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Central Bank Digital Currency Adoption Challenges, Solutions, and a Sentiment Analysis

Abstract: We identify some factors limiting CBDC adoption and some of the possible solutions. We also assess the media sentiment about central bank digital currencies in general as well as about locally issued CBDCs. We find that there is a high correlation between the negative media sentiment about CBDCs in general and locally issued CBDCs. We also find that the negative media sentiment about the eNaira, DCash and Sand Dollar was caused by the existing negative media sentiment about CBDCs in general. However, a positive media sentiment about the eNaira, DCash and Sand Dollar was not caused by the existing positive media sentiment about CBDC in general.

Keywords: CBDC, eNaira, DCash, Sand Dollar.

JEL Classification: E31, E58.

1. Introduction

In this paper, we identify some factors limiting central bank digital currency (CBDC) adoption and some of the possible solutions. We also assess the media sentiment about central bank digital currency adoption.

A central bank digital currency is simply a digital equivalent of cash and a liability of the issuing central bank (Engert and Fung, 2017; Auer and Böhme, 2020). Recently, central bank digital currencies have attracted increased attention among academic and policy researchers. Central bank digital currencies emerged from the need to transform money to meet the realities of a digital world (Scardovi,

2017; Bordo, 2021). As Auer and Böhme argue, CBDCs can perform all the functions of physical cash, except having the physical attributes of paper money.

The benefits and risks of issuing and adopting a central bank digital currency have been a subject of intense debate by central banks, policy makers and academic researchers. The literature has identified some benefits and risks of issuing and adopting a central bank digital currency. The literature shows that the issuance and adoption of central bank digital currencies can increase financial inclusion, reduce fraud and money laundering associated with cash transactions, guarantee sovereign alternatives for digital payments, stimulate local payments innovation, enhance monetary policy transmission, and channel welfare payment to citizens (Davoodalhosseini, Rivadeneyra and Zhu, 2020; Auer, Haene and Holden, 2021; Ward and Rochemont, 2019; Ozili, 2022a; Mincewicz, 2023). Some notable risks associated with the issuance and adoption of CBDCs include obsolescence and technology risks, cybersecurity risks, denial of service (DoS) attacks, privacy and consumer protection risks, financial stability risk and third-party risks (Guo, Kreitem and Moser, 2022; Tian, Zhao and Olivares, 2022; Jabbar, Geebren, Hussain, Dani and Ul-Durar, 2023; Kumhof and Noone, 2021; Ozili, 2022b; Vučinić and Luburić, 2023). Other studies have also identified some factors limiting CBDC adoption and the possible solutions.

Despite the debates about the benefits and risks of issuing and adopting a central bank digital currency in the literature, there is a growing media sentiment about issuing a central bank digital currency. Some believe that the introduction of a central bank digital currency is too early and could lead to low CBDC acceptance or widespread rejection of CBDCs by the population. Others think that the issuance and adoption of a central bank digital currency is needed because of the benefits it presents and that CBDC will gradually be accepted by the society over time.

Media sentiment about central bank digital currencies is important because it can influence what people think about central bank digital currencies. The information people receive from the media can influence them to adopt a CBDC or reject it. Media sentiments can also help shape people's perception about CBDC and such perception will determine whether people will easily accept CBDC or be reluctant to accept CBDC once they are issued. Therefore, it is important to identify the existing media sentiments and understand whether there are more positive sentiments about central bank digital currencies than the negative ones and vice versa. Such understanding is important because it can provide insight into whether there is an expectation gap between what policymakers think about a central bank digital currency and what the media thinks about a central bank

digital currency. Such insight can also help policymakers to know what the sentiments are, and what they can do to influence pre-existing negative sentiments about CBDC in the media. Despite the valuable insight that could be gained through analysing media sentiments, existing CBDC studies have not analysed CBDC from a sentiment analysis perspective. This study contributes to the existing literature by presenting an analysis of CBDCs by looking at the sentiment analysis as well as by identifying the general factors that could limit CBDC adoption as well as possible solutions to address these limitations.

In this study, we perform a simplistic media sentiment analysis using desk survey research. We classified the selected CBDC media articles into positive and negative media sentiment about central bank digital currency. We use the title of vetted media articles to determine whether the sentiments are positive or negative. Thereafter, we code the information into data-points that enable us to perform a trend analysis, correlation analysis and regression analysis. We find that there were more positive and negative sentiments about CBDC in the year 2021 and 2022 compared to the previous years. The Nigeria eNaira received more negative media sentiment than the Bahamian Sand Dollar and the ECCB DCash. There is a high correlation between the negative media sentiment about CBDC in general and the negative media sentiment about locally issued CBDC. We also find that the negative media sentiment about the eNaira, DCash and Sand Dollar was caused by the existing negative media sentiment about CBDC in general. Meanwhile, the positive media sentiment about the eNaira, DCash and Sand Dollar was not caused by the existing positive media sentiment about CBDC in general.

Our study contributes to the literature in three ways. First, the study contributes to the existing literature that analyses country-specific use case of CBDC (see e.g. Darbha and Arora, 2020; Bindseil, 2019; Gross, Sedlmeir, Babel, Bechtel & Schellinger, 2021; Barontini and Holden, 2019; Bordo and Levin, 2017). In this paper, we analyse some country specific CBDC and identify the benefits and risks of adopting a central bank digital currency. Also, the study contributes to the emerging literature on central bank digital currencies as it presents a unique sentiment analysis to assess the media sentiments about CBDC. Finally, the study contributes to the monetary economics literature by showing how media sentiment affects the form of money.

The rest of the paper is organized as follows. Section 2 presents the literature review. Section 3 presents the factors limiting CBDC adoption and some possible solutions. Section 4 highlights the sentiment analysis of central bank digital currencies and section 5 presents the conclusions.

