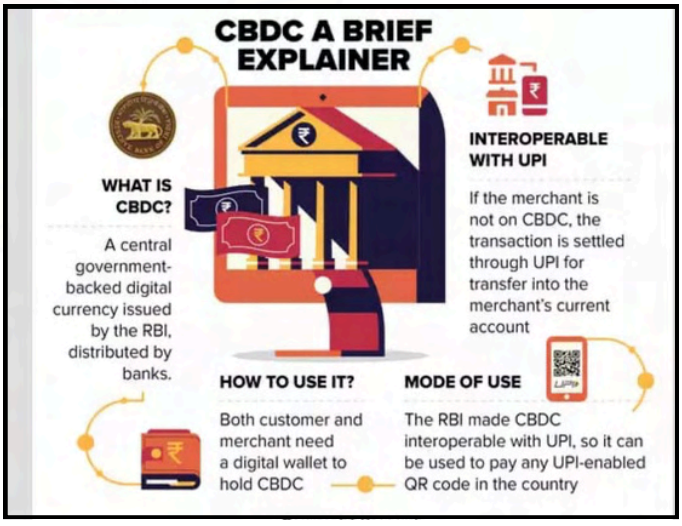
Central bank digital currencies (CBDC) are a digital form of a country's national currency which is issued and regulated by the country's central bank. CBDC can be easily distinguished from reserves or settlement balances held by commercial banks at central banks. Unlike cryptocurrencies, the value of CBDC is fixed by the central bank and is considered to be equivalent to country's fiat currency.

A country's monetary authority, or central bank issues a CBDC which helps to promote inclusive finance and simplifies monetary and fiscal policy. Different from traditional digital money in commercial banks, CBDC is a direct liability of the central bank. It is designed to operate on blockchain or distributed ledger technology.

CBDC can help to provide businesses and its consumers with privacy, financial security, accessibility, convenience. CBDC can potentially help lower barriers to financial inclusion in countries with underdeveloped financial systems, limited access to affordable and safe financial services and low financial penetration. CBDC can also decrease the cost of maintenance which could be required in case of complex financial system. It can also reduce cross- border transaction costs and provide alternative money transfers with lower- cost options. Since CBDC's are backed by the government and controlled by the central bank, it helps to provide households, businesses, consumers means of exchanging digital currency safe and securely. Introduction of CBDC can also help in ensuring fulfillment of anti-money laundering and counter terrorism funding requirements as well as satisfying public policy requirements of other tax regimes and supervisory. In times of financial crisis, CBDC can provide a stable and safe form of digital currency complements physical cash.

Introducing CBDC can result in wider presence of central banks in financial systems. Hence, it can provide greater role to central bank in allocation of economic resources which might cause total economic losses if the organizations are less efficient than the private sector in allocation of economic resources.





TYPES OF CBDC

Central bank digital currency (CBDC) can take various forms based on its design and accessibility. The main two types of CBDC are:-

Wholesale CBDC:-
Wholesale CBDC are primarily utilized by financial institutions such as banks and its main purpose is to allow interbank transactions, settlements and other financial institutions. It is not intended to be used by the general public. Wholesale CBDC works in the backend of financial system ensuring smooth settlement of large value transactions between different financial institutions.

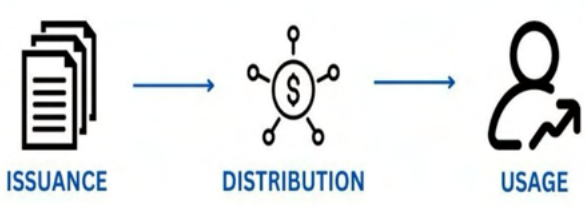
Retail CBDC:-
Retail CBDC are primarily utilized by individuals allowing transactions between individuals, businesses and non-bank entities in digital currency directly with the central bank. Retail CBDC is used in everyday transactions, thus allowing it to be stored in digital wallets provided by central bank. It can potentially reduce the need to carry physical currency.

There are two types of retail CBDC's. These are differentiated on the basis of how individual users access and use their currency

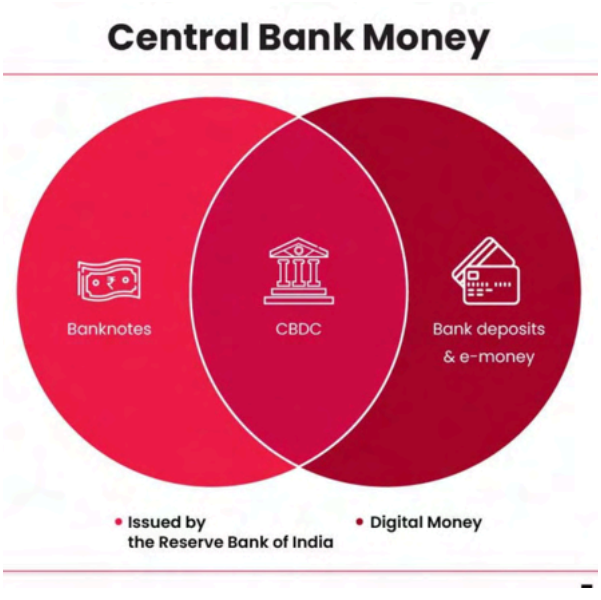
- Token-based retail CBDC:- Token based CBDC are issued in the form of digital tokens and are associated with blockchain or distributed ledger technology. Each token is unit of currency and can be transferred between users directly.

- Account-based retail CBDC:- Account based CBDC are issued and recorded in digital accounts where transactions are recorded in the centralized ledger maintained by the central bank. This type of retail structured CBDC requires digital identification in order to gain access to the account.

HOW DOES IT WORK?



Implementation and working of CBDC across the globe can vary in different countries due to the certain factors like monetary policy, financial frameworks, regulatory frameworks, technologies etc. However, the core principles in implementation of CBDC remains the same.
The working of CBDC can be broadly categorized under three stages:- - Issuance, Distribution and Usage.



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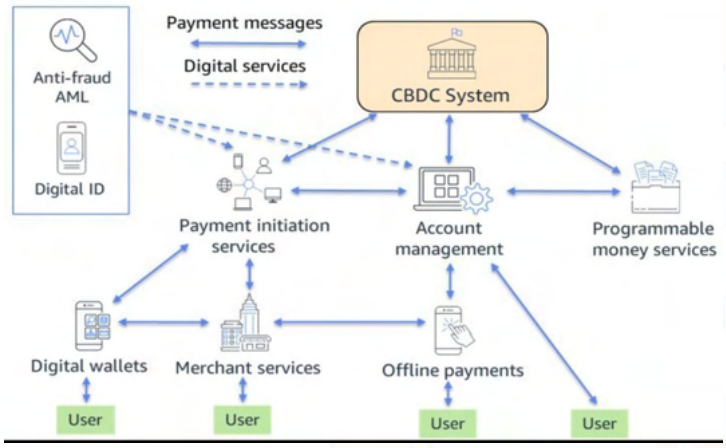


ISSUANCE:-
Issuance of CBDC in a country can be described in three steps which are:-

- INITIALIZATION:- - The central bank develops a secure and strong infrastructure which is used to manage the ecosystem associated with the CBDC. This process can involve describing the structure of control, setting up IT systems, establishing security problems. The central bank establishes rules for CBDC issuance, ensuring it aligns with the monetary policy and legal requirements. The central bank specifies the technical requirements of the CBDC, which includes primary technology, transactions protocols and data storage mechanisms. It must specify the design choice of architecture of CBDC i.e., account-based, token-based or hybrid model of CBDC.

- MINTING:- - The central creates digital tokens which represent the CBDC units which are going to be circulated in the economy. This process involves assigning values to the token and generating unique identifiers such as serial numbers, cryptographic keys, or other secure representations for each token. The minted tokens are stored securely with the central bank digital vault or distributed ledgers. The minting process can be used by the central bank to increase or decrease the money supply in the economy.

- SUPPLY MANAGEMENT:- - The central bank regulates the total supply of CBDC in the market. It may require adjusting the supply through mechanisms like open market operations, interest rate adjustments, reserves etc. The central bank can adjust reserve requirements for commercial banks which affects the supply of CBDC in the economy. Central banks can also destroy existing CBDC's in the economy to adjust the supply. If CBDC uses smart contract functionality, the central bank can use its programmable rules to adjust the supply dynamically.

DISTRIBUTION:-
CBDC as being issued by the central bank can be distributed through interbank, retail distribution or through Anti-Money Laundering and Counter-Terrorism Finance Compliance.

