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The perils of Central Bank Digital Currencies

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Executive Summary:

Introduction

Central Bank Digital Currencies (CBDCs) are a breaking development in the financial world, representing digital forms of a nation's currency issued and regulated by the central bank. A priori, they are designed to enhance transaction efficiency and increase financial inclusion. However, their introduction also entails some inherent risks that must be managed and analyzed in a cautious manner. This thesis discusses the possible perils of CBDCs such as: financial instability, exchange rate volatility, public acceptance challenges among others. Policymakers, financial institutions and society at large need to understand these risks.

What are CBDCs

CBDCs are digital versions of national currencies that are meant to act as secure and efficient medium of exchange. There are two primary types: retail CBDCs, for the general public for their day-to-day transactions and wholesale CBDCs, designed to be used by banks for interbank settlements and operations. The global interest in CBDCs among central banks is rising due to potential benefits like enhancing payment systems and financial inclusion. However, their complexity restricts them from being implemented without a detailed scrutiny of the risks involved.

Potential risks of CBDCs

Financial instability is one of the major dangers involved in CBDCs and especially disintermediation risk. In the case of shifting from commercial bank deposits to CBDCs, banks' capacity to lend can be decreased with their funding costs rising while interest rates on loans may go up in return. This aspect could present a bigger challenge during times of economic downturn, thus worsening financial instability that would necessitate central bank interventions.

Exchange rate volatility is another significant risk. The ease and speed of CBDC transactions could lead to increased volatility, especially during periods of economic uncertainty. Speculative attacks may threaten weaker economies causing central banks to make frequent interventions in currency markets aimed at stabilizing their exchange rates. As a result, this will disrupt global trade and have very far-reaching ramifications for economies globally.

Another significant challenge is the acceptance by the public. In nations with low digital literacy and limited access to digital devices, CBDCs could face problems in their attempt towards going mainstream. Moreover, democratic countries may find the issue of privacy as a serious hurdle since they could think that government will increase surveillance on them leading to a rejection of CBDCs. Consequently, this opposition may impede their implementation, reducing their effectiveness.

Moreover, technological and cybersecurity risks are also critical. Due to the fact that CBDCs are digital, they can be compromised by cyber-attacks hence demanding robust

measures of securing them from all cyber threats. Also, old people or those who lack technical skills might not be able to use CBDCs thereby constituting barriers for the adoption of such means by many people. Well-drafted regulations framework should thus be enforced comprehensively to these ends.

Furthermore, businesses need clear incentives to adopt CBDCs. Without clear benefits such as cost reductions, companies may be reluctant to adopt CBDCs. This hesitance can retard general acceptance rates.

Impact analysis

The risks posed by the introduction of CBDCs do not affect the same across all regions. For example, the risk of bank disintermediation, which affects commercial banks by reducing their lending capabilities, impacts primarily small to medium sized economies that depend heavily on bank loans. During economic recessions, there is a higher financial stability risk brought about by a wide-scale transition to CBDCs which can worsen the instability.

Exchange rate volatility mainly impacts emerging markets, which may have a weaker financial ecosystem and are more vulnerable to speculative attacks. Rapid and uncertain fluctuations in exchange rates tend to interfere with international trade, impacting both exporting and importing businesses.

In terms of public adoption challenges, these occur more prominently in rural areas as well as under-developed regions, where digital infrastructure and knowledge is limited. Moreover, democratic countries, which are characterized as valuing privacy as one of the most important rights, may reject CBDC implementation because of fears of more government surveillance.

Technological and cyber-security risks are particularly relevant for countries with weak cybersecurity structures in place. Elderly populations and those with limited technological skills are particularly affected by the introduction of CBDCs. Moreover, CBDC implementation may be more difficult for emerging regulatory regimes, and large companies with established payment systems may find the transition to CBDCs more disruptive without clear benefits.

Potential solutions to mitigate risks

To improve financial stability, it is important to enhance deposit insurance schemes that would secure bank deposits of commercial banks and offer liquidity support to banks facing disintermediation problems.

Exchange rate volatility management can be done through the establishment of stabilization funds as buffers of exchange rate shocks and having clear policies for central bank interventions in times of extreme volatility.

In order to increase public acceptance, governments should invest in digital literacy programs. Additionally, building public trust in CBDCs requires enhanced legal frameworks protecting user privacy.

Addressing technological and cybersecurity risks involves developing and implementing advanced cybersecurity protocols and ensuring that CBDC platforms are user-friendly and accessible to all, including the elderly and technologically challenged populations.

Developing comprehensive regulatory frameworks is key towards successful implementation of CBDCs. Standardized regulatory guidelines can be created through international collaboration with financial institutions. This approach stresses on gradual implementation with adjustments based on initial feedback/outcomes hence reducing potential pitfalls thus ensuring a smoother transition.

Current Situation of CBDCs in the European Monetary Union

The European Union is actively exploring the development of CBDCs. They are running several pilot programs and research initiatives to assess how feasible they are and their implications. That's why the ECB is trying to make sure that CBDCs can be an integral part of existing payment systems as well as contribute to financial stability. These initiatives aim to address the potential risks while leveraging the benefits of CBDCs for the European monetary system.

The ECB predicts that the digital euro could be launched by the middle of this decade, sometime around 2025-26. However, these schedules are conditional upon several factors such as ongoing pilot projects results, public consultations outcomes and regulatory preparations.

Conclusion

While CBDCs offer promising benefits, their implementation poses significant risks that must be carefully managed. Regulators must act to mitigate these dangers, by setting up strong regulatory frameworks with emphasis on financial stability, consumer privacy and harmonizing with existing financial systems. Cybersecurity measures are also crucial against potential cyber threats, requiring continuous updates and collaboration with cybersecurity experts to maintain the integrity and security of CBDC systems.

Moreover, successful adoption of CBDCs requires public awareness and acceptance. The general community should be informed through inclusive educational campaigns about the merits and probable demerits of this invention by addressing concerns about privacy and improving digital literacy even for all age groups. A gradual phase based approach involving pilot programs and controlled rollouts can help identify any issues early that may arise ensuring a smoother transition. By ensuring careful planning and risk mitigation, CBDCs could bring various advantages thus fostering a stable and more inclusive future of finance.

Resumen Ejecutivo:

Introducción

Las Monedas Digitales de Banco Central (CBDCs) son un desarrollo crucial en el mundo financiero, representando formas digitales de la moneda de una nación, emitidas y reguladas por el banco central. Su objetivo es mejorar la eficiencia de las transacciones y aumentar la inclusión financiera. Sin embargo, su introducción conlleva riesgos intrínsecos que deben ser gestionados y analizados cuidadosamente. Esta tesis aborda las posibles desventajas de las CBDCs, tales como: inestabilidad financiera, volatilidad de los tipos de cambio, problemas de aceptación pública, entre otros. Los responsables de políticas monetarias, instituciones financieras y la sociedad en general deben comprender estos riesgos.

¿Qué son las CBDCs?

Las CBDCs son versiones digitales de las monedas nacionales con el objetivo de ser un medio de intercambio seguro y eficiente. Hay dos tipos principales: las CBDCs minoristas, destinadas al público en general para sus transacciones diarias, y las CBDCs mayoristas, diseñadas para ser utilizadas por bancos en liquidaciones y operaciones interbancarias. El interés global por las CBDCs entre los bancos centrales está aumentando a lo largo de los últimos años debido a sus posibles beneficios, como la mejora de los sistemas de pago y la inclusión financiera. Sin embargo, su complejidad impide su implementación sin un análisis detallado de los riesgos involucrados.

Riesgos potenciales de las CBDCs

La inestabilidad financiera es uno de los mayores peligros asociados a las CBDCs, especialmente el riesgo de desintermediación. La transición de los depósitos en bancos comerciales a las CBDCs podría disminuir la capacidad de los bancos para prestar, aumentando sus costos de financiación y elevando las tasas de interés de los préstamos. Esto podría representar un desafío mayor en épocas de recesión económica, agravando la inestabilidad financiera y requiriendo intervenciones de los bancos centrales.

La volatilidad del tipo de cambio es otro riesgo significativo. La facilidad y rapidez de las transacciones con las CBDCs podría aumentar la volatilidad, especialmente durante períodos de incertidumbre económica. Los ataques especulativos podrían amenazar a economías más débiles, lo que llevaría a los bancos centrales a intervenir frecuentemente en los mercados de divisas para estabilizar sus tipos de cambio. Esto, a su vez, interrumpiría el comercio global y tendría repercusiones de gran alcance en las economías a nivel mundial.

Otro desafío importante es la aceptación pública. En naciones con baja alfabetización digital y acceso limitado a dispositivos digitales, las CBDCs podrían enfrentar problemas en su intento de ser adoptadas ampliamente. Además, en países democráticos, la cuestión de la privacidad podría ser un obstáculo serio, ya que la población podría temer un aumento en la vigilancia gubernamental, lo que llevaría al rechazo de las CBDCs. Esta oposición podría dificultar su implementación y reducir su efectividad.

Los riesgos tecnológicos y de ciberseguridad también son también muy críticos. Dado que las CBDCs son digitales, pueden ser vulnerables a ciberataques, lo que exige medidas robustas para protegerlas de todas las amenazas cibernéticas. Además, las personas mayores o aquellas que carecen de habilidades técnicas podrían no ser capaces de utilizar las CBDCs, constituyendo una barrera para su adopción. Por lo tanto, se deben implementar marcos regulatorios de manera integral.

Además, las empresas necesitan incentivos claros para adoptar las CBDCs. Sin beneficios evidentes, como reducciones de costos, las empresas pueden ser reacias a adoptar las CBDCs, lo que puede frenar las tasas de aceptación general.

Análisis de Impacto

Los riesgos asociados con la introducción de las CBDCs no afectan de igual manera a todas las regiones. Por ejemplo, el riesgo de desintermediación bancaria impacta principalmente a los bancos comerciales al reducir su capacidad de otorgar préstamos, afectando principalmente a economías pequeñas y medianas que dependen en gran medida de los préstamos bancarios. Durante las recesiones económicas, hay un mayor riesgo de inestabilidad financiera derivado de una transición a gran escala hacia las CBDCs, lo que puede agravar la inestabilidad.

La volatilidad del tipo de cambio afecta principalmente a los mercados emergentes, que suelen tener un ecosistema financiero más débil y son más vulnerables a ataques especulativos. Las fluctuaciones rápidas e inciertas en los tipos de cambio tienden a interferir con el comercio internacional, impactando tanto a empresas exportadoras como importadoras.

Los problemas de adopción pública impactan de manera más prominente en áreas rurales y en regiones subdesarrolladas, donde la infraestructura digital y el conocimiento son limitados. Además, los países democráticos, que valoran la privacidad como uno de los derechos más importantes, pueden rechazar la implementación de CBDCs por temor a una mayor vigilancia gubernamental.

Los riesgos tecnológicos y de ciberseguridad son especialmente relevantes para países con estructuras de ciberseguridad débiles. Asimismo, la implementación de las CBDCs puede ser más difícil para regímenes regulatorios emergentes, y las grandes empresas con sistemas de pago establecidos pueden encontrar la transición a las CBDCs más disruptiva sin beneficios claros.

Soluciones potenciales para mitigar riesgos

Para mejorar la estabilidad financiera, es importante fortalecer los esquemas de seguro de depósitos que aseguren los depósitos bancarios y ofrezcan apoyo de liquidez a los bancos que enfrentan problemas de desintermediación.

La gestión de la volatilidad del tipo de cambio se puede realizar mediante el establecimiento de fondos de estabilización y la implementación de políticas claras para intervenciones del banco central en momentos de volatilidad extrema.

Para aumentar la aceptación pública, los gobiernos deben invertir en programas de alfabetización digital. Además, generar confianza pública en las CBDCs requiere mejorar los marcos legales que protegen la privacidad del usuario.

