



Digital Currencies and the Future of Monetary Policy: Risks and Opportunities

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Abstract ;

This paper explores the growing impact of digital currencies on monetary policy and global financial systems. It analyzes the development of cryptocurrencies, central bank digital currencies (CBDCs), and stablecoins, and examines their potential to reshape payment systems, financial inclusion, and policy implementation.

While digital currencies offer faster transactions, cost savings, and innovation, they also pose significant risks, including volatility, cybersecurity threats, and regulatory challenges. The study highlights how central banks are adapting to these changes through new policy frameworks and digital strategies.

It concludes that effective integration of digital currencies requires strong legal, ethical, and technological safeguards to preserve financial stability and public trust.

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1. Introduction

In recent years, the world has witnessed a rapid wave of technological advancement that has brought digital currencies to the forefront of financial innovation. These currencies represent both a challenge and an opportunity for monetary policymakers and central banks, as they have the potential to reshape payment systems, facilitate cross-border transactions, enhance financial inclusion, and reduce transaction costs and delays.

As global economies transition towards digitalization, many countries and their financial institutions—particularly central banks—have begun to explore the development and issuance of Central Bank Digital Currencies (CBDCs). This shift raises critical questions about the future of monetary policy, the stability of financial systems, and the evolving role of monetary institutions in a decentralized and highly dynamic financial environment. The growing adoption of decentralized cryptocurrencies that operate outside conventional regulatory frameworks further intensifies these challenges.

This study aims to analyze the economic and monetary impacts of digital currencies by examining their types, features, associated risks, and the opportunities they offer. It also explores the adaptive responses of central banks to this emerging financial reality, and the implications for policy design and implementation.

1.1. Research Problem:

The rise of digital currencies presents a fundamental question for contemporary monetary systems:

How do digital currencies—particularly cryptocurrencies and CBDCs—affect the ability of central banks to conduct effective monetary policy and maintain financial stability?

This problem is rooted in the growing tension between technological decentralization and centralized monetary control.

1.2. Research Objectives:

This paper seeks to:

- Examine the different forms of digital currencies and their technical foundations.
- Analyze the implications of digital currencies for monetary policy transmission mechanisms.
- Identify the key risks and opportunities associated with their adoption.
- Investigate how central banks and regulatory authorities are responding to the rise of digital finance.
- Propose a framework for balancing innovation and stability in future monetary systems.

1.3. Research Questions

- What are the main characteristics and classifications of digital currencies?
- How do digital currencies influence the implementation and transmission of monetary policy?
- What are the primary risks posed by digital currencies to financial systems and central banks?
- What policy options are available to regulators to ensure safe and effective integration of digital currencies?

1.4. Research Methodology

- This study adopts a qualitative analytical approach based on a comprehensive review of existing academic literature, policy papers, and real-world case studies. By synthesizing insights from economic theory, financial regulation, and technological developments, the paper provides a multidisciplinary perspective on the role of digital currencies in reshaping modern monetary governance

2. Introduction to Digital Currencies

Digital currencies potentially offer a variety of benefits to the economy. Payment systems could see significant improvements by eliminating intermediaries and ensuring secure transfers without third-party risks. In the retail space, cryptocurrencies could lead to faster and cheaper cross-border payments. CBDCs would provide the security and backing of a central bank behind the digital currency while enabling user anonymity. Digital currencies may help eliminate the underground economies that conduct transactions off the books and outside the regulatory framework. Better monitoring of money supply is expected as tax evasion through alternative currencies becomes more difficult. Digital currencies may also digitize and transform the economy as other types of assets, such as stocks, bonds, or even real estate, move on to a DLT (distributed ledger technology) (Ally et al., 2016). On the other hand, digital currencies may also pose risks. The evolution of digital currencies may threaten monetary stabilisation and risk contamination of the payments system. Digital currencies risk replacing the transactions function of money as payment networks move to the pre-existing cryptocurrencies, which combined with private stablecoins, bypass the state fiat money and the central bank (Babu & M Abraham, 2021). Such developments may weaken the central banks' ability to implement monetary policy or data demand and increase risk concerns in the financial sector. Other risks arise as private trust systems are incorporated into internetworks, making them vulnerable to attacks on their architecture or political interference in their use. Risks of digital erosion of financial intermediation and undermining of financial stability may arise as non-banking payment service providers erode the payment and settlement hierarchical structure. Finally, risks may arise from unexpected breaches of transaction privacy and security, as global, pervasive networks durably log all aspects of users' online interactions to use them for profit and control.

3. Historical Context of Monetary Policy

The risks and opportunities of central bank digital currencies (CBDCs) are relatively similar in developed and developing countries. They stem from the dual role of central banks as issuers of cash and intermediaries in the payment system, which is behind the changes in central banks' monetary policy. The risk of CBDCs changing the transmission mechanism of monetary policy, and hence the price stability prospects, is probably the priority concern of most governments. Central banks' sources of liquidity funding can change with the issue of CBDCs, given the interbank markets' perverse reaction to bank runs. The fact that CBDCs, unlike crypto-currencies, are riskless and have liquidity services like bank deposits limits but does not completely eliminate arbitrage opportunities. The system of targets is even more delicate. Again, CBDC-related changes in the design or workings of monetary policy weigh more in hand-to-hand with the evolution of the economy than the forms and distribution of money in the economy.

As payments evolve, central banks' monetary design and operations probably need to evolve in parallel. History shows that the monetary technology has so far provided sufficient payment instruments, and central banks as the issuers of money have issued new instruments in response to technological shifts. However, CBDCs as new monetary instruments will change the trade-off between liquidity and returns in a way that previous payment instruments have not. Since the introduction of fiat money in modern economies, those who were not agents of the state could not hold the state's monetary instruments. The agents of the state might change with the introduction of CBDCs (Maher Hassan, 2016). Those who wish to hold funds in the state's liabilities in line with their statutory rights to do so might hence choose not to hold as many state-credit money equivalents as previously. Credit flows will change, given the same level of fundamentals. The liquidity structures of the economy, hence the transmission of monetary policy shocks and the prospects of price stability, can change with the introduction of CBDCs (W. Peters et al., 2015). In the years following zero lower bound in interest rates, central banks globally are looking to exhaust all possible policies to ensure the successful conduct of monetary policy.

4. Types of Digital Currencies

There are essentially two types of digital currencies: those that are a form of e-money or digital payment systems, which facilitate the electronic transfer of "government fiat" currency deposits to new electronic format; and those commodities or reserves that serve as a medium of exchange (W. Peters et al., 2015). In the former category (in a narrow definition of the term), we find digital currencies issued by individuals or non-financial institutions. In this case, the digital and electronic technologies merely allow the updating of a payment system to remove the physical limitations of coins and banknotes, including the cost of printing, transport, storage, handling and risk of devaluation. Technically speaking, electronic money allows bank balance transfers via

other telecommunications networks, thereby removing the physical limitations of writing checks and vouchers, which are still technologically very convincing in the proofs they provide for clearing debts (P Dwyer, 2014).

At the same time, there is a serious downside to the digitization of a currency based on its force, coercive powers and privileges. If citizens do not have physical access to currency, they cannot use it on purchase in physical markets, which removes a level of privacy in economic exchanges. A more fundamental concern on e-money categories pertains to the prospects of possible technical breakdowns, which have occurred at various stages in the regional deployment of the SWIFT RMTP clearing network. Although still being the best form of payment available, the Millenium Bug fears were thoroughly explained in this case. In this scenario, too, a strictly controlled, private currency can circumvent the state ban and will create an underground economy at a level of transactions a sovereign's power cannot reach.

4.1. Cryptocurrencies

Cryptocurrencies consist of two main components: a cryptocurrency platform and a cryptocurrency instrument. Each platform has rules for the creation and transfer of its cryptocurrency instrument. Cryptocurrencies are a revolutionary economic, social, and political innovation. They were first launched in 2009, with the earliest success seen in the form of Bitcoin, which is now widely recognized by the public and traded in the marketplace. Cryptocurrencies consist of a diverse ecosystem of multiple platforms and instruments. Bitcoin is the largest and has the widest recognition, but other cryptocurrencies such as Ethereum, Ripple, Litecoin, Monero, and Dogecoin also have significant market weight and popularity. These platforms have significant variation in their designs and implementations, which means that the advantages and disadvantages of cryptocurrencies vary substantially across platforms (Babu & M Abraham, 2021).