- INTERBANK DISTRIBUTION:- - Central bank acts as the trusted intermediatory in inter bank transactions involving CBDC. Its digital ledger records and verifies the transfer of CBDC in order to ensure security and integrity of the system. While transactions are recorded on the digital ledger, the details of individual transactions must be kept confidential. Banks can use their CBDC holdings as collateral for obtaining loans and participating in other financial activities keeping in mind the rules and regulations of the central bank.

- RETAIL DISTRIBUTION:- - Accounts are created by individuals and businesses directly with the central bank or authorized financial institutions. Digital wallets are used to store and manage the CBDC holdings. These wallets can be created by central bank, commercial banks or authorized financial institutions. CBDC can be made accessible through ATM and point to sale terminals. Users can also have access to their CBDC holdings through mobile apps or online platforms allowing day to day transactions between the general public.

WHY CBDC

CBDC has been in the headlines for a very long time but why? Why only CBDC and not some other alternative? What is so special about CBDC? Central bank digital currency holds a lot of potential in advancing financial inclusion at a global level. To examine this potential effectively various factors need to be put into consideration to ensure CBDCs fulfill their purpose of serving those marginalized communities which lack traditional banking services and making them financially and economically empowered. One of the reason for successful CBDC adoption is the pre-requisite of education and to crack this code government need to provide adequate financial literacy to almost every marginalized section and community, considering the need for enough financial education covering both financial literacy and practical aspects of digital money, from storage to benefits and risks for them which would help in understanding them its benefit eventually leading to inclusive participation in the digital financial ecosystem. Moreover, for financial inclusion we cannot ignore the aspect of interoperability, the focus should be on creating interoperable systems that facilitate easy transitions between different digital currencies, which is one of the main concerns for The International Monetary Fund, the World Bank, and the Bank of International Settlements and they emphasize the need for interoperability and coexistence with other payment instruments to ensure the seamless transition between different payment.

Major CBDC project developments so far in Q2 2023
Key details around CBDC projects in recent months

Central Bank	Region	Date	Development
RESERVE BANK OF AUSTRALIA		31 May	Monoova completed the first real-world cross-border settlement using the Reserve Bank of Australia's Australian dollar CBDC
EUROPEAN CENTRAL BANK		30 May	Worldline delivered an offline P2P payment use case for digital euro payments as part of an ECB project
		29 May	Entered pilot phase of CBDC project, published second phase of proof of concept work and created a CBDC forum to get input from private sector
EUROPEAN CENTRAL BANK		26 May	Published results of a 'prototyping exercise', which found that it would be possible to integrate digital euro payments into the European payments system
BANCO CENTRAL DO BRASIL		26 May	Selected 14 entities, including Visa and Microsoft, for digital real CBDC pilot
NATIONAL BANK		8 May	Started public consultation on digital Canadian dollar
中国银行 BANK OF CHINA		5 May	Linked BNP Paribas' corporate clients in China with the Bank of China's system, allowing them to store and make real-time payments with digital yuan

It would provide the central bank with direct control over the currency, enhancing their ability to manage the money supply and implement economic policies. Additionally, a CBDC could streamline the distribution of government benefits, allowing funds to reach intended recipients without intermediaries. However, it's important to note that the introduction of a CBDC could potentially impact the overall money supply, which may indirectly influence factors such as inflation and interest rates.

Influence on Interest Rates

The issuance of CBDCs allows central banks to implement interest rate policies more directly. As demonstrated in economic models, the interest rates on CBDC holdings can be adjusted to influence spending behavior, investments, and credit availability, affecting the overall economic output. Economic Stability and Inflation Management,By leveraging CBDCs in monetary policy frameworks, central banks can potentially enhance economic stability. Improved monitoring capabilities enabled by CBDCs may aid in mitigating risks associated with money laundering, tax evasion, and illegal financial activities, contributing to a more stable economic environment.

CBDC and anonymity

CBDC does not get the ultimate anonymity that cash enjoys i.e. it leaves a digital footprint behind, making it much easier for the agencies to track any suspicious transactions, substantially reducing the chances of fraud or scam that will eventually lead the public with high trust in the system, also being built on a programmable language it will be different from cryptocurrency and have much higher stability and is subject to less volatility otherwise in the case of cryptocurrencies.
Furthermore, with the internet reaching almost every corner of the world it would further increase Cross-border payments which are slow, costly, and complex due to the involvement of multiple intermediaries and different currencies. CBDCs have the potential to make cross-border transactions faster, cheaper, and more efficient for businesses and individuals. By removing the need for multiple intermediaries, CBDCs can reduce the high fees typically associated with traditional banking services for international transactions.

Additionally, The RBI has taken an aggressive approach to piloting CBDCs in both wholesale and retail segments, aiming to scale up CBDC transactions to one million per day by the end of 2023, a significant leap from the current 5,000-10,000 daily transactions in the retail CBDC space, also, integrating CBDC with cross-border payments

offer huge future prospectus for revolutionising global finance with their instantaneous settlement capabilities and potential for interoperability across different jurisdictions, stand as a beacon for cheaper, faster, and more secure international transactions.

Anti money laundering and counter terrorism finance compilance

The integration of Anti-Money Laundering/Countering Financing of Terrorism (AML/CFT) technology solutions into these multilateral platforms was stressed to combat the risks associated with illicit finance, The United Nations Office on Drugs and Crime (UNODC), the Governor highlighted the significant magnitude of global money laundering, pegged between 2-5% of global GDP, representing approximately $800 billion to $2 trillion. These staggering figures underscore the urgency for robust measures to counter financial crimes, where CBDCs could potentially play a pivotal role, with their distributed ledger technology (DLT) authorities can monitor transactions more effectively which could help in controlling illegal activities such as tax evasion or money laundering, etc. Also, in times of recession or economic crisis, CBDCs can provide financial stability by providing a substitute for cryptocurrencies that would help reduce volatility in global markets.

Efficient refugee handling

The refugee crisis has highlighted the devastating impact of lost or missing identity documentation. Refugees struggle to access basic services, find employment, and build new lives. Blockchain technology could revolutionize this situation by providing a secure, unchangeable way to store and verify identity. This would give refugees the tools to access healthcare, education, financial services, and the chance to fully participate in society.

One noteworthy case illustrating the integration of blockchain technology in aiding refugees is seen in Finland. Amid a surge in asylum seekers, the Finnish Immigration Service (Migri) partnered with the Helsinki-based startup MONI to initiate a pilot project in 2015. This initiative provided refugees with prepaid Mastercards linked to their digital identities stored on a blockchain, specifically Ethereum. By maintaining a record of financial transactions made with these cards, blockchain technology facilitated an efficient means for refugees to establish financial credibility, pay bills electronically, and receive income from employment. The utilization of blockchain not only expedited the refugees' integration into Finnish society but also streamlined their path to economic independence. Privacy concerns have been addressed in this system, emphasizing a privacy-preserving approach that safeguards individuals' identities while enabling third-party verification compliant with card program requirements. It must ensure that identities remain confidential, offering a level of anonymity while allowing necessary parties to authenticate identities without compromising individuals' true identities.

The application of blockchain technology in refugee policy extends beyond Finland. Similar initiatives are being explored in disadvantaged areas of the United States, such as New York City's Bronx area, through projects like Fummi. These endeavors highlight the scalability and potential global impact of leveraging blockchain for refugee integration.

While blockchain presents a promising solution, it's essential to acknowledge its limitations and challenges. Implementing blockchain systems requires technical expertise, and the energy-intensive nature of verifying transactions may pose environmental concerns. Additionally, transaction processing times during periods of high usage remain a concern, although advancements are continually being made to address these issues.

The adoption of blockchain in refugee policy signifies a paradigm shift in leveraging technology for social good. This innovative approach not only assists refugees in reclaiming their identities but also offers a glimpse into the future of humanitarian aid and societal integration. The European Union's commitment to studying the benefits of blockchain and establishing forums to explore its potential in refugee assistance further underscores its growing importance on a global scale.