2. Literature review

The majority of debates in the CBDC literature revolve around the benefits and risks of issuing CBDC (Mancini-Griffoli et al., 2018; Davoodalhosseini et al., 2020; Auer et al., 2021; Ozili, 2022). In terms of benefits, Mancini-Griffoli et al. (2018) show that a CBDC could reduce the cost of payments and can also encourage financial inclusion if private sector solutions and policy efforts to increase financial inclusion do not bear fruit. However, they point out that the benefits of CBDC are varied; therefore, central banks should consider their specific country circumstances and pay careful attention to the relative benefits of CBDC for issuing a CBDC. Davoodalhosseini et al. (2020) show that a CBDC could help to maintain the effectiveness of monetary policy effectiveness by reducing the incentives to adopt alternative means of payment; however, they cautioned that there could be consequences of removing cash and replacing it with CBDC issuance of CBDC. Auer et al. (2021) show that CBDC could provide a convenient and cheap access to other currencies for remittances, travel, and trade, thereby, giving users more incentives to adopt a CBDC. However, they cautioned that these benefits are relevant for emerging market economies that are poorly served by existing banking systems. In a review of literature, Ozili (2022) identified some benefits of issuing a CBDC which are to improve the conduct of monetary policy (Zharikov, 2022), enhance the efficiency of digital payments and increase financial inclusion. The author argued that the potential benefits of CBDC may not be realized due to the limiting nature of CBDC design and its inability to meet multiple competing domestic goals. The author recommends that central bankers should pay more attention to CBDC design features and identify, in clear terms, the goals they want to achieve with CBDC and design CBDC to have those features.

In terms of the risks of CBDCs, Mancini-Griffoli et al. (2018) and Vučinić & Luburić (2022) show that CBDC could give rise to operational risks arising from disruptions and cyberattacks, it could also lead to increased risks to financial integrity, and it could increase risks to financial intermediation. Darbha and Arora (2020) argue that CBDCs have hidden vulnerabilities, a lack of scalability and complicated operations, and it carries risks of unnecessary trade-offs. Kumhof and Noone (2018) also identified financial stability risks or the risk of a system-wide run from bank deposits to CBDC to be a significant risk associated with issuing CBDCs. Bindseil (2020) shows that CBDCs could lead to risk of structural disintermediation of banks and centralization of the credit allocation process within the central bank, and it can also increase the risk of systemic runs on banks in crisis situations. Kiff et al. (2020) cautioned that if central banks do not implement adequate data protection and cyber-resilience measures, there could be data theft and data privacy breaches that could cause the central bank to face

high reputational damage which would outweigh any potential benefits gained from issuing a CBDC.

3. Factors limiting CBDC adoption and possible solution(s)

3.1. Factors limiting the development in the implementation of CBDC

Central bank digital currencies (CBDCs) are very topical. According to the updated report by Auer et al. (2023) in February 2023, there are four CBDCs in operation in the world: in the Bahamas, the Caribbean (ECCB), Nigeria and Jamaica. This makes the Caribbean the current epicenter of operational CBDCs (Náñez Alonso, Echarte Fernández & Jorge-Vázquez, 2022). However, in addition to the above, there are currently pilot projects in 34 jurisdictions, covering both wholesale and retail CBDCs. Despite the fact that there are countries where CBDCs are already in operation and others have pilot projects at an advanced stage, the speed of implementation in some cases is slow, and in other countries the projects have been halted because they present some problems (Bindseil, 2022). In many cases, these problems are related to the reasons for issuing a CBDC; they vary from country to country (Bijlsma, van der Crujsen, Jonker & Reijerink, 2021; Maryaningsih, Nazara, Kacaribu & Juhro, 2022; Náñez Alonso, Jorge-Vazquez & Reier Forradellas, 2020), as do policy approaches and technical designs. In this section, we examine the social, economic, and institutional factors that make it difficult for current CBDC projects to be successfully implemented and accepted by citizens. Not all countries or monetary areas are equally optimal for implementing CBDC (Náñez Alonso, Jorge-Vazquez & Reier Forradellas, 2021).

3.1.1. Lack of digital skills of their citizens

A first limiting factor for the adoption of a CBDC would be the lack of digital skills of citizens in the country where digital currency is intended to be implemented. Digital financial services such as mobile money allow users to store funds safely and cheaply, transfer them quickly and affordably to distant locations, the generation of remittances and higher consumptions (Demirgüç-Kunt, Klapper Singer & Ansar, 2021); all being positive, as well as investments. In 2021, 76% of adults worldwide had an account with a financial institution or a mobile money provider. However, both commercial banks and central banks admit that there is a technology gap between customers who are more accustomed to using their digital services; and those who continue to operate in their offices (Mnoghithnei, Neguț (Cudric) & Horobeț, 2021). Moreover, this situation has wors-

ened, especially after the coronavirus health crisis, as reported in the latest World Bank report on digital payments (Demirgüç-Kunt et al., 2021). The confinement in the first instance and the continuing restrictions thereafter have expanded the possibilities offered by banks to citizens so that they do not have to physically go to branches. But there are still many citizens, particularly the elderly, for whom these digital skills are a challenge. This means that they are often relegated by limited opening hours, restricted presence in the physical branch and the call to use the Internet, mobile applications, or telephone banking, i.e. tools that not everyone is able to use proficiently (Demirgüç-Kunt et al.).

Ultimately, disparities in financial services remain for adults who are typically underserved, such as women, the poor and the less educated (Alfar, Kumpamool, Nguyen & Ahmed, 2023). And this is a factor that is clearly configured as a constraint to the expansion and success of a CBDC. In the study conducted by Alfar et al. (2023) and Nández Alonso, Jorge-Vázquez & Reier Forradellas (2020) in Spain, it is concluded that a CBDC could have difficulties to be implemented and accepted in rural areas where the population is older, and their level of education is low. Also, in the study by Guerra-Leal, Arredondo-Trapero & Vázquez-Parra (2021), it is indicated that there is a gender gap in access to digital bank accounts, ownership, and use of digital currencies; as women are more excluded than men (Alonso, Jorge-Vázquez & Hernández, 2023; Nández Alonso, Echarte Fernández, Kolegowicz, Sanz Bas & Jorge Vázquez, 2023). We also find the lack of digital skills as a limiting factor in the acceptance of a CBDC in the study by Bhaskar et al. (2022); or also in the case of Singh et al. (2022), they point out the potential benefits of launching a CBDC on financial inclusion, and the difficulties existing in many countries due to the lack of digital skills of their citizens. In the pilot test conducted by Uruguay (e-Peso), it was detected that the use and acceptance of CBDC was very low in people over 64 years of age and in women (Sarmiento, 2022). As for the Sand Dollar, the Bahamas' CBDC was launched with a clear objective, to increase financial inclusion (Wenker, 2022). However, its uptake is very slow as only 7.9% of citizens are using it, there are 338,908 Sand Dollars in circulation (Wright, McKenzie, Bodie & Belle, 2022); and with a population of 393,000, that is only 86¢ per citizen. Therefore, it is possible that despite trying to increase financial inclusion, this is not being achieved due to the need to increase the digital skills of the population (Carlissa, 2022). In the case of Jamaica, which has also launched its CBDC called JAM DEX, one can expect a similar situation of difficulty as indicated in Bahamas. If we look at the 2021 Global Findex Indicator data, only 13% of Jamaicans had a mobile money account and 7% used it two or more times a month; the most alarming figure being that only 10% of the population is able to use a mobile money account without assistance from anyone (World Bank Group, 2022). In short, the implementation of a CBDC could have

a positive impact on financial inclusion, but it presents a limitation or problem among segments of the population that do not have the necessary digital skills for its use and management (Oh & Zhang, 2022; Radic et al., 2022).

