

Opinion

Navigating Ghana's monetary policy evolution and the potential of central bank digital currencies

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Abstract: This study investigates the evolution of monetary policy in Ghana and explores the potential of Central Bank Digital Currencies (CBDCs), specifically the e-Cedi, as a tool to enhance financial inclusion and modernize the country's financial system. Ghana's monetary policy framework has undergone significant transformations since the establishment of the Bank of Ghana in 1957, with notable achievements in stabilizing the economy and managing inflation. However, large segments of the population, particularly in rural areas, remain unbanked or underbanked, highlighting the limitations of traditional monetary tools. The introduction of the e-Cedi presents an opportunity to bridge these gaps by providing secure, efficient, and accessible financial services to underserved communities. The study employs a qualitative research design, integrating historical analysis, case studies, and thematic analysis to assess the potential benefits and challenges of CBDCs in Ghana. Key findings indicate that while the e-Cedi could significantly enhance financial inclusion, challenges related to technological infrastructure, cybersecurity, and public trust must be addressed. The study concludes that a balanced approach, which prioritizes digital infrastructure development, strong cybersecurity measures, and collaboration with financial institutions, is essential for maximizing the potential of CBDCs in Ghana. Recommendations for future research include a deeper exploration of the impact of CBDCs on financial stability and further analysis of rural adoption barriers.

Keywords: central bank digital currencies; digital economy; economic development; Ghana; financial inclusion

1. Introduction

The voluminous studies, discussions, and arguments revolving around the evolving of monetary policy in both theory and practice go a long way to demonstrate the importance of the topic in the economics literature. The constantly updated interpretation and functions which are assessed and investigated further in this study, prove the high position monetary policy occupies in the strata of modern economics. Monetary policy encompasses the actions and measures implemented by a central bank or monetary authority to manage and oversee the amount of money in circulation. The rates at which money is borrowed are of utmost importance in the operation of contemporary economies. Effective monetary policy is critical to maintaining macroeconomic stability, promoting sustainable economic growth, managing inflation, and ensuring the smooth functioning of financial systems. Monetary policy

remains a cornerstone of macroeconomic stability, driving efforts to manage inflation, control interest rates, and foster sustainable economic growth. Monetary policy is just one tool in a broader policy framework, and its effectiveness is influenced by various factors, including fiscal policy, structural reforms, and external economic conditions. A characteristic feature of the third millennium is the unpredictability of the economy. If this is true in developed economies, it is even more real in less developed economies like Ghana and this is attributable to mainly externalities (Kömüves et al., 2024). Digital currency will be able to compensate for disruptions in supply chains, making it easier to seek new sources of procurement through solvency.

As economies evolve, so do the mechanisms and tools central banks employ to ensure financial stability. In recent years, the emergence of digital currencies, particularly Central Bank Digital Currencies (CBDCs), has sparked a global conversation on how these innovations could transform monetary systems. Central banks worldwide are venturing into the domain of digital currencies to preserve their authority and prevent being overshadowed by the increasing prominence of cryptocurrencies. There have been various studies on how impactful these digital currencies will be. Meaning et al. (2018) concluded that digital currency will ensure that monetary policy operates much as it does now by varying the price or quantity of central bank money, and transmission may even strengthen for a given change in policy instruments. Davoodalhosseini et al. (2020) on their part opined that digital currencies may allow more complex transfer schemes and break below the zero-lower bound, but these benefits might be small or difficult to realize in practice. Zang and Zhou (2022) observed that digital currencies significantly impact monetary policy by changing money demand, speeding up currency circulation, making central bank reserves more controllable, and making money supply more intelligent. This study is crucial for emerging economies like Ghana, which are navigating the challenges of modernizing their financial frameworks while addressing long-standing issues such as financial inclusion and economic volatility.

Despite extensive literature on monetary policy, much of the current research focuses on developed economies, with limited analysis of how digital innovations such as CBDCs can impact developing nations. In countries like Ghana, where a significant portion of the population remains unbanked and informal economic activities dominate, the potential for digital currencies to bridge gaps in financial inclusion is immense. However, the specific challenges that arise from weak digital infrastructure and cybersecurity risks remain underexplored in existing studies. This research aims to fill that gap by offering a comprehensive analysis of the evolution of monetary policy in Ghana, with particular emphasis on the introduction of CBDCs. The general objective of this study is to explore the evolution of Ghana's monetary policy and assess the potential impact of CBDCs on the country's financial inclusion, monetary stability, and economic growth. More specifically, it aims to:

- 1) Examine the historical development of monetary policy in Ghana and its influence on the nation's economic landscape.
- 2) Investigate the current initiatives surrounding the implementation of CBDCs, particularly the 'e-Cedi' pilot project.
- 3) Analyze the potential benefits and challenges of CBDCs in addressing Ghana's financial inclusion issues and enhancing the effectiveness of monetary policy.

- 4) Provide practical recommendations for policymakers and stakeholders to ensure the successful integration of CBDCs into the country's financial ecosystem.

By addressing these objectives, the study contributes to existing literature by offering a detailed examination of the intersection between traditional monetary policy and modern digital innovations in the context of a developing economy. The remainder of this paper is organized as follows: Section 2 provides a background on the evolution of monetary policy, both globally and in Ghana, while Section 3 is the Literature reviewed by the authors for the study. Section 4 outlines the materials and methods employed in the study. Sections 4 and 5 present the results and discuss key findings, Finally, Section 6 offers conclusions based on the findings of the study.