Abordar los riesgos tecnológicos y de ciberseguridad implica desarrollar e implementar protocolos de ciberseguridad avanzados y garantizar que las plataformas de CBDC sean amigables y accesibles para todos, incluyendo a las poblaciones mayores y aquellas con limitaciones tecnológicas.

El desarrollo de marcos regulatorios integrales es clave para la implementación exitosa de las CBDCs. Se pueden crear directrices regulatorias estandarizadas mediante la colaboración internacional con instituciones financieras. Este enfoque enfatiza una implementación gradual con ajustes basados en los resultados iniciales, reduciendo así posibles riesgos y asegurando una transición más fluida.

Situación actual de las CBDCs en la Unión Monetaria Europea

La Unión Europea está explorando activamente el desarrollo de CBDCs. Están llevando a cabo varios programas piloto e iniciativas de investigación para evaluar su viabilidad y sus implicaciones. Por ello, el BCE está trabajando para asegurar que las CBDCs puedan ser una parte integral de los sistemas de pago existentes y contribuir a la estabilidad financiera. Estas iniciativas buscan abordar los riesgos potenciales mientras se aprovechan los beneficios de las CBDCs para el sistema monetario europeo.

El BCE prevé que el euro digital podría lanzarse a mediados de esta década, alrededor de 2025-2026. Sin embargo, estos plazos están condicionados a varios factores, como los resultados de los proyectos piloto, las consultas públicas y los preparativos regulatorios.

Conclusión

Si bien las CBDCs ofrecen beneficios prometedores, su implementación presenta riesgos significativos que deben ser gestionados con cuidado. Los reguladores deben actuar para mitigar estos peligros estableciendo marcos regulatorios sólidos con énfasis en la estabilidad financiera, la privacidad del consumidor y la armonización con los sistemas financieros existentes. Las medidas de ciberseguridad también son cruciales para proteger contra amenazas cibernéticas, exigiendo actualizaciones continuas y colaboración con expertos en ciberseguridad para mantener la integridad y seguridad de los sistemas de CBDC.

Además, la adopción exitosa de las CBDCs requiere conciencia y aceptación pública. La comunidad en general debe ser informada a través de campañas educativas inclusivas sobre las posibles desventajas de esta innovación, abordando preocupaciones sobre la privacidad y mejorando la alfabetización digital para todos los grupos de edad. Un enfoque gradual basado en fases, que involucre programas piloto y implementaciones controladas, puede ayudar a identificar cualquier problema que surja, asegurando una transición más suave. Con una planificación cuidadosa y mitigación de riesgos, las CBDCs podrían brindar diversas ventajas, fomentando un futuro financiero más estable e inclusivo.

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0) Abstract

In the digital age, Central Bank Digital Currencies (CBDCs) have emerged as a promising frontier in the realm of payments and financial innovation. However, beneath their veneer of convenience and efficiency lurk a myriad of perils that demand meticulous examination. The following thesis sets out to analyze the potential risks associated with the issuance and possible adoption of CBDCs. The study will shed light on the complexities and implications surrounding the implementation of CBDCs, offering insights crucial for policymakers, financial institutions, and society.

The implementation of CBDCs poses significant risks, including potential financial instability, exacerbation of exchange rate fluctuations, and challenges related to public acceptance and privacy concerns. While CBDCs offer theoretical benefits, their adoption could lead to increased economic volatility and require robust regulatory frameworks to mitigate associated risks.

1) Introduction

What CBDCs are

The past decade has witnessed substantial and rapidly accelerating transformations in the financial and banking sectors as consumers travel towards digital payment methods. These changes have the potential to fundamentally reshape the workings of the banking system, impacting its stability and efficiency. With this transition to digital payments, central banks worldwide have initiated exploration into the design and potential issuance of a Central Bank Digital Currency (CBDC) (Auer et al., 2022).

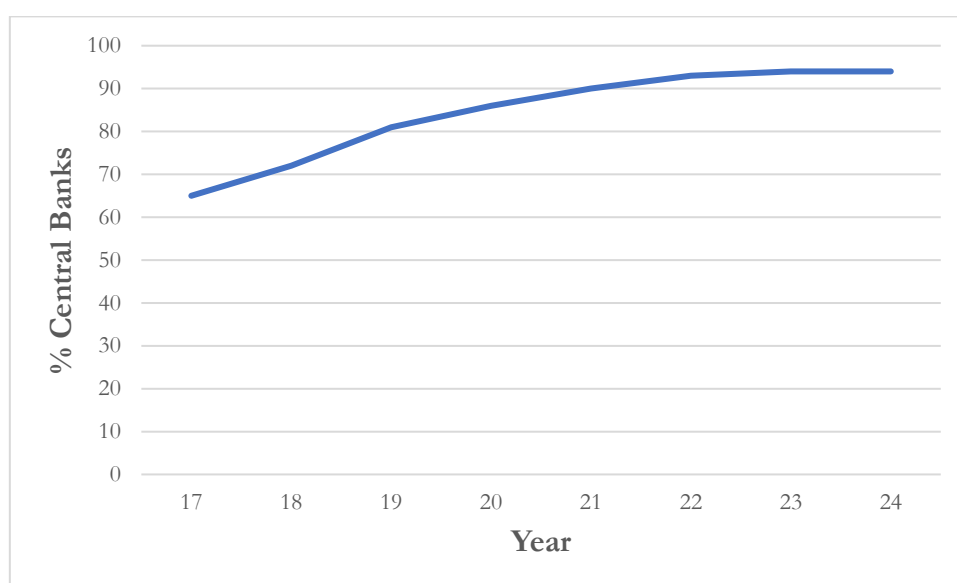
In this project, I will shed light on the immediate consequences of introducing Central Bank Digital Currencies (CBDCs). By examining potential impacts on financial stability, privacy, and monetary policy, I aim to highlight the critical issues and risks associated with the adoption of CBDCs. This analysis seeks to inform policymakers and the public about the challenges and opportunities presented by this emerging financial technology.

The Bank for International Settlements (BIS) initiated a wide-ranging study in late 2022, besides many other studies that have been carried out in the last few years, that aimed at understanding CBDC involvements of central banks, their reasons, and possible plans to employ such instruments. A total of 86 central banks took part in the research, and these involved both Advanced Economies and Emerging Economies.

Results further confirmed notable progress in the development of CBDCs with as many as 93% of those surveyed stating that they are actively involved. Additionally, more than half were engaged in concrete experiments as well as pilot programs targeted at advancing the development of CBDCs (Kosse and Mattei, 2023).

Figure 1 shows an upward tendency of how the issue has been approached over time by depicting increased engagement on behalf of central banks due to an expanding interest concerning digital currencies.

Figure 1: Engagement in CBDC work



Source: Results of the 2022 BIS survey on central bank digital currencies and crypto

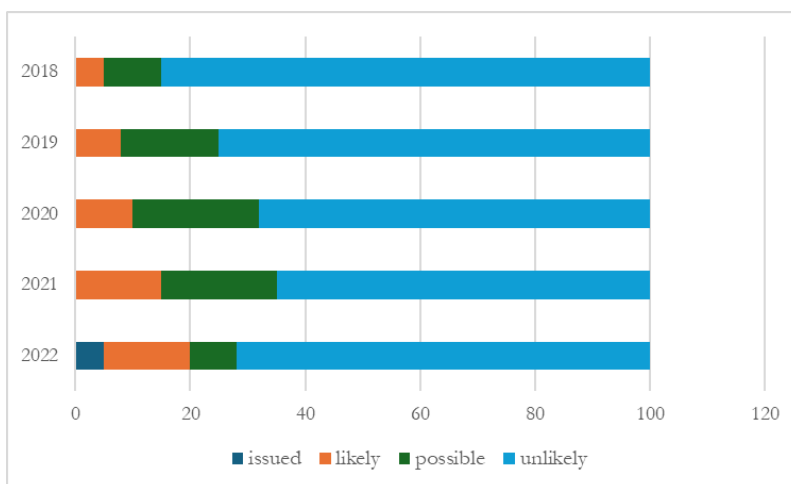
CBDCs are digital versions of money that are issued and controlled by central banks, and can be directed towards various economic, political, and social objectives. There are two primary types of CBDCs: retail CBDCs and wholesale CBDCs. Retail CBDCs are designed for the general public and can be used for everyday transactions, just as we use cash or digital payment methods. On the other hand, wholesale CBDCs are designed for interbank transactions and settlements (Auer and Bohme, 2021).

The extensive body of theoretical work on CBDCs examines their advantages as well as disadvantages such as when it comes to improving financial inclusion. Countries that opt for CBDCs do so with different objectives such as access to finance enhancement or modernization of payment systems among others. In an increasingly digitized economy, discussions about CBDCs have become more relevant especially in addressing issues like digital divide which is a hindrance to a more comprehensive financial ecosystem. This chapter is a short introduction to the multi-faceted framework of CBDCs that will serve as a basis for exploring their implications and potential applications in diverse socio-economic environments (Fáykiss et al, 2022).

Central banks are becoming less uncertain about the short-term issuance of a CBDC as the development keeps advancing. There has been a big shift, as in comparison to the previous years, some central banks are now more likely to introduce a retail CBDC within the next three years, while others are showing a decreased likelihood of doing so. Regarding wholesale CBDCs, the percentage of central banks considering the introduction of them in the short-term has more than doubled. According to the survey findings, it is projected that by the end of this decade, there could be 15 retail CBDCs and nine wholesale CBDCs in circulation among the public. It is worth noting that there are currently four live retail CBDCs in the world: The Bahamas, the Eastern Caribbean Monetary Union, Jamaica and Nigeria. In terms of wholesale CBDCs, there are currently none in existence (Kosse and Mattei, 2023).

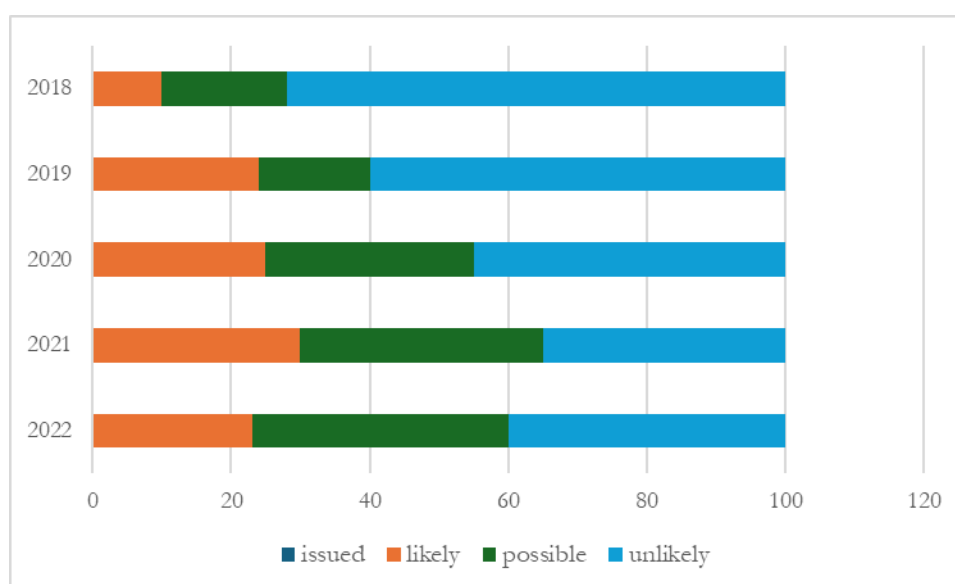
In the following graphs, we can see the comparison between the last recent years of the likelihood of issuing a retail CBDC in the short term and in the medium term.