3.1.2. Citizens do not see differences/advantages with other existing digital payment methods

Another problem faced by CBDCs is the existence of a large number of payment methods. From the traditional ones such as cash or debit and credit cards through Paypal to other more modern ones such as Apple Pay, Alipay, etc. These means of payment can be a rival or an obstacle for the acceptance and implementation of a CBDC. In the pilot test carried out by Uruguay, it was observed that at higher ages, cash prevailed over digital (Sarmiento, 2022). As for the Bahamas, 94.3% of adults had some type of bank account. The group with the lowest rate of account ownership was the 55+ age group, who are precisely the most resistant to using digital payments as they prefer to use cash (Walker, 2022). In addition, it is possible that given its difficult operation to differentiate from means, such as PayPal or Apple pay, despite being legal to tender (Wenker, 2022); it is hindering its acceptance by younger groups of citizens who are more inclined to accept technological innovations. And this same problem, the lack of differentiation with other digital media, has also been identified in China. Regarding China, it is a society very accustomed to digital payments as more than 96% of small retail transactions in that country are processed by AliPay or WeChat Pay (Huang, Wang & Wang, 2020). Moreover, according to the 2021 GFI results, 76% of Chinese citizens report using their cell phone to make online payments or purchases (World Bank Group, 2022). After showing interest in launching its own CBDC, initial pilot tests were conducted in 2019 to establish the Chinese CBDC (e-CNY); and the final tests have been conducted in April 2020. Subsequently, the pilots expanded to nine cities, including Shenzhen, Guangzhou, as well as Hong Kong and Macau. The first mass test took place in the city of Shenzhen. The pilot test was conducted through a lottery, where the winners (50,000 people out of two million applicants) received 200 digital yuan (about US\$30) to spend in stores before October 18, 2020 (between October 12 and 18). The results were positive as 95% of the winners of the digital yuan lottery for the test already spent the designated money and some even reloaded the digital wallet again (Bhattacharya, 2022). The second test took place in Suzhou province on December 12, 2020. It followed the same structure as the first one: a lottery where citizens receive CBDC to spend. In this case, following the success of the first test, it was extended to 100,000 participants. However, despite this apparent success, there have been reports of test participants highlighting that they were not impressed by the digital yuan, and

mainly believed that it did not offer anything different from other online payment applications such as Alipay and WeChat Pay (Xu, 2022). This same situation could be replicated in places where digital means of payment are well established such as the United Kingdom, Central Europe, or the Nordic countries.

3.1.3. Difficulties related to privacy and security

Digital payment methods and the rise of large technology companies that manage them have had an exponential growth worldwide (Adrian & Mancini Grifoli, 2019). Now, as the use of these new forms of payment grows, concerns about privacy and security also arise (Tronnier, Harborth, & Hamm, 2022). Some consumers are reluctant to adopt these digital means of payments. And all this, even assuming that they are more convenient means of payment, because they feel they lose out on privacy (Tronnier et al., 2022). The feeling that these payment providers, including the Central Bank in the case of a CBDC, have sensitive data about them makes them shy away from using these means of payment. In addition, data thefts suffered by some of these providers increase the distrust of a part of the consumers. The European Central Bank conducted a survey between October 12, 2020, and January 1, 2021, among citizens of the euro area. The results were convincing, with 43% of respondents citing privacy as the key issue, followed by 18% citing security (European Central Bank, 2021). However, it is not only in the euro area that privacy is identified as a fundamental aspect that may hinder the acceptance and use of CBDCs by citizens. In the study by Srouji (2020) in the United Arab Emirates, it is concluded that cash predominates over digital media due to the distrust of many citizens towards these new media, as their privacy is not guaranteed. This same situation is pointed out by Tronnier et al. (2022) when they indicate that privacy is configured as a crucial aspect for the acceptance of a CBDC in Germany. In his study on the Bahamas, Wenker (2022) indicates that the low initial acceptance of the Sand Dollar is partly due to the fact that "an official currency, such as a CBDC, must meet several KYC requirements and is seen as a means of payment with low anonymity". In turn, Koziuk & Ivashuk (2022) note that "transaction tracking reduces the popularity of digital money", and their results are obtained from surveys conducted in Africa, Eastern Europe, and Asia. Therefore, when it is not guaranteed in the operation of a CBDC, privacy is a limiting factor in its general adoption, which is configured as global and not only relative to certain regions or countries.

Security, along with privacy, is another determining factor. CBDCs have direct implications for security risk management. CBDCs must follow the highest standards of cybersecurity against fraud and cyberattacks (Coulter, 2023). Thus,

it is possible that if CBDCs do not show an image of robustness and security, some citizens may refuse to use them for fear of scams, theft of digital money or hacks of their accounts or digital wallets.

3.1.4. Distrust in CBDC-fiat money and use of alternative means: cryptocurrencies

In the last 14 years, cryptocurrencies have evolved from being a new technology oriented to peer-to-peer payments without supervision of a centralized authority to becoming mainly financial assets, which are traded by millions of users worldwide (Kyriazis, 2021). In this sense, some authors see these cryptocurrencies as an added difficulty for CBDCs to be accepted by citizens (Liu et al., 2022; Ngo, Van Nguyen, Nguyen, Thi Tram & Hoang, 2023). However, other authors have found evidence that citizens only use cryptocurrencies as a speculation asset and not out of distrust of FIAT money (Auer & Tercero-Lucas, 2022). Therefore, along with competition from cryptocurrencies, the trust that households have in the digital currency of central banks may shape up as a fundamental variable (Koziuk & Ivashuk, 2022; Solberg Söilen & Benhayoun, 2021). This trust in institutions will vary greatly from one country to another. Thus, in countries where confidence is lower, CBDC may have greater difficulty in being implemented, while in countries where the central bank or monetary authority is strong, CBDC will have a greater chance of being accepted. However, in those countries where citizens have less confidence in their central bank or monetary authority, it will be more difficult, and citizens will use other digital currencies. According to Finder's Cryptocurrency Adoption Index (Finder, 2023), the global average stands at 14%. India is at the top, with 29%, Nigeria also stands out with 27%, and Ghana with 20%; in the South American continent, Venezuela's percentage of adoption stands at 18%, Brazil at 17% and Argentina at 13%. Turkey comes in at 16%. At the other extreme, we find the USA where the rate of cryptocurrency adoption is 10%, Germany with 6% or the UK and Japan with 7%. At the global level, we also find the ING study that indicates an adoption in its sample of fifteen countries of 9%, with Turkey presenting the highest adoption (18%), followed by Romania (12%) and Poland (11%), the USA (8%), and Australia (7%). Those showing the least adoption are Luxembourg (4%), Belgium (5%) and France (6%) (ING Bank N.V., 2018). In the case of Google Trends, Nigeria or Turkey pay the most attention to the term cryptocurrency (Google Trends, 2023b), which does not imply that adoption is higher. Comparing this with the CBDC search, the highest results are obtained in Jamaica, Hong Kong, China, or Canada along with United Kingdom, the Netherlands, Singapore, or South Korea (Google Trends, 2023a). Finally, the study published by Bitpay shows that 46% of merchants accept pay-