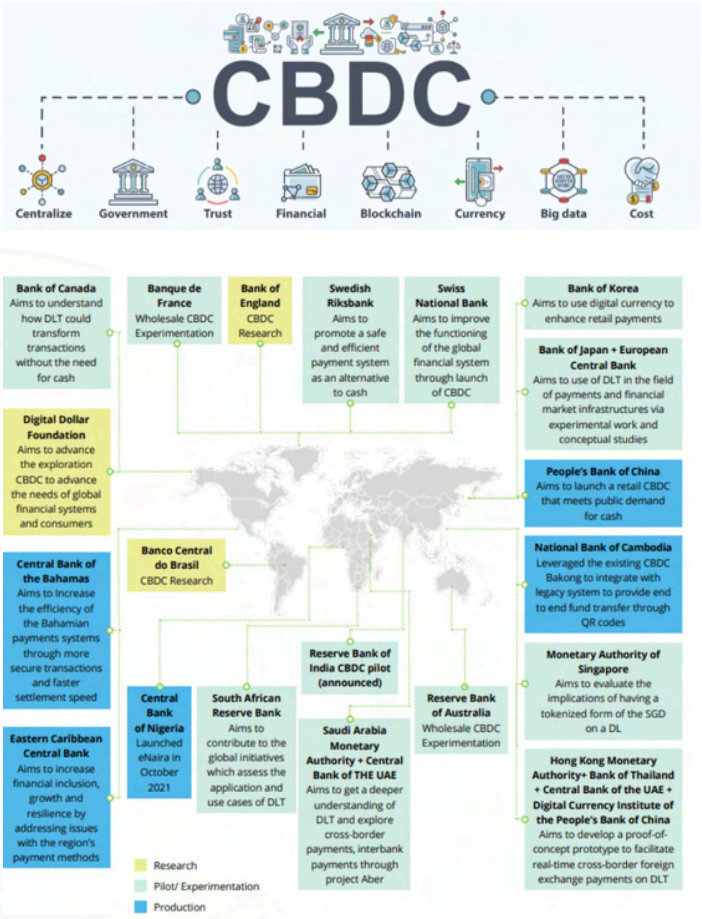
HOW WILL IT BE IMPLEMENTED?

A Central Bank Digital Currency (CBDC) system is likely to share key components and functions with traditional payment systems. Central banks would grapple with familiar policy questions regarding access, services, and structure, much like they do currently (CPSS, 2003). Payment systems consist of operators, participants, instruments, procedures, and rules governing fund transfers (CPMI-IOSCO, 2012). In addition to the "core" system, a broader ecosystem encompasses end users, technical processing, supporting infrastructure providers, and contextual legal, supervisory, and contractual arrangements.

At the heart of any CBDC ecosystem lies a CBDC core rulebook, delineating the legal foundation, governance, risk management, access, and other requirements for participants in the CBDC system. This rulebook is supported by a core technical infrastructure that operates a central ledger, facilitating the issuance, redemption, and settlement of CBDC, along with potential additional activities.

Participants in the CBDC system function as intermediaries connecting the central bank and end users. These intermediaries may include banks, payment service providers, mobile operators, and fintech or big tech companies, depending on access policies outlined in the core rulebook. Each use case follows specific business and technical rules, dictating initiation, processing, fees, compensations, data usage, and data protection. For example, rules may address how offline payments are processed and corresponding risks managed outside the CBDC ledger, all within the broader requirements set out in the CBDC scheme rules.

Intermediaries employ one or several processing infrastructures to process payment messages, reconcile transactions, and communicate with the core infrastructure. Their responsibilities encompass pre-transaction tasks such as onboarding and providing access devices and channels, transaction-related activities like customer service and support, and post-transaction duties such as providing advice, statements, and billing. Intermediaries also include operators of processing infrastructures and providers of processing services.



Most regulators globally have taken initiatives towards embarking on their CBDCs journey by either connecting with industry experts to research different models or are in a testing phase. Some countries like Cambodia and the Bahamas have already launched CBDCs. The below diagram depicts some of the ongoing projects globally.

There is a need to explore the concept of retail Central Bank Digital Currency (CBDC) from three perspectives. We should consider a scenario where the central bank acts as the sole issuer and service provider without the involvement of Payment Service Providers (PSPs) in the rollout. The models should revolve around the structure of the legal claim, and a shared feature is the implementation of a two-tiered system. In this setup, core issuing functions remain with the central bank, while authorised PSPs play a role in deployment and usability.

It's important to note that two-tiered systems are not novel in the realm of payments, and the design choices for retail CBDC can lead to diverse outcomes in system functionality. The coexistence of public and private stakeholders in an ecosystem is foreseeable, with legal definitions governing the backstopping of money holdings being a significant factor .

In a related vein, emphasis should be on two crucial aspects behind retail CBDC. First, they highlight how central bank digital money serves as a digital representation of fiat money, akin to cash. Second, they underscore the importance of private sector engagement (PSPs) in the widespread adoption of digital cash.

The CBDC Working Group (CBDC WG) proposes a definition of retail CBDC based on two fundamental features related to money and payments. On the money side, retail CBDC is described as a digital representation of fiat money. On the payments side, a retail CBDC relies on a supporting infrastructure.

Central banks around the world are exploring the potential of Central Bank Digital Currencies (CBDCs). A key question they face is how to design CBDC ecosystems that balance the involvement of public and private sectors. This balance is crucial for achieving desired policy goals, fostering innovation, and meeting users' evolving needs.

One key theme that emerges is interoperability, or the ability of different systems to work seamlessly together. For CBDCs, this means ensuring smooth flow of funds between the CBDC system and other national payment options. This would promote accessibility, resilience, and diversity within the overall payment landscape.

Central banks have various options to achieve interoperability, like using established standards or building new technical interfaces. However, challenges like technical hurdles, commercial concerns, and legal barriers need to be addressed through open dialogue with stakeholders.Another critical aspect is access to and use of payment data. Balancing privacy concerns with facilitating interoperability and encouraging diverse service providers presents design challenges. This includes finding the right messaging standards, creating incentives for participation, and ensuring compatibility with traditional systems that require detailed information.

Central bank digital currencies (CBDCs) could boost a country's ability to handle financial disruptions. They could act as a backup payment method if other systems fail, but only if they're designed with resilience in mind.CBDCs themselves need to be tough against technical glitches, fakes, and cyberattacks. A central bank-run system, separate from existing payment networks, could keep going even if those networks crash.

But building such a system is no easy feat, and the cost must be weighed against how well existing payment systems already handle disruptions.

Every piece of a CBDC system needs top-notch security and reliability. Depending on the design, the core infrastructure might need even more protection. Sharing processing power with other systems could save money, but it also means both systems could go down together if that shared infrastructure fails. Building separate processing systems could be more resilient, but it would also be more expensive for everyone involved. And to truly be a backup, a CBDC needs to work seamlessly with other payment methods. This means it should be easy to switch between a CBDC and other forms of money, like cash or digital wallets.

Payment systems, like other infrastructure, can become dominated by one or a few players. This can be good because it creates efficiency, but it can also be bad because it reduces choice for users and stifles innovation.

A central bank digital currency (CBDC) could help to avoid this by promoting a diverse ecosystem of payment providers. This would be achieved by requiring different providers to work together (interoperability).More providers would mean more competition, which would benefit users with lower fees and better services. It would also make the system more resilient, as there wouldn't be a single point of failure.

Privacy is important

Most international agreements, like the UN Declaration of Human Rights, recognize privacy as a fundamental right. In payment systems, privacy protects people from unfair business practices, bad actors, and unnecessary government snooping.Designing a CBDC that protects privacy while also preventing illegal activities like money laundering and terrorism financing is a tricky balancing act. Finding the right balance will involve considering international recommendations and country-specific data protection laws.Some regulations require collecting and sharing user data, like the "travel rule" that tracks transactions across different payment providers. This can raise privacy concerns, so it's important to find ways to protect people's data while still meeting regulatory requirements.

The implementation of CBDCs signals a monumental shift in the global financial landscape. By navigating the intricate terrain of technology, regulation, and public understanding, central banks pave the way for a secure, accessible, and efficient digital currency system. As nations continue to explore and adopt CBDCs, the financial world stands on the brink of a transformative evolution.

HOW CAN CBDC AFFECT THE GLOBAL FINANCIAL SYSTEM?

The US dollar survived the collapse of the Bretton Woods system in the early 1970s, and its dominance even rose somewhat after the recent COVID-19 pandemic. The US has long enjoyed the many benefits that flow from minting the dominant global currency—from continuous capital inflows and lower foreign borrowing costs to reduced foreign exchange risk in trade and the power to sanction other nations.

While there has been much debate in recent decades about whether the US will maintain its privileged position, to date the dollar has steadfastly defied predictions of its decline. This could be set to change with the development of new monetary technologies and the sanctions imposed this year on Russia's central bank after the invasion of Ukraine.