Cryptocurrencies were initially introduced with the promise of several advantages over traditional currency systems, resulting in worldwide interest, experimentation, and sale and trading of cryptocurrencies in a marketplace. These advantages include: 1) Anonymity: The transactions made through these platforms are much more anonymous than those using all other electronic systems. 2) Disintermediation: There are no intermediaries involved or needed in the functioning of crypto platforms (Boskov, 2018). For example, with Bitcoin, a party willing to send currency to another party has to decode the receiver's public key and also the amount in the said transaction and pack all of this information into a hash. The sender then encrypts this hash using its own private key, creating a digital signature that only the sender could have created, which ensures that the transmission of the hash has not been tampered with on its journey from sender to receiver. The public and encrypted hash is sent out into a pool of other encrypted hashes,

known as a block. Miners then try to decode the hashes using hash algorithms and start solving a series of mathematical problems to find a nonce, which is added to the original hash and changed it. 3) Conventional systems such as Visa and Paypal charge 2%-5%, whereas the transaction costs for crypto payments are approximately 0.01%. 4) Transactions occur almost instantaneously (in seconds) if on-net and within 20 minutes if on-off net. 5) Transactions occur instantaneously, regardless of location, and can be programmed to occur automatically with crypto smart contracts.

4.2. Central Bank Digital Currencies (CBDCs)

The rapid digitization of everyday activities has led to the emergence of new payment technologies and digital currencies, creating a competitive landscape fueled by rapid technological innovation. In response, central banks worldwide are investigating the issuance of their own Digital Currency—Central Bank Digital Currency (CBDC). This discussion delves into CBDC, proposing an operational framework, motivations, and concerns, as well as questions for policymakers to consider.

The emergence of cryptocurrencies highlighted important considerations for the currency design of a digital rupee. Cryptocurrencies are generally issued by private parties through DLT, where issuance and transactions rely on the consensus of the network participants, and monetary creation occurs through mining choices. While decentralization and censorship resistance are attractive features of cryptocurrencies, violations of these properties, as in the case of the Canadian trucker protests, reveal the potential for state intervention (Beniak, 2019). Stable currencies, however, offer a central-party trusted model with less anonymity. Private stable currencies may raise concerns about systemic risk and financial destabilization.

Implementations of CBDCs rely on a central party through a ledger that is aware of balances and transfers, and this implementation provides a central authority with the means of tracking user activity. The ledger through which CBDCs are done may consist of one or more CUs that are sequential in nature. The ledger may consist of DLT or a traditional RDBMS (Babu & M Abraham, 2021). Issues of performance, reliability, and consistency may lead the central bank to choose an RDBMS implementation, in which case transaction throughput could be dealt with through sharding. In a DLT implementation, where there is no transaction defined notion of time, clearly specifying how monetary policy operations would take place is not trivial; publishing the estimated transaction order in advance may be a solution.

However, if CBDCs stop being exchangeable at par with cash, the cash gap in countries that have been significantly cashless over the past few years may widen excessive inflation. The markets would then dictate the value of the currency. CBDCs with a view and role on cash may also

depreciate the black market value of cash by minting CBDCs, thereby depreciating the nominal fixed interest rate bonds of the central bank by the risk of default and liquidating lots of money stocks, thus opening golden opportunities for governments to invest many trillions of dollars in risk-free assets with many gains. The fears of monetary policy paralysis from the Cowen effect of CBDCs are overblown. CBDCs on the ledger may cool the financial economy by imposing “pro-cyclical” limits on bank interbank lending, effectively freezing overshooting investing.

4.3. Stablecoins

Stable coins are crypto assets designed to have a stable value relative to an underlying asset, often a fiat currency. Various types of fiat-backed stable coins exist. These include over-collateralized stable coins, algorithmic stable coins, and efficiency-focused hybrid/method-agnostic stable coins. In recent years, the rapid growth of fiat-backed stable coins in the cryptocurrency market has drawn regulatory concerns (Kahya et al., 2021). There are three primary forms of fiat currency, including cash, bank reserves, and bank deposits. However, the rest of the crypto assets can produce money that thrives as means of payment and stores of value. Fiat-backed stable coin systems must maintain their peg of (at least) one unit of fiat currency, liquidity tightening may depeg the numeric value of the fiat currency-backed stable coin over time. In particular, during a market downturn in the crypto market, no safe place to resell the crypto assets may be provided with pegged stable coins. Providers of pegged coins may instead come out arbitrage opportunities by discovering degrading collateral assets. Global arbitrage across exchanges may also not happen causing some exchanges to manipulate the liquidation terms reported by custodians, estimating that 42% of the forced liquidation in DEX PancakeSwap's MUI markets endured by dealers throughout the 711934th block occurred on KuCoin.

Thus far no rule-based or service-based monitoring system of governance or custodian of fiat-backed stable coins is universally accepted. Moreover, issuers or custodians may restore the one to one ratio of redeeming after the peg to fiat currency entry loss. The orientation of pegged coins can also be switched to avoid the peg redemption risk and insecurity for holders. These outcomes were not the failure of the cheddar and resolving an order of magnitude faster. The measurements that the proposed cross-exchange framing SNAP and intra-exchange framing Le WAV exceed inefficiency-evaluation-based frameworks, potentially provide the lowest execution cost and become robust view of evaluating G-spot trades are the paper's contributions and implications.

5. Technological Innovations and Their Impact

Cash is increasingly absent everywhere worldwide. Poems and posters in cafes warning of counterfeits should be replaced with ones that reassess conventional payment practices. Regulatory supervision should be reoriented to obstruct preemption of cash (Boskov, 2018). After

Sweden, Finland, Denmark, and the Netherlands, the UK is sending the worldwide liability of payment in cash and the expense of money. The expected systemic concerns have not influenced government behavior, but they have galvanized responses from central banks, ranging from wholesale cryptocurrency to a sovereign cryptocurrency. Fear of the unknown abounds; people might opt for banks without interest income, money agents without cash handling, algorithm-driven financial intermediaries with opaque margins, etc. It is also unclear whether user-decreed currencies are compatible with maintaining state sovereignty, at least in previously cognizant forms. After an era of financial innovations, money itself, important but taken for granted, harbors designs that could reframe power over the economy. Several countries are exploring the introduction of so-called Central Bank Digital Currency (CBDC) in payment transactions. While outside of money, non-IOW based payment systems proliferate. In such systems, decentralized currency-like media of exchange enable transactions across internet platforms. Anti-speculation government actions could sensibly prove pointless to the activity in global terms and without the user-decreed currency medium. The panic made Everyone San Francisco who banks digitally and pays cash. Speculative trading made it hard for average people to understand what it is all about. A principle of design is post-trading transparency; investors wish to simply know holdings agreed upon, past performance devoid of calculations.

5.1. Blockchain Technology

While being the underpinning technology of Bitcoin and other cryptocurrencies, blockchain can be seen as a disintermediation solution for many industries. Blockchain technology allows users to manage their digital assets directly, without the necessity of a trusted intermediary, such as a central bank, a clearinghouse, or a financial agent. The importance of intermediaries for trust in financial infrastructures has a long history. Blockchain can be seen as a technology that goes a long way toward eliminating a centralized point of trust in the digital space (Walch, 2015).

Blockchain technology is a sample of Distributed Ledger Technology (DLT), which can be described as a database shared among a group of network actors (DAJ, 2018). This kind of system has existed for decades, known from a practical viewpoint, from its many applications in banks, railways ticketing, and air traffic control. A core observation of DLT-based systems is the historic sequence of transactions and updates shared among all users. Thus, the ledger is distributed, but all actors generally obtain the same broadcasted information. Each time that an update occurs, a consensus protocol is executed so that everybody agrees on the new state of the ledger. For the case where the actors are known, reliable, and only one trusted authority is needed to cope with data integrity, DLTs similar to the Blockchain cannot be called for. On the contrary, there is a need to design and run the whole network without trust assumptions. It implies that the previous actors need to be anonymous, unreliable, and possibly malicious. The Blockchain mechanism assures this will hold with a large degree of reliability.