ments in cryptocurrencies, but only 23% say they accept payments through crypto wallets (Bitpay, 2022).

Therefore, as we can observe from the above studies in countries where there is greater instability of their currency, the adoption of cryptocurrencies seems to be higher (see Turkey, Venezuela, or Argentina), countries where the national currencies suffer from exchange rate instability problems, and devaluations. However, in those countries where fiat currency and trust in institutions is stable (see the USA, Europe, Canada, or Japan), the adoption of cryptocurrencies is lower. Therefore, here CBDCs (considering only this factor) would have fewer problems for their acceptance and implementation.

3.2. Possible solutions for the implementation of a CBDC

In the previous section, we have pointed out the major difficulties that the monetary authorities and central banks of the various countries are currently facing or will face when they try to implement a CBDC. This section analyses some possible solutions which, to a greater or lesser degree of effectiveness, could resolve these difficulties.

3.2.1. Financial education and digital skills programs

One of the advantages of launching a CBDC is precisely to increase financial inclusion (Náñez Alonso, Echarte Fernández, Sanz Bas & Kaczmarek, 2020; Ozili, 2023; Wenker, 2022). However, as previously analysed, in some of these countries or currency areas, citizens do not enjoy the necessary digital skills to be able to handle and use a CBDC fluently on a daily basis. Therefore, an effective solution should come hand in hand with financial education programs and increased digital skills. This would follow the path initiated by the Bahamas with its Sand dollar CBDC training program, whose main objective is to "accelerate education around digital financial services" (Central Bank of the Bahamas, 2023). This training website, has been operational since January 4, 2021, and it collects basic information and training: what it is, how it works, how to use and download the mobile application, etc. In the case of JAM DEX, the Jamaican CBDC also has a web page dedicated to explaining its functions (Bank of Jamaica, 2022). The objective is also to bring CBDC users closer to its functions, features, form of use and provide answers to a large number of possible questions. For its part, DCash, the CBDC that operates in the Caribbean, in those islands that are part of the Eastern Caribbean Central Bank, also has a website with resources on how it

works (Eastern Caribbean Central Bank (ECCB), 2023). However, more effective measures may need to be taken to increase digital skills for the daily management and use of a CBDC in these places. In this regard, some effective measures that have been identified to increase the digital skills of the population and ensure access to digital banking services (which would include a CBDC) are: First, that payments of salaries, scholarships or other amounts made by the government should be made through digital means. This would be the case that Jamaica is successfully doing, with its JAM DEX CBDC (Bank of Jamaica, 2023). Second, attention is paid to consumer protection and financial capability to promote responsible and sustainable financial services (Tay, Tai & Tan et al., 2022). Third, attention is paid to consumer protection and financial capability to promote responsible and sustainable financial services (Apostu, Panait, Vasile, Sharma & Vasile, 2022; Tay et al., 2022). Fourth, focus on improving digital infrastructure (Ozili, 2022; Tay et al., 2022; Nández Alonso et al., 2024). Fifth, implement training and education plans in digital finance (Apostu et al., 2022; Tay et al., 2022); especially with strong public support for sectors of the population with lower levels of income and education (Gómez-Fernández & Albert, 2019).

3.2.2. CBDC that respects privacy and ensures security

Some consumers are reluctant to adopt digital payment methods, including CBDCs, because they feel they lose out on privacy (Tronnier et al., 2022). As extracted from the consultation conducted by the European Central Bank published in 2021, 43% of the participants pointed out privacy as a fundamental aspect, followed by 18% who pointed out security (European Central Bank, 2021). Here the dilemma that arises and must be solved by central banks is: How to guarantee privacy while maintaining security? Is it possible for CBDCs to acquire the demanded characteristic of untraceable cash? To solve the first question (privacy and security), central banks and monetary authorities should have a KYC (Know Your Customer) system through a process of identification and verification of the identity of a CBDC user, in which a series of controls and checks are applied to avoid operations with people related to terrorism, corruption or money laundering, among others. The CBDCs currently in operation have KYC verification systems (Eastern Caribbean Central Bank (ECCB), 2023; Wenker, 2022). This verification for the sake of ensuring security is carried out through different methods: driver's license, passport, proof of document indicating address, cell phone number or even two-factor authentication. Therefore, CBDCs operating in this way show an image of security. The key will be to convey this image of security to the citizen to increase their acceptance (Ferrari Minesso, Mehl & Stracca, 2022; Tronnier et al., 2022).

Regarding ensuring payment privacy, this is a controversial topic in academia today. While citizens demand for a CBDC that has the same level of privacy as cash, it is possible that this feature is not fully met. However, seeing the demand of citizens and their preference for privacy, some central banks are designing CBDCs that have elevated privacy feature. Thus, we find that in the case of the digital euro, Pannetta (2023) indicated that the future European CBDC would have an offline payments functionality and "The offline functionality would give payments a level of privacy close to that of cash". Other studies, such as the one published by the Digital Euro Association, also argue that CBDCs should guarantee the privacy of citizens, and that this will help ensure their wider acceptance (Amiri et al., 2023). This same assessment is defended by other authors such as Grothoff & Moser (2021) or Tronnier et al. (2022). Therefore, maintaining the privacy of payments via CBDC in the same way as cash, or as close to it as possible, is clearly a determining factor in guaranteeing their acceptance. All this, together with a design that allows offline payment operation (Pannetta, 2023; Tronnier et al., 2022).

