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Central Banks Digital Currency (CBDC) Adoption in Europe

Introduction

Recently, the traditional concept of money has evolved significantly, marked by the shift from cash to non-cash transactions and the rapid development of payment infrastructures. The transformation of monetary institutions appears inevitable, with the rapid pace of change. The article analyzes the European money market and highlights the directions central banks are taking in creating digital currencies (CBDCs).

The Research and Evolution of CBDC

The main drivers of CBDC change are innovations and technology. Between the discussion about revolutionary and evolutionary significance, CBDC seems an enormous innovation, but it was similar in the history when the changes were driven by technology, tastes, economic growth and the demands to effectively satisfy the functions of money (Bordo, 2021). Each transition has been marked by technological and structural changes.

CBDC is the next shift in monetary history as become a popular topic from 2017.

The introduction of CBDC is a significant evolution that may affect banks in many fields as: payment systems, monetary policy, financial stability and also lending activities. From banking perspective, lending is a core activity for banks stability. Taking into account that banks rely on deposits as a primary source, it is being discussed if and how CBDCs could affect bank lending in through their impact on bank deposits. If customers choose to hold their money in the form of CBDCs rather than traditional bank deposits, commercial banks could experience a reduction in their deposit base.

The cutting-edge research emphasizes that the introduction of a CBDC has no detrimental effect on bank lending activity and may, in some circumstances, even serve to promote it. Competitive pressure leads to a higher monopoly deposit rate which reduces profit, but expands deposit funding through greater financial inclusion and desired saving. A properly designed CBDC is not likely to threaten financial stability (Andolfatto, 2021).

From the macro perspective it is important to secure the banking system against credit crunch or lack of the liquidity because of CBDC introduction. Some research suggest that the introduction of CBDC, when combined with a specific mechanism known as "central bank pass-through funding", does not necessarily have to lead to a reduction in the availability of credit (a credit

crunch) or negatively impact the overall stability of the financial system (Brunnermeier, Niepelt, 2019).

Fernández-Villaverde and colleagues suggest that under normal conditions, when there's no panic, a CBDC can achieve the same outcomes as traditional banking systems. However, in times of financial panic, the central bank's agreements with investment banks are more rigid, which can help prevent bank runs. Because of this stability, people might prefer to deposit their money with the central bank instead of commercial banks. This could lead the central bank to dominate the deposit market, potentially threatening the way banks typically transform short-term deposits into long-term loans. This risk should be carefully considered when planning and implementing a CBDC (Fernández-Villaverde, et al. 2021).

Where Does the World Stand on CBDCs adoption?

It is observed a dynamic and challenging race as 134 countries are in CBDC launching process. There are reported 3 launched CBDCs in: The Bahamas, Jamaica and Nigeria. In the pilot phase are 36 countries, 30 countries are in development phase and 44 in research phase. Some of the countries have CBDS in an inactive phase (17) and 2 countries canceled CBDC process.

China is famous for its pilot CBDC known as the digital yuan or e-CNY, e-RMB, which is the most advanced CBDC project in the world launched by a major economy. The People's Bank of China was among the first in the world to start exploration of CBDC. China is the leader in mobile payments, with 88% penetration rate amongst the population in 2021. At the end of 2022, pilot programs were launched in 25 cities. For everyday users, the e-CNY works like other mobile payment systems and also leverages Near Field Communication technology, allowing users to make payments by tapping their devices together without connection to the Internet. Its implementation has gone into overdrive in 2023 and in July total transactions had reached a cumulative value of 1.8 trillion yuan (Nulimaimaiti, 2023).

CBDC in Europe

European countries are at disparate stages of CBDC implementation, reflecting differences in technological infrastructure, regulatory frameworks, and policy objectives. 51 European countries were taken into analysis. Only 29 countries reported their CBDC status. The reasons why only 29 countries in Europe report their CBDC status are multifaceted, involving differences in development stages, regulatory and political considerations, technological readiness, strategic interests, and resource availability. It is possible that more European countries will report their status in the future.

The pilot phase is reported by 6 countries (Spain, Sweden, Ukraine, Turkey, Kazakhstan, Russia). 16 countries are in the development phase. Then 5 countries are in research phase and 2 countries have reported inactive phase.

