

Decoding the Digital Euro: Reshaping Funding Costs for Spanish Banks

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SUMMARY

The launch of the Digital Euro (European CBDC) is prompt to induce Spanish depositors to shift part of their funds into this digital currency. This movement will represent a deposit (liability) outflow from banks that will influence the average funding costs of Spanish commercial banks. The study primarily analyzes the adoption rate of Spanish depositors in various scenarios in order to estimate the total amount of Digital Euro converted. We considered factors such as Digital Euro remuneration, deposit