3.2.3. Offer interest rates for CBDC accounts directly at the central bank

It is unlikely that the introduction of a CBDC would significantly affect the main transmission channels of monetary policy (both expansionary and restrictive) under the most plausible CBDC designs. However, it is also possible to design a CBDC that would allow accounts to be held at the central bank of issue, and for these to be remunerated with interest rates (Vučinić & Luburić, 2022). Interest rates would certainly be the instrument most affected by the introduction of a CBDC, and this instrument could be strengthened (especially if the design is a Direct CBDC). Changes in policy interest rates (expansionary or restrictive) induce households and firms to rebalance investment and consumption between the future and the present, especially if they are exposed to interest-sensitive lending and savings instruments (Powell, 2018). To the extent that CBDC increases financial inclusion (which would also mean increasing access to loans and other banking products); the transmission of monetary policies could be strengthened (Mehrotra & Nadhanael, 2022). Acceptance by citizens would be more evident if CBDC earned interest. However, this measure may be problematic. If interest rates are increased or existing CBDC accounts in a Central Bank were to be repaid, this situation would also force banks to take measures that would consist of increasing the remuneration of their deposits which will attract bank deposits (Kaczmarek, 2022) and bank loans could also be strengthened (Ferrari Minesso et al., 2022). Through this means, interest rates and their expectations (upward or downward) affect banks' balance sheets and profits (and ultimately their solvency) so it will also affect their non-deposit funding cost and lending rates (Tomaš,

2023). That is, if a system is used when implementing "Direct" CBDC where the subject holds an account at the central bank itself. According to Adrian & Mancini Griffoli (2019), some depositors will abandon commercial banks in favour of a CBDC account at the central bank. In this case, banks might react to this manoeuvre by increasing deposit rates to make them more attractive (Ferrari Minesso et al., 2022). But also, banks will try to increase lending rates (in order to maintain the profit margin) (Sanchez-Roger & Puyol-Antón, 2021), although at the cost of loan demand (which will fall). When banks have more market power in lending (which is also reflected in the slope of the deposit demand curve), they can better insulate their profits by passing on the increase in deposit rates to lending; but this could generate financial stress on households and firms (Kaczmarek, Nájuez Alonso, Sokołowski, Fijorek & Denkowska., 2021). In the case that the CBDC system implemented was not direct but a hybrid or a synthetic one, commercial banks would not suffer so much from the impact discussed above, and the financial system would be less affected since they would be able to continue their usual operations. However, a priori, CBDC would not be so interesting for citizens. Also, it should be considered that the exchange rate policy is affected, whereby changes in official interest rates produce a rebalancing between foreign and domestic assets and a proportional variation of the exchange rate affecting exports and imports (Barrdear & Kumhof, 2016; Ferrari Minesso et al., 2022). Regarding inflation, the inclusion of a CBDC would not affect inflation (Rehman, Irfan, Naeem, Lucey & Karim, 2023).

3.2.4. Programmable CBDC

A programmable CBDC is a digital currency that can be programmed to act in a specific way based on predetermined criteria (Arauz, 2022), where this programming is governed by what is known as a 'smart contract', which determines exactly how this digital money works. That is, this money would add some extra functionalities to traditional cash, such as the date on which a payment can be made or the conditions that must be met for a transaction to take place (Arauz, 2022; Lee, Yan & Wang, 2021).

The advantages of a programmable CDBC would be, above all, for governments. They would be able to monitor economic factors in real time and adjust monetary policies based on these data. In theory, it could also allow, for example, the automatic collection of taxes on each transaction. Citizens will be able to access their deposits through a state account managed through a wallet and without the need for intermediaries. The promise is that the system will thus be more efficient (Sethaput & Innet, 2021). Some authors see the solution to inflation in a program-

mable CBDC, but also a digital currency that promises to be less environmentally aggressive (Mainetti, Aprile, Mele & Vergallo, 2023).

However, despite these advantages of a programmable CBDC, some authors question whether we really need programmable digital money (Walker, 2020) and whether it will be accepted by citizens. If a CBDC is designed in such a way that it can operate as programmable money, it would give power to central banks and monetary authorities to restrict certain payments (Lee et al., 2021). This can become a problem in countries with non-democratic governments where human rights are in question. If we add to this the existing evidence from academic studies on citizens' preferences for a CBDC that guarantees privacy, security, and offline payments (as in the Eurozone), for a CBDC to be programmable would probably not help to increase its acceptance by citizens. Thus, despite the possible advantages, it would not be an entirely effective measure to improve the acceptance and implementation of a CBDC.

3.2.5. Prohibition on the use of other digital means of payment

The regulation of cryptocurrencies has become, in recent years, a priority issue for most of the world's governments (Yadav, Agrawal, Bhati, Al-Turjman & Mostarda, 2020; Nández Alonso et al., 2024), currently engaged in trying to control a technology that saw the light of day in 2008 with the launch of Bitcoin. The collapse of Terra (LUNA) and the UST stablecoin last May in 2022 was the straw that broke the camel's back. The slogan has become unanimous in recent weeks: the Bank for International Settlements (BIS) and the International Monetary Fund (IMF) insist on the need to create a legal framework for bitcoin. The Bank for International Settlements (BIS) published a report on the increasing adoption of bitcoin and the repercussions - in the traditional financial environment - of the acceptance of assets issued under the promise of decentralized and non-brokered money management (Auer et al., 2022). The regulation of this type of assets (decentralized finance) seems clearly necessary. However, we may wonder whether their regulation and even the prohibition of their use would positively affect the adoption of CBDCs by citizens. There are studies that indicate that the ban on the use of cryptocurrencies in some jurisdictions is not achieving the expected effects. Thus, while in South Korea the ban seems to have reduced volatility, there is no evidence that it has reduced the number of users (Shi & Shi, 2019). In the case of China, Chen & Liu (2022) in their study conclude that "we provide strong evidence that the crackdown on Bitcoin trading has not been effective, as Chinese investors continue to buy Bitcoin using the stablecoin Tether rather than Chinese yuan." Therefore, the decision to ban cryptocurrencies thinking that it will help

to increase the acceptance of a CBDC would not be an optimal decision (Sanz-Bas, del Rosal, Nández Alonso & Echarte Fernández, 2021).

4. Media sentiment analysis

4.1. Methodology

The media sentiment analysis (MSA) is used to assess the sentiment about central bank digital currency in the vetted media. Prior studies in finance and economics have also used sentiment analysis such as Ngo et al. (2023) and Ozturkcan, Senel and Ozdinc (2022). We also use a media sentiment analysis.