Central Bank Digital Currencies ('CBDCs') have the potential to disrupt dollar dominance by providing faster and cheaper ways to settle international trade and financial transactions. CBDC'S can provide faster and cheaper ways of settling transactions as they eliminate the intermediaries and streamline the process. The transactions can be settled directly between parties, reducing the need of multiple banks or payment processors. CBDCs are a form of digital currency issued by the central bank, either for use by the public (retail) or by businesses (wholesale). The Bank for International Settlements recently found that 90 percent of central banks are exploring CBDCs, with 54 percent considering issuing one in the next six years. China is leading the world in these efforts, with its CBDC—the e-CNY—expected to be the first issued by a major economy.

The e-CNY has already been trialed in over 20 cities and used in over (~US$14 billion) worth of transactions, giving China a massive first-mover advantage. E-CNY is a digital form of Chinese yuan that is regulated and controlled by the People's Bank of China and it provides a secure and efficient means by digitizing the payments globally. It was launched recently in April 2020 giving China a first mover advantage with CBDC's. It has already regularized the payment system as it is controlled by the People's Bank of China and is an efficient means of making payments digitally which as said also calls for greater digital inclusion. It considers the real challenge that CBDCs could pose to dollar dominance.

We situate this development of CBDCs within the broader context of efforts by states to develop alternatives to the US dollar in recent decades, particularly those led by the BRICS (Brazil, Russia, India, China, South Africa) coalition, which was formed in 2009-10 to increase the member nations' status and influence in global governance. BRICS was established in 2006 and was established by the above-mentioned countries to boost the economies of emerging and developing nations through cooperation and coordination.

CBDCs are the most promising development for states looking to build alternatives to the US dollar, a quest empowered by the unprecedented sanctions imposed by the West on Russia in response to its invasion of Ukraine in February 2022. In recognition of this risk, the US has now expedited development of a digital dollar, although it is far behind in this particular race.
In exploring these developments, our paper focuses in particular on wholesale CBDCs. While these have attracted much less attention than their retail counterparts and seldom been analyzed from a political perspective, their potential to deliver massive efficiency gains in cross-border payments related to trade, investment and remittances could transform the global financial system and disrupt dollar dominance in the long term. Cross-border payments refer to financial transactions that occur between individuals, businesses, or financial institutions in different countries. These transactions involve the movement of money across national borders to facilitate various purposes such as international trade, remittances, investments, or personal transfers. cross-border payments can be conducted through various channels including wire transfers, online payment platforms, or through correspondent banking relationships. The process of cross-border payments typically involves currency conversion, compliance with regulatory requirements, and settlement through international and payment systems. It plays a crucial role in facilitating global economic activities and fostering international collaboration.

While CBDCs are potentially transformative financially and technically, they could also be so geopolitically. Our paper explores three possible outcomes that could flow from the launch of CBDCs and come to characterize the global financial system of the future. First, a digital dollar could maintain or strengthen dollar dominance, even in spite

of alternatives developed by rival states, because a digital dollar will be cheaper and easier to use than today's arrangements. Second, the US could lose its dominant position in the global financial system as rival states develop CBDC-based alternatives, which risks fragmenting the global economy into two or more competing blocs. If this occurs, states could be forced to choose between joining a US-led or China-led bloc, with serious implications for national security, economic growth and financial stability. Third, we could see a gradual transition to a multipolar system characterized by cooperation rather than competition, though this outcome seems least likely in the current geopolitical climate. In the context of CBDC's a multipolar system refers to a scenario where multiple countries or regions have their own central bank digital currencies in circulation. Each central bank digital currency operates independently within its respective, allowing for diverse digital currency ecosystems across the globe. This multipolar system can promote financial sovereignty, enhance cross-border transactions, and potentially foster competition and innovation in the digital currency space.Each of these possibilities will pose opportunities and risks for states and the global financial system as a whole. However, the second outcome, a global economy fragmented into two or more competing blocs, likely led by the US and China, poses an existential threat to the currently truly global financial system.

The World Trade Organisation recently estimated that the disintegration of the global economy into two trading blocs will reduce global GDP by about 5 percent in the long term, with larger losses felt by emerging and developing economies. We could also witness the dismantling of the global reserve currency system—an existing trend accelerated by the freezing of some $300 billion of Russian foreign exchange reserves.The consequences of fragmentation will be severe and this outcome should, if possible, be avoided. As central banks across the world continue to explore CBDCs and work toward issuance, policymakers must begin working on approaches and strategies to build trust and facilitate greater cooperation among states. Otherwise, a potentially transformative technological development could result in a weaker—rather than stronger—global financial system in the future.

5 WAYS IN WHICH CBDC CAN AFFECT THE GLOBAL FINANCIAL SYSTEM

DIGITISATION OF PAYMENTS

CBDCs might make payments quicker and more efficiently because they would do away with the need for intermediaries. Costs could be brought down as a result, along with financial inclusion and an improved global payments system.
CBDCs could also enable cross-border payments to become faster and more efficient, as they would not be subject to the limitations of the traditional financial system.

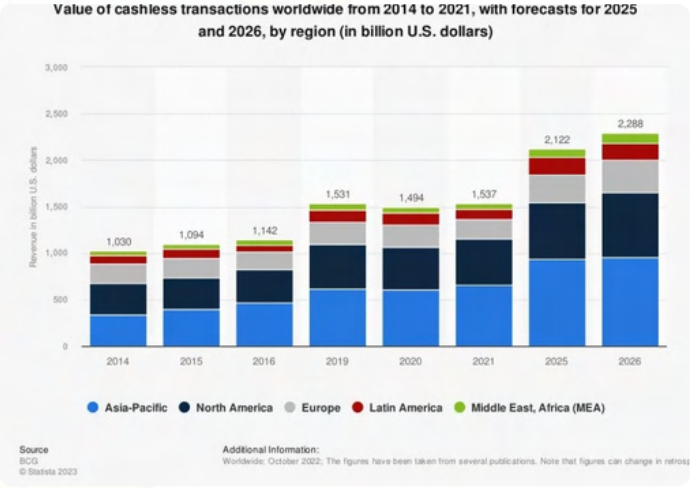
The ease and reduced cost of conducting cross-border commercial transactions could have a big impact on global trade.

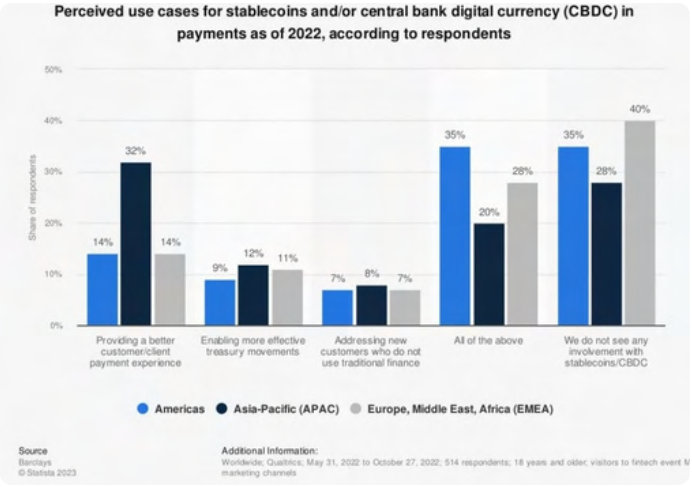
Additionally, because they would be supported by the central bank and subject to strict security controls, CBDCs could aid in lowering the risks connected with payment systems, such as fraud and cyberattacks.

REDUCED USE OF CASH

The use of cash may drop with the introduction of CBDCs as more individuals switch to making digital payments. This might make it simpler for central banks to monitor cash movements and thwart fraud and other criminal activity.

There may be less need for ATMs to disburse cash as more consumers switch to digital payments. This can result in fewer ATMs being used and less money being spent on servicing them. Moreover, CBDCs could enable peer-to-peer payments between people and companies, doing away with the requirement for in-person cash transactions. Without requiring actual cash, this would make it simpler for people to give and receive money.