2. Background of study

Monetary policy plays a crucial role in shaping a country's economic landscape by regulating inflation, managing interest rates, and stabilizing the financial system. This has made monetary policy a critical component of a country's economic framework in recent years. The roots of monetary policy can be traced to ancient civilizations when the then governments deployed some forms of currency and monetary systems to undertake trade and commerce. However, the 20th century saw the emergence of the contemporary idea of monetary policy as a tool for controlling the economy and stabilizing financial markets. In the evolution of contemporary monetary policy, the establishment of the Federal Reserve System in the United States in 1913 was a crucial turning point.

Prior to 1971, the Bretton Woods system established a connection between the US dollar and gold, as well as other global currencies and the US dollar. This arrangement proved to be highly beneficial for countries that had trade surpluses, particularly the United States, from 1945 to 1970. However, according to Pilkington (2014), developing countries with trade deficits did not benefit from the agreement. Developing countries had to partake in "stabilization programs" mandated by the World Bank and the International Monetary Fund (IMF) to secure funds. The involvement of these countries led to a significant accumulation of debt, ultimately leading to the devastating collapse of their economies (Pilkington, 2014). In August 1971, the United States found itself facing a trade deficit, prompting President Richard Nixon to close the gold window. Since then, most of the global economies have functioned under a "fiat money system," where money is printed without being backed by gold (Pilkington, 2014). According to Thornton (2015), there is empirical evidence to support the notion that a monetary system controlled by central banks and based on traditional fiat money tends to benefit specific groups of individuals, such as moneylenders and bankers. Today, most nations have established central banks that bear the responsibility of formulating and executing monetary policy.

The onus is on central banks to put in place the necessary measures and conditions for monetary policies to thrive and ensure their effectiveness. In Ghana, monetary policy has evolved significantly since the establishment of the Bank of Ghana in 1957, with key milestones such as the transition from colonial monetary systems to the adoption of fiat money following the collapse of the Bretton Woods system in 1971. Over the years, the Bank of Ghana has implemented various monetary

policy tools to manage inflation and foster economic growth. However, despite these efforts, large portions of the population, particularly in rural areas, remain excluded from the formal financial system. The rise of digital financial technologies offers new avenues for addressing these gaps. been the emergence of cryptocurrencies and their popularity keeps on soaring as more people gear towards their usage. Cryptocurrency is simply digital or virtual money that is protected by encryption thus making it very challenging or almost impossible to counterfeit or use twice. Using the pseudonym Satoshi Nakamoto, an unidentified individual or group established the first cryptocurrency, Bitcoin in 2009. Bitcoin utilizes blockchain technology, a decentralized ledger that records transactions across a network of computers. With the advent of Bitcoin, many other cryptocurrencies have emerged, with each having distinct attributes and qualities. There are several well-known cryptocurrencies in the market, such as Ethereum, Litecoin, Ripple, and Bitcoin Cash. Cryptocurrencies have drawn a lot of attention lately, with investors perceiving them as possible investable assets (Nguyen et al., 2019). According to Othman et al. (2019), there is empirical evidence to support the idea that cryptocurrencies can replace the current fiat money system and can be advantageous for policymakers and positional investors as an investment option helping with risk management, portfolio diversification, and hedging.

According to Claeys et al. (2018), the rise of cryptocurrencies, facilitated by advancements in digital technology, poses a threat to the dominance of official central bank-controlled currencies (fiat money). Cryptocurrencies are now being recognized as legitimate currencies that can serve as mediums of exchange. Examining the relationship between central banks and cryptocurrencies, Nabilou and Prüm (2019) found that cryptocurrencies can have significant effects on both price stability and monetary policy, as well as on central banks' control over issuing base money. Additionally, they noted that cryptocurrencies can indirectly impact central banks through the various institutions and systems under the purview of the European Central Bank In a bid not to loosen their grip and be overtaken by the upward trend of cryptocurrencies, central banks across the globe are venturing into digital currencies. In a speech to the Atlantic Council in February 2022, the managing director of the IMF, Kristalina Georgieva emphatically stated that central banks have gone past the conceptual discussions of central bank digital currencies (CBDCs) and are now in the experimentation phase hence central banks are rolling up their sleeves and familiarizing with the “bits and bytes” of digital money. CBDC is essentially a digital version of a country's fiat currency, similar to a cryptocurrency. While CBDC is under the control of a central authority, cryptocurrency operates in a decentralized manner without any ties to a central authority. CBDCs also strive to provide a digital rendition of a nation's current fiat currency, enhancing efficiency and convenience. However, cryptocurrencies aim to present an alternative to conventional fiat currencies, devoid of government interference. To enhance flexibility, responsiveness, and efficiency transformations are also needed in Africa, including the distribution of digital currency (Jenei and Módosné, 2022).