5.2. Smart Contracts

Recent years have seen large corporations use smart contracts in bitcoin, Ethereum, and other cryptocurrencies. Distribution, based on code, offers the promise of potentially autonomous digital institutions that remove sleepless lawyers, clumsy law courts, and other mediating institutions from many areas of social and economic activity. Sufficient digital cooperation could facilitate global justice, better sharing of public goods among cooperating countries, and swift eradication of climate change. On the darker side, governments can regulate smart contracts and their distributed ledgers with the same tools they use to regulate video rental shops and drug dens, if not more effectively. A more paradoxical issue regarding smart contract definitions is this: The crucial benefit of smart contracts, according to their proponents, is that they obviate the need for trust in individual agents and in their agreements. For a smart contract to be safe to use, however, trust in the code is indispensable. The potential of digital institutions has as much to do with issues of code risk as it has to do with distributed data storage. In more concrete terms, and without attempting a general theory of smart contracts, a typology is constructed of ‘code risk’ and its consequences when applied to widely known smart contracts.

Recent developments in cryptocurrency bring new risks. Unlike, say, Tetracycline, which satisfy a handful of very precise, imprecisely understood, and empirically verifiable chemical properties, many smart contracts will be subject to mutable and heretofore unobserved ‘features’ that have the potential to cause havoc across currently unimagined dimensions in the economic, political, and social lives of billions of people. Therefore, distributed-ledger technology, and its smart-contract variants, offer the prospect of ubiquitous digital and cryptographic institutions, such as decentralized stock markets, courts, international agents, or corporations, with unprecedented power to radically reconfigure many realms in societies around the world. For this very reason, it is also understandable that such emergent Bitcoin-code echoes from the 1980s should be met with caution, even hostility, from the established institutions of society, including the financial industry, lawyers, courts, and regulators (Debois et al., 2022).

6. Risks Associated with Digital Currencies

The possibility that digital currencies will have a widespread impact on the current financial and monetary systems needs to be taken seriously. In particular, it has to be recognized that it is possible that some, probably in the form of cryptocurrencies, will be used as currencies on a scale that has important implications for government monetary policies and their ability to control monetary aggregates, interest rates and inflation (Ally et al., 2016). To the extent digital currencies are introduced and widely accepted in a country, payments that had been settled in the currency of that country would be moved from the central bank liabilities that had previously served as money to the digital currency. This would amount to a substitution of one form of

money for another and could be expected to lead to a significant drop in deposits and a corresponding drop in the monetary aggregate.

The major concern that has been expressed regarding the rise of digital currencies is whether they will help or inhibit government monetary policies. It is believed that their introduction would significantly complicate the conduct of monetary policy. The rationale for this view has been articulated in various degrees of sophistication and it is appropriate to consider each of the arguments in turn. It is a serious matter that on the one hand digital currencies are capable of rendering every government's monetary policy impotent. Yet on the other hand, many economists, including the most eminent central bankers, either do not understand how a currency controlled and issued by private interests can have unintended consequences that wreak monetary havoc or have offered nonsensical explanations.

6.1. Volatility and Speculation

The high volatility of digital currencies and cryptocurrencies, in particular, has motivated researchers to examine cryptocurrencies and versified currencies in general, as these new asset classes attract more attention from investors. With respect to this motivation, there is a relative lack of research in the capital asset pricing model (CAPM) framework regarding Bitcoin, Ethereum, Litecoin, and Ripple, even though these digital currencies are the major assets traded over the internet (Stavroyiannis, 2017).

The period considered is from August 2015 until the end of March 2017; in total the paper reports on data for 102 observations for the four digital currencies. For the most popular digital currency, Bitcoin, it appears that the price formation mechanism cannot merely be deemed as efficient. On the whole, the relation to US Dollar does not seem to hold; however, the major reported positive relationship with currency pairs has reversed after the bubble formation. Only the exchange rate of Euro and Bitcoin appears to hold in the post-bubble period. Overall, it seems that there is limited relationship either with traditional economic determinants or with that of conventional currencies (Corbet et al., 2017).

To rank the digital currencies trades are first reported this time in terms of cross-market correlation. This ranks the market trades as: i) BTC, ii) ETH, iii) LTC, iv) XRP. The findings indicate that digital currencies are subject to a higher risk, therefore, to a higher sufficient buffer and risk capital to cover potential losses. Furthermore, the findings shed light on the potential future role of Bitcoin and other digital currencies into the economies and the financial system. Currently, a critical issue pertaining to digital currencies is that there is yet no regulation and no financial instruments. This skyrocketing volatility, when coupled with the preceding discussed

issues for virtual currencies, raises questions as to whether or not these assets may become a sudden source of systemic risk.

6.2. Cybersecurity Threats

Cybersecurity accidents can severely damage or influence central bank credibility (Lannoo, 2018). Although no official central bank digital currencies (CBDCs) have been implemented this risk exists also in the context of cash. Cash arrangements need to be sufficiently robust to prevent loss of confidence in the currency. Like all technology-based systems, CBDC arrangements are susceptible to cyber-attacks, or even commercial sabotage. This risk is exacerbated by the potential consequences of a successful attack. If a CBDC service provider is successfully attacked or goes bankrupt, this could result in a much greater loss of confidence than the failure of a traditional, government-run monetary system. Technological overcomplication does not eliminate risk, instead it likely increases it. The disruption of a commercial bank's systems is a contemporary example of how technological innovation poses new threats to confidence in money. Guarding against loss of confidence is a core function of central banks. The issuing of cash guarantees anonymity and creditworthiness, two essential aspects of confidence and trust in the currency. In contrast, a hybrid form of digital currency based on commercial bank deposits or private money issuers does not guarantee its USD equivalency. Monetary sovereignty may be endangered if these private forms of digital money gain greater public acceptance.

In combination with a central bank reputation for competent governance, on balance technological innovation generally increases rather than erodes the public's confidence in its currency. The potential unfixable loss of confidence in the primary domestic currency could have catastrophic effects and inevitably result in a major global crisis. Consequently, central bank digital currency systems should be designed and managed with careful consideration of these issues. The technical architecture must be minimal, not overly complex. Cyber-resilience is a necessary, albeit not sufficient, protection against attacks. The architecture must not rule out the effectiveness of remedial steps. Recourse should take the form of processes, not the decommissioning of digital money assets or general measures. If a value transfer mechanism is broken, then fixing it must be feasible. Tech-based mechanisms to eliminate bank notes do not meet the credible requirement of having 'off-switches'.

6.3. Regulatory Challenges

The new global digital economy may trigger a real disruption in the financial sector, particularly in the context of payments and monetary policy, deposit management, finance intermediation, and the currency hierarchy.

The first major cryptocurrency exchange, COINBASE, went public and was evaluated at \$85 billion on the first day of trading. Other developments included the mayor of Miami asking for the imposition of policies that would tax crypto offerings already existing in the city and the provision of a platform for its promotion. These remarkable events highlight the emergence of a fast-changing financial landscape in which major incumbents are challenged by new entrants. The process may bring benefits in terms of competition, innovation, and efficiency but also involves serious risks, including a concentrated financial market in the hands of few unregulated big techs, the rise of decentralized finance (DeFi), operational issues, cybersecurity threats, and the potential destabilization of monetary policy.

The above threat requires proactive and smart regulation aimed at anticipating these problems. To this end, some countries have passed legislation to tackle digital currencies, while most have set up regulatory sandboxes . In a similar vein, at the end of September 2020, the European Commission published its Digital Financial Strategy, which is a comprehensive response to these developments. The Commission's task is to renew the existing legislative and regulatory framework to adapt it to the new environment, while protecting customers' interests. The strategy addresses a variety of issues, including, among others, anti-money laundering, the adaptation of the entire regulatory framework to digital innovation, stablecoins, and the question of digital euro.