The distribution of European countries across different phases of CBDC development highlights the region's diverse approach to adopting this emerging technology. With 6 countries, including Spain, Sweden, and Russia, actively piloting CBDCs, there is a clear commitment among these nations to explore the practical applications and implications of digital currencies. The fact that 16 countries, including major economies like the United Kingdom, Germany, and France, are in the development phase indicates strong momentum toward implementing CBDCs, reflecting the importance they place on staying at the forefront of financial innovation. However, the 5 countries

are still in the research phase, suggest that a cautious and deliberate approach is being taken by some nations, likely driven by the need to fully understand the potential impacts before moving forward. The 2 countries in the inactive phase, Iceland and Denmark, indicate that not all European nations see immediate value or necessity in pursuing CBDCs at this time, possibly due to economic, political, or technological considerations. Overall, these numbers illustrate that while Europe is actively engaged in exploring CBDCs, the journey towards widespread adoption is varied.

Picture 1. CBDC in Europe



Source: <https://www.atlanticcouncil.org/cbdctracker/>

European central banks are exploring CBDC issuance to enhance financial inclusion and diversify payment systems, potentially improving monetary policy transmission. It seems that CBDC may play crucial role in enhances financial inclusion, by providing accessible, secure, and low-cost financial services to underserved populations. By lowering barriers to entry, reducing costs, and enabling innovation, CBDCs may bring people into the formal financial system.

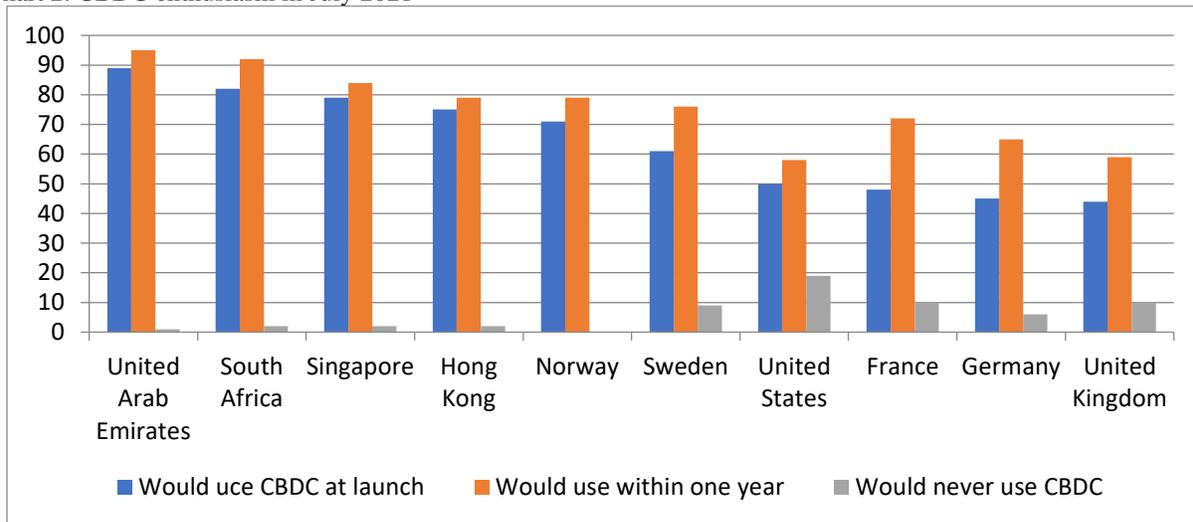
Mnohohitnei concluded that while CBDCs could bolster financial stability, they pose risks such as diminishing bank profitability and increasing the likelihood of bank runs, which can be mitigated by appropriate policies. Authors emphasize that the benefits are particularly significant for non-Euro Central and Eastern European countries due to their lower levels of digitalization and financial inclusion (Mnohohitnei, et al., 2021).

One of the success stories is E-krona pilot by the Sveriges Riksbank (central bank of Sweden). The Riksbank is conducting extensive tests and now it is in 4th phase where it was tasted how E-krona could work in practice if electricity and telecommunications are not working. The technical solution reserves E-krona for offline use in a so-called “shadow wallet” in the online system.