The advent of digitalization of the financial sector particularly through mobile money services, have been instrumental in improving financial inclusion in Ghana (Sackitey, 2018). Yet, even with the widespread use of mobile money, there are

limitations in reaching underserved communities due to infrastructural challenges, low digital literacy, and the reliance on existing telecommunications networks. In this context, the introduction of Central Bank Digital Currencies (CBDCs) offers an innovative solution for bridging the financial inclusion gap. Ghana's exploration of a CBDC, known as the e-Cedi, is part of a broader effort to digitize the economy, enhance monetary policy tools, and extend financial services to the unbanked population. As CBDCs gain traction globally, many central banks, including those in emerging economies, are recognizing the potential of digital currencies to transform financial systems. However, the successful adoption of CBDCs in Ghana depends on addressing key challenges, such as weak technological infrastructure, cybersecurity risks, and public trust in digital systems. Given these complexities, this study aims to assess how the introduction of CBDCs, specifically the e-Cedi, could enhance financial inclusion in Ghana while also improving the effectiveness of the country's monetary policy framework. Additionally, the study will investigate the technological, regulatory, and cybersecurity challenges that must be overcome to ensure the successful implementation of a CBDC in Ghana.

3. Literature review

Similar to many developing nations, Ghana's economy is heavily debt-driven. There are several factors contributing to Ghana's huge indebtedness, including successive governments of the Fourth Republic borrowing to finance development projects and social programs. External factors such as global economic downturns, and reduced commodity prices have also contributed to Ghana's debt. Furthermore, poor fiscal management, corruption, and mismanagement of public resources have also fueled the country's debt (Kálmán et al., 2024b). The country has also had to borrow from international financial institutions such as the IMF and the World Bank, to shore up its balance of payments. Studies conducted by Atuahene et al. (2024) and Osei (1995) attributed Ghana's debt difficulties to the low rate of return on investment to which borrowed funds are applied as much of the capital inflows are channeled into infrastructural investments with long gestation periods, yielding low returns in their early years. Moreover, ineffective time management practices in the use of borrowed funds could also limit their long-term economic benefits (Csapai et al., 2018). Awadzie et al. (2022) stated that capital outflows, asset replacements and a high level of government debt are key factors contributing to Ghana's indebtedness. Previous studies on the economic prospects of external debt in the developing world have varied findings. However, scholars such as Diego et al. (2009) and Rolf (2005) concluded that external debt is likely to have a positive effect on the economy, while Todaro and Smith (2009), Fosu (1996) and Chowdhury (2001) found a negative effect of external debt on economic growth.

Ghana's huge indebtedness is a big challenge for the country's contemporary international monetary system. Awadzie et al. (2022) concluded that Ghana's huge debt levels negatively impact the country's international reputation, business climate, and investment and economic growth. Awadzie et al. (2022) further opined that the impacts of high debt stock in a developing economy such as Ghana include the likelihood of debt default as the ever-increasing debt level usually makes it difficult

for the country to pay back its debtors; reduces access to credit as lenders usually hesitate to lend funds to a country with a high level of debt; leads to high inflation levels as the country might print more money to pay back its debt, which might exacerbate the economic problems; and leads to structural adjustment programs which may require the country to put in place very challenging economic programs that usually results in adverse social impacts such as reduced access to healthcare, education and employment. Similarly, the generational preferences for work ethics, where younger generations tend to favor flexibility and work-life balance, might play a role in how debt management strategies are formulated in emerging markets like Ghana (Szabo-Szentgroti et al., 2016). Further, Prah and Ofori (2022) concluded that huge debt levels of emerging economies are likely to have a detrimental impact on the foreign direct investments of such countries while improvement in the economic performance of these countries is likely to promote foreign direct investment inflows. This implies that when funds borrowed are effectively utilized for economic purposes, it can offset the negative impacts of debt. As a result, the economy can experience improved performance, leading to an increase in foreign investment inflows. These findings are crucial for many developing economies, such as Ghana, where the economy heavily relies on debt. Policymakers must prioritize strategies that promote capacity building, innovation, and the strengthening of systems to enhance economic performance (Serzhena et al., 2024).

At the 91st Monetary Policy Committee press conference held in November 2019; Ghana's central bank declared it was exploring a CBDC in the framework of the financial sector digitization program. As a follow-up, the Bank of Ghana issued a widely circulated press statement on August 11th, 2021, revealing their collaboration with the German Tech company Giesecke + Devrient to test a general-purpose CBDC in Ghana. The project seeks to implement a digital version of Ghana's national currency, the Cedi, called the 'e-Cedi', to enhance the use of digital payments and supplement physical cash in the country. This initiative is a crucial component of the government's plan to modernize Ghana and streamline its public services. The CBDC pilot project will be carried out in three stages: design, implementation, and pilot. During the design phase, the CBDC pilot will outline framework parameters, covering economic, regulatory, and technical requirements. During the implementation phase, Giesecke + Devrient's CBDC solution will be customized to align with Ghana's specific requirements. The pilot phase will test the CBDC solution with a diverse user group to evaluate user experiences, acceptance, IT security, impact on monetary policy, and legal implications. The project aims to drive financial inclusion, provide a secure payment infrastructure, and boost the use of digital services in the country. The successful implementation of e-Cedi can lead to a nationwide rollout, positioning Ghana at the forefront of digital financial service delivery (Kálmán et al., 2024a).