INCREASED FINANCIAL STABILITY

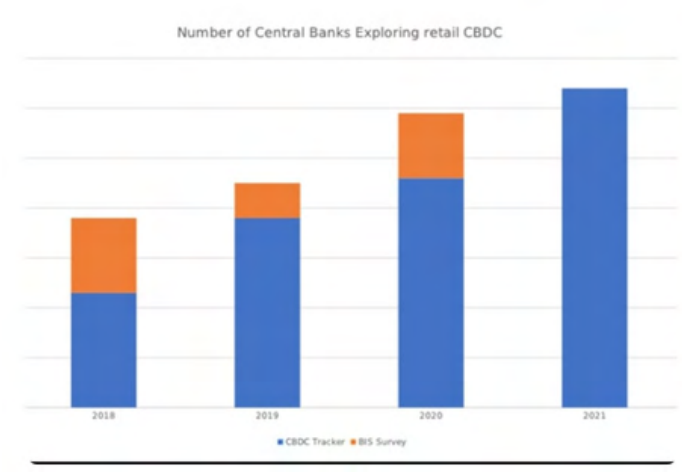
By giving central banks more direct control over the money supply and interest rates, CBDCs may enhance financial stability. Although CBDCs could offer an alternative to conventional bank deposits, they could also aid in lowering the risks related to bank runs.
People may withdraw their money from banks during tough financial times, which could result in a bank run. People would have another option to withdraw their money with CBDCs, lowering the possibility of bank runs.
Since they are supported by central banks and are subject to strict security regulations, CBDCs could increase the robustness of payment networks. This would lessen the likelihood of cyberattacks and assist in preventing payment system failures.

Digital wallets with spending limits
CBDCs could enable central banks to implement digital wallets with spending limits. These wallets could be used to provide targeted support to specific sectors of the economy during times of stress, such as a pandemic. For example, the central bank could provide digital wallets with spending limits to households affected by a recession, stimulating spending and boosting the economy.

Real-time data
CBDCs could provide central banks with real-time data on spending patterns, enabling them to make more informed decisions about monetary policy. This could help central banks react more quickly to changes in the economy, reducing the risk of recessions.
Automated policy implementation
CBDCs could make it possible for central banks to autonomously carry out monetary policy. A central bank may, for instance, set a desired inflation rate and then automatically modify the money supply to meet that goal. This would lessen the need for manual monetary policy action.

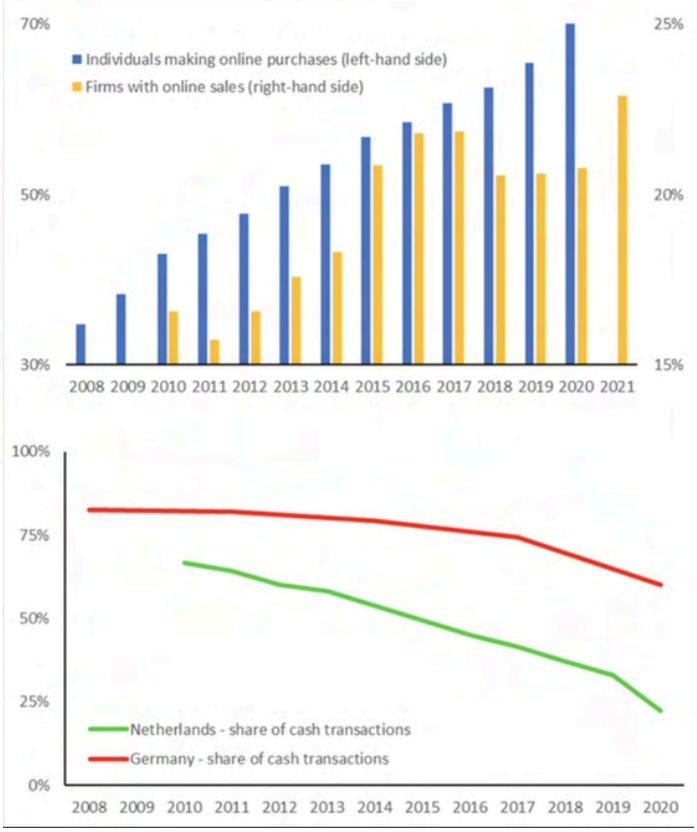
Impact on the international monetary system
Although countries with stronger CBDCs might have a greater impact on international financial markets, the adoption of central bank digital currencies could potentially result in changes to the international monetary system. Moreover, CBDCs might contribute to lessening the United States dollar's hegemony in global trade and finance.

The Sand Dollar, a digital counterpart of the Bahamian dollar that is issued by the central bank and guaranteed by the government, is one instance of a CBDC in implementation. Due to the lack of access to conventional banking services in the Bahamas, the Sand Dollar is intended to encourage financial inclusion in that nation. Additionally, it aims to increase the effectiveness of payments while lowering the cost of delivering financial services.



How to pay in a digital world?
You can't use cash to pay online. This is one of the reasons why physical currency is losing its appeal as an efficient means of payment in the digital age. The proliferation of online shopping and digital payments has been accompanied by a steady decline in cash use over the past one and a half decades (see Figure 1). Broadly speaking, digitalisation of economic activity profoundly affects how people pay for things.

Figure 1 Growth in e-commerce and the declining use of cas



Cash is public money – it is a liability of the central bank and thus perfectly safe. Image: CEPR.

Most people don't see a difference between cash and digital payments, beyond the obvious fact that paying with cash involves exchanging physical money, whereas digital transactions do not. But there is also a subtler difference. Cash is public money – it is a liability of the central bank and thus perfectly safe. By contrast, digital money originates in the private sector, most commonly in the form of bank deposits. Despite being the liability of a private entity, money issued by banks can always be converted to cash at face value thanks to financial regulation and deposit insurance. This is why people consider it to be safe and useful as a means of payment.

The rise of digital platforms as a dominant business model of the information age is challenging the central role of banks in the payment system. Large technology firms and financial startups are bundling payments with digital services, such as online marketplaces, messaging apps and financial services (for example lending and insurance). While banks continue to provide the underlying payment rails for these solutions, they are losing access to the customer interface. Further disruption is potentially looming on the horizon, caused by rapidly developing and complex payment innovations. This includes distributed ledger technology, which provides the basis for 'stablecoins' (crypto-assets designed to maintain a stable value) that could be used as means of payment.

Why central bank digital currency?

The declining use of cash and the potential for a growing role of new forms of money outside the regulated banking sector have led to calls for the introduction of a digital version of cash, often referred to as central bank digital currency (CBDC). 1 There are at least three key arguments that support these calls.

First, public money plays a special role as the anchor of the monetary system. People are willing to accept payments in private money (credit cards and bank transfers) because they know that it can be exchanged easily for perfectly safe public money (cash). However, if cash is no longer used widely, the promise of perfect convertibility loses bite. In this scenario, a digital version of cash would ensure the continuation of the current monetary system.

Second, the issuance of CBDC helps to preserve the central bank's control over the currency (Brunnermeier et al. 2019). Thanks to their global reach, digital platforms may become large issuers of private digital money. 2 If, in an extreme scenario, private money crowds out public money as the monetary unit in contracts and transactions (the 'unit of account'), the central bank can no longer conduct effective monetary policy or safeguard financial stability by acting as lender of last resort. 3 A CBDC could prevent such a scenario by offering a public version of digital money to meet demand.

Third, a CBDC could help to preserve privacy. Private enterprises typically seek to profit from the personal data they can collect when people make digital payments, which can discourage their use in the first place – an inefficient outcome. A CBDC could be designed to provide users with more control over their data, for example over whether they choose to share personal data with third parties to receive more personalised services. This can foster efficiency and welfare in the digital economy (Ahnert et al. 2022b).

CBDC was not proposed with the intention of developing a new monetary policy tool. Nonetheless, it might provide an additional lever for central banks. For example, it could improve the extent to which central bank policy rates are passed on to savers by increasing competition in deposit markets. 4 Similarly, it may enable the central bank to separately target specific frictions in the financial system, and thus stabilise inflation and the overall economy more efficiently (Assenmacher et al. 2022).

Introducing a CBDC could imply changes for central banks' operations and their balance sheets. In particular, following a substitution of bank deposits for CBDC, central banks may need to channel funds back to the banking sector through lending operations (Brunnermeier and Niepelt 2019).

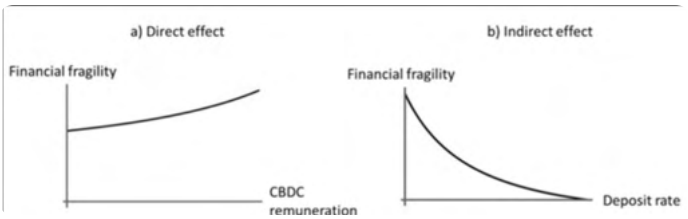
More broadly, the introduction of CBDC would also affect the way that monetary policy is implemented in practice. For example, volatility in CBDC demand could render interest rate control in a traditional corridor system more challenging, and thus favour a floor system with an ample level of reserves (see Malloy et al. 2022). If non-banks were to distribute CBDC to the public, they might require direct access to the central bank balance sheet and this could necessitate changes to the counterparty framework
.