7. Opportunities Presented by Digital Currencies

Digital currencies could present significant opportunities through cost savings and enhanced consumer welfare. These would be realised through increased competition in the payments space, which would lead to lower wholesale and retail prices, and more innovative offerings (Ally et al., 2016). The implementation of a digitally inclusive currency would also offer opportunities for the Reserve Bank to undertake measures to ensure an efficient payments and settlements system. The macroeconomic implications of digital currency for a dollar-backed central bank digital currency, in addition to the risks, are more uncertain and conjectural.

Using the Reserve Bank's estimates of the costs of paper cash, if a wholesale digital currency were to displace all paper cash, the annual savings for the economy would be around \$325 million. In addition, if presenting cash instead moves the Reserve Bank's response function more toward raising either rates or buffer ratios, this could result in another annual saving of around \$725 million. Welfare losses could also arise due to the Reserve Bank passing on the costs of cash presentation (around \$350 million cheaper implicitly than it should be).

However, digital currencies could also increase the threat of a bank run and, depending on the rate of conversion, could be avoided by the introduction of implicit or explicit taxes on the

converted up to avoid liquidation of the macroeconomic risks. This risk could be reduced by a central bank-backed currency which, notwithstanding the social costs, would most likely be a much cheaper option.

7.1. Increased Financial Inclusion

According to the G20 report on ‘Digital Financial Inclusion,’ roughly 1.7 billion adults around the world do not have a bank account, most of whom are poor and uneducated; more than half (50%) are women (Srikrishnan, 2017). A population with no access to savings accounts cannot take a bank loan to start a business, and their savings just lie in cash, unable to earn any interest wages. This problem is seen mainly in developing countries and economies where banking is expensive and unregulated due to high poverty rates.

Central Banks of various countries respond by turning to Distributed Ledger Technologies (DLT) and Blockchains, and propose developing Central Bank Digital Currency (CBDC) as a digital clone of cash, and massively invest in developing it. By launching a CBDC, the central bank could eliminate the need for bank accounts and debit cards to pay for any electronic transactions. People could store money in the CBDC app in the phone as fast and easy as they install WeChat. For small transactions and shops, the sender presses the “pay” button and scans the QR code; the transaction would complete in 1 second with the cost of 0.01 cents. For transferring funds to rural areas, people just need to input the phone number, and the money could be sent in 6 seconds. In developing countries like Thailand where more than 70% of people own a smartphone, CBDC would greatly enhance the accessibility of banking services (Kapsis, 2019). In 2020, the Bank of Thailand not only studied the feasibility of retail CBDC but also demonstrated a successful pilot project. CBDC would help incorporate poor and underbanked people into the financial system, and vastly promote financial and economic inclusion and literacy

7.2. Efficiency in Transactions

Digital currencies can be used for various purposes, but they currently lack broad areas of complementary use, such as alternative currencies like Bitcoin or different transaction techniques like contactless payment. Many new players in commercial innovation are linked to banks and experiment with new payment instruments. Institutions are beginning to transform into digitally driven business models. Smartphones are becoming a catalyst for payments, and digital currency can be a solution as long as participants behave appropriately. It’s ambiguous whether different types of digital currency can coexist. Only those with broad use and simple conversion to money will bring efficiency gains and money laundering reduction (Boskov, 2018).

Some widely used payment systems are difficult to escape, such as PayPal. Domestic networks are commonly based on cards, but the international settlement area is still dependent on SWIFT. Bitcoin doesn't focus on settlements but the transfer of value. Players can still be connected through the Ethereum platform without digital currency integration. With stable coins, a single payment system may take root evidence, and only major corporations with payment power can issue them.

The European Central Bank is currently considering a digital Euro with diversified purposes. Instead of being a transaction medium, it might be a bridge between different payment schemes with widely differentiated purposes. Virtually all forex interventions used to be conducted in the management of indirect exchange rate bands. However, on December 12, 2015, the ECB and the Swiss National Bank jointly intervened in the market to halt Euro appreciation against the Swiss Franc.

7.3. Innovation in Payment Systems

The growth of cryptocurrencies is the most disruptive change in the existing system for cashless retail payments (Beniak, 2019). In addition to being a Bitcoin "currency," this new form of money represents a decentralized payment ecosystem. The prominent currencies are under a competitive and unregulated monetary system. Concretely, these measures comprise the issuance of retail e-money tokens, equivalent to the central bank reserves in crypto ledgers opened by the non-bank cryptocurrency payment service providers. The rapid digitalisation of payment systems has opened up a novel range of opportunities relative to the cost and time efficiency, ubiquity, and inclusiveness. Such opportunities, however, are paired with risks that hinge exactly upon the potential perils of rapid digitalisation in the area of payments. The risks are the legal and security challenges stemming from the activities implemented in the present technologically advanced environment. Beyond doubt, the dislocations may also spread along to a wider lifespan, manifesting broader implications, such as the potential weakening of financial stability and the swiftest depletion of monetary policy transmission channels observed by monetary authorities.

The aforementioned postulations on the work of the aim at outlining the need for a new, uniform payment infrastructure. National boundaries as implementation frameworks would quickly eclipse and gradually decay given the more recent trends. Addressing CBDC and denoting it as a new, uniform, and central bank-back method to complete the monetary system vision is a substitution for the potentials and relative risks. Currently, the two intertwined objects forming their concept are subject to robust definitions and heaps of challenges that the analysis has not fully captured, recognised, and/or addressed. The analysis attempting to contribute to this fast-growing literature is constructed. The review covers the literature on CBDC independently on their forward linkages and operations mechanisms. Unlike a central bank that non-conventionally

has a universal, harmonised definition, CBDCs, as a respective subset of the comparable novelty notion of E-Money, ambitiously across and between currency jurisdictions of varying monetary systems and institutions, have yet to be exhaustively understood in its entirety in designing, governing, and conducting monetary operations.

8. Impact on Traditional Banking Systems

The proliferation of digital currencies alongside the emergence of state-backed digital currencies is poised to have a profound impact on banking systems around the globe. The extent of the impact is of course contingent on the design of new currencies and how they are regulated. However, if large parts of the population begin holding and using them, banks are likely to come under growing pressure to adapt. There are several factors that suggest that traditional banks will be forced to change significantly.

Currently, bank deposits make up the bulk of money and are the main avenue which it circulates in the economy. Central banks operating along the current models must provide banks with funds to meet customer demands for withdrawals or reserves to meet the requirement percentages. Once commercial banks issue a banknote and it is deposited at another bank, the receiving bank must pay it to the central bank in order to clear it. So long as customers are offered interest on deposits and held by the borrower country's own central bank, several economic consequences appear. As with regular deposits, a central bank digital currency (CBDC) deposit would also attract interest payments. The prospect of withdrawal from banks and greater bank runs becomes more serious.

Monetary policy transmission channels both inward and outset would likewise require a rethink. A move towards a hybrid model bears various issues that have consequences for some roles customarily attributed to banks. Commercial banks would, in the words of control authorities, require management and strategies something akin to a "CBDC window" or "CBDC repo" to adjust the commercial bank balances on the central bank. Transmission of monetary policy via changes in interest rates would require New Policy tools and be more akin to those already observed in the introduction of Negative rates or Quantitative Easing (Beniak, 2019). Attitudes towards financial stability would become very critical given the prospect of sudden and large-scaled withdrawals. Hints in relation to fiscal policy, economic policies, banking regulation and competition policies also raise consequences for central banks and possibly implications or reforms for related international governance and co-ordination.