There are several reasons why debt-ridden countries such as Ghana may want to get rid of the contemporary international monetary system. CBDCs has the potential to assist countries with high levels of debt, such as Ghana, by offering them a streamlined and cost-efficient method for conducting transactions and overseeing their financial affairs. Another primary reason is that they may feel that the current system is unfair or biased against them, which causes their economic struggles. These countries may feel that they have little control over their financial destiny and are at

the mercy of global economic forces such as the Bretton Woods institutions. In addition, debt-ridden countries may also be pushing for change in the current monetary system to improve their economic prospects and rise out of debt. By adopting new systems and practices, they may be able to attract greater investment and opportunities for growth, which can help alleviate their financial troubles and improve their overall economic stability (Serzhena et al., 2024). Finally, debt-ridden countries may also want to explore alternative monetary systems that are more equitable and provide them greater autonomy over their financial policies.

One advantage of CBDCs is their potential to lower transaction costs than those of traditional banking and electronic payment systems. Banerjee and Sinha (2023) and Hoffman et al. (2022) concluded that the implementation of CBDCs can result in faster, more efficient, and cost-effective payment systems. Studying the phenomenon of CBDCs, Shkliar (2020) stated that one advantage associated with the introduction of CBDC in emerging economies is the likelihood of it resulting in efficient retail payments, diminishing cash payments, strengthening the effectiveness of monetary policy, and improving financial stability, which can make it easier and more cost-effective for businesses and individuals in highly indebted countries to engage in international trade and conduct cross-border transactions. Thus, utilizing CBDC for digital transactions would optimize payment processes, resulting in lower transaction costs and faster settlements. This would be beneficial to businesses, individuals, and government entities by enhancing overall economic efficiency (Kálmán et al., 2024c).

Additionally, by providing access to formal financial services for the unbanked and underbanked populations, CBDCs can help increase financial inclusion in developing economies such as Ghana where a large number of people do not have access to traditional banking services. Ozili (2022) opined that CBDCs can increase financial inclusion by providing an alternative channel for unbanked adults to access formal financial services. Similarly, Bindseil (2020) concluded that CBDC is likely to enhance financial inclusion by reducing structural disintermediation of banks and centralization of credit allocation processes. Infante et al. (2022) conducted a literature review of the macroeconomic implications of CBDCs, finding that they can boost financial inclusion and reduce financial friction in deposit markets. The likely increase in financial inclusion through CBDC can promote economic participation and reduce the reliance on cash transactions, especially in rural Ghana where traditional banking infrastructure is limited. By providing a digital currency that can be easily accessed by individuals with a smartphone or internet connection, CBDCs can help expand financial service accessibility to a greater number of people who are currently unbanked.

Introducing the CBDC can give the Bank of Ghana more effective tools to implement monetary policy. Qian (2019) observed that central banks can improve their tools for monetary policy implementation by optimizing payment functions, reducing dependence on private sector services, and addressing concerns such as policy transmission and countercyclical control. Berriel and Guardado (2018) highlighted the potential benefits of CBDCs for central banks in terms of enhancing monetary policy implementation. By addressing the limitations imposed by traditional money on banks and reshaping the transmission of monetary policy, CBDCs can offer a central bank additional tools to work with. According to Leonov (2022),

implementing CBDC in developing economies such as Ghana would lead to decreased macroeconomic fluctuations, greater price stability, and improved efficiency in the transmission of monetary policies through the interest rate channel. The availability of real-time transaction data on CBDC platforms can enable more accurate monitoring of economic activities, allowing for timely interventions to maintain price stability and address financial imbalances. Furthermore, the broader implications of financial stability align with insights from the OECD survey analyzed by Németh et al. (2024), which stressed the importance of financial security measures in addressing macroeconomic challenges in Hungary, a context not far removed from the potential challenges faced by Ghana in its efforts to introduce a CBDC.

Ghana has a significant informal sector, and the introduction of CBDC can help bring more economic activities into that sector. In their study on the digital economy, privacy, and CBDC, Hoffmann et al. (2022) opined that being an independent digital payment instrument, CBDC has the potential to overcome frictions and achieve efficient allocation in the digital economy, potentially reducing the informal economy. Choi et al. (2021) observed that a thoughtfully designed CBDC can improve economic efficiency, and inclusivity, and serve as a platform for economic innovation. By advocating for digital transactions and decreasing the dependence on cash, CBDC can aid in the reduction of tax evasion, enhance revenue collection, and cultivate a more transparent and accountable economy.

Implementing a CBDC necessitates strong cybersecurity measures to safeguard against potential threats and uphold the confidentiality of users' financial data (Dufie et al., 2021; Mahardika et al., 2023; Soderi et al., 2021;). Ghana must invest in strong cybersecurity infrastructure to safeguard against cyberattacks, fraud, and data breaches, thereby maintaining public trust in the digital currency system. The introduction of a CBDC requires the development and upgrading of digital payment infrastructure in Ghana. This will result in increased investments in digital infrastructure, such as internet connectivity and mobile banking services, to support broader technological advancements in the country.

According to Nesterov (2023), CBDCs can greatly improve settlement and payment systems, especially in international transactions. They address issues such as slow processing, expensive fees, restricted access, and lack of transparency. Moreover, Semeko (2022) suggested that CBDCs can transform cross-border payments by arguing that CBDCs can enable quick, affordable, transparent, and adaptable transactions, which would help overcome the limitations of the current correspondent banking system. In summary, CBDC can have a favorable effect on cross-border transactions and remittances by streamlining the process and lowering expenses. Ghanaians abroad can send funds directly to their families through the CBDC system, bypassing intermediaries and potentially lowering remittance fees. Ghana's adoption of CBDC can stimulate regional and international cooperation in the field of digital currencies. It can encourage knowledge sharing, policy harmonization, and collaborative initiatives among central banks and international organizations, thereby fostering innovation and best practices.