Figure 2: Likelihood of issuing a retail CBDC in the short term



Source: Results of the 2022 BIS survey on central bank digital currencies and crypto

Figure 3: Likelihood of issuing a retail CBDC in the medium term

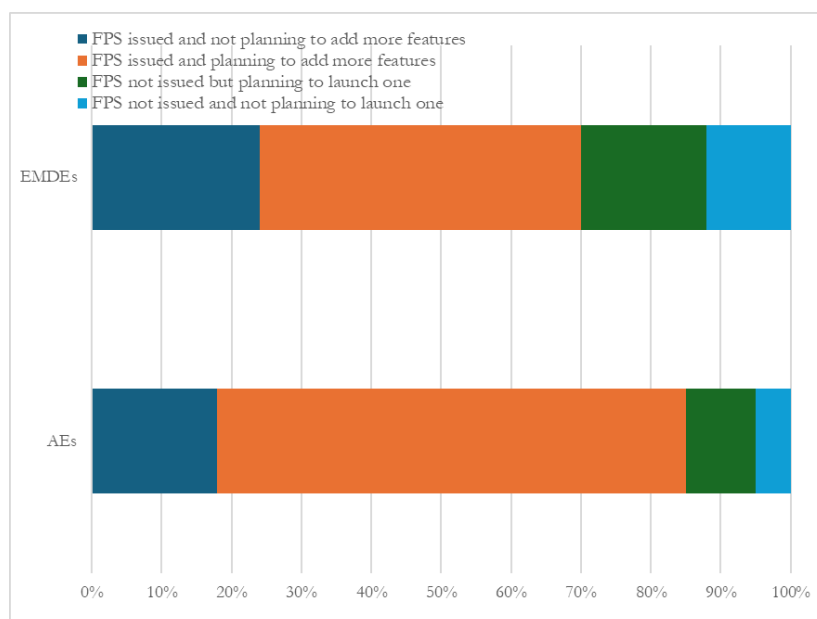


Source: Results of the 2022 BIS survey on central bank digital currencies and crypto

A priori, if CBDCs for retail use are introduced, they are likely to exist together with other local payment methods. Many regions already have or are planning to launch a faster payment system (FPS) and see the benefit of having both an FPS and a retail CBDC. This highlights the need to make sure that these new digital currencies can easily work with existing payment systems. This ensures that people and businesses can easily send and receive payments, no matter the payment method or the company providing the service.

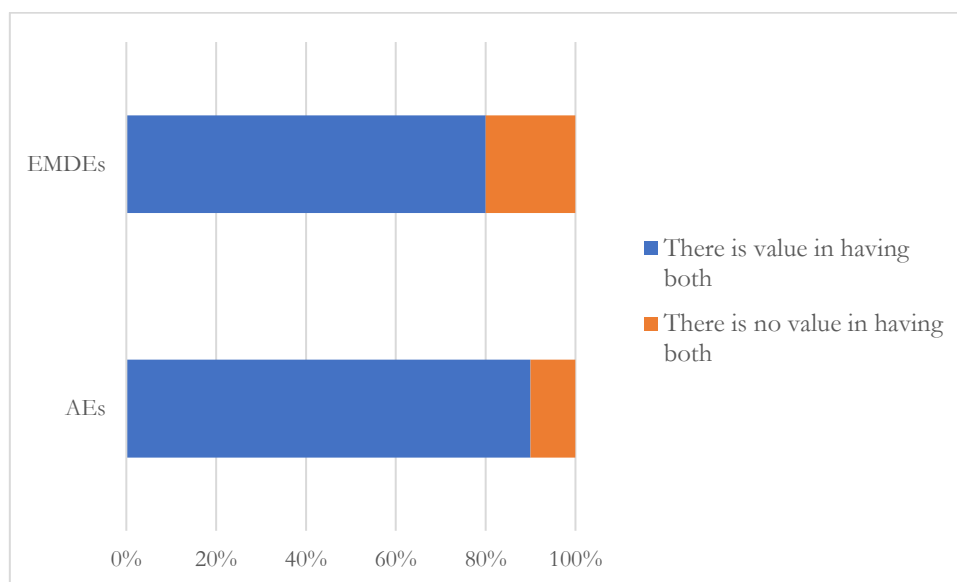
In the following graphs we can see how most central banks see value in having both a retail CBDC and a fast payment system:

Figure 4: Applicable statements



Source: 2022 BIS central bank survey on CBDCs and crypto.

Figure 5: Central banks' assessment of whether there may be value in having both an FPS and a retail CBDC.



Source: 2022 BIS central bank survey on CBDCs and crypto.

Developing wholesale CBDCs is primarily aimed at improving cross-border payments. To ensure that this objective becomes a reality, there should be interoperability of CBDCs

beyond national borders. A joint report released in July 2022 by the Committee on Payments and Market Infrastructures (CPMI), BIS Innovation Hub, International Monetary Fund (IMF), and World Bank identified and examined different methods of enabling each country access to and interoperability of CBDCs as tools for facilitating cross-border payments. The report emphasizes the need for international cooperation in the initial stages of designing CBDCs. This calls for collaboration among central banks from all over the world if the full potential benefits associated with both wholesale and retail CBDCs are to be realized in improving cross border payment systems.

So far, creators of digital assets like stable coins have increasingly expanded the range of use cases for their tokens. Initial purposes – speculative and store of value have now been changed to usable or as a means of transaction (Kosse & Mattei, 2023). However, investigations carried out currently show that stablecoins and similar digital specimens are rarely used to conduct transactions outside cryptocurrency ecosystem. Nonetheless, market fluctuations in crypto assets during 2022 through early 2023 demonstrated risks related to their poor designs and inadequate regulation. Periodic surveillance is vital for central banks in identifying emerging risks and dealing with them effectively within existing frameworks, supervision as well as tools (Kosse and Mattei, 2023).

CBDC classification based on different features

Retail and wholesale are the two major types of digital currencies that central banks have been discussing as seen in our previous discussion. However, these distinctions are just a fraction of what constitutes CBDCs because they are distinguished by many other attributes and categories. Thus, there can be several ways to divide the CBDCs into distinct classes using certain qualities or characteristics. The table below gives an idea about such classifications and is intended as a reference point for understanding the intricacies of Central Bank Digital Currencies within today’s digital finance landscape.

Figure 6: Types of CBDCs based on different features.

Based on use and target audience	Retail CBDCs	Wholesale CBDCs
Based on interest accrual	Interest-bearing CBDCs	Non-interest-bearing CBDCs
Based on limitations	Caps CBDCs	Non-caps CBDCs
Based on technology	Account-based CBDCs	Token-based CBDCs

Source: Author's own creation based on data from the Bank for International Settlements (2020).

1)Retail vs wholesale CBDCs

The terms "retail CBDC" and "wholesale CBDC" refer to different use cases or target audiences for these digital currencies:

Retail CBDCs have been designed for the general public, including corporations and individuals, to conduct day-to-day transactions like buying goods and services. For everyone's benefit, retail CBDCs foster financial inclusiveness through direct access to digital currencies. This may be through digitally issued tokens or deposit accounts in a central bank with benefits such as wider accessibility of financial services, reduced dependency on physical cash, no risks of third parties and tracking of money flows to guard against criminal activities.

On the other hand, wholesale CBDCs are aimed at financial institutions for interbank transactions and settlements. Wholesale transaction-based access to wholesale CBDCs is confined only to few financial institutions focusing mainly on settlement of interbank transfers and related wholesale transactions. These aim at simplifying interbank settlements; reducing traditional banking costs relating to infrastructure; eliminating counterparty risks; thus, enhancing efficiency in the financial system (Geroni, 2023).

2)Interest bearing vs non-interest bearing CBDCs

This classification refers to variations in how a central bank designs the digital currency with respect to interest accrual.

Interest bearing CBDCs allow their holders to earn interest on their investments. The CBDC interest rate set by the central bank may determine the level of interest paid. The introduction of interest-bearing CBDCs can have significant implications for deposit and lending markets. For example, an increase in the CBDC interest rate could result in variations in deposit rates at commercial banks that will affect market shares and loan volumes as well. Market dynamics can be influenced by how these new financial instruments are designed as it relates to deposit and lending behaviors, making it possible to bring different types of financial institutions to the same level.

On the other hand, non-interest-bearing CBDCs do not offer any interest on holdings, making them more akin to traditional cash in terms of value preservation. Their convenience, security and ability to replace physical cash transactions with digital alternatives are some value propositions of non-interest bearing CBDCs since they cannot earn users any interests. These might take up a form that looks like money or deposits, giving people a way of representing currency digitally without bothering about associated interests (Garratt & Zhu, 2021).

3)Caps vs non-caps CBDCs

CBDC caps imply that there are some restrictions or conditions that must be followed when implementing CBDCs. They can involve limiting the amount of CBDC issued, imposing regulatory controls or even restricting who can use it. The objectives of these caps on CBDCs might be to control inflation, stabilize, or support monetary policy.

On the flip side, non-caps CBDCs mean that there are no severe limitations or binding terms that guide the issuance of CBDCs. This simply implies a more adaptable way of carrying out digital currency without any strict maximum levels as well as checks. Considering this, no limits could help popularize CBDCs widely, accelerate innovation and address specific economic and financial objectives (Das et al, 2023).

4)Account-based vs token-based CBDCs

CBDC based on accounts consists of the holding of CBDCs by people or organizations in accounts that are associated with a central bank directly or through another party. It is like the traditional banking system where people have their own accounts and transaction records are kept in one place. Hence, this model requires authentication and access controls.

In token-based CBDC systems, digital currency is represented using cryptographic tokens. These are cryptographic units that can be moved between participants. Each token represents a certain value in a unique and secure manner. Token –based CBDCs utilize blockchain for transacting as well as validating transactions thereby allowing users to transmit tokens to each other directly without intermediaries. The tokens are decentralized whereby ownership is maintained by means of cryptographic keys.

The decision between account-based and token-based models for CBDC depends on various factors like the objectives of central banks, regulatory concerns, technological infrastructure and preferences of customers among others. Some CBDC projects may also incorporate elements from both models (Allen et al, 2021).

However, the relevance of differentiating between token-based and account-based CBDCs is diminishing. Initially, this characterization appeared useful for thinking about CBDCs, as “horseless carriages” did for cars. However, persisting with such distinctions in the course of central banks’ development of CBDC design may cause confusion and hide its practical significance, especially with regards to user anonymity.

Moreover, pure token based CBDC’s practicability is challenged since they do not exist currently as well as implementing them would likely require a break from existing systems. Even blockchain-based CBDCs inherently involve account elements, which makes it impossible to think in terms of a pure token model. In addition, there are legal concerns associated with providing retail CBDCs that raise questions about current regulatory frameworks.

Policy makers should instead explore other types of central bank digital currencies like intermediated or wholesale models, as it was explained before, in place of this outdated categorization. By doing so, these strategies can address privacy issues more subtly while resolving regulatory bottlenecks.

So generally speaking, as we go through different stages of CBDC initiatives, we need to change our perceptions and concentrate on more practical aspects rather than getting stuck up on old classifications (Chopic, 2022).

Why studying the drawbacks of CBDCs is relevant

The study of the negative aspects of CBDCs is not merely an academic exercise; rather, it is imperative considering their transformative impacts on the financial sector. CBDCs mean a change from conventional money systems that goes beyond economics. Consequently, when policymakers, researchers and public people embark on discussing this aspect they will be able to have the whole picture relating to risks involved with its implementation.

The first and most important reason to evaluate the downsides of CBDCs is that identifying risks helps in policy making which is essential for central banks that are concerned with maintaining financial stability. By outlining potential vulnerabilities associated with privacy concerns, fraud, cybersecurity threats, and individual rights among others, stakeholders can create strong strategies for risk management that will help in mitigating these risks more effectively (Ballivián & Tombini, 2023).

Moreover, public acceptance of CBDCs depends on being open about what they cannot do and what they mean to the society. By informing people about possible disadvantages, stakeholders may be able to manage expectations from the public and carry out informed deliberations which would enhance wider acceptability of initiatives towards introducing CBDCs (Ballivián & Tombini, 2023).