What is interesting, “shadow wallet” does not have a widely recognized definition in finance or technology, but it can be interpreted in a few contexts depending on the industry or the specific application mainly as something unofficial, anonymous, not regulated, but for the E-krona it means that “shadow wallet” is designed to maintain the usability of the digital currency in offline scenarios. It ensures that users can continue to transact with e-krona even when they cannot connect to the central bank's online infrastructure, thus enhancing the resilience and reliability of the digital currency in various situations.

The Riksbank has tested transfers to and from payment cards, offline payments to merchants and offline transfers between end-users. The general openness to new digital financial tools among Swedish society suggests a positive reception for the E-krona (chart 2).

Chart 2. CBDC enthusiasm in July 2021



Source: own study based on: <https://www.ledgerinsights.com/cbdc-consumer-survey-finds-us-citizens-less-enthusiastic/>

Sweden's advanced digital infrastructure and high levels of cashless transactions make it a prime candidate for CBDC adoption. Chart 2 shows that countries with more advanced digital infrastructures and lower cash usage, like the United Arab Emirates, show higher readiness for CBDC adoption. In contrast, countries like the United States, exhibit more caution, with a notable portion of the population reluctant to embrace this digital currency innovation. This reflects differing levels of trust, digital readiness, and cultural attitudes towards financial innovation.

Linking the CBDC adoption to Central and Eastern Europe (Latvia, Romania, Lithuania, Bulgaria, Serbia, Slovakia, Estonia, Czech Republic, Croatia, Türkiye, Poland, Hungary) it is important to emphasize that only 5 countries report any status. Czech Republic and Hungary are in research phase. Estonia and Lithuania are in development phase. Only Turkey reports pilot phase called Digital Turkish Lira. In December 2022, the Central Bank of the Republic of Türkiye had successfully executed its first payment transactions using the digital Lira, and is currently in the second phase, which includes testing on interoperability with other payment infrastructures and programmable payments. It will also explore offline payments and hardware wallets and also cooperate with international institutions for further exploration of cross-border CBDCs. Decision on issuance will be made by end of 2024. The use case is focused on retail, but the architecture is not reported yet. Technology partnerships in this project are: Aselsan, Havelsan, Tubitak Bilgem.

Stronger together: Cross-border projects

Cross-border projects are initiatives that involve collaboration and cooperation across national borders and they are often driven by the need to address issues that transcend national boundaries or to leverage resources and capabilities from multiple countries for mutual benefit. Whether focused on economic development, environmental protection, security, or technological innovation, these projects bring together countries to work towards common goals, ultimately benefiting the broader global community. The essence of CBDC cross-border cooperation is to join forces, share experience and increase the potential in implementing CBDC solutions. There

are 18 cross-border CBDC projects in different phases reported nowadays. There are 3 launched cross-border CBDC projects: Jura, Cedar x /Ubin+ and Aurum (table 2).

Table 2. Launched cross-border CBDC projects

Name	Overview
Jura	It is an experiment using wholesale CBDC for cross-border settlement on a distributed ledger technology (DLT) platform.
Cedar x /Ubin+	DLT can enhance interoperability and achieve 30-second atomic settlement in cross-border multi-currency payments—reducing settlement times and risk.
Aurum	It is a new phase to research the privacy of retail payments using CBDC.

Source: own study based on: <https://www.atlanticcouncil.org/cbdctracker/>

Jura demonstrates the application of wholesale CBDC for cross-border transactions between France and Switzerland, while Cedar/Ubin+ explores multi-currency atomic settlements. Aurum addresses the privacy aspects of retail payments using CBDC.

Synthetic conclusion about economic, legal and societal impacts

It seems that adoption of CBDC and exploding digital transformation have far-reaching implications for Europe across economic, legal and societal dimensions. Europe moves towards greater digitalization and understanding these impacts is crucial for policymakers, businesses, and citizens. This is only the beginning of the race and one can already see significant changes happening in economy with the goal to:

- enhanced financial inclusion;
- monetary policy and financial stability;
- impact on the banking sector, which are only selected examples.

The legal impacts are mostly focused around regulatory challenges and also cross-border regulations, that are going to shape and create background for CBDC implementation with aspects of privacy and data security and also legal tender and monetary sovereignty.