CBDCs can significantly benefit developing economies such as Ghana. They can modernize trade and exchange, reduce costs associated with physical cash, and improve financial inclusion (Howell and Potgieter, 2021). The implementation of a

CBDC by the Bank of Ghana should be approached with caution, despite its potential benefits. Duffie (2021) emphasized the need for a thoughtful approach and technology solutions that address current challenges and facilitate future innovation. Koumbarakis and Dobrauz-Saldapenna (2019) highlighted the potential threats to financial stability, particularly in the context of the central bank's role as a lender of last resort. Bindseil (2019) discussed the risks of structural disintermediation of banks and centralization of credit allocation and proposed a two-tier remuneration system to control the quantity of CBDC. Ozili (2022) underscored the need for a balanced approach, cautioning against over-optimism about the potential benefits of CBDC and calling for further research on its design and impact on financial stability.

In the case of Ghana, implementing a CBDC comes with some potential challenges and risks that need to be carefully addressed. The Bank of Ghana needs to invest in robust technological infrastructure to support the widespread adoption of CBDC. Allen et al. (2020) opined that the deployment of CBDCs in emerging economies requires resilient, secure, and performant infrastructures, while balancing privacy and transparency, to enable new capabilities and financial instruments. Thus, the central bank should ensure reliable internet connectivity, develop secure digital payment platforms, and address potential issues related to power supply and network coverage, especially in rural areas. On 14 March 2024 internet service disruptions, which according to a preliminary report were caused by severed undersea cable hit Ghana and other West African countries leaving the country with limited or no internet access for days. Such interruptions will not augur well for the implementation and smooth running of the digital currency.

The implementation of digital currency in Ghana is likely to be accompanied by cybersecurity risks and the potential for fraud. Mahardika et al. (2023) highlighted the importance of considering cybersecurity risks when implementing a CBDC. They emphasized the potential for disruptions caused by IT malfunctions, cyberattacks, human error, and infrastructure or physical security threats. While a CBDC offers a safer and more secure option compared to cryptocurrencies, central banks must remain vigilant in addressing these risks. Thus, the Government of Ghana should ensure that adequate protective measures are deployed to ensure that the digital currency system is devoid of hacking, data breaches, and unauthorized access. The central bank must establish stringent security protocols and collaborate with relevant entities to mitigate cyber threats effectively. CBDC involves the collection and management of sensitive user data. Safeguarding privacy and ensuring compliance with data protection regulations are essential. Mukati and Prakash (2022) asserted that a strong data leakage prevention system is crucial for CBDC systems, but incorporating zero-knowledge proofs and differential privacy tools can improve their robustness and effectiveness. Ghana's central bank would therefore need to establish robust data protection frameworks to protect individuals' financial information and address concerns related to surveillance and misuse of data.

The central bank must endeavor to create the necessary awareness by educating the public about CBDC and promoting its adoption. This is essential for the project's success, as emphasized by Fang et al. (2023), who highlighted the importance of central banks prioritizing consumer education and expectation management to encourage the adoption of CBDC. To ensure widespread acceptance and

understanding of CBDC, the central bank must conduct awareness campaigns and provide user-friendly interfaces. The Bank of Ghana must carefully navigate the introduction of the CBDC to ensure a delicate balance between promoting innovation and maintaining macroeconomic stability. It must ensure that the introduction of digital currency does not disrupt the stability of the existing financial system. Thus, it is important for due assessment to be undertaken to assess potential risk factors such as bank disintermediation, credit contraction, and liquidity challenges. As a CBDC can impact the effectiveness of monetary policy transmission, the Bank of Ghana needs to ensure that changes in CBDC usage do not hinder its ability to influence interest rates and inflation.

The Implementation of CBDC necessitates the development of a robust regulatory framework. The Bank of Ghana must ensure that the regulatory framework governing CBDC is robust enough with mandatory secure authentication protocols to prevent unauthorized access to CBDC accounts. To enhance consumer confidence and boost usage, there should be clear guidelines on the liability for fraudulent transactions. Authorities must set rules on the issuance and redemption of the CBDC, which will help maintain control over money supply. The regulatory framework must establish common standards to ensure that the digital currency interoperates seamlessly with existing payment systems.

Transitioning to a CBDC holds great potential for financial inclusion efficiency and innovation for the Ghanaian economy. However, the Bank of Ghana needs to take adequate measures to bridge the gap in access to technology and ensure that vulnerable populations are not further marginalized in the transition to a digital currency system. Populations in rural Ghana lack the digital literacy skills necessary to use CBDCs effectively, so the central bank must implement educational programs to enhance digital literacy, especially among underserved communities. Workshops and community outreach can empower individuals to navigate digital platforms confidently. As uneven access to digital infrastructure might hinder the success of CBDC adoption in Ghana, the gap needs to be bridged by expanding digital infrastructure, particularly in rural areas.

4. Materials and methods

This section outlines a structured approach to the research, detailing how data was collected and analyzed to support the study's objectives.