Furthermore, technological challenges inherent in developing CBDCs including scalability issues and compatibility with existing infrastructure call for thorough investigation. These challenges matter significantly in planning how it should be rolled out successfully and integrated into financial ecosystems without any difficulties (Anthony & Michel, 2022).

Moreover, studying their cons is crucial if our aim is to promote global coordination and cooperation given that CBDCs may mean a change in the shape of international financial systems. In this way, stakeholders can work towards harmonizing regulatory frameworks and mitigating cross-border risks by explaining how CBDCs might relate to other countries' monetary regimes and affect global financial stability (Papaioannou, 2022).

In addition, legal and regulatory frameworks form another key aspect of CBDC implementation. By addressing the legal and regulatory challenges associated with CBDCs, practitioners can develop comprehensive frameworks for their issuance, use and oversight, thereby ensuring conformity with existing laws and regulations (Bossu et al., 2020).

It is important to consider ethical considerations as well as social implications when discussing CBDCs. Ethical concerns have therefore become an important part of the discussion on CBDC development and deployment due to privacy issues, surveillance concerns as well as the need for financial inclusion (Bossu et al., 2020).

Summarizing, studying the disadvantages of CBDCs helps stakeholders navigate through unfamiliar territory while adopting digital money. Therefore, it enables individuals to make sense of the intricacies accompanying this revolutionary economic environment through highlighting potential pitfalls and engendering informed conversations about them.

The rest of the investigation is presented as follows: Section 2 summarizes the main manuscripts focusing on the possible impact of issuing a CBDC. Section 3 elaborates on the dangers of CBDCs in a detailed and orderly manner, arguing why they pose risks and

providing comparative examples from recent history. Section 4 provides a graphical representation of where the previously described dangers can have the most significant impact and why. Section 5 offers potential solutions that can be implemented to counteract the dangers associated with CBDCs. Section 6 describes the current situation of CBDCs in the European Monetary Union. Finally, section 7 concludes the thesis.

2) Literature review

The possible alterations that a CBDC could introduce to the banking system, financial stability, payments, monetary policy and financial inclusion have spurred researchers, both within and outside central banks, to construct theoretical models aimed at comprehending the potential impacts. Therefore, this investigation contributes to several literatures spanning the fields of economics of CBDCs, banking, financial stability, and payments. This work in particular is closely related to the recent literature that tries to understand the factors and determinants of issuing a CBDC, such as the following ones: Anhert explores the economics of CBDCs, discussing motivations for its adoption, implications for monetary policy and financial stability, and key policy challenges. It focuses on retail CBDC accessible to citizens and non-financial firms, excluding the discussion about wholesale CBDC for financial intermediaries (Anhert et al, 2022). Medina investigates the relationship between national development indicators and the adoption of central bank-issued digital currencies across 67 countries and suggest that that highly democratic countries with good governance are more likely to adopt CBDCs (Medina et al, 2023). Soderberg explores retail CBDCs amid the increasing digitalization of economies and offers a structured framework for policymakers, focusing on policy management aspects (Soderberg et al, 2023). Alfar examines factors influencing central banks' decisions to issue CBDCs and finds that underdeveloped economies are more likely to pursue CBDCs (Alfar et al, 2023).

Secondly, I also contribute to the literature analyzing the impact of issuing a retail CBDC in the banking system. The possibility that commercial banks could lose their traditional role as intermediaries of monetary policies, with CBDC being created to compete with interest bearing bank deposits, which may inhibit the process of credit creation by banks. However, a small interest earning on CBDC can induce financial institutions to offer more favorable terms thereby promoting intermediation (Chapman et al, 2023).

This is important because what transpires with CBDC depends on its convenience value vis-à-vis existing deposits and whether the newly launched currency has its own value proposition. This pattern might be favorable to financial intermediaries such as large banks, or it could go in favor of the smaller ones thereby affecting the distribution of both loans and deposits (Chiu et al, 2023).

The existing literature is extensive, but certain aspects have been overlooked, such as alternative funding sources, the impact on intermediary quality, disciplinary role played by banks and asset-side policies of central banks. Exploring new ways of financing is essential as banks might switch lost deposits to costly wholesale funding, thereby impacting

profitability and raising interest rate risk. Secondly, there should be more studies on CBDCs effects on banks functioning as a tool for promoting safer deposit taking.

My investigation tries to address these key issues so that we can understand how retail CBDCs will affect traditional banking systems. In doing so, I hope to contribute to what I know about financial institutions adapting and flourishing in a changing digital age.

Thirdly, this manuscript also relates to the literature that focuses on exploring the impact of a CBDC in financial stability and payments. Some of the existing literature is the following: Panetta discusses the considerations and potential implications of introducing retail Central Bank Digital Currencies (CBDCs), emphasizing their impact on financial stability and public policy objectives. It highlights the need for careful design to mitigate risks such as disintermediation of banks and uncertainty surrounding CBDC adoption and suggests exploring safeguards and policy interventions to address potential challenges, providing a framework for further analysis as CBDC design evolves (Panetta et al, 2021). Carapella and Flemming also discuss the potential effects of CBDCs on monetary policy, financial stability and welfare, and states that CBDCs can influence interest rates, taxes, and GDP in the long run, while also mitigating the impact of economic shocks, preventing bank runs by increasing the price level, but this may affect inflation targeting. CBDCs may improve welfare for unbanked households but could reduce it for banked households due to limited bank commitment (Carapella & Flemming, 2020). Anhert investigates the impact of CBDC on financial stability using a model of financial intermediation. The study finds that higher CBDC remuneration increases consumer withdrawal incentives, raising bank fragility. However, it also prompts banks to offer more attractive deposit contracts, reducing fragility. Thus, the relationship between CBDC remuneration and bank fragility follows a U-shaped curve (Anhert et al, 2023). Chapman states that competition with existing payment methods depends on the appeal of CBDCs to consumers. There are some models in order to predict demand that include consumer surveys and structural models. For instance, a Dutch survey found that 49% would consider opening a CBDC account. Desired features include theft protection, privacy, higher interest rates, and trust in central banks. Gaps exist in current research, such as incomplete data coverage and limited analysis of bank bundling services. Understanding CBDC demand requires considering consumer preferences, merchant acceptance, bank responses, and the adoption path. Closing these gaps is crucial for informed decision-making (Chapman et al, 2023).

3) Perils of CBDC

The foregoing sections have shown that the emergence of CBDCs is not a distant possibility but rather an imminent global reality. Strangely, however, most people do not know or are ignorant about central bank digital currencies. This signifies the need for broad knowledge and readiness to address the significant changes such systems imply both in economic and societal aspects.

We are on the brink of a paradigm shift that may render physical cash obsolete as governments and their central banks acquire unprecedented authority related to personal

finance. We should be ready for this transformative journey into the digital era where financial autonomy and privacy could assume new shape.

Therefore, this section examines deeply the main risks associated with CBDCs. The risks that will be analyzed are the following: technological risks and cyberattacks, bank disintermediation and financial stability, low adoption, privacy concerns and higher exchange rate fluctuations.

1) TECHNOLOGICAL RISKS/CYBERATTACKS

The risks associated with CBDCs in terms of technology and cybersecurity are significant and warrant careful consideration. CBDCs would gather lots of sensitive payment and user information, which makes them attractive for cyber-attacks and surveillance (Ballivián & Tombini, 2023). The collection of transaction data in a central location as is suggested by many CBDC designs carries serious privacy and security threats because it could be instrumental in monitoring citizen's payments activities and further enhance security risks that can attract more criminals (IMF, 2022).

Some tools such as zero-knowledge proofs and cryptographic hashing techniques can be used to authenticate private information with the ability to mitigate these risks without revealing such information which might lead to its compromise. However, the implementation of these tools is not without challenges, as they require extensive testing and validation to ensure their effectiveness and security (IMF, 2022).

Some severe implications can be associated with a cyber-attack on CBDCs that go far beyond just financial. It would undermine confidence in the infrastructure, the central bank and possibly the entire financial system. Besides, such an infringement might result from cyber-attacks or technical failures and create many different reputational, operational and legal outcomes, thereby affecting the stability and functionality of the financial ecosystem. Furthermore, storing huge sums of money in digital form makes the system more vulnerable to cybercrimes like hacking, fraud and data breaches which are significant threats to security and integrity of CBDC system (Shah, 2023).

Another concern is that CBDCs could be employed as a device for government control and surveillance, particularly in dictatorial countries where the probability of abusing these powers is high. Even within democratic states, there might be an excessive temptation to use CBDCs improperly for policy enforcement, eventually leading to loss of freedom (River Learn - Bitcoin Technology). The reason behind this is that CBDCs would be programmable, which raises significant concerns regarding privacy and autonomy. Even though CBDCs are praised for its contribution in the fight against corruption and money laundering, the surveillance and management of expenditures has a downside too. Current happenings such as how pandemic was managed have shown that these platforms can also be misused. This brings up moral queries on how authorities should control spending during calamities while stomping on individual freedoms. As programmable money is embraced, there must be clear rules and safeguards that will stop unnecessary intrusions and preserve privacy rights (Tolfsen, 2023).

For this reason, it is important to build strong protective measures and open regulatory systems for CBDCs that also guarantee human rights are safeguarded and promote proper safety measures and capacities in central banks (Ballivián & Tombini, 2023).

Furthermore, CBDCs could also provoke digital divide. With CBDCs working towards reducing exclusion in the financial system, it is still a challenge to people who cannot afford digital devices like smartphones or even have access to the internet. This will prevent the banks from lending, since their cost of risk will be higher, so the poverty will be widened and the segregation of the financial system in this way. People in rural areas or with the low incomes may have problems related with emerging digital financial lifestyle which may be caused by limited access to the resources or facilities.

To control this issue, policymakers and central banks would have to insert policies at places where the digital divide is felt most. This would require projects on affordable digital access, education programs on digital literacy or the broadcast of instructions on how to use ATMs, internet banking and other digital services, as well as creating and maintaining physical banking locations for people who do not use these services.

To anticipate which divides can arise among the citizens, CBDCs must be ready to accommodate these events. Proactively executing measures secures CBDCs alignment with a mission of financial inclusion, and development of a more democratic and accessible financial system (Lanquist & Tan, 2023).

2) BANK DISINTERMEDIATION/FINANCIAL STABILITY

The introduction of CBDCs presents significant challenges to the traditional banking sector, primarily through the potential disintermediation of banks. Disintermediation refers to a situation where customers hold their funds directly with the central bank instead of going through commercial banks. Consequently, such changes could result in reduced commercial bank deposit bases leading to less lending and higher funding cost. The Bank for International Settlements (BIS) notes that widespread adoption of CBDCs may lead to substantial withdrawal of deposits from the banking system thereby reducing access to credit and increasing the cost of bank funding (BIS, 2020).

Additionally, the impact of the disintermediation can worsen financial instability. If commercial banks lose deposits, they may have to resort to more dependence on wholesale funding, which is usually less stable than retail funding. Consequently, this could produce greater liquidity risks making banks even more susceptible during times of financial stress. In a new release by International Monetary Fund (2020) it was found out that, digital currencies could further make things worse through increasing systemic risks if not handled well with proper regulations and enough safety nets (IMF, 2020).

According to the European Central Bank (2019), CBDCs might also result in a new type of bank run whereby depositors could transfer their deposits from commercial banks to the perceived safer digital currency issued by the central bank. This scenario could create significant liquidity strains on banks and undermine the stability of the entire financial system (ECB, 2019).

To mitigate these risks, central banks and regulators must consider implementing measures such as limits on individual CBDC holdings or tiered remuneration systems to discourage mass withdrawals from commercial banks. The World Economic Forum (2020) provides a policy-maker toolkit that highlights various approaches to addressing the disintermediation risks posed by CBDCs, emphasizing the need for careful design and robust regulatory frameworks to ensure financial stability. By addressing the potential for disintermediation and implementing strategic safeguards, the transition to a digital currency can be managed in a way that minimizes risks to the banking sector and maintains overall financial stability (WEF, 2020).