How might central bank digital currency affect financial stability?

As with monetary policy, the effects of CBDC on financial stability would be channelled through the banking system. If banks experience an increase in funding costs, as discussed above, this may lead to a reduction in profit margins. Consequently, this may encourage banks to take on more risk on the asset side of their balance sheets, for example by extending more risky loans or investing in more speculative securities (Keeley 1990).On the liability side, the availability of CBDC alters banks' exposure to the risk of runs, where large numbers of depositors rush all at once to withdraw their funds in cash. In Ahnert et al. (2022c), two countervailing effects are at work.

On the one hand, given its nature as safe and interest-bearing investment, the availability of CBDC increases depositors' incentives to run, relative to an economy where cash is the only alternative to bank deposits ('direct effect'; see Figure 2). On the other hand, to retain deposits, banks respond to the introduction of CBDC by raising interest rates; this makes deposits more attractive and thus reduces fragility ('indirect effect').

As a consequence, the overall effect of CBDC on bank fragility varies with the relative strength of these two forces. For low (high) levels of CBDC remuneration, the indirect (direct) effect dominates, so that an increase in remuneration reduces (increases) financial fragility.
Figure 2 The direct and indirect effect of CBDC remuneration on bank fragility



CBDC design features may also play an important role for financial stability. Image: CEPR.
CBDC design features may also play an important role for financial stability – for example, by improving the effectiveness of policies aimed at stabilising the financial system. It is well-known that the timing and the design of policy interventions such as bailouts and liquidity support are crucial. Policymakers can make better decisions if they have better information. Movements in CBDC accounts held by the central bank could provide real-time information about the health of the financial system, which could improve the effectiveness of central bank interventions, and thus overall financial stability (Keister and Monnet 2022).

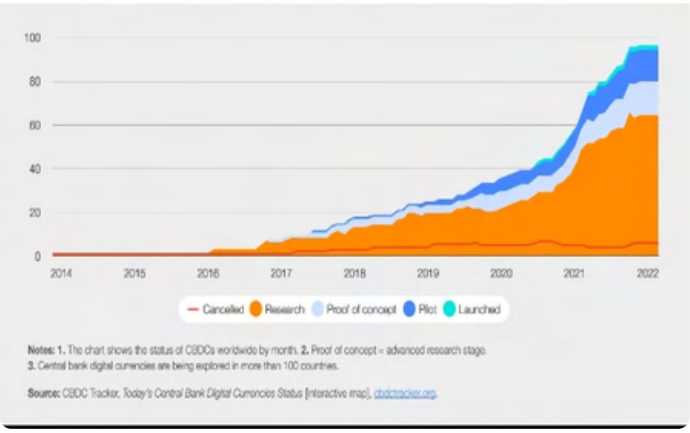
Future Scenario

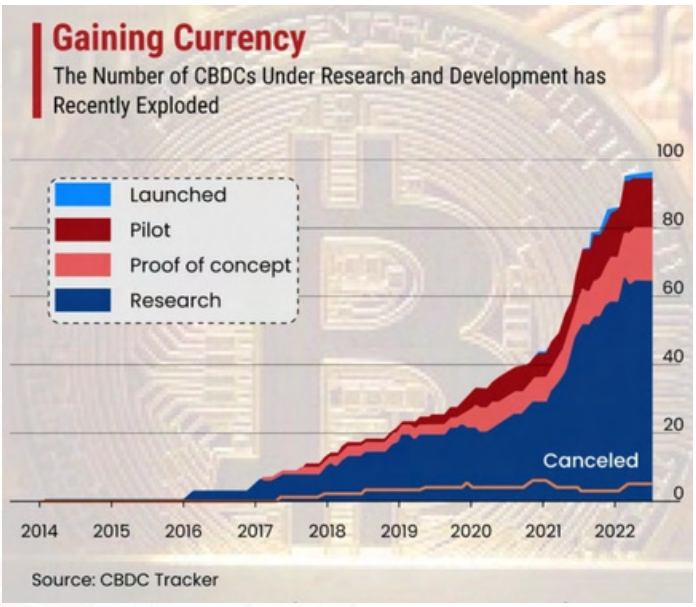
The potential introduction of Central Bank Digital Currencies (CBDCs) represents a significant opportunity for India to revolutionize its monetary landscape and stay ahead in an evolving financial ecosystem. CBDCs hold the promise of expanding financial inclusion, streamlining transactions, and bolstering efforts to combat money laundering. However, to fully harness the benefits of CBDCs, India must approach their implementation with careful consideration and collaboration among key stakeholders. This involves addressing critical aspects such as digital infrastructure development, regulatory frameworks, and building public trust in the security and reliability of CBDCs.

Despite the potential advantages, CBDCs also come with challenges, including privacy concerns stemming from transaction traceability and potential resistance from traditional financial institutions to system transformation. Yet, as India continues to prioritize innovation and economic growth, exploring the role of CBDCs becomes essential in shaping the nation's financial future.

It necessitates a comprehensive approach that balances opportunities with challenges, ensuring that CBDCs contribute positively to India's financial landscape while mitigating potential risks.

FIGURE 1 Exponential growth in CBDC exploration





Limitations

The potential introduction of Central Bank Digital Currencies (CBDCs) presents a myriad of risks and challenges that necessitate comprehensive examination by policymakers. One significant concern is the possibility of financial disintermediation, where the adoption of CBDCs could diminish the role of traditional financial intermediaries, notably banks. This shift may have ripple effects, potentially leading to job losses within the banking sector and dampening overall economic activity, as banks play crucial roles in credit provision and liquidity management.

Furthermore, there is a looming risk of bank runs and systemic instability associated with CBDCs. Sudden surges in demand for CBDCs, possibly triggered by external shocks or changes in consumer behavior, could lead to widespread panic and undermine confidence in the financial system.

This could have far-reaching consequences, impacting not only individual financial institutions but also the broader economy.

Moreover, the implementation of CBDCs entails significant investment in technological infrastructure, posing challenges for countries with limited resources or outdated systems. This technological burden raises questions about accessibility and inclusivity, particularly in regions where digital infrastructure is underdeveloped or unreliable.

Cybersecurity vulnerabilities represent another critical concern. Given the digital nature of CBDCs, they are inherently susceptible to hacking attempts and cyberattacks. Safeguarding against these threats requires robust cybersecurity measures and continuous monitoring to ensure the integrity and security of CBDC systems.

Privacy considerations also come to the forefront in discussions surrounding CBDCs. Depending on the design and implementation of CBDC systems, there is a risk of privacy infringement and the potential for enabling surveillance. Balancing the need for transaction transparency with individuals' rights to privacy presents a complex challenge for policymakers.Additionally, facilitating cross-border transactions and achieving regulatory harmonization across jurisdictions pose significant challenges. The fragmented nature of regulatory frameworks and differing approaches to financial oversight complicate efforts to establish interoperability and facilitate seamless cross-border transactions using CBDCs.

Furthermore, there are concerns about the distributional effects of CBDCs, with the potential to exacerbate existing income inequalities if not implemented equitably. The absence of a physical cash backup further complicates matters, leaving CBDC systems vulnerable to disruptions such as power outages or cyberattacks.Implementing effective anti-money laundering (AML) and counter-terrorism financing (CTF) measures in the digital realm presents unique challenges compared to traditional cash-based transactions. Policymakers must devise innovative solutions to monitor and regulate CBDC transactions effectively while minimizing illicit activities.

Finally, there is a risk of central bank overreach, where the design of CBDC systems may grant excessive power to central authorities. This raises concerns about potential abuses of power, economic manipulation, or decisions that may not align with the public interest.

To address these risks and challenges, policymakers must adopt a multifaceted approach that includes stringent regulations, robust cybersecurity measures, privacy safeguards, and measures to promote financial inclusion and equitable distribution of CBDCs. Additionally, international cooperation and coordination are essential to address cross-border challenges and ensure the smooth implementation of CBDCs on a global scale.