Regarding the selection criteria, the criteria of inclusion and exclusion of selected media articles were established based on keywords. We include media articles that display the precise expression ‘CBDC’ or ‘central bank digital currency’ or its local variant (e.g., eNaira, DCash or Sand Dollar)¹. This is essential as we aim to use the title of vetted media articles to identify the media articles that contain positive and negative sentiments about central bank digital currencies. Second, the article should be published in a reputable vetted mainstream media source. We focus on the vetted media to ensure that our analysis only captures reasonable, educated, and unbiased sentiments about CBDC.

Table 1: Number of media articles with positive and negative sentiments during the 2017-2021 period

Year	CBDC		eNaira		DCash		Sand Dollar	
	Positive sentiment	Negative sentiment	Positive sentiment	Negative sentiment	Positive sentiment	Negative sentiment	Positive sentiment	Negative sentiment
2017	1	0	0	0	0	0	0	0
2018	1	4	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0
2020	0	0	0	0	0	0	2	0
2021	0	0	2	3	0	1	2	0
2022	1	8	5	5	1	2	2	1

Source: Google media search

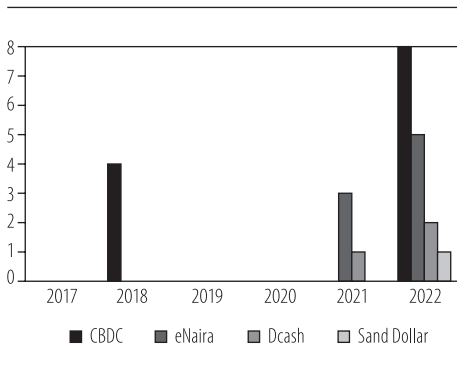
¹ The Jamaica CBDC “JAM DEX” was excluded from the analysis because it was issued very recently in July 2022. Therefore, no meaningful data can be generated for the JAM DEX at this time.

We did not use sentiments on the unvetted social media (e.g., TikTok, Twitter, Facebook, YouTube, personal blogs, etc.) to avoid unrealistic, irrelevant, and biased sentiments about CBDC. Third, we only review publicly available media articles that are published in reputable vetted media sources. Fourth, we only select media articles that have been published between 2017 and 2022. Fourth, we focus on media articles that are written in the English language to avoid language differences. Fifth, the search platform used in the news media article search is Google. Finally, we repeat the same media article selection process for each of the issued local CBDC. The title and number of selected media articles can be found in Appendix 1, while the processed data based on Appendix 1 can be found in table 1. We use data in table 1 to analyse the trends in positive and negative sentiments in figures 1 and 2. We also use data in the table to perform a correlation analysis and a univariate regression in tables 3 and 4, respectively.

4.2. Positive media sentiment analysis (trends in CBDCs, eNaira, DCash and Sand Dollar).

Analysis of positive sentiment in the media shows that there was a high positive sentiment about CBDC in general in 2018 and 2022. There was no positive sentiment about CBDC in 2019, 2020 and 2021. This was due to the COVID-19 pandemic. Thereafter, there was a rise in positive sentiment about CBDC. The rise in positive sentiment about CBDC in 2022 was due to the optimism about the role of CBDC in a post-COVID world. This led to the need for media information about the benefits of CBDC, thereby leading many people to issue positive sentiment about CBDC in the media. The eNaira recorded the second highest positive media sentiment in 2021 and 2022. A

Figure 1: Positive media sentiment



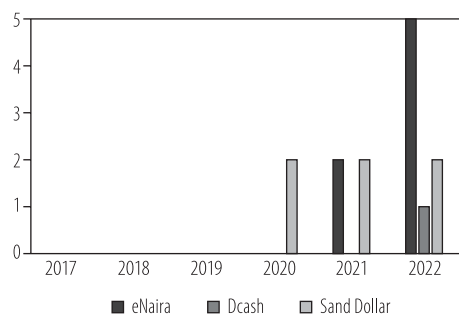
Source: Google media search

possible reason for this could be due to the eNaira issuance in 2021 and the growing interest in how the eNaira could solve problems related to financial inclusion, payments efficiency and cross-border payments in Nigeria. It can also be observed that DCash had a relatively low positive sentiment in the media in all the years from 2021 and 2022, while the Sand Dollar had the lowest positive media sentiment during the entire period.

4.3. Negative media sentiment analysis (trends in CBDCs, eNAIRA, DCash and Sand Dollar).

Analysis of the negative sentiment in the media shows that there was high negative sentiment about CBDC in general, especially when the CBDC concept first emerged in the media in 2017. The rise in negative sentiment in 2017 was due to the pre-existing obsession with cryptocurrencies and a total aversion towards a CBDC innovation that would counter or rival cryptocurrencies. This led many people to issue negative sentiment about CBDC in the media. After the year 2017, there was no negative sentiment about CBDC in the media in 2019 and 2020. Thereafter, negative sentiment about CBDC emerged in 2022 due to growing debates about the best use-case of CBDC, its design problems, lack of infrastructure/technology to deliver CBDC, and the acceptance of CBDC by the population. It can also be observed that there was a growing negative media sentiment about the eNaira in 2021 and 2022 and these were the years when this negative sentiment was the highest. A possible reason for this could be due to the widening of digital illiteracy, a strong preference for cash in rural areas, and a general lack of motivation to switch from using bank payment channels to using the eNaira payment channel. It can also be observed that DCash had the lowest negative sentiment in the media in all the years from 2017 to 2022. This could be due to the operational effectiveness of DCash or due to favourable reporting about the DCash in the media during the period. Furthermore, the Sand Dollar had a sustained negative sentiment in the media in 2020, 2021 and 2022. This could be due to the frequent operational failures of the Sand Dollar in 2022 and its other problems.

Figure 2: Negative media sentiment



Source: Google media search

4.4. Pearson correlation - media sentiment analysis

In this section, we analyze the Pearson correlation of the negative and positive media sentiments about the eNaira, DCash, Sand Dollar and CBDCs in general based on the data from table 1. Table 2 shows that the correlation coefficients are above 0.65 (or 65%) in all cases. This indicates that the negative media sentiment about the DCash, eNaira and Sand Dollar are highly correlated with the nega-

tive media sentiment about CBDC in general. In contrast, table 3 shows that the correlation coefficients of eNaira (0.268), DCash (0.447) and Sand Dollar (-0.333) with CBDCs in general are all below 0.45 (or 45%) in all cases. This indicates that the positive media sentiment about the DCash, eNaira and Sand Dollar are weakly correlated with the positive media sentiment about CBDC in general. The low and weak correlation coefficient in table 3 is due to the heterogeneous nature of the individual CBDCs which explains why the positive media sentiment about the individual CBDCs are weakly correlated.