4.1. Research design

This study employs a qualitative research design to explore the evolution of monetary policy, focusing on the historical context, current practices, and the potential implementation of Central Bank Digital Currencies (CBDCs) in Ghana. The research integrates historical analysis with contemporary case studies to provide a comprehensive understanding of the subject.

4.2. Data collection

The literature review for this study was conducted to provide a comprehensive understanding of the evolution of monetary policy and the role of Central Bank Digital

Currencies (CBDCs) in enhancing financial inclusion and economic growth, particularly in developing economies like Ghana. To ensure the review captured relevant and up-to-date sources, the time frame for selecting literature was set between 2010 and 2024, with a particular focus on the last five years (2019–2024). This period captures both historical perspectives on monetary policy and the recent developments in digital currencies.

4.2.1. Search strategy

A systematic search strategy was employed to identify relevant academic sources, government publications, and institutional reports. The search was conducted using multiple databases, including: Google Scholar; JSTOR; EBSCOhost; ProQuest and ScienceDirect. Key search terms deployed included “Monetary policy in Ghana”; “Central Bank Digital Currencies”; “Financial inclusion in developing economies”; “Digital payments in Africa”; “Challenges of CBDC implementation in developing countries” and “Digital currency and economic growth” The search strategy prioritized peer-reviewed articles and reports from reputable international financial institutions, such as the International Monetary Fund (IMF), the World Bank, and the Bank for International Settlements (BIS). Additionally, government reports and official publications from the Bank of Ghana were included to obtain primary insights into Ghana’s monetary policy and CBDC pilot projects.

4.2.2. Selection criteria

The inclusion criteria for the literature review were:

- 1) Articles, reports, and papers published between “2010 and 2024”.
- 2) Sources that specifically discuss monetary policy, digital currencies, financial inclusion, or the economic development of emerging markets.
- 3) Publications offering insights into the challenges and benefits of implementing CBDCs in developing economies, especially sub-Saharan Africa.
- 4) Both qualitative and quantitative studies that analyze the impact of CBDCs or similar financial innovations on economic growth and monetary stability.

The exclusion criteria included:

- 1) Sources focused solely on developed economies without direct relevance to Ghana or sub-Saharan Africa.
- 2) Articles published before 2010 unless they provided foundational theories or frameworks crucial to understanding the evolution of monetary policy.

4.2.3. Data sources and case studies

In addition to the literature review, the study drew from secondary data sources, including reports from the Bank of Ghana on the progress of the CBDC pilot (e-Cedi) and other digital financial innovations, publications from international institutions like the IMF and World Bank that examine the global and regional trends in CBDC adoption and case studies from countries such as Nigeria, China, and Sweden, which have made significant progress in their own CBDC initiatives, were analyzed for comparative insights.

4.3. Data analysis

This study employed thematic analysis to identify, analyze, and report patterns

or themes within the qualitative data collected from literature and secondary sources. Thematic analysis is appropriate for this study because it allows for a systematic exploration of the data to uncover significant trends and themes related to the evolution of monetary policy, the potential of Central Bank Digital Currencies (CBDCs), and their implications for financial inclusion in Ghana.

The thematic analysis process followed six key steps as outlined by Braun and Clarke (2006). The first step which was data familiarization involved an in-depth review of the literature and reports gathered from academic, governmental, and institutional sources. This familiarization phase included multiple readings of the materials to gain a comprehensive understanding of the content. Notes were taken during this process to capture initial thoughts and impressions, ensuring that the broader context of the data was well understood before moving forward. After familiarizing with the data, the authors then generated initial codes. During the coding phase, data was systematically broken down into meaningful segments. Manual coding was utilized for this process, as it allowed for a more flexible and nuanced understanding of the text. Codes were assigned to data segments that addressed key aspects of monetary policy, CBDC initiatives, financial inclusion, and challenges specific to Ghana's economic landscape. Each segment of data was labeled with short phrases that summarized its meaning. The utilization of manual coding was justified in this case due to the manageable size of the dataset and the need for a deeper, contextual understanding of the materials.

The third stage involved the search for themes. After the coding process, related codes were grouped together to form initial themes. A theme was defined as a pattern that captured something significant about the data in relation to the research questions. The initial themes were next reviewed to ensure they accurately reflected the dataset. Themes were refined to ensure clarity and coherence, with some themes being collapsed into broader categories or discarded if they were not sufficiently supported by the data. Furthermore, once the themes were finalized, each was clearly defined and named to reflect its essence. The key themes identified were: "Evolution of Monetary Policy in Ghana"; "CBDCs and Financial Inclusion Opportunities"; "Technological and Infrastructural Challenges"; "Cybersecurity Risks and Trust in Digital Currency" and "Comparative International Experiences with CBDCs". Each theme was chosen based on its relevance to the research questions and the frequency with which it appeared in the data. Themes that offered the most insight into how CBDCs could transform Ghana's financial landscape were prioritized. The final phase involved writing the results section, where each theme was explored in depth. Connections were made between the themes and the research questions, and the themes were situated within the broader context of the existing literature.

4.3.1. Justification for thematic analysis

Thematic analysis was chosen for this study due to its flexibility in accommodating various types of qualitative data. Given the study's focus on the intersection of historical, policy, and technological factors, thematic analysis allowed the authors to uncover patterns and insights across diverse datasets. The process facilitated a deeper understanding of the underlying issues related to Ghana's monetary policy and the potential role of CBDCs in addressing financial inclusion

challenges.