CURRENT STATUS OF CBDC AROUND THE WORLD

Pilot Stage:-

China:- China's Digital Currency Electronic Payment (DCEP) project, also known as the digital yuan, has made substantial progress. As of September 2021, over 140 million digital yuan wallets had been issued, with transactions exceeding 34.5 billion yuan ($5.3 billion USD). The pilot programs have been conducted in several cities, including Shenzhen, Suzhou, Chengdu, and others, covering various scenarios such as retail payments, government services, and transportation.

Sweden:- The Riksbank, Sweden's central bank, has embarked on multiple pilot projects to assess the feasibility of an e-krona. These pilots have involved testing the digital currency in real-world scenarios, including retail payments, e-commerce transactions, and interbank settlements. The Riksbank has engaged in dialogue with stakeholders, including banks, payment service providers, and consumers, to gather feedback and insights.

Research Stage:-

United States:- The Federal Reserve has been actively researching the potential implications of a digital dollar. According to a survey conducted by the Federal Reserve Bank of Boston in 2020, around 80% of central banks worldwide were exploring CBDCs, including the Federal Reserve. The Federal Reserve has convened working groups and engaged with stakeholders to study various aspects of CBDCs, such as technology, regulatory frameworks, and monetary policy implications.

European Union:- The European Central Bank (ECB) initiated the investigation phase of its digital euro project in July 2021. A survey conducted by the ECB in 2020 revealed that 70% of respondents preferred a digital euro issued by the central bank. The ECB has been consulting with stakeholders, including financial institutions, policymakers, and technology experts, to assess the potential benefits and risks of a digital euro.

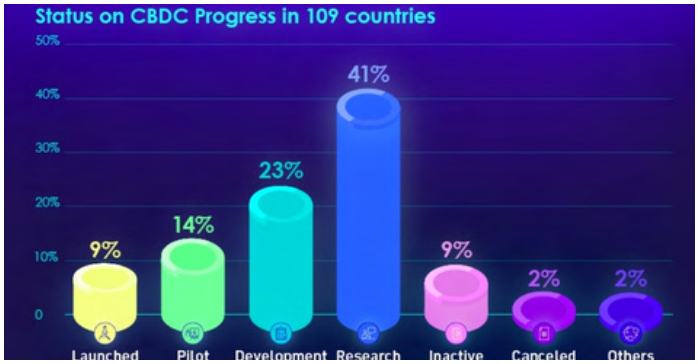
United Kingdom:- The Bank of England has been actively exploring the possibility of introducing a digital currency. In 2020, the Bank of England published a discussion paper outlining various design options and policy considerations for a central bank digital currency. The Bank of England has engaged with industry stakeholders, academia, and the public to solicit feedback and assess the potential impact of a digital currency on the UK's financial system.

Implementation Stage:-

Bahamas:- The Central Bank of The Bahamas launched the Sand Dollar, the world's first central bank digital currency, in October 2020. The Sand Dollar aims to enhance financial inclusion and reduce transaction costs in the archipelago. As of September 2021, over 130,000 Sand Dollar wallets had been registered, facilitating transactions across various sectors, including retail, government payments, and remittances.

Uruguay:- The Central Bank of Uruguay announced plans to launch a pilot program for its digital currency in 2021. The digital peso project aims to increase financial inclusion and reduce the use of physical cash. The pilot program is expected to focus on government payments, remittances, and digital identity verification.
Here's what we know about Uruguay's CBDC initiative and its potential outcomes:-

- Digital Peso Initiative:- The Central Bank of Uruguay announced its intention to explore the issuance of a digital peso to enhance financial inclusion and reduce the use of physical cash in the country. The digital peso project aims to leverage digital technology to modernize payment systems and facilitate more efficient and inclusive financial services.
- Pilot Program:- Uruguay planned to launch a pilot program to test the functionality, security, and usability of the digital peso. The pilot program may involve collaborating with financial institutions, government agencies, and other stakeholders to assess the feasibility and impact of the CBDC in real-world settings.



Expected Outcomes:-

Financial Inclusion:- The digital peso initiative is expected to improve access to financial services for underserved and marginalized populations in Uruguay, including those in remote areas or without traditional banking accounts.

Reduced Transaction Costs:- By digitizing payments and reducing reliance on cash, the digital peso could lower transaction costs for businesses and individuals, leading to greater efficiency in the economy.

Enhanced Monetary Policy Tools:- The Central Bank of Uruguay may gain additional tools for implementing monetary policy and managing the money supply through the issuance and regulation of the digital peso.

Increased Transparency and Security:- The use of blockchain or other secure digital ledger technologies could enhance transparency, traceability, and security in financial transactions, reducing the risks of fraud and illicit activities.

Challenges and Considerations:- Like any CBDC initiative, Uruguay's digital peso project may face challenges related to technology adoption, regulatory compliance, cybersecurity, and public acceptance. Addressing these challenges will require close collaboration between the central bank, government agencies, financial institutions, and other stakeholders.

Exploratory Stage:-

Japan:- The Bank of Japan has been exploring the potential of a digital yen to address issues such as declining cash usage and the need for a resilient payment system. The Bank of Japan has conducted research and engaged in discussions with stakeholders to assess the technical, economic, and regulatory implications of a digital currency.The Bank of Japan (BOJ) has been actively researching the potential implementation of a central bank digital currency (CBDC), often referred to as a digital yen. The research conducted by the Bank of Japan has encompassed various aspects, including technical feasibility, economic implications, regulatory frameworks, and potential benefits and risks. Here are some key areas of research and their outcomes:-

- Technical Feasibility:-

The BOJ has explored the technological infrastructure required for the issuance and circulation of a digital yen. This includes considerations such as distributed ledger technology (DLT), blockchain, centralized systems, and their implications for scalability, security, and efficiency.

Outcome:-

The research has provided insights into the technical requirements and challenges associated with implementing a digital yen, helping the BOJ to assess the feasibility of various technological solutions.

- Economic Implications:-

The BOJ has studied the potential economic impact of introducing a digital yen on monetary policy, financial stability, payment systems, and overall economic activity. This includes analyzing changes in the demand for money, the velocity of money, and the transmission mechanisms of monetary policy.

Outcome:-

Research findings have contributed to a better understanding of how a digital yen could affect monetary policy operations, financial intermediation, and the broader economy, enabling the BOJ to formulate appropriate policy responses.

- Regulatory Frameworks:-

The BOJ has examined the legal and regulatory frameworks necessary for the issuance, distribution, and supervision of a digital yen. This involves assessing compliance with existing laws and regulations related to payment systems, anti-money laundering (AML) regulations, consumer protection, and data privacy.

Outcome:-

Research outcomes have informed discussions on potential regulatory challenges and policy adjustments needed to support the safe and efficient operation of a digital yen, ensuring compliance with domestic and international standards.

- Public Engagement and Stakeholder Consultations:-

The BOJ has engaged in public outreach efforts and consultations with various stakeholders, including financial institutions, businesses, consumer groups, and policymakers. This has involved seeking feedback on the potential benefits, concerns, and preferences regarding a digital yen.

Outcome:-

Public engagement has facilitated dialogue, raised awareness, and gathered valuable insights into the expectations and concerns of stakeholders, guiding the BOJ's decision-making process and the design of a digital yen.

Overall, the research conducted by the Bank of Japan on central bank digital currencies, particularly the digital yen, has contributed to a deeper understanding of the opportunities, challenges, and implications associated with their implementation. While specific outcomes may vary depending on the focus of individual studies and ongoing developments, these research efforts are essential for informed decision-making and the development of robust policy frameworks.

India:- The Reserve Bank of India (RBI) has been studying the feasibility of a digital rupee. RBI Governor Shaktikanta Das has emphasized the importance of careful consideration and research into various aspects of CBDCs, including technology, security, and legal frameworks. The RBI has convened internal working groups and consulted with external experts to evaluate the potential benefits and risks of a digital rupee.