3) LOW USAGE/ADOPTION

Lack of public usage and acceptance is one of the major obstacles facing CBDCs implementation. If CBDCs have any real-life benefits over digital payment systems that already exist, they remain theoretical at best, like transaction efficiency and increased financial inclusiveness. Widespread adoption may be delayed by poor knowledge and limited understanding of CBDCs in the public domain as recently pointed out by BIS. Because there are no clear value additions to a new currency regime, customers and firms may be hesitant to adopt it especially if it has trivial advantages over other well-known modes of payments (BIS, 2020).

Moreover, the introduction of CBDCs could face resistance due to concerns over privacy and surveillance. Many individuals value the anonymity and privacy offered by cash transactions, which CBDCs do not replicate. Lack of strong privacy safeguards would make users avoid use of CBDCs due to fear of increased control by governments and improper utilization of personal data as pointed out by the International Monetary Fund (2020). In fact, the absence of trust within these systems paves way for low acceptance levels thereby hindering CBDC adoption since privacy is a critical aspect for most individuals (IMF, 2020).

The technological barrier to adoption is another critical issue. There are significant improvements that need to be made in the current financial infrastructure and make it easier for users. In addition, there will be older populations and individuals with poor technological skills who may shy away from using CBDCs due to their intricate systems. If CBDCs are not user-friendly, they won't receive wide acceptance because there are still some groups within the society which hate digital technologies (ECB, 2019).

Furthermore, the absence of apparent benefits to companies for accepting CBDCs might further restrict their employment. A lot of businesses usually need strong motivations to change payment systems such as cost reduction or increased effectiveness. The World Economic Forum however indicates that firms may not appreciate the significance of adopting CBDCs in so doing without obvious and meaningful advantages particularly if there are many initial expenses or disturbance of the current operations. This lack of confidence by businesses might pose as a serious impediment towards overall adoption of CBDCs (WEF, 2020).

These challenges must be critically addressed to ensure that CBDCs do not remain a niche innovation with limited impact on the broader financial system.

4) HIGHER EXCHANGE RATE FLUCTUATIONS

The introduction of CBDCs has the potential to exacerbate exchange rate fluctuations, posing significant risks to the stability of national economies. One of the primary fears is that CBDCs might lead to more instability in the currency market due to easy remittance and potentially higher money velocity. According to BIS, quick movement of large amounts of digital currencies across borders could amplify fluctuations in exchange rates especially when there is an economic downturn. This increased volatility makes it difficult for monetary policy to be stable thereby affecting international trade (BIS, 2020).

CBDCs' capability to be readily used and globally could subject smaller economies that have weaker financial systems to speculative attacks. According to the International Monetary Fund, Speculative investors might take advantage of CBDCs in order to move their funds rapidly in and out of countries, hoping for short-term changes in the exchange rate. Such actions may knock down exchange rates and force central banks to undertake more currency market interventions which might be expensive and recurrent (IMF, 2020).

The European Central Bank also stresses that the adoption of CBDCs may weaken conventional exchange rate regulation tools. Faster and more transparent transactions enabled by CBDCs could interfere with central banks' control over capital flows as well as their exchange rate management through traditional channels such as adjusting interest rates or using foreign exchange reserves. Moreover, these developments may cause a greater frequency and intensity of changes in currency values thereby complicating economic administration even more (ECB, 2019).

In addition, the World Economic Forum claims that the introduction of CBDCs can cause competitive devaluation among countries that are trying to win in trade. In case numerous nations embrace CBDCs, they may employ monetary policies of competition to reduce the value of their digital currency so as to make their goods cheaper on the world market and thereby boost export. Such steps would be possible triggers for "race-to-the-bottom" which could lead to severe exchange rate instability and hinder global economic integration (WEF, 2020).

The ease and speed of transferring digital currencies could lead to increased market volatility, speculative attacks, reduced effectiveness of traditional exchange rate controls, and competitive devaluations. These factors must be critically evaluated and mitigated to prevent destabilizing effects on the global financial system.

4) Map classification of CBDCs' risks

In this section, I am going to map each of the previous risks that have been discussed and then I will provide an analysis of why these risks may affect more to some regions than others. From figure 7 to figure 16, countries that appear on grey have not been analyzed because not enough information was found in order to determine a score that fits them.

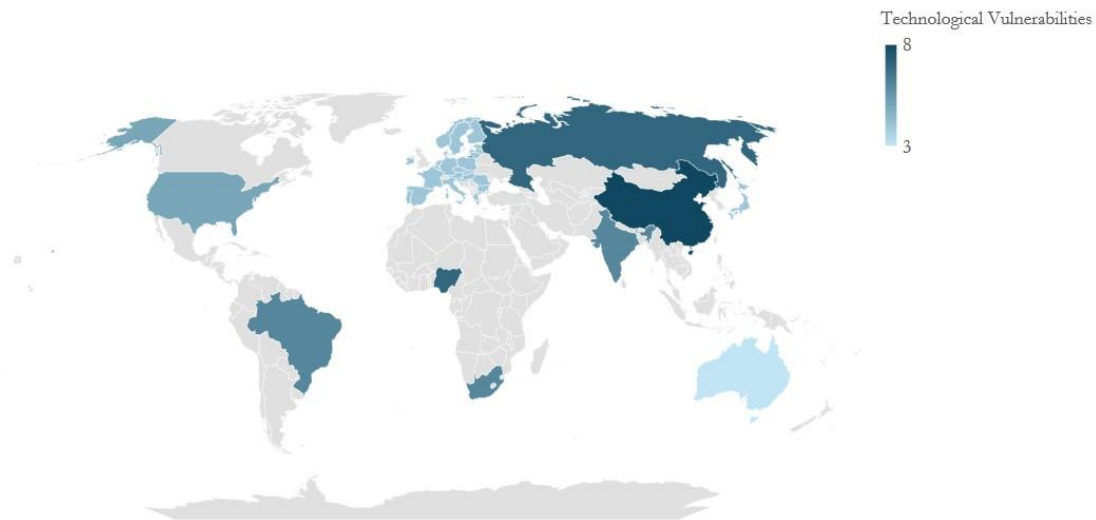
To determine the scores of the countries, I have followed a specific methodology. I have made use of existing literature review from reputable sources such as BIS, IMF or WEF, categorizing risks into cybersecurity, privacy, digital literacy, financial stability, and public acceptance. Data from these sources and from expert opinions were used to assess each country on a scale of 1 to 10. High scores (7-10) indicate high risk, medium scores (4-6) indicate moderate risk, and low scores (1-3) indicate low risk.

1) TECHNOLOGICAL RISKS/CYBERATTACKS

I am going to break down this risk into 3 subcategories in order to provide more valuable insights:

Technological vulnerabilities and cyber-attacks

Figure 7: Technological vulnerabilities and cyber-attacks



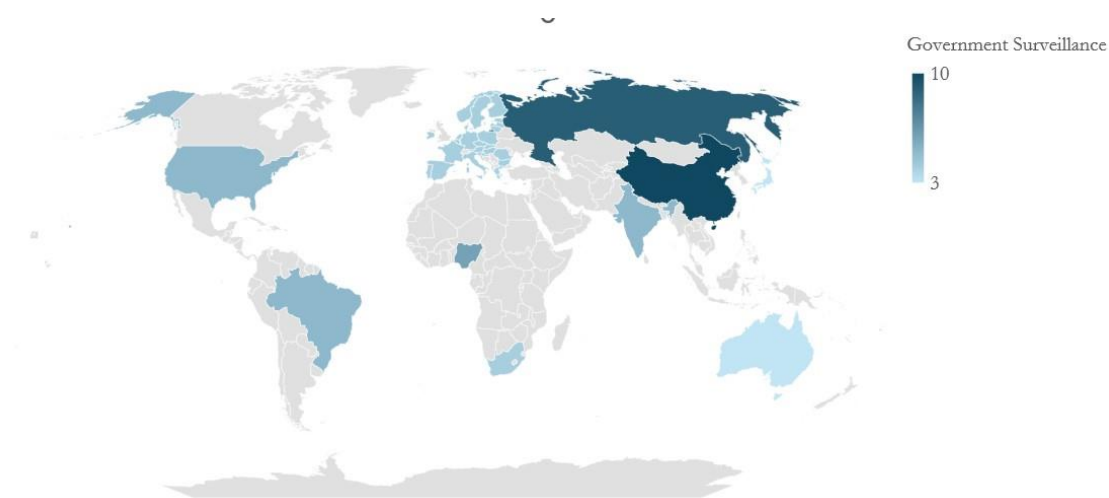
Source: Author's own creation

As we can see in the map countries like China and Russia have high scores because of their advanced technological infrastructures as well as significant cybercrime activities displaying big cybersecurity fears. The high-risk environments in these countries are indicated by China's extensive control and monitoring-oriented cybersecurity strategy on one hand, and a strong cyber warfare capability of Russia on the other (Connell, 2020).

Developed countries like the United States and European Union members have moderate scores, indicative of well-established cybersecurity frameworks but persistent cyber threats. The United States has comprehensive cybersecurity frameworks through the National Institute of Standards and Technology, while the European Union maintains substantial protective measures. Finally, countries like Japan and Australia have low scores due to their strong cybersecurity measures and lower cybercrime activities constituted by robust cyber defense postures (Ministry of Internal Affairs and Communications Japan, 2021; Australian Cyber Security Centre, 2022).

Government surveillance

Figure 8: Government surveillance



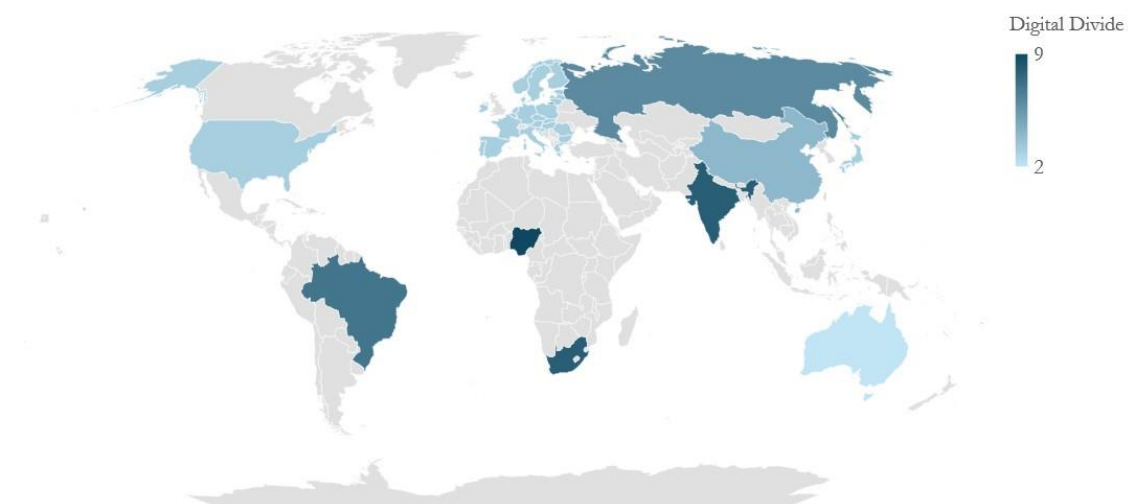
Source: Author's own creation

Prevalent government surveillance in countries like China and Russia results in the highest scores due to their significant use of advanced technological infrastructures for extensive monitoring and control. The high privacy intrusion risks and cyber security threats are represented by the amplified cyberspace capacities in Russia, as well as China's overall surveillance coverage that includes its Social Credit System. These measures can easily be combined with CBDCs to exacerbate concerns over government outreach and privacy infringement (Kshetri, 2021).