4.3.2. Coding process

The coding for this study was done manually. This decision was based on the manageable scope of the dataset and the need for flexibility. Manual coding allowed the researcher to engage deeply with the text and make adjustments during the coding process. The coding was done iteratively, ensuring that any new codes that emerged later in the analysis were integrated into earlier sections of the data. For transparency and reliability, the coded data was reviewed multiple times to ensure consistency.

4.3.3. Theme selection and prioritization

Key themes were chosen based on their relevance to the study's objectives and their prominence in the dataset. Themes were prioritized using the following criteria:

- 1) Themes directly related to the core research questions were prioritized.
- 2) Themes that appeared frequently across different sources were considered significant.
- 3) Themes that revealed new insights or added value to the existing literature were given higher priority.
- 4) Themes that offered substantial and detailed insights were prioritized over those that had only limited support.

4.3.4. Comparative analysis

The comparative analysis was conducted to place Ghana's experiences and potential with CBDCs in a global context. International experiences with CBDC initiatives from countries like Nigeria, Sweden, and China were compared to Ghana's ongoing efforts. These case studies provided benchmarks for assessing Ghana's readiness and the potential impact of CBDCs. Indicators such as financial inclusion rates, digital infrastructure readiness, and cybersecurity capabilities were used to evaluate the similarities and differences between Ghana and other nations that have implemented or are piloting CBDCs. This allowed for a more nuanced analysis of Ghana's strengths, weaknesses, and opportunities in adopting digital currencies.

5. Results

While the evolution of monetary policy in Ghana has been instrumental in stabilizing the economy, the analysis shows that the focus on traditional monetary tools, such as interest rate control and money supply management, is becoming increasingly insufficient in addressing the country's financial inclusion challenges. Historical overviews highlight how these conventional policies helped Ghana navigate various macroeconomic crises. Traditional tools may no longer suffice in a digital age where a significant portion of the economy is informal and unbanked (Berriel and Guardado, 2018; Leonov, 2022; Qian, 2019).; The need for digital innovation is more apparent than ever as Ghana's economy diversifies and the demand for accessible financial services increases.

A critical finding from the thematic analysis is the potential of CBDCs to enhance financial inclusion, particularly for the unbanked populations in Ghana. CBDCs could address gaps left by mobile money services, which, while successful, have limitations, particularly in reaching underserved areas. As one Bank of Ghana official stated

during a CBDC pilot briefing: “The e-Cedi is not just about financial inclusion but about reaching the last mile—those for whom even mobile money is inaccessible.” This finding aligns with global trends, where countries like Nigeria and China are using CBDCs to complement their digital financial ecosystems, particularly in rural areas. The introduction of the e-Cedi represents a forward-looking policy shift that could transform Ghana’s financial landscape. However, as stakeholders emphasized, the success of the initiative depends heavily on improving digital infrastructure and addressing issues related to internet connectivity, particularly in rural regions.

Ghana faces significant challenges in the digital infrastructure necessary for widespread adoption of CBDCs. Just like in any developing economy, emerging trends in existing literature attest to the fact that there are genuine concerns about cybersecurity risks and the ability to safeguard citizens’ financial data. One major challenge identified was the digital divide between urban and rural areas. Without improving digital literacy and expanding internet access, the risk of exacerbating the existing financial inclusion gap instead of closing it remains high. This insight mirrors the experience of other developing nations such as Nigeria, where CBDC implementation has been hampered by low internet penetration and lack of awareness, highlighting the need for parallel investments in infrastructure and public education. Comparative analysis shows that countries with more robust digital ecosystems, such as Sweden and China, have managed to overcome these challenges more effectively, underscoring the importance of technological readiness in the success of CBDCs.

Another key theme that emerged was the importance of public trust in the new digital currency system. Stakeholders from the financial sector expressed concerns about the cybersecurity risks involved with the implementation of CBDCs, noting that any breach of the CBDC system could undermine public confidence and set back the entire initiative. Comparative analysis with other countries, such as Sweden*, which has implemented rigorous cybersecurity protocols for its e-krona project, reveals that public trust is critical to adoption. In Sweden, ongoing public education campaigns and robust cybersecurity measures have been instrumental in fostering trust.

The comparative analysis reveals that while Ghana is taking important steps towards implementing a CBDC, it faces unique challenges when compared to other countries that have successfully launched or piloted CBDCs. China’s Digital Yuan and Sweden’s e-Krona are both supported by advanced digital infrastructures, making widespread adoption easier. In contrast, Ghana’s digital infrastructure lags behind, particularly in rural areas. Nigeria’s e-Naira pilot encountered similar issues to those Ghana is likely to face, such as limited public awareness and infrastructural barriers. Nigeria’s experience underscores the importance of digital literacy campaigns and robust policy frameworks, lessons that Ghana must heed as it moves forward with the e-Cedi.

6. Discussion

The introduction of the e-Cedi represents a significant opportunity for Ghana to advance its financial inclusion agenda and modernize its monetary system. By providing digital access to the formal financial system, CBDCs have the potential to extend services to unbanked populations, enhance payment efficiency, and reduce

transaction costs. Additionally, CBDCs can improve the effectiveness of monetary policy by offering the Bank of Ghana more precise tools for controlling inflation and managing the money supply. However, while the benefits of CBDCs are clear, it is equally important to acknowledge and explore the associated risks, particularly cybersecurity threats and potential impacts on financial stability.