Table 2: Pearson Correlation of the negative media sentiment

Variables	CBDC	ENAIRA	DCASH	SANDDOLLAR
CBDC	1.000 -----			
ENAIRA	0.664 (0.15)	1.000 -----		
DCASH	0.714 (0.11)	0.995*** (0.00)	1.000 -----	
SANDDOLLAR	0.878** (0.02)	0.831** (0.04)	0.878** (0.02)	1.000 -----

, * denote statistical significance at the 5% and 1% level. P-values are reported in parenthesis. Source: Own elaboration.

Table 3: Pearson correlation of the positive media sentiment

Variables	CBDC	ENAIRA	DCASH	SANDDOLLAR
CBDC	1.000 -----			
ENAIRA	0.268 (0.61)	1.000 -----		
DCASH	0.447 (0.37)	0.920*** (0.01)	1.000 -----	
SANDDOLLAR	-0.333 (0.51)	0.626 (0.18)	0.447 (0.37)	1.000 -----

*** denotes statistical significance at the 1% level. P-values are reported in parenthesis. Source: Own elaboration.

4.5. Univariate regression result - media sentiment analysis

We also investigate whether the media sentiment (both positive and negative) about CBDC in general is a determinant of the media sentiment (both positive and negative) about the DCash, eNaira and Sand Dollar. To do this, we set up a univariate OLS regression estimation to determine the effect of CBDC media sentiment on DCash, eNaira and Sand Dollar media sentiment. This approach allows us to determine whether media sentiment about CBDC is responsible for the media sentiment about the DCash, eNaira and Sand Dollar. The result is reported in table 4. The significant results in columns 1, 2 and 3 of table 4 show that the positive media sentiment about CBDC in general did not have a significant effect on the positive media sentiment about DCash, eNaira and Sand Dollar during the period. This means that the positive media sentiment about the eNaira, DCash and Sand Dollar was not caused by the existing positive media sentiment about CBDC in general. The significant results in columns 4, 5 and 6 of table 4 show that the negative media sentiment about CBDC in general led to a significant increase in the negative media sentiment about DCash, eNaira and Sand Dollar during the period. This means that the negative media sentiment about the eNaira, DCash and Sand Dollar was caused by the existing negative media sentiment about CBDC in general. The implication of the findings is that there is a need to improve the media perception or sentiment of CBDC in the media. This can be achieved through better sensitization of the population about the general benefits of CBDCs.

Table 4: Effect of general CBDC media sentiment on individual CBDC sentiment Ordinary Least Squares (OLS) Regression Estimation

	(1)	(2)	(3)	(4)	(5)	(6)
	Positive media sentiment about DCash	Positive media sentiment about eNaira	Positive media sentiment about Sand Dollar	Negative media sentiment about DCash	Negative media sentiment about eNaira	Negative media sentiment about Sand Dollar
	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)
Positive media sentiment about CBDC in general	0.333 (1.58)	1.667 (1.42)	0.666 (0.79)			
Negative media sentiment about CBDC in general				0.200** (2.98)	0.500** (2.67)	0.100*** (4.47)
R-square	0.20	0.01	-0.77	0.48	0.40	0.76

Source: Own elaboration

5. Conclusion

In this article, we have conducted a review of the difficulties being faced by countries or currency areas with a CBDC already in place. To do so, we have executed a sentiment analysis of the term CBDC from 2017 to the present in those countries. In turn, we have analysed the difficulties for its implementation and the possible solutions that can be adopted by the countries or currency areas involved; all with the aim of accelerating and maximizing the acceptance of a CBDC among their citizens.

Thus, we have found the following difficulties once a CBDC has been set up. First, the lack of digital skills of its citizens. This is a considerable factor to consider, since CBDCs have in many cases been implemented to increase financial inclusion. But one cannot financially include those who do not have the digital skills to manage a CBDC on a day-to-day basis. Second, in some countries, citizens do not see differences or advantages between CBDCs and existing digital means of payment. This factor can greatly limit the speed of adoption of a CBDC. Third, difficulties have been encountered in the acceptance of a CBDC that relate to privacy and security. This factor may probably be the most limiting. Citizens show a preference for a CBDC that maintains the characteristics of classic cash. The fourth limiting factor that we have pinpointed is the distrust in CBDC-FIAT money, and the use of alternative means: cryptocurrencies. Although this factor is the least important of all, there is empirical evidence that shows that most users of cryptocurrencies do it mostly for speculation and not because of distrust in the monetary system.

As measures that can be adopted by the monetary authorities in order to increase the acceptance of a CBDC, we have detected effective measures and others that would not be effective due to the risks involved.

As an effective measure to increase the acceptance and use of a CBDC in an efficient way, we can point out the implementation by the authorities of financial education programs and the increase of digital skills. Another effective measure to increase the acceptance and use of a CBDC would be for it to be designed in such a way that it respects the user's privacy (with features as close as possible to cash); and to ensure its security in design (against possible counterfeiting, fraud and/or hacking).

On the other hand, other measures have been analysed to increase the use and acceptance of a CBDC. However, they are not seen to be as effective as the previous two. The first option would be to offer interest rates for CBDC accounts

directly at the central bank. However, its possible impact on the financial system and the risk of disintermediation, as well as other possible effects on exchange rates, inflation, etc., make this measure inadvisable. Secondly, there would be the possibility of including a programmable CBDC. However, due to users' preference for privacy, despite its apparent advantages, this measure could limit in part the acceptance of a CBDC. Finally, there remains the "coercive" and indirect imposition of a CBDC by prohibiting the use of other digital means of payment. However, this measure does not seem likely to be very effective, in light of some results analysed in countries where this measure has been adopted (prohibition of the use of cryptocurrencies); and the results have been poor.

A media sentiment analysis (MSA) has also been executed. The objective has been to assess the sentiment about the central bank digital currency (CBDC) in the media. The data have been extracted only from the media and not from social networks such as Twitter or Instagram in order to avoid biases. The data analysed covers the years 2017 to 2022. The term used for the analysis has been "CBDC" or "central bank digital currency" or its local variant (e.g., eNaira, DCash or Sand Dollar). The extracted data have been further processed and a correlation analysis and univariate regression have been run. The results obtained allow us to conclude that the years with positive sentiment towards CBDCs were 2018 and 2022, due to the optimism and impact that a CBDC would have in a post-COVID world. The Nigerian CBDC e-Naira obtains the best results in terms of positive sentiment, relatively low is with DCash, while Sand Dollar obtains the worst result.