8.1. Disintermediation

Liquidity runs can sap deposit off banks and unquenchably dry up the funding needed for the origination and circulation of all those assets. As in old-fashioned bank runs, money might pour into digital currency, societal panic suddenly manifesting itself in the much feared run to the bank, or, in this case, the run to the decentralized ledger technology-embedded asset. Each depositor has myriad wallets, and CBDC would provide instant and always-available means of fund access. What to do? Install a FIS. This is conceptually simple but politically tremendously complicated. The restriction of deposit withdrawals during a liquidity run (and subsequently, the unveiling of liquidity access hierarchy), would cause outrage about government involvement in both the global economy and personal lives beyond anything experienced during the pandemic. It's worth noting that, amid the requisite liquidity panic, bank runs were correctly understood as a function of proactively restrictive deposit access, and digital currencies, by contrast, were perceived as risk-transmission vectors.

CBDC could play an important deterrent role against these crises, deferring the rare but catastrophic imposition of a FIS and deposit disintermediation amplification. For the proposed system of CDM, individuals can not transfer bank account value to any digital currency or asset bucket instantly and freely as they can submit a banknote to a cashless payment system for its notional value. Existing alternative currency forms, well-tested cash and cash-equivalent systems, should come to mind as paradigmatic scientific use cases for this scheme. For one thing, if the bank crisis is multifaceted, innovative disrupted terminology will find application in no horizon—non-consensual services consumption and cost prevention. For another, it's also worth restating that interbank settlements are designed precisely for these class-of crises.

8.2. Changes in Monetary Transmission Mechanisms

The introduction of a central bank digital currency (CBDC) would affect not only the implementation of monetary policy but also the monetary policy transmission mechanism. The bulk of the impact on the wider economy would come through the interest rate channel, most notably deposit rates. With interest-bearing CBDC, the effective lower bound might be preserved below zero or reduced, as would be the case with the least bearing CBDC design. The extent to which this additional monetary policy space would be exploited in a hypothetical zero lower bound episode depends on the degree of popularity of CBDC, the financial systems involved, and other implicitly modelled parameters. It has also been shown that the introduction of CBDC in the current environment of (excess) liquidity and very low interest rates would lead to a mild increase in inflation (Beniak, 2019). On the other hand, a shift away from bank deposits may severely affect the broader economy. The contribution of the CBDC would be rather muted in the steady state. By lowering the output loss with the sustained CBDC introduction, the social

welfare would increase. However, there are significant financial system stability risks associated with account-based CBDC. Should a wholesale CBDC model be considered, the likely transmission effect would be instead through the asset price channel. On the other hand, without examining the CBDC implementation process, it has been shown that the macroeconomic effects are an outcome. By varying the weights in the loss function, the once dead end communication game may now give rise to a new monetary policy equilibrium or find a new non-equilibrium steady state. The literature on CBDC and its potential impact on monetary policy adjustment mechanisms remains lively and ongoing. Although monetary policy issues have been widely addressed, these aspects did not attract as much attention. However, the question regarding the initial choice of CBDC design is often imperfectly addressed. It would differ from a foreign highly popular currency issued by a foreign central bank, on which an indirect monetary policy transmission could be built. As uncertainty concerning the capacity and design of CBDC is relevant for all countries, the international aspects should be more thoroughly examined.

9. Global Perspectives on Digital Currency Adoption

Crypto-currencies, innovative virtual currencies that leverage unique technology known as blockchain, are emerging as a new form of money and payment system. As understanding of the capabilities of this new technology advances, the potential implications for payments, banking and monetary policy are being hotly debated. Crypto-currencies are fast-growing technologies that allow individuals to store and transmit value over traditional communication networks without the use of government-sanctioned financial intermediaries such as banks and agents (Ally et al., 2016).

The first successful implementation of this technology was Bitcoin, which serves as a public ledger of transactions that records, verifies and distributes the ownership and transfer of the virtual currency. The implications of the digital currency for the financial system, particularly with regards to monetary policy and banking, may be viewed as an opportunity for productive change or as a significant threat to stability, consumer protection and banking's unique role in the financial system.

Presently, it remains to be seen whether cryptocurrencies will replace or complement traditional forms of money or be used primarily for speculation or illicit activities. Nevertheless, the speed at which this technology has developed and expanded has led some regulators to advocate hastily assembling legislation similar to bans on other forms of money. Others contend that this innovation provides positive opportunities or is an overly-hyped fad without significant implications for the existing financial system. Some have gone as far as to proclaim an “arms race” between traditional and decentralized forms of money for payment, commercial and monetary policy functions (Boskov, 2018).

9.1. Case Studies from Various Countries

This paper investigates quantitative models that capture the short-term volatility of cryptocurrency price data in comparison to fiat currency price data, illustrating the significance of time-varying, long-memory volatility processes and jumps. A key economic issue is whether and how some cryptocurrencies can be adopted as a substitute for fiat currencies and corresponding financial assets. This is important, not least because the adoption of a digital currency as a mode of payment, investment or as a store of value has the potential to impact on monetary policy and financial stability. Both the systematic and on-systematic forecasting performance of the models is evaluated using a rolling-window exercise and loss functions that capture both short and long horizons, as are the key insights on the processes modelling price volatility, from statistical and economic perspectives. This analysis will offer important insights into the market dynamics that underpin volatility temporalities beyond the four-hour horizon which are hugely relevant to the forecasting or trading decisions of market entrants with a longer-term investment horizon. Central Banks in many countries around the world are considering the adoption of an electronic version of their fiat currency. While its costs and benefits are still highly debated, a majority of the academic literature suggests that the risks of Digital Currency use outweigh its potential benefits.

9.2. International Regulatory Approaches

The emergence of digital currencies has raised the possibility of the need for regulation or governmental oversight, both in regard to the currencies themselves and to any firms or companies that support these currencies. Australia's financial system regulators and the RBA are taking an active interest in the digital currencies environment and monitoring developments as they arise. The provisions in the Corporations Act 2001 (Cth) and the anti-money laundering legislation would cover a range of activities involving digital currencies in Australia. These arrangements will continue to oversee matters such as disclosures to investors, the integrity of the financial markets, and safeguarding the rights of consumers. Other jurisdictions have been prompt in creating regulations for virtual currencies (Sara Ross, 2017). Early efforts have occurred in a volatile environment, where market volatility, fraud, theft, hacks, and undue risks to national economies and financial systems emerged rapidly as well as significant opportunities across all sectors. The environments are evolving rapidly and regulators try best to catch up (and even pre-empt) with fast-moving technology and man-made risks. However, there is an indication that regulations in some jurisdictions may have unintended consequences, limiting opportunities for innovation or migrating economic activity to those jurisdictions with lighter regulations (Ally et al., 2016). Central Banks and authorities across the globe are continuing to conduct research on the nature and role of digital currencies with a close watch on events unfolding. There is also interest in the broader economic effects of virtual currencies and events such as the Global Financial Crisis demonstrate how quickly things can change. International regulatory bodies are

responding with calls for concerted action but balancing risks and opportunities poses a challenge. In considering 'killing the goose that laid the golden egg', governments of jurisdictions with significant stake in the virtual currency environment may wish to heed the experiences in prior instances where jurisdictional competition has impacted economic stewardship.

10. The Role of Central Banks in Digital Currency Development

Digital currencies have gained momentum, igniting pivotal debates on their benefits and hazards. These discussions prompted a rising interest in the future of money, a search for the suitable middle ground between cash and commercial banks on the one hand, and universal access and cash substitution on the other. While advances in digitalization reshape citizen's lives, central banks evaluate how to reply to the developments to meet their obligations to deliver price stability, safeguard financial systems, and preserve trust and confidence in currencies (Beniak, 2019). Technological developments re-design the form and payment, savings, lending, and investment operations of money and banks. As a consequence, nonbanks, mainly tech firms, have significantly enlarged their offerings, while the scope of banks' traditional intermediation was narrowed, and their positions weakened. The scenario of rapid digitalization is most valuable and fruitful when envisaged against the central banks' objectives, standards, and cardinal principles, their obligations to governance, transparency, privacy, and justice (Babu & M Abraham, 2021).