The most common societal impacts are: digital divide and inclusion (bridging the digital divide, education and awareness). Also, trust and public perception are building during the preparation and implementation phase of CBDC that have a crucial impact on the adaptation. The rapid changes naturally have an influence on the need of job displacement and reskilling. It is expected that CBDC should help to reduce financial inequalities by providing low-cost access to financial services for underserved populations. As Europe moves forward with these initiatives, careful consideration of these impacts will be essential to maximizing the benefits while minimizing the risks.

References

Allen, F., & Gale, D. 2000. Comparing Financial Systems. MIT Press.

Andolfatto, D., 2021. Assessing the Impact of Central Bank Digital Currency on Private Banks. *The Economic Journal*, Volume 131, Issue 634, February 2021, Pages 525–540, <https://doi.org/10.1093/ej/ueaa073>

Bordo, M. D. 2021. Central Bank Digital Currency in Historical Perspective: Another Crossroad in Monetary History. HOOVER Institution Economics Working Papers. Economics Working Paper 21113. Stanford University. P. 3. https://www.hoover.org/sites/default/files/research/docs/21113-bordo_1.pdf [access: 15.07.2024].

Bordo, M. D., & Levin, A. T. 2017. Central Bank Digital Currency and the Future of Monetary Policy. NBER Working Paper No. 23711.

Brunnermeier, M. K., Niepelt, D., On the equivalence of private and public money. *Journal of Monetary Economics* Volume 106, October 2019, Pages 27-41. <https://doi.org/10.1016/j.jmoneco.2019.07.004>

Davies, G. 2002. *A History of Money: From Ancient Times to the Present Day*. University of Wales Press.

Eichengreen, B., & Flandreau, M. 1997. *The Gold Standard in Theory and History*.

Fernández-Villaverde, J., Sanches, D., Schilling, L., Uhlig, H. 2021. Central bank digital currency: Central banking for all? *Review of Economic Dynamics* Volume 41, July 2021, Pages 225-242. <https://doi.org/10.1016/j.red.2020.12.004>

Franklin, A., Xian, G., Julapa, J., 2022. Fintech, Cryptocurrencies, and CBDC: Financial Structural Transformation in China. *Journal of International Money and Finance*, Volume 124, June 2022, 102625. <https://doi.org/10.1016/j.jimonfin.2022.102625> [Access: 15.07.2024].

Goodell, G., Al-Nakib, H. D., Tasca, P. 2021. A digital currency architecture for privacy and owner-custodianship. *Future Internet*, 13 (5) (2021), 10.3390/fi13050130

Gross, J. et al. (2021). Designing a Central Bank Digital Currency with Support for Cash-Like Privacy, *SSRN Electron. J.* doi: 10.2139/ssrn.3891121.

Guardtime, <https://www.ledgerinsights.com/cbdc-consumer-survey-finds-us-citizens-less-enthusiastic/> access: 18.07.2024].

International Monetary Fund. 2023. *CBDC Virtual Handbook*. <https://www.imf.org/en/Topics/fintech/central-bank-digital-currency/virtual-handbook> [access: 15.07.2024].

Mnoghithnei, I., Negut, C. A., Horobet, A. L. 2021. The Future is Near: On the Prospects of Central Bank Digital Currency Adoption in Central and Eastern European Countries, *EBEEC Economies of the Balkan and Eastern European Countries*, Knowledge E Social Sciences, Volume 2021, p. 1–15. DOI 10.18502/kss.v5i9.9882

Nulimaimaiti, M., 2023. What's the state of China's digital yuan in 2023? South China Morning Post. https://www.scmp.com/economy/china-economy/article/3237317/whats-state-chinas-digital-yuan-2023?campaign=3237317&module=perpetual_scroll_0&pgtype=article [access: 17.07.2024].

QPS, What is the Digital Yuan (e-CNY)? <https://qpssoftware.net/blog/what-is-digital-yuan-e-cny> [access: 15.07.2024].

Svergies Riksbank. E-krona pilot phase 4. 2023. <https://www.riksbank.se/en-gb/payments--cash/e-krona/e-krona-reports/e-krona-pilot-phase-4/> [access: 17.07.2024].

Tapscott, D., & Tapscott, A. 2016. Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World. Portfolio Penguin.

Tronnier, F., Harboth, D., Hamm, P. 2022, Investigating privacy concerns and trust in the digital Euro in Germany. Electronic Commerce Research and Applications, Volume 53, May–June 2022, 101158. <https://doi.org/10.1016/j.elerap.2022.101158>