In contrast, democratic countries like the United States and those in the European Union have moderate scores. They represent nations that worry about watching out for policy enforcement, but they do so within legal frameworks that protect people's privacy. For instance, the US has complicated privacy laws such as the Fourth Amendment while in the EU there is General Data Protection Regulation (GDPR) which tries to balance between benefits of digital currencies and individual right to privacy. Even though these nations still face hurdles on potential abuse of CBDCs for surveillance, they must be continually watchful through strong legal protections (National Institute of Standards and Technology, 2022).

Digital divide

Figure 9: Digital Divide



Source: Author's own creation

Countries like Nigeria, India, and South Africa have high scores due to significant portions of their populations lacking access to digital devices or the internet. Bridging the digital divide in these areas is a major challenge that diminishes the potential benefits of CBDCs and perpetuates financial exclusion. In these nations, limited infrastructure and low levels of digital competency hinder the effective implementation of CBDC initiatives without significant efforts to increase digital access and education (Lanquist & Tan, 2023).

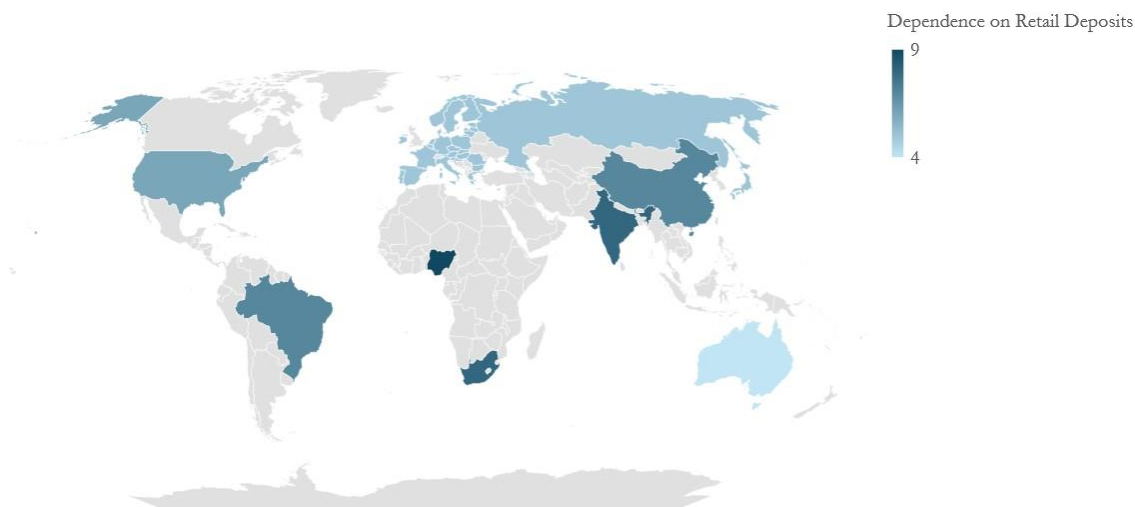
On the contrary, developed countries such as Japan, the European Union, and Australia have lower scores due to widespread access to technology and higher levels of knowledge about its usage. These regions have advanced technological infrastructures and strong policies that support digital inclusion which make it easier for their people to adopt and use CBDCs. Thus, compared to developing nations, there is much less risk in relation to digital divides in these countries (Fáykiss, Nyikes & Szombati 2022).

2) BANK DIDINTERMEDIATION/FINANCIAL STABILITY

As I did with the previous risk, this one will also be broken down into 3 subcategories in order to make a more disaggregated analysis:

Disintermediation risk due to high dependance on retail deposits

Figure 10: Disintermediation risk due to high dependance on retail deposits



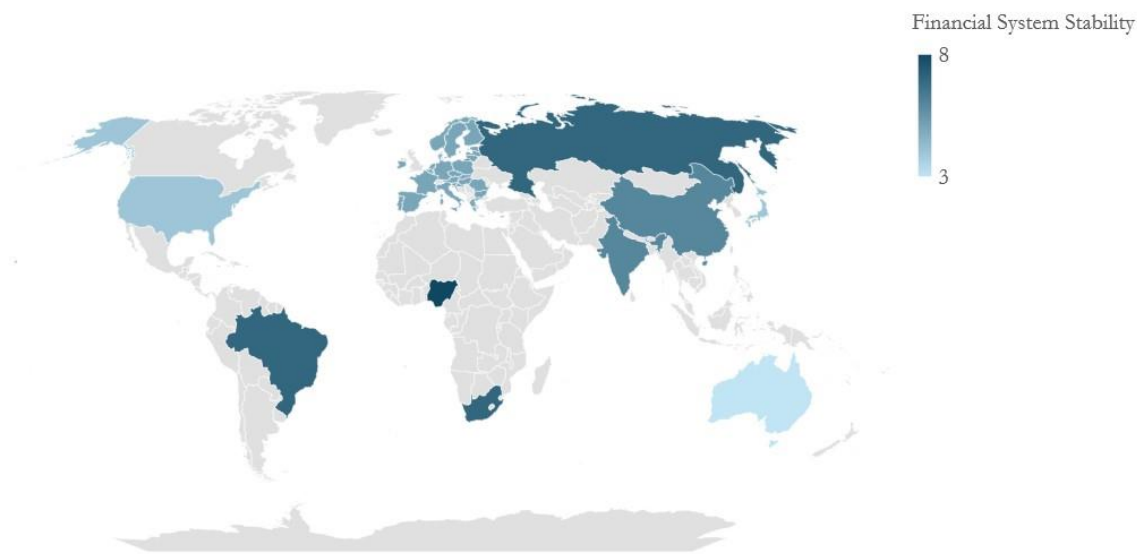
Source: Author's own creation

Countries that depend heavily on retail deposits, such as Nigeria, India, and South Africa, are particularly vulnerable to disintermediation risks posed by CBDCs. The lending capacity of these banks may be reduced, and the funding costs may increase if there is a significant withdrawal of deposits from commercial banks due to CBDCs. The movement of money into central bank accounts from commercial banks could destabilize the traditional banking sector, necessitating increased reliance on wholesale funding which is less dependable and costlier than retail deposits (Chapman et al., 2023).

In contrast, countries with more diversified banking systems and stronger financial infrastructures, such as those in the European Union and the United States, are less susceptible to these risks. These include having deeper financial markets enabling them to resist possible disintermediation impacts. This means in case the use of CBDCs becomes more popular in these countries, then their impact on the banking sectors would not be as harsh as compared to that one on economies relying heavily on retail deposits (Adalid et al., 2022).

Financial system stability

Figure 11: Financial system stability



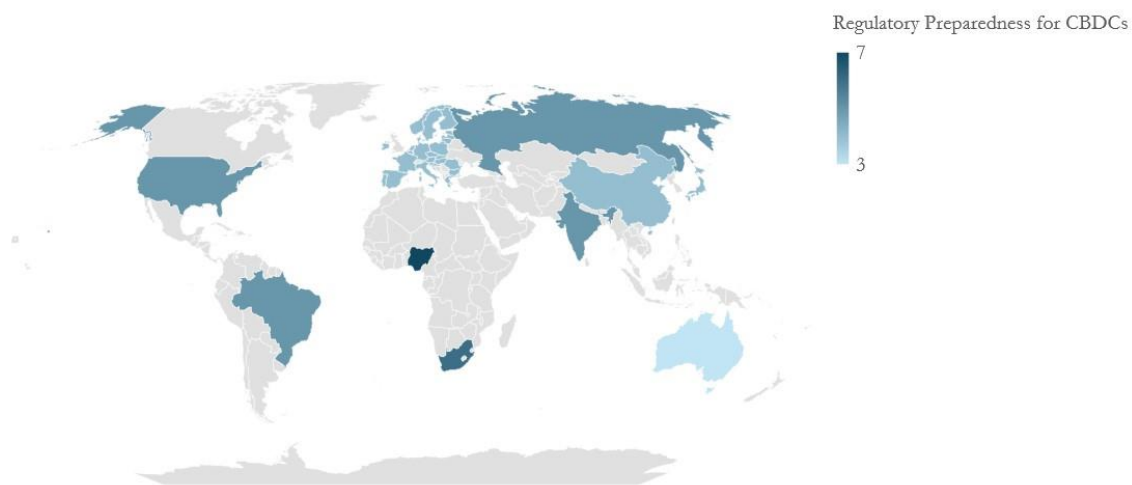
Source: Author's own creation

Countries like Brazil and Nigeria, which have witnessed economic instability in the past are at greater risk of being affected negatively by CBDCs introduction if necessary protective measures are not put in place. Implementation of CBDCs could lead to a different type of bank run where people pull money out of traditional banks and invest it in the new digital currency for fear that their savings will be eroded away. This can enhance financial instability and create serious liquidity problems for commercial banks (Papaioannou, 2022).

In such scenarios, commercial banks may struggle with maintaining sufficient levels of liquidity which could lead to possible credit squeeze as well as higher borrowing costs. As a result, these economies' financial systems may turn to be more fragile, undermining their economic stability and worsening the overall financial health. Therefore, countries with a history of financial instability should establish watertight safeguards while introducing CBDCs so as to mitigate these risks (Anhert et al., 2023).

Regulatory Preparedness for CBDCs

Figure 12: Regulatory Preparedness for CBDCs



Source: Author's own creation

Countries like Nigeria and India have weaker regulatory frameworks for digital currencies, making it challenging to implement CBDCs in a way that mitigates risks. This could make the financial system vulnerable to systemic risks, as a result of lack of safety nets and regulatory measures which may render the financial system unstable and operationally weak. The absence of strong regulatory environment can increase chances of operational weaknesses and instability (Papaioannou, 2022).

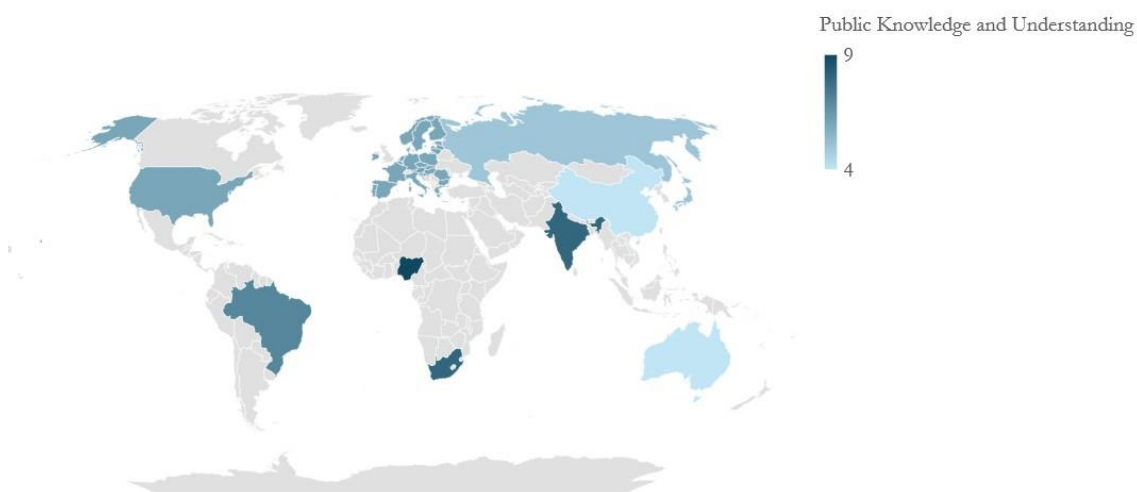
On contrary, the European Union (EU) and Australia are better placed to transition into CBDCs with minimal negative consequences. These regions have robust proactive regulatory systems which form a solid basis upon which CBDCs can be effectively implemented. Their comprehensive regulatory frameworks help ensure stability and operational resilience, reducing the risks associated with CBDCs and promoting a smoother transition (Anhert et al., 2023).