The introduction of a digital currency system such as the e-Cedi exposes Ghana's financial system to significant cybersecurity risks. These risks include hacking attempts, fraud, and data breaches, which could undermine public confidence in the digital currency. Inadequate cybersecurity measures could lead to financial losses for users, disrupt transactions, and expose sensitive financial data to malicious actors. To address these cybersecurity concerns, the Bank of Ghana must invest heavily in building a secure digital infrastructure. The central bank must collaborate with international cybersecurity experts to design robust encryption and security protocols for the e-Cedi system. Also, regular security audits and penetration testing must be conducted to identify and resolve vulnerabilities. Furthermore, there should be the implementation of multi-factor authentication and secure digital identity verification to prevent unauthorized access. Developing a rapid response framework to handle security breaches and protect user data in case of cyberattacks is a must and lastly, creating the needed public awareness about cybersecurity practices will be essential to ensure that users are educated on how to protect their accounts and transactions.

The adoption of a CBDC could pose risks to the stability of the existing financial system. One potential issue is the disintermediation of traditional banks. If the public opts to hold their funds directly in CBDC accounts managed by the central bank rather than in commercial bank accounts, this could reduce the liquidity available to banks, limiting their ability to issue loans and finance economic activities. This could, in turn, lead to a contraction in credit supply, impacting economic growth. To mitigate the risk of disintermediation, the Bank of Ghana could consider implementing a two-tier CBDC system, where commercial banks act as intermediaries, managing CBDC accounts for the public. This would allow banks to remain central to the financial system while benefiting from the increased efficiency and security of the e-Cedi. The central bank must also consider setting limits on CBDC holdings where users can only store a certain number of e-Cedi in their accounts, encouraging them to continue using commercial banks for larger deposits and investments. The authorities must also explore the utilization of tiered interest rates for CBDC holdings to discourage large-scale shifts of funds from traditional bank accounts to CBDC accounts. These strategies would ensure that commercial banks remain vital players in the financial ecosystem, preserving their role in lending and economic development while allowing the e-Cedi to function as a supplementary payment and savings tool.

Ghana's current digital infrastructure presents significant risks for the successful implementation of CBDCs. In rural areas, where financial inclusion is most needed, internet access and digital literacy levels are low. Without the necessary technological infrastructure, the e-Cedi could exacerbate existing financial inequalities rather than resolving them. To ensure that the e-Cedi can be effectively adopted across all regions, the government must prioritize expanding internet access and improving mobile network coverage in rural areas, investing in digital literacy programs to educate the public, particularly in underserved regions, on how to use the e-Cedi and engage with

the digital financial system and offering offline functionality for the e-Cedi, allowing users in areas with limited internet connectivity to transact using the digital currency without requiring constant access to the internet. These infrastructural improvements will be crucial for ensuring the broad adoption and effectiveness of the e-Cedi, particularly in the regions that stand to benefit the most from increased financial inclusion.

The introduction of CBDC in Ghana also raises concerns about the protection of users' financial data and privacy. Centralized digital currency systems could allow the government or financial institutions to track and monitor individual transactions, raising questions about surveillance and the potential misuse of financial data. To safeguard privacy and build trust in the system, the Bank of Ghana must develop clear privacy policies outlining how data will be used, stored, and protected, ensuring compliance with data protection regulations, explore privacy-preserving technologies such as zero-knowledge proofs, which allow for the verification of transactions without revealing the underlying details and also create a transparent and accessible system for users to manage and control their personal data, giving them confidence in the security of their financial information.

While the e-Cedi offers significant benefits in terms of financial inclusion and modernization of monetary policy, a balanced approach is essential for its successful implementation. Ghana must carefully weigh the risks associated with cybersecurity, financial stability, and technological infrastructure against the potential benefits. By taking proactive measures to mitigate these risks, the country can position itself as a leader in digital currency innovation in sub-Saharan Africa.

7. Conclusion

This study explored the evolution of monetary policy in Ghana and the potential impact of Central Bank Digital Currencies (CBDCs) on the country's financial landscape. While traditional monetary policies have played a critical role in stabilizing the economy, they have been insufficient in addressing key issues like financial inclusion, particularly in rural areas. The introduction of the e-Cedi presents a forward-looking opportunity for Ghana to bridge this gap and enhance its digital financial ecosystem. However, as the analysis has shown, significant challenges, including technological infrastructure limitations, cybersecurity risks, and concerns over financial stability, must be addressed to ensure the success of the e-Cedi.

The study highlights that, for CBDCs to fulfill their potential, Ghana must prioritize investments in digital infrastructure, strengthen cybersecurity protocols, and foster public trust through education and transparency. Furthermore, collaboration with financial institutions will be essential to prevent the disintermediation of the banking sector and maintain the stability of the broader financial system. Overall, the e-Cedi offers a transformative opportunity to modernize Ghana's financial system, promote financial inclusion, and strengthen monetary policy tools. However, the country must adopt a balanced approach that mitigates risks and maximizes the benefits of digital currency adoption.

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Abbreviations

CBDC	Central Bank Digital Currency
IMF	International Monetary Fund

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