The paper is devoted to a debate what role and responsibilities are left for central banks. The first part of the paper provides an overview of how the current payment arrangements are served and the shortcomings in meeting central banks' standards, while the second part outlines four scenarios how the rapid digitalization of money and payments could be attained. Finally, four alternative modes of the exchange horizon are tested. The scenario of extinction, augmenting existing modes, and building up bank payment systems as hybrids with universal access are rejected. The conclusion is that the future of money and payments is the state-of-the-art partnership among tech firms, trustworthy payment service providers, diversify monetary and digital banks and peer-to-peer mutual structures, and the internet access market under the governance of central banks. Redirected attention is paid to privacy, intolerance of discrimination, and no coercion in imposing contracts/obligations.

10.1. Policy Frameworks

The introduction of new currencies or income streams, particularly from a central authority, can be effective in stimulating the economy, but work must be done to prepare and build a financial and technical infrastructure that can accommodate these. The broad-based nature of this scarcity relief is key, as cushioning the blow for only a select few segments of the population can lead to

sticky systems, no longer well poised for recovery, but vulnerable to collapse (Goodell et al., 2020).

This digital currency approach that uses the existing payment rail and allows for a monetary and fiscal policy response without sapping linkages with the established ecosystem is anticipated to hone the salience of the impending concepts as developments are made on tooling and infrastructure such that the prospect of a new monetary instrument is on the same term as every other newly dubbed currency for states and scientists alike.

One approach to unpack this process of linking the traditional ecosystem with new offerings that have the potential to obliterate traditional rail paving the way for creative destruction and reframing expectations instead of overhauls is to locate new currency entries accordingly. If not coupled with an external agent, new digital currencies have a duplicitous effect as the consumer will extract utility from existing stores of value. This spin-off from the net, not being a productive or employment gain, leads to losses on both revenues for states and fees for central banks (Ally et al., 2016).

The objective is to operate within the existing regime, not necessarily by any means, but the digital currency market is rapidly maturing and equilibrium prices must be formulated as consumer preference and in response liquidity depth and market accessibility. Existing theorisation on price determination for securities could be adapted and further explored to incorporate additions to liquidity unit states. Likewise, a shift from speculation flows to native liquidity could help surpass an illiquid period improving the user experience of the store of value proposition as price risk halts patience.

10.2. Partnerships with Private Sector

Central banks have been increasingly interested in the role that distributed ledger technology (DLT) could play in the future of payment systems (Groß et al., 2020). Their research typically puts a strong emphasis on the technical side of DLT. In their view, individuals would hold their own digital currency outside of banks, which subsequently would not have access to reserves at the Central Bank. This account-free system has indeed been implemented in the case of Bitcoin, but it is unlikely that it will play a decisive role in the future of payment systems. First, central banks prefer curated systems where they have enough information to effectively supervise the conduction and clearing of payments. A curated system reduces the scope of shadow banking while mitigating systemic risk and the risk of bank runs. However, such curated systems need a central operator that provides the ledger. While this is a hard technical problem, there are solutions based on current technology. Critically, it is uncertain whether any of these solutions

will empower a private firm or consortium or whether the central banks and central banks alone will provide such systems.

Second, it is unlikely that the population at large could extract the economic benefits of cryptocurrencies. As cases of Mt. Gox and other similar companies show, usually there can be no refunds and far fewer protections for individuals compared to established payment networks. It is also doubtful that there will exist a full system of private, centralized, on-chain self-custodial wallets to cater for the mass population. If they emerge, central banks and governments will find immense difficulty regulating them (Goodell et al., 2020). For all these reasons, a central bank digital currency (CBDC) provides an enforceable guarantee over custodial wallets that mitigates against such risks that plague cryptocurrencies. Central banks could guarantee such wallets against possible exploitation by the custodians. In addition, CBDC provides central banks with the information needed to counter illicit activities. So far, central banks have announced various retail CBDCs that would compete with the current payment systems. Such systems would allow for the holding of accounts at the CB directly and the making of payments directly between CBDC holders. In some announcements, CBDC would compete against the existing payment systems. In other cases, the stance is softer, as cases of Norway and Sweden (which are somewhat more concerned about privacy).

11. Future Trends in Monetary Policy

The monetary policy of a central bank has a set of objectives that are supposed to be achieved by specific channels through which the central bank influences economic agents' expectations and behaviours. It is therefore immune to the subject of the monetary standard. However, considering recent developments, some central banks have turned their attention to innovations in the payment systems, especially to the emergence of privately issued e-money and, more recently, digital currencies issued by the central bank. On the one hand, these innovations pose a significant challenge for cash and, hence, the conventional monetary policy. On the other hand, they create an opportunity to improve the efficiency and effectiveness of the monetary policy itself by ensuring a more favourable and robust operational environment for the central bank (Beniak, 2019).

The sheer form of money does not impact the objectives, general principles or channels of the monetary policy. The said principles remain unchanged by the kind of money. That is, gold standard, fiat money, private paper money, State notes, Fiduciary money, commodity standard, etc. would all entail a different standard; but the principles of the monetary policy (as an architectonic subject) would remain unaltered. That is unaltered because (i) the objectives, (ii) the *modus operandi* and (f) the channels are entirely independent of the standard. Those properties

belong to the monetary policy in an existential manner. Irrespective of the subject of the chosen standard, the monetary policy remains identical.

The term “monetary standard” is used to denote the form of the money supply corresponding to any monetary system. It usually includes a commodity standard, convertible paper money, fiduciary money, etc. Attention is drawn here to the form of money and its potential influence on the maintenance of the quantitative standard and, hence, the required monetary policy. In a switch of a monetary standard, the monetary policy framework can either remain unaltered or require adaptations.

11.1. Integration of Digital Currencies

The introduction of cryptocurrencies poses real challenges to the conduct of monetary policy. In a scenario where the use of largescale cryptoassets undermines the viability of the existing monetary establishment, financial stability itself would be threatened. With the introduction of CBDC, a new and potentially far-reaching market experiment will commence, not only affecting the supply dynamics of money but also transforming the market structure in which money is supplied. While there is much uncertainty about the consequences of all this, economic theory has to offer some useful heuristics to analyse stability questions. The emergence of CBDC entails a shift from a two-tier banking system toward a more monopolistic retail payment structure or ledger economy, where data production is the key to efficiently manufacturing money. The emergence of new payment systems tends to destabilize the pre-existing retail money supply structure, warranting a precautionary regulatory stance by the monetary authorities. Such a precautionary stance entails the permission of existing private digital money echelons in order to alleviate the competitive pressure on existing predominating payment systems. Central banks, however, could still act as lender-of-last-resort, mitigating general illiquidity run risks. Recently, digitalisation has led to the rapid development of payment innovation around the world. Strong commercial bank competition and the mobile internet were factors that triggered the innovation. Payment innovations brought greater cost and time efficiencies and led to improved firm profitability. However, legal and security risks also exist. As payment innovations progress, several central banks are considering and testing solutions through which the public can transact in funds ultimately backed by the central banks. One of these solutions is central bank digital currency (CBDC), which refers to the digital version of cash. CBDC is expected to give rise to far-reaching changes in the economy, including some potential effects on monetary policy and monetary policy transmission, as well as financial stability concerns. All central banks are actively exploring this money development. The development of cryptocurrencies and their underlying blockchain technology is no doubt a financial innovation that may affect payment systems, monetary policy, and the financial system. Bitcoin was the first cryptocurrency created by an anonymous inventor in 2009. The evolution of bitcoin spurred the development of around

1,000 other cryptocurrencies, called altcoins. Although the cryptocurrency market started with bitcoin, over time it has evolved into a complex ecosystem. Most of the cryptocurrencies created after bitcoin are themselves variants or adjustments of its architecture and underlying mechanisms. Ripple's philosophy is different from bitcoin. Ripple aims to create a network of trusted banks transacting directly with each other rather than a platform for untrusted users to independently transact with each other. Ripple could act as a sort of private token money for a closed forum, a trusted but not publicly accessible transaction network (Beniak, 2019).

11.2. Potential for New Monetary Tools

Further, CBDCs could strengthen the transmission of policy at the lower bound. If central banks set the interest rate at the effective lower bound, CBDCs could potentially complement or replace the interest paid on reserves as a tool to stimulate monetary policy. If the amount of CBDC were increased sufficiently, it could lower financial rates, supporting private spending. A similar approach is feasible for a reserve-cap CBDC. Owners of CBD (or reserves) could purchase a longer-term and riskier private bond, augmenting private lending. On the one hand, this could assist quantitative easing operations; on the other, it could produce strong financial market and cross-asset volatility and may present fiscal risks.