3) LOW USAGE/ADOPTION

Low usage of CBDCs could be based on several factors, as explained in the previous section. Therefore, let's break down this peril into subcategories:

Public Knowledge and Understanding

Figure 13: Public Knowledge and Understanding



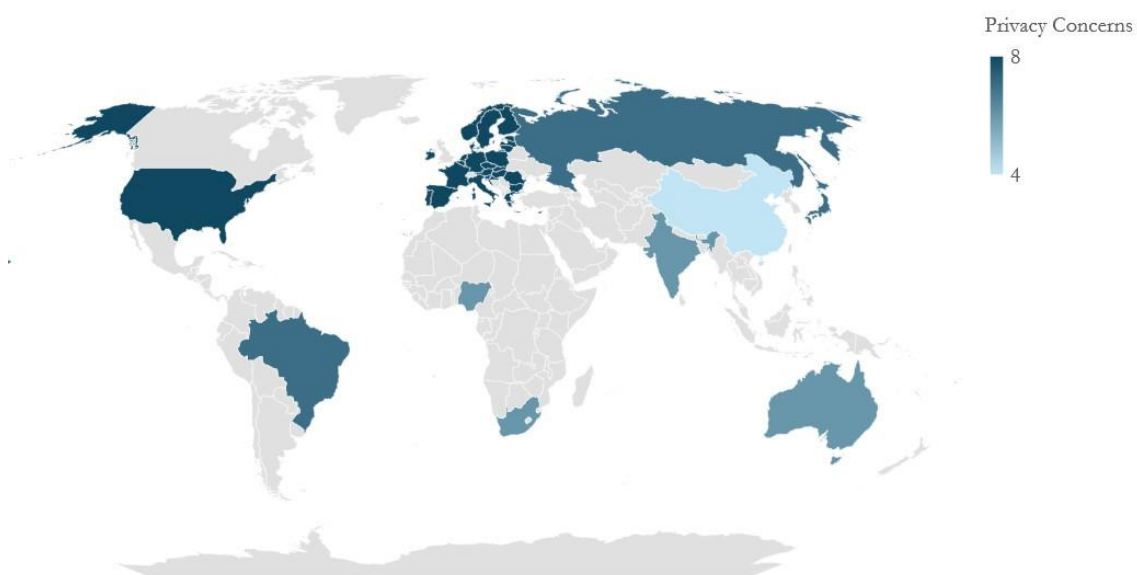
Source: Author's own creation

Countries like Nigeria, India, South Africa and Brazil that have generally low awareness and understanding of digital financial products can expect their public to reject CBDCs. These nations are not well acquainted with digital payment systems thereby making the implementation of CBDCs more difficult. The absence of computer literacy among the populace may impede them from grasping the usefulness of CBDCs leading to a low adoption rate (Kosse & Mattei, 2023).

In contrast, countries such as Australia and China might face fewer problems in this regard because they already possess strong public knowledge and perception about digital finance products. Knowing how e-finance works tends to be an advantage when it comes to smoothly shifting to or accepting new forms of money like CBDC (Fáykiss, Nyikes & Szombati, 2022).

Privacy concerns

Figure 14: Privacy concerns



Source: Author's own creation

Countries that emphasize privacy and data protection as crucial factors for implementing CBDCs, such as the European Union and the United States, may face more opposition to these currencies. The inhabitants of these areas are specially aware of privacy and mass surveillance making them reluctant to adopt cryptocurrencies that could compromise their anonymity. This cultural and legal emphasis placed on privacy laws may significantly delay the adoption of CBDCs (Papaioannou, 2022).

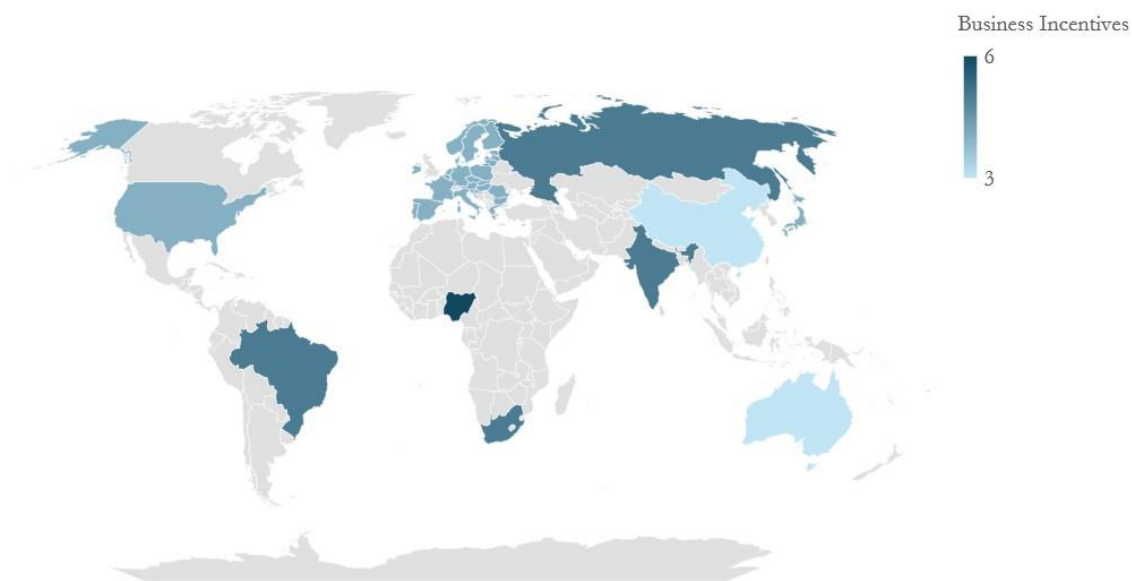
On the other hand, China with its different norms about surveillance and privacy might face less pushback over these issues. The acceptance of government surveillance in daily life is more familiar, thus reducing the negative impact that concerns about private life might have caused. This cultural consent serves a smoother launch plus integration into China regarding CBDCs (Tolfsen, 2023).

Technological barriers

This factor will not be represented in a map because it is the same case as digital divide. Countries like Nigeria, India or South Africa, which have low levels of technology and digital literacy, are likely to encounter more difficulties in the adoption of CBDCs. On the other hand, countries like Australia, with robust technological infrastructure and higher digital literacy, are less likely to face these barriers.

Business incentives

Figure 15: Business incentives



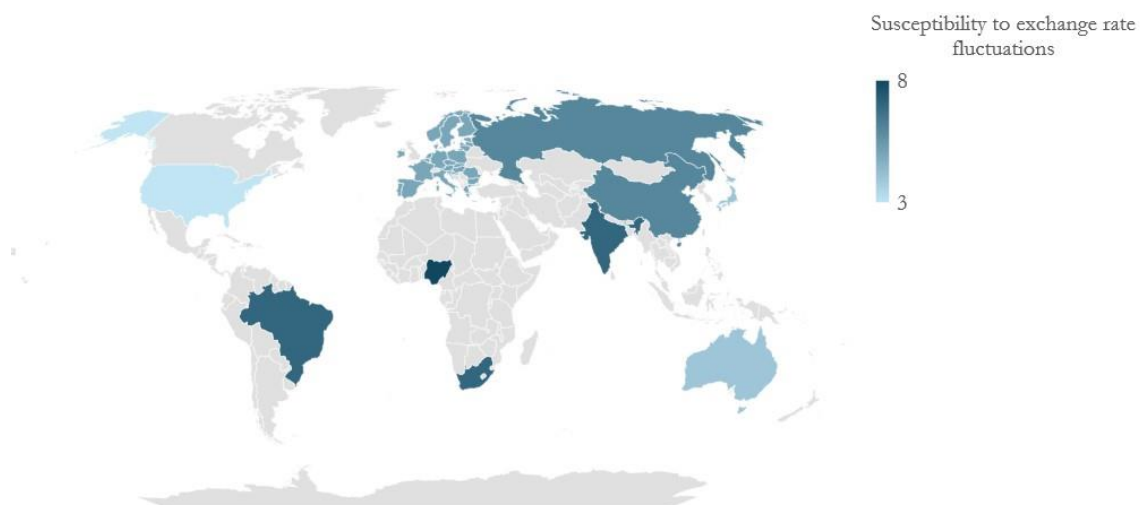
Source: Author's own creation

Countries such as Nigeria and Brazil, where businesses are not provided with clear incentives to switch to CBDCs, might experience slower adoption rates. In these locations, firms may lack impetus to change from physical currencies into digital ones as no obvious benefits are seen in terms of reduced costs or better service quality (Anthony & Michel, 2022).

On the other hand, states like China and Australia who have more attractive business conditions for new technology adoption might notice quicker embrace of CBDCs. Supportive policies and incentives for adopting digital innovations in these areas could significantly hasten the implementation and acceptance of CBDCs thus enabling a faster transition to e-currencies (Lanquist & Tan, 2023).

4) HIGHER EXCHANGE RATE FLUCTUATIONS

Figure 16: Susceptibility to exchange rate fluctuations



Source: Author's own creation

The map shows that countries like Nigeria and South Africa are particularly at risk because of their large economy sizes and fragile financial systems. These countries face several risks including fluctuation of exchange rate, speculative attacks on currencies as well as using traditional exchange rate regulation tools that are ineffective. Additionally, they are more prone to competitive devaluation, where rapid transfers of digital currencies between countries can lead to increased instability in their currency markets. These countries may resort to competitive devaluations to boost exports, but such actions could further destabilize their economies (Geroni, 2023).

Moreover, the rapid movement of digital currencies exacerbates the instability of currency markets in these countries. They have not only to manage exchange rates with normal tools but also deal with a more likely possibility of competing devaluations. While such devaluations might provide immediate economic relief through increasing export competitiveness, they imperil long-term monetary stability and economic destabilization (Papaioannou, 2022).

5) Possible solutions to be implemented

The potential threats that could result from the application of CBDCs have been explored in the previous sections. However, these are very serious issues and at the same time, CBDCs are an inevitable part of financial evolution and have no chances to stop this process. Therefore, it becomes pertinent for managing organizations to invest time in such risks'

anticipation and prevention. In this section, I will describe the best containment strategies for each of the mentioned risks, so that we are properly prepared to address the difficulties arising from the implementation of CBDCs.

1) TECHNOLOGICAL RISKS/CYBERATTACKS

The implementation of CBDCs must be safeguarded against the risks of technology and cyber-security. The provision of government information systems has been a source of concern as it is open to cyber-attacks, theft or loss. This calls for strong mechanisms that can help in addressing the issue of security. Nevertheless, it is important to stress that these security measures need verification and testing before they can guarantee full protection against threats. These technologies still have to go through serious real-life scenarios testing and validation so as to ensure their viability and dependability in different situations. In the same breath, governments and central banks should form an alliance with cybersecurity specialists towards coming up with mechanisms that will make sure that this respect framework possesses state-of-the-art defense (IMF, 2022).

Another main issue is the possible government control and surveillance via CBDCs particularly in a despotic country. Therefore, there should be well defined and transparent legal frameworks that safeguard the personal privacy of people and prevent any abuse of CBDCs for law enforcement purposes. In addition to this, imposition of strong data protection rules as well as an independent oversight will ensure that CBDCs are used morally without interfering with the rights and freedoms of citizens. Moreover, involving civil society as well as stakeholders in developing policies related to CBDCs may provide a much-needed balance between the advantages of digital currencies and preservation of human autonomy (Tolfsen, 2023).

To ensure that CBDCs do not make financial exclusion worse, addressing the digital divide is important. Policymakers need to fund projects aimed at enhancing the access of people to digital services in remote places and other underserved areas such as rural areas. All citizens of these countries must have access to programs on how they can improve their skills regarding using computer software and devices which will help them in participating actively in activities that take place online and they are connected with economics. Also, CBDCs should support physical banking system while providing for alternative means of accessing finances for those who cannot go digital (Lanquist & Tan, 2023).