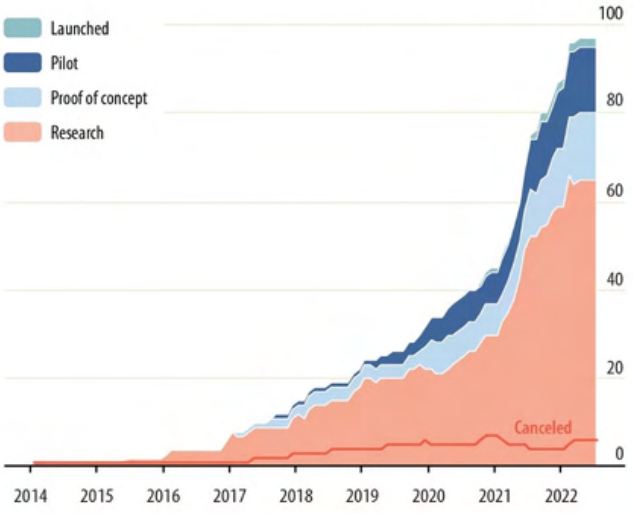
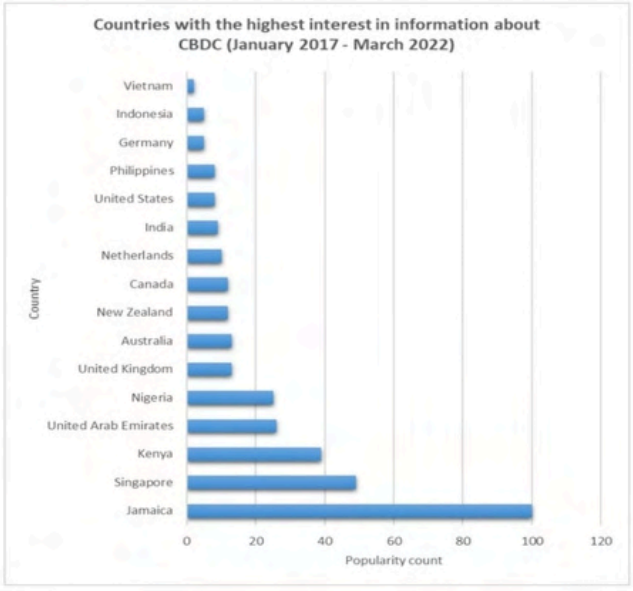


Figure 3. Countries with the highest interest in information about CBDC



(source: Google trends)

RISE OF CBDC

The potential introduction of Central Bank Digital Currencies (CBDCs) represents a significant opportunity for India to revolutionize its monetary landscape and stay ahead in an evolving financial ecosystem. CBDCs hold the promise of expanding financial inclusion, streamlining transactions, and bolstering efforts to combat money laundering. However, to fully harness the benefits of CBDCs, India must approach their implementation with careful consideration and collaboration among key stakeholders. This involves addressing critical aspects such as digital infrastructure development, regulatory frameworks, and building public trust in the security and reliability of CBDCs.

Despite the potential advantages, CBDCs also come with challenges, including privacy concerns stemming from transaction traceability and potential resistance from traditional financial institutions to system transformation. Yet, as India continues to prioritize innovation and economic growth, exploring the role of CBDCs becomes essential in shaping the nation's financial future. It necessitates a comprehensive approach that balances opportunities with challenges, ensuring that CBDCs contribute positively to India's financial landscape while mitigating potential risks.

LIMITATIONS

The potential introduction of Central Bank Digital Currencies (CBDCs) presents a myriad of risks and challenges that necessitate comprehensive examination by policymakers. One significant concern is the possibility of financial disintermediation, where the adoption of CBDCs could diminish the role of traditional financial intermediaries, notably banks. This shift may have ripple effects, potentially leading to job losses within the banking sector and dampening overall economic activity, as banks play crucial roles in credit provision and liquidity management.

Furthermore, there is a looming risk of bank runs and systemic instability associated with CBDCs. Sudden surges in demand for CBDCs, possibly triggered by external shocks or changes in consumer behavior, could lead to widespread panic and undermine confidence in the financial system. This could have far-reaching consequences, impacting not only individual financial institutions but also the broader economy.

Moreover, the implementation of CBDCs entails significant investment in technological infrastructure, posing challenges for countries with limited resources or outdated systems. This technological burden raises questions about accessibility and inclusivity, particularly in regions where digital infrastructure is underdeveloped or unreliable.

Cybersecurity vulnerabilities represent another critical concern. Given the digital nature of CBDCs, they are inherently susceptible to hacking attempts and cyberattacks. Safeguarding against these threats requires robust cybersecurity measures and continuous monitoring to ensure the integrity and security of CBDC systems.

Privacy considerations also come to the forefront in discussions surrounding CBDCs. Depending on the design and implementation of CBDC systems, there is a risk of privacy infringement and the potential for enabling surveillance. Balancing the need for transaction transparency with individuals' rights to privacy presents a complex challenge for policymakers.

Additionally, facilitating cross-border transactions and achieving regulatory harmonization across jurisdictions pose significant challenges. The fragmented nature of regulatory frameworks and differing approaches to financial oversight complicate efforts to establish interoperability and facilitate seamless cross-border transactions using CBDCs.

Furthermore, there are concerns about the distributional effects of CBDCs, with the potential to exacerbate existing income inequalities if not implemented equitably. The absence of a physical cash backup further complicates matters, leaving CBDC systems vulnerable to disruptions such as power outages or cyberattacks.

Implementing effective anti-money laundering (AML) and counter-terrorism financing (CTF) measures in the digital realm presents unique challenges compared to traditional cash-based transactions. Policymakers must devise innovative solutions to monitor and regulate CBDC transactions effectively while minimizing illicit activities
.
Finally, there is a risk of central bank overreach, where the design of CBDC systems may grant excessive power to central authorities.

CONCLUSION

In conclusion, this report has identified the fact that the future of money is embedded in the introduction of CBDCs but made a note of the fact that the success of CBDCs should address a host of challenges. First, it is crucial to address the risks associated with CBDCs to effectively govern them. This involves the protection of IT systems from cyber criminals and fraudsters, user anonymity without compromising on supervision from the necessary authorities, and preventing financial chaos, such as bank disintermediation- a phenomenon which may see markets and consumers exclude traditional banks out of the process and directly obtain accounts from the central bank. It becomes the tasks of policymakers to come up with structures that will handle the above risks, but at the same time foster innovation.

Building international relations are equally important as domestic ones and need proper working in order to successfully respond to the new approaches. The more nations consider and start adopting the CBDCs, if everyone creates their own wallet in a centralized manner then global cross border payments and trade might become highly siloed. International financial institutions such as the International Monetary Fund (IMF) and the Bank for International Settlements (BIS) have a critically important role to provide for standardization and adoption of mechanisms of interaction between CBDCs. Lack of the coordinated efforts could direct the CBDCs to act as agents of disruption in the existing international financial framework, instead of improving it.

Finally, to fully harness the potential of CBDCs, it is important that as much of the incremental gains is shared proportionally among all. This calls for guaranteeing that everyone in society, but especially clients previously excluded from effective participation in the economy owing to their lack of a bank account, can access and benefit from this type of digital money. Governments must ensure that people acquire adequate knowledge and skills in using Information Technology and that appropriate facilities are put in place to avoid a divergence between the Information haves and the have-nots. Furthermore, CBDCs cannot be designed in a way that hampers the growth of the sector, to ensure that everyone gets access to cheap and efficient financial solutions, especially in the developing world.

CBDCs present risks that must be effectively managed through robust governance frameworks. One key concern is the vulnerability of digital currencies to cyberattacks, fraud, and other security threats. Central banks must develop resilient IT systems to protect against these dangers. Another challenge is balancing user privacy with regulatory oversight. CBDCs must provide user anonymity to some degree, but without compromising the ability of authorities to monitor for illegal activities such as money laundering or tax evasion. Additionally, there is a significant risk of bank disintermediation, where consumers may bypass traditional banks and hold accounts directly with the central bank. This could destabilize the banking sector, so regulatory policies need to mitigate such risks while fostering financial innovation.

Global coordination is just as crucial as domestic policies for the success of CBDCs. If each country adopts its own digital currency without standardization, cross-border payments and international trade could become fragmented and inefficient. Institutions like the International Monetary Fund (IMF) and the Bank for International Settlements (BIS) play a crucial role in ensuring CBDCs can interact seamlessly across borders. Without such collaboration, CBDCs could inadvertently create silos, disrupting the international financial system rather than improving it. Standardized protocols and mechanisms are needed to prevent this fragmentation and ensure that CBDCs foster global financial integration.

One of the key goals of CBDCs is to promote financial inclusion, particularly for individuals and communities currently excluded from traditional banking. To achieve this, governments must ensure that underserved populations have the necessary digital literacy and access to technology to benefit from CBDCs. Closing the digital divide is essential to prevent further disparities between those with access to digital currencies and those without. Additionally, CBDCs must be designed to complement rather than stifle the growth of private financial institutions, especially in developing economies where affordable and efficient financial solutions are critical for development.
In conclusion, the future of CBDCs hinges on addressing these governance, coordination, and inclusion challenges, ensuring they drive innovation, financial stability, for all.

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