Finally, CBDCs could help provide a more stable and non-discriminatory payment environment. Some central banks are concerned that private stablecoins may provide a competitive challenge to traditional retail banks and shrink bank deposits. And if stablecoins are not properly regulated, they could produce greater financial and operational risk. In contrast, central bank payments would likely preserve the legitimacy of the sovereign currency within the domestic economy and help ensure that the central bank and government remain in a position to maintain long-run price stability. But CBDC would not be a panacea against these risks. Understanding the financial, economic, and institutional channels through which those proposed benefits might be delivered would require systematic further research and experimentation.

While academics have conducted some constructive and serious analyses and experiments of CBDC, central banks' and policymakers' approaches have been largely uncritical and "blue sky." Those promising areas may benefit the most from further scrutiny and explorations, especially from the positive approaches. In addition to positive analysis, which is traditionally under-researched, normative ones focusing on institutional detours and side effects that CBDC might cause/take appear to be especially valuable. Understanding how CBDC might alter, disrupt, transform, or challenge the current economic and financial structures and systems is very important, as are investigation and considerations of the necessary "preparations" in terms of policy and regulation in case of future CBDC adoption. This paper serves as an exploratory pilot and aims to encourage further discussion and investigation (Beniak, 2019).

5.2. Smart Contracts

Recent years have seen large corporations use smart contracts in bitcoin, Ethereum, and other cryptocurrencies. Distribution, based on code, offers the promise of potentially autonomous digital institutions that remove sleepless lawyers, clumsy law courts, and other mediating institutions from many areas of social and economic activity. Sufficient digital cooperation could facilitate global justice, better sharing

12. Public Perception and Acceptance of Digital Currencies

There is a large variety of different digital currencies already on the market provided mainly by private actors. These can be broadly classed into two main categories: 1) cryptocurrency systems like Bitcoin where each user has an open account in a peer-to-peer ledger, transactions are processed by a self-regulating fraction of the user community, and any degree of anonymity is offered to the system's participants; 2) digital coins and electronic money proposals where user accounts are stored within a centralised database controlled by a central server operated by a private company offering the service (Ally et al., 2016). The latter's transactions could be faster and more convenient, but they expose users to risks of compromising because of server failures or bankruptcy. Even if the latter system has security advantages, the lack of the ability for one to one transaction, anonymity and censorship resistance are growing concerns regarding various financial constrictions. Currently Bitcoin is the leading social exchange for cryptocurrencies, where users can buy or sell these currencies using different processes like computational power, direct trading and more. However, there is a high entry barrier for some methods as users need to setup PGP keys and wallets. Also trading is hampered by the low liquidity. With the advent of alternative currencies like Ripple, Litecoin, and MaidSafe etc., trading will become a lot easier, and more platforms will become available. Also there is now a wider range of services available in exchange for cryptocurrencies, e.g. discounts in online retailers and vouchers.

In addition to the current attempts by private companies to form a common currency, various governments and Central Banks seem to be working on their own currencies for now more than three years (Boskov, 2018). China is the most advanced in this field with various tests run by the People's Bank of China since the late 2015. Russia declared the ban of cryptocurrencies as a means of payment in 2017, but still the Central Bank is actively working on the "Cryptoruble" project which would be in many regards similar to the proposed ICE digital dollar. Australia was one of the first countries to indicate that no action on the side of the government is necessary, mirroring the statements of some US politicians and highlighting the limit of control of current market place actors from federal regulations. In early 2017, however, the Reserve Bank of Australia invited various actors to provide thought pieces on any effects the emergence of digital currencies may have on their day-to-day operations. With increasing user-base this circle of

players is getting ever wider and wider, while the efforts from governments and central banks have rarely produced any tangible understanding, rather political statements and intentions. Nevertheless, there exist several big hurdles that need to be overcome before Bitcoin and related currencies can provide a sufficient alternative to current payment solutions on a larger scale.

12.1. Trust and Security Concerns

The future of monetary policy will be a landscape populated by digital currencies. The utility of any digital currency hinges not only on the economic efficiency of its transaction mechanisms, but also on whether it can hold public trust. Securing the root of trust is particularly acute for bank-created digital money as well as decentralized cryptocurrencies. Therefore, monetary authorities and central banks need to experiment with Central Bank Digital Currencies to explore the future of modern monetary systems. Legislative, operational and liability frameworks should start to be designed, notwithstanding that these frameworks need to evolve as the digital currency ecosystem matures (Boskov, 2018). The cash layer in the banking system is open for access by banks and other institutions, creating trust as the banking layer is managed by central bank deposits thousands of billion dollars. This functional and operational architecture allows banks and institutions to engage in transactions. Banks serve as gateways to the interbank system where account balances include debts or claims in the central bank's cash layer. A bank with insufficient cash can communicate interest rates to its agents to redeem or execute correspondent transactions. The centrally managed cash layer provides trust. In this view, users may store, transfer and settle fiat currencies as debt in a trusted and protected manner. The money layer of modern monetary systems is organized through dedicated public and private infrastructures. The design rules of modern money systems require expertise in finances and capabilities in asset allocations; financial banks do this job and generate each money's price. In addition to cost, modern money systems create additional trust issues after financial systems have been successfully built. The future monetary policy will be a landscape populated by digital currencies: the central bank-issued digital currencies (CBDCs), fast digital money issued by private institutions and decentralized cryptocurrencies created by algorithmically run networks. Currencies issued by banks become public institutions when users hold an account in a central bank. Decentralized cryptocurrencies depend on whether they can keep trading fees low to render trust or not. Each kind of currency can survive given a fair cost structure of money and finances, and the expectation is wider coexistence of different varieties.

12.2. Educational Initiatives

The last few years have seen the emergence and the rapid development of a number of new types of digital currencies. Cryptocurrencies have captured the attention of the media, the financial sector and the authorities as the public has observed the rise of the Bitcoin cryptocurrency and

many others, with astonishing gains as well as huge losses, a great deal of speculation but little high volume use for transactions and payments (Groß et al., 2020). Even more intriguing is the introduction of a private digital currency, the Facebook Libra (now Diem), which aims at becoming a popularly used, global, easily accessible unit of account pegged to a basket of real world currencies. Recently, central banks have also entered the field by exploring and piloting digital currency concepts of their own designs. To appreciate the relative promise, prospects and risks of these different types of digital currencies, it is imperative to distinguish between their key architectural features. A possible route of investigation could be to examine the design choices made and the operational modalities of each of the newly proposed currencies, where the most relevant features include, (i) architecture: decentralised versus centralised, (ii) privacy: fully private, pseudo-anonymous or transparent, (iii) finality: instant finality or settlement in real time, or wait, possibly a long time, before settlement finality, (iv) accessibility: closed-loop access only or open-loop access (Goodell et al., 2020). However, this paper follows a different route of investigation. Instead, it will focus on the design choices made, as well as the operational modalities, of the ‘high-stakes’, fully ambitious types of newly proposed digital currencies. High-stakes proposals are defined here as currency proposals that, if implemented, could fundamentally alter the monetary architecture, financial ecosystems and payment systems at the global level.

13. Ethical Considerations in Digital Currency Implementation

While central banks have an obligation to protect the integrity of their currencies, the move to digital currencies raises ethical considerations. The ethical implications of the goals and methods of monetary policy change, as does the ethical responsibility for how decisions are made. Key issues include the intended effects of monetary policy and the consequent benefit and burden to stakeholders; the degree of independence for the implementation of policy; the expanded dimensions of policy, including through other central banks or other government agencies; the focus on new technologies; consideration of a new policy framework; and the adequate openness to outside input. In its historic role of ensuring specificity and transparency for policy, the ethical considerations for central banks and the question of how best to fulfill them has largely focused on the nature of the policy and its accountability (Goodell et al., 2020).