The results obtained on the negative sentiment analysis allow us to conclude that the negative sentiment towards CBDCs was extremely high in 2017. This is due to a previous total aversion to the CBDC innovation in terms that they would counter or rival cryptocurrencies. This negative sentiment appears again in 2022 due to the debate on the implementation of CBDCs (discussion of form, format, infrastructure, etc.). During the observed period, e-Naira always obtained the highest rejection, while DCash shows the lowest rejection. In the case of Sand Dollar, its situation remains constant over time.

All in all, it can be concluded that the negative media sentiment about eNaira, DCash and Sand Dollar was caused by the existing negative media sentiment about CBDC in general. Meanwhile, positive media sentiment about eNaira, DCash, and Sand Dollar was not caused by existing positive media sentiment about CBDC in general.

As limitations of this article, we can first point out that CBDCs are constantly changing and evolving due to the current large debate around them. As a result, data are changing rapidly and constantly. This may affect the results obtained in this article. Both in terms of difficulties (new ones may arise as implementation progresses) and solutions (there may be changes or modifications that eliminate the difficulties or generate new ones not addressed in this paper). Also, the speed of change in the CBDC situation may affect the results derived from the sentiment analysis in the media. Changes in trends, fashions, etc. will affect these results. A limitation of this study is the time period analysed (5 years) and the small number of countries currently operating a CBDC. More years will be needed to see whether negative or positive news about CBDC have had a high, medium, or low impact on its acceptance by citizens.

In the future, when more countries have CBDC and more years have elapsed since its implementation, or more countries move forward in pilot testing phases, it will be necessary to investigate and detect whether the identified difficulties have persisted or have been eliminated and whether new ones have arisen. It will also be necessary to analyse in each specific case whether the measures adopted and proposed to increase the implementation of CBDC have been effective.

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Appendix 1

S/N		Media Headline	Source	Year	Sentiment type
1	CBDC	Central bank digital currencies could cut costs for merchants	Finextra	2017	Positive
2	CBDC	No Point of a Central Bank Digital Currency in Australia:	CCN.com	2018	Negative
3	CBDC	Central bank digital currency could worsen panics	www.central banking.com	2018	Negative
4	CBDC	Why central bank digital currencies will destroy bitcoin	The Guardian	2018	Positive
5	CBDC	Central Bank-Issued Digital Currencies Are Not an Effective Economic Tool	CoinTelegraph	2018	Negative
6	CBDC	Central Bank Digital Currency Threatens Financial Privacy and Economic Growth	The Cato Institute	2018	Negative
7	CBDC	Why central banks should not push ahead with CBDCs	Financial Times	2022	Negative
8	CBDC	Why Would Anyone Use A Central Bank Digital Currency?	Centre for European Reform	2022	Negative
9	CBDC	Bank of England Governor Questions Need For Digital Pound	www.silicon.co.uk	2022	Negative
10	CBDC	Central-Bank Digital Currencies Are Coming—Whether Countries Are Ready or Not	Wall Street Journal	2022	Positive
11	CBDC	Prevent the introduction of any "programmable" CBDC in the UK	Petitions to UK Government and Parliament	2022	Negative
12	CBDC	CBDC Caution	City Journal	2022	Negative
13	CBDC	The Risks to Society of Central Bank Digital Currencies (CBDC)	LinkedIn	2022	Negative
14	CBDC	Big payments companies poke at CBDC	Payments Dive	2022	Negative
15	CBDC	Financial inclusion may be beyond the reach of CBDC	OMFIF	2022	Negative
1	eNaira	Nigeria's CBDC project fails to pick up as only 0.5% of residents use eNaira	Finbold	2022	Negative
2	eNaira	ICYMI: eNaira ranked first on PwC global index of top retail	ICYML	2022	Positive
3	eNaira	Nigeria's digital currency: what the eNaira is for and why it's not perfect	The Conversation	2021	Negative
4	eNaira	Poor awareness, fear of fraudsters bug eNaira's take off	The Guardian Nigeria	2021	Negative
5	eNaira	eNaira Shows That CBDCs Are Maturing	Forbes	2022	Positive
6	eNaira	Nigeria's eNaira Won't Save the Economy	Foreign policy	2021	Negative
7	eNaira	'Only 5% of people living in Abuja use eNaira application for	Daily Trust	2022	Negative
8	eNaira	Nigeria's poor internet connection could spell difficulty for eNaira transactions	Nairametrics	2022	Negative
9	eNaira	How digital divide threatens eNaira's mass adoption	The Punch	2022	Negative
10	eNaira	How CBN's eNaira sets global example for Central Bank digital currencies - IMF	IMF	2022	Positive
11	eNaira	eNaira success will trigger bandwagon effect	PWC	2022	Positive
12	eNaira	Poor mobile networks, others threaten eNaira acceptance	The Punch	2022	Negative
13	eNaira	eNaira will lower cost of receiving, sending money	Bitts Inc	2021	Positive

14	eNaira	How the eNaira is turning CBDC theory into reality	Tech Monitor	2022	Positive
15	eNaira	Nigeria's eNaira is a ground-breaking litmus test for crypto innovation in Africa	TechCabal	2021	Positive
1	DCash	A Bold Caribbean Experiment in E-Cash Hits a Major Obstacle	Bloomberg	2021	Negative
2	DCash	Eastern Caribbean CBDC 'DCash' Goes Offline for Over 2 Weeks	Yahoo Finance	2022	Negative
3	DCash	DCash Shows Why Fedcoin Could Be A Disaster	Forbes	2022	Negative
4	DCash	ECCB and DCash Poised to Drive Further Innovation and Impact	SKN Vibes	2022	Positive
1	Sand Dollar	Sand Dollar CBDC Could 'Foster Financial Inclusion' in the Bahamas - IMF	Crypto News	2022	Positive
2	Sand Dollar	Bahamas seeks to list its central bank digital currency on major crypto exchanges	Yahoo Finance	2022	Positive
3	Sand Dollar	Central Bank of Bahamas makes progress with Sand dollar...	Ledger Insights	2021	Positive
4	Sand Dollar	The Bahamas is 'disaster-proofing' payments with its first-ever digital currency	Master Card	2021	Positive
5	Sand Dollar	Sand dollars: a postmodern monetary architecture	IFLR	2020	Positive
6	Sand Dollar	Sand Dollar undermined? 'Nothing further from truth'	The Tribune	2022	Negative
7	Sand Dollar	Sand Dollar to offer lower merchant fees and faster payment	Eyes witness news	2020	Positive