To balance CBDC implementation, central banks should continuously engage with stakeholders like banks, tech companies and even the public. This collaboration can assist in identifying risks that may arise and develop ways of mitigating them. Also, pilot projects and gradual release of CBDCs may provide invaluable lessons and allow for adjustments from feedback on how it works. Central bankers can ensure that CBDCs are developed and deployed in a way that maximizes advantages while reducing disadvantages by being measured and having inclusive approaches (Ballivián & Tombini, 2023).

2) BANK DISINTERMEDIATION/FINANCIAL STABILITY

In order to prevent bank disintermediation, one effective solution is to design CBDCs in a way that makes them less attractive than commercial bank deposits. For example, central

banks can put limits on how much CBDCs individuals can have or employ tiered remuneration systems by offering lower interest rates on CBDCs as compared to commercial bank deposits. This will ensure that traditional banking services remain attractive while enjoying the benefits brought about by the use of CBDCs (BIS, 2020).

To address greater liquidity risks and financial instability, central banks could adopt sound regulatory frameworks for enhancing stability and resilience in the financial system. These measures should include requirements for maintaining liquidity and conducting stress tests for commercial lenders should be developed in order to prepare them well for situations involving large scale outflows of deposits. As well as that making clear guidelines and safety nets like access to central bank liquidity facilities can reduce the intensity of sudden shifts in deposit bases (IMF, 2020).

Another possible solution is to create a two-tier system where commercial banks act as intermediaries for CBDC issuance and distribution. According to this approach, individuals would hold CBDCs through commercial bank accounts rather than directly with the central bank. This can help retain the role of commercial banks in the financial system to safeguard their deposit bases and lending capabilities alongside providing CBDC benefits (ECB, 2019).

To stop new types of bank runs central banks could introduce mechanisms which slow down fund transfers from commercial banks towards CBDCs during periods of financial strain. Such measures as time-based restrictions on converting deposits with commercial banks into CBDCs or increasing conversion charges when the economy is unstable may discourage panic withdrawals while maintaining stability in the financial sector. These measures would have to be finely balanced between ease of use and managing risks to the overall system (ECB, 2019).

Another crucial measure is the interaction between central banks, commercial banks and other relevant financial institutions to maintain order while implementing CBDCs. Creating channels of communication guarantees that all stakeholders are ready to overcome the challenges of change. This may also help in creating standards and general approaches on how regular problems arising from issuance of CBDCs can be solved (BIS, 2020).

3) LOW USAGE/ADOPTION

Comprehensively educating the public about CBDCs is important to make them understand. This might be done through various media platforms that would inform the public about how CBDCs operate and the advantages they have. Furthermore, this could reach wider audiences by partnering with financial institutions and using social media. Furthermore, policies that protect privacy may alleviate fears surrounding surveillance by government agencies over personal information mishandling (IMF, 2020).

CBDC adoption by businesses needs strong incentives through real benefits such as lowering costs and increasing operational efficiency. These advantages should be identified and communicated to businesses by central banks and policy makers in partnerships. Also, offering tax incentives may also encourage businesses to use CBDCs. Besides, creating pilot programs that demonstrate how CBDCs can work effectively could help to instill confidence on its potentiality of improving business operations (WEF, 2020).

Finally, trust can be built up through transparent and open policy formation. The involvement of wider stakeholders including the general public, businesses and financial institutions in designing and implementing CBDCs is crucial. Regular consultative forums as well as feedback mechanisms are key in ensuring that all parties' concerns and issues are adequately tackled, thereby enhancing acceptance levels (BIS, 2020).

4) HIGHER EXCHANGE RATE FLUCTUATIONS

To reduce exchange rate fluctuations, it is necessary to coordinate the development and regulation of CBDC on the international level. To ensure that there is no volatility, there should be built international frameworks around CBDC transactions and remittances. This coordination could be wrought by international monetary institutions like the International Monetary Fund or the Bank for International Settlements, through merely offering the forum for talk and cooperation among the central banks (BIS, 2020).

Strong legal measures that control capital flows must be developed to protect smaller economies from speculative attacks facilitated by the rapid movement of CBDCs. Regulations like transaction ceilings or anti-speculation taxes imposed by central banks would be aimed at discouraging short-term speculation movements (IMF, 2020).

Another important strategy is to make the conventional exchange rate regulation tools stronger. New tools should be created by central banks while some existing ones should be adjusted so that they can handle the challenges that come with CBDCs. For instance, enhancing traditional interventions in exchange markets through digital technology and developing sophisticated algorithms to monitor and predict flows of currencies can improve traditional interventions' efficiency. Moreover, maintaining enough foreign currency reserves and using them strategically can assist in bringing about stability in exchange rates against volatility (ECB, 2019).

To avoid competitive devaluation as well as "race-to-the-bottom," there should be international agreements on currency stability. Countries could agree on limits for competitive devaluation among themselves under multilateral agreements. The WEF and other international bodies might support these agreements, ensuring countries adhere to mutually beneficial policies for encouraging worldwide financial orderliness as well as integration.

Nevertheless, there is still much research to be made in order to understand the evolving impacts of CBDCs on the exchange rates. Specially, central banks must invest in research to study the long-term effects of CBDCs. By adapting to new developments, challenges can be addressed (BIS, 2020).

6) The current situation of CBDCs in the European Monetary Union

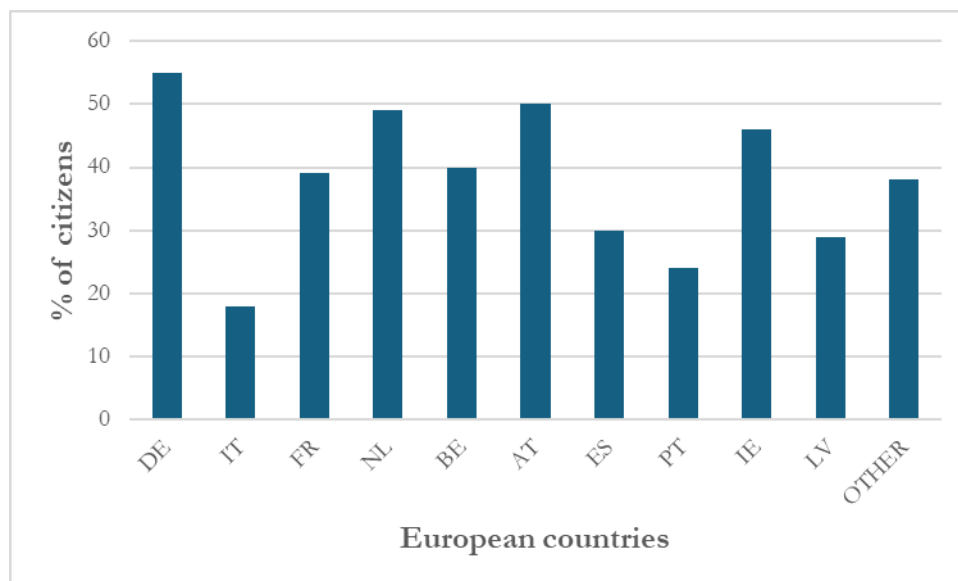
The European Central bank has been actively exploring the potential of a digital euro. Spain, as a member of the Eurozone, is closely involved in these discussions and developments. As a CBDC, the digital Euro would be accessible to the public, complementing cash and bank deposits (ECB, 2022).

The Bank of Spain plays a critical role in the research and possible implementation of the digital euro in Spain. It has participated actively on ECB's Task Force for Digital Euro project. This partnership guarantees that Spanish specific economic and financial factors are analyzed within the wider Euro-zone setting. The Bank of Spain underscored the need to ensure that any future digital currency design promotes its integration with existing payment systems as well as financial infrastructures without causing disruptions, thereby maximizing its expected gains to consumers and producers (Bank of Spain, 2022).

The developments of the digital Euro needs public consultations as well as pilot projects. The ECB has carried out vast public consultations in order to get views from citizens, business people and financial institutions throughout Europe including Spain. From these consultations, it was evident that the digital euro had attracted a lot of interest, with privacy, security and usability being some of the concerns expressed by participants. Moreover, several pilot schemes and experiments have been conducted to tryout different technical solutions and applications for which the digital euro may be utilized through which useful insights have been obtained on how it can be used in practice (ECB, 2021).

Figure 17 shows how privacy is one of the risks that concerns people the most in the main European countries.

Figure 17: Percentage of citizens per country that pointed out privacy as the main risk



Source: ECB (2021). Public consultation on a digital euro

The legal framework is another critical area of focus. The implementation of a digital euro in Spain would necessitate careful consideration of existing regulations and possible legal adjustments. In order for the digital euro to conform with national and EU laws, Spanish government and regulatory bodies are working with ECB to look at the necessary legal provisions which will include dealing with matters related to data privacy, anti-money laundering measures, consumer protection among others that are important for public acceptance (Garrido, 2022).

There is a high possibility of huge benefits accruing to Spain from the introduction of a digital euro. It could promote financial inclusion by giving all citizens, including those who are presently excluded from traditional banking systems, an accessible and secure digital payment option. Additionally, it may reduce transaction costs and enhance efficiency in payment systems. Nonetheless, as we discussed before, there are risks too such as cyber threats or how it affects monetary policy or financial stability. These dangers need to be mitigated via robust technological solutions and regulatory tools (Cœuré, 2020).

The digital euro's timetable for the implementation has been a matter of great concern. A study phase was initiated in October 2021 and concluded in October 2023. The current phase involves making a decision on whether to move forward with the actual development and rollout of the project. The ECB predicts that the digital euro could be launched by the middle of this decade, sometime around 2025-26. However, these schedules are conditional upon several factors such as ongoing pilot projects results, public consultations outcomes and regulatory preparations (ECB, 2022).

7) Conclusion

The implementation of CBDCs is very risky, and therefore, can cause huge problems leading to the economic collapse of nations. This thesis has explained that these digital currencies face difficulties in four major areas: cyber-attacks and technological risks, banking disintermediation and financial stability, low usage and adoption, as well as increased exchange rate fluctuations. The complexities and potential dangers involved with CBDCs are indicated by each one of these factors.

The most worrying issue is that CBDCs are vulnerable to cyber-attacks especially those associated with technology. They represent an attractive target for pirates because they exist completely online hence posing a threat to national security and global economy. Since the financial system is supported by increasingly dependent on digital infrastructure, cybersecurity measures must be put into consideration.

Additionally, another considerable risk is posed by disintermediation in banking. The traditional functions of commercial banks could be affected by the advent of CBDCs and this would consequently affect their ability to mediate monetary policy and credit creation. If commercial banks find it difficult to cope with changing nature of money owing to digitalization, this disruption may destabilize financial markets.

Also, the issue of low usage and adoption raises some concerns. For any CBDCs to work well there should be a high level of acceptance by the general public at large. This however may not happen because there are other key factors that affected electronic payments like trust from the public in these new currencies, fear for interference with individual's privacy etc. but limited digital options available also pose as serious limitations for such an innovation. Inadequate use of CBDCs would limit its effect on financial inclusion and efficiency hence their usefulness will never be realized fully.

Moreover, an important problem with CBDCs is the increased possibility of rising exchange rates. It means that transferring large amounts of digital money across countries can make currencies unstable, especially in economies with less developed financial systems. This makes monetary policy more complex and may result in economic instability.

In summary, while CBDCs offer promising opportunities for enhancing financial inclusion and efficiency, their implementation must be approached with caution. Further still, if implemented wrongly while others have their reservations on it, Central Bank Digital Currencies offer a great chance to enhance financial inclusion and efficiency. The risks highlighted in this thesis indicate the importance of comprehensive regulatory frameworks, strong measures for cyber security and ways to encourage widespread adoption by the general public. Without taking all this into account, policymakers are not able to maximize gains nor minimize threats tied to CBDCs implementation without posing opportunistic challenges related to economic stability.

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