Concerns of government compulsion, privacy, and possible exclusion of the unbanked arise with the development of private digital currencies. Government-backed currency backed by nominal assets of public interest could enhance confidence (P Dwyer, 2014). Also of concern are the vulnerabilities of monetary systems to information technology advances. Digital currency could make cyber currency threats for nation states more acute and is open to corporate interference. Considerations arising from the treatment of the new possibilities also include the desirability of maintaining a vigorous, innovating economy not subject to government control of ideas. As a result, a systemic perspective on monetary policy implementation, built up from the original core

of its action on market-wide liquidity provisions, is thus extended significantly toward new methods and means for action under new conditions.

Questions are thus raised of how overall responsibility is structured with regard to the implementation of monetary policy. The outlined extended system with its changed focus for monetary policy provides essential dimensions for responsible, trustworthy, credible, and effective central banking at the same time as it draws on a closer and clearer overall design than that of the past. Not only have the means and rationale for acting changed, but also the whole broad foundation from which monetary policy is conducted, including many new dimensions and agents previously without design consideration. Ethical considerations therefore arise on ensuring proper designs and direction for the implementation of monetary policy in the changed circumstances.

13.1. Privacy Issues

Privacy is an interesting topic. Privacy is necessary for freedom. No one sane wants to live in a world where every act is recorded in some permanent indisputable ledger, where it is possible to correlate every health concern, every intimate detail, every dalliance in trivialities or vice into a whole. Privacy is desirable in online environments, whether the virtual reality extension of the real world or an alternative universe entirely, it still introduces the problem of sovereignty over data. This is an issue addressed through pseudonym, protocol, and technical innovations by many parties. Some, who are wary of the implications of this technology, advocate for the most irrelevant adoption scenarios: merely transferring fiat structures to the blockchain. This offers no more than a protection clamshell for the age-old problems of bureaucracies. Others propose divorce and radical re-imagination of states and finance. Radical re-imagination of records, governance, ownership, identity, and enforcement have also been speculated as grand visions of the crypto-libertarians to be built on blockchain technology (Harvey & Branco-Illodo, 2020). The absence of privacy generally creates situations where enclaves of privacy become sepulchres for immorality or criminality. The early gregariousness of the dishonest classes make their culpability doubt on its own. Child porn prevention and tracking are cited, but Disney and Co. have been implicated in several pedophile rings.

From a minority fringe position, this position redoubles: “if you want to have integrity, enter the system.” It rejects any sort of wild west protection. It holds that as things now stand, no end of productive underground economy use of privacy software excuses or blames its utility for the ongoing thorough creation of the all-seeing machine. There is potential for ad-hoc accumulation of data and creation of false profiles based on its minutiae, but under even a capitalist regime of governance and trade, users can only obscure what is built into their published identities, residence, social network, habits, existing on the wage labor side of the economy. Investigator

exert ultimately nuances beyond possibilities of this into systemic forces and both agency and responsibilities beyond individual choices.

13.2. Equity in Access

Access to the central bank digital currency (CBDC) network requires a central bank digital identity for both users and payment instruments. Therefore, the same efforts that were undertaken to ensure banking access need to be repeated to ensure digital identity access (Goodell et al., 2020). This universal approach to digital identity needs to individually encompass both private and public systems to account for those who are not able to comply with schemes for the private system. Only with the provision of a properly issued digital identity will payment access occur. The alternative of accepting physical credentials directly into the CBDC becomes unwieldy and a target of fraud. Government intervention through both CBDC and a digital identity needs to take place in parallel to achieve universal access.

The COVID-19 lockdowns have highlighted unbanked individuals' lack of access to funds needed for food, housing, and healthcare. The opportunity to provide direct assistance to the most vulnerable members of society is being lost through the funding of traditional payment networks. High-friction payment mechanisms are ill-suited for stimulus checks. By supporting accounts with no or minimal KYC requirements and the ability to receive payments in digital currency, digital currencies would create a network of trust to distribute funds to everyone. Banks would be responsible for KYC and AML for exchanges and payment processors so that cash-to-digital currency transfers would be filtered. This ensemble of payment mechanisms would ensure that large, wealthy individuals with private payments may not receive direct assistance and no one with funds failing to appear on the KYC register would be able to transfer their funds into something more useful than the paper USD.

Digital currency needs to target the most economically vulnerable individuals. Accessing funds must be low friction and occur before withdrawal or transfer friction can take effect. If processing and transfer take less than 5 seconds, wealthy individuals will not have time to take advantage of their situation. Isolation fees must be levied on exchanges and payment processing. Senders would specify the KYC charge within the payment so that the amount reachable to recipients is identified. This fee should just cover costs to eliminate large arbitrage opportunities while ensuring profitability.

14. CONCLUSION

The advent of digital currencies has evoked strong reactions and provoked thoughtful scrutiny at all levels of society. Supporters argue that alternative currencies will allow free-market competition and create new business opportunities, while detractors claim that such hardship

contrasts with securing safe and liquid government liabilities. Arguments concerning using new information technologies to seek improved transactions plummeted into the problems of secure liabilities in competition and stability. Preliminary comments on the questions of money, currency Framework/Law and Regulation/Surveillance, Commercial, Central Banks, Liberalism/Individualism/Privacy, and Trust. Preliminary comments on vigilance in the future development and use of digital currency.

More details from diverse viewpoints and paradigms are needed, the arguments on each of these topics need revisiting; thus that postulates and arguments suffered from the weakness-by focusing on different aspects of an issue. The particular form viewed here entails trust in a currency, means to block counter-productive uses here pointing toward damage to limit funds in the system already viewed here as unnatural and complex. This postulate does not approach the bargaining zone between best achievable security within free-market competition and purely governmental coercive regulation.

A first-principles approach to digital currencies is proposed in which agents (individual, business or government) are not forced to trust any institution to prevent mishaps but because any serious error is fixed rapidly with the same or improved quality. Cyber-Libertarians were not right about an end to human history; presently no forms of defence functions with assurance against an onslaught of humanity's ills for there are security holes into which it withers. Alternatively, top-down hyper-monopolies in security could be seen advancing incentive uses for those who use amplifying or complacent circular argumentation and laying waste to the former clarity of practical action or thought.

14.1.Key Findings

- Digital currencies are reshaping the global financial landscape by introducing faster, more cost-effective, and decentralized payment systems.
- Central Bank Digital Currencies (CBDCs) have the potential to enhance monetary policy transmission but may disrupt traditional banking functions.
- Cryptocurrencies, while offering anonymity and decentralization, present challenges in terms of volatility, speculation, and regulatory oversight.
- The adoption of digital currencies poses risks such as cybersecurity threats, loss of monetary control, and financial disintermediation.
- Blockchain and smart contracts provide innovative infrastructure for trustless transactions but require robust legal and technical safeguards.

- The implementation of digital currencies varies significantly across countries, reflecting different levels of regulatory readiness and public trust.
- Financial inclusion could be significantly enhanced through CBDCs, especially in developing economies with limited access to traditional banking services.
- Traditional monetary tools may become less effective in a digital currency-dominated environment, requiring new policy frameworks.

14.2.Recommendations

- Central banks should adopt a cautious and phased approach to CBDC implementation, prioritizing transparency, resilience, and public engagement.
- Clear regulatory frameworks must be developed to govern cryptocurrencies and stablecoins, ensuring consumer protection and systemic stability.
- Investments in cybersecurity infrastructure and technical capacity-building are essential to protect digital currency ecosystems from potential attacks.
- Cross-border cooperation should be strengthened to address global challenges such as money laundering, tax evasion, and regulatory arbitrage.
- Financial literacy programs should accompany digital currency initiatives to ensure informed public adoption and reduce the digital divide.
- Policymakers must balance innovation with prudence by conducting regular impact assessments and stress tests of digital financial systems.
- Legal frameworks should be updated to integrate smart contracts and distributed ledger technologies into enforceable economic agreements.
- Collaboration with the private sector is vital to ensure inclusive, interoperable, and efficient digital currency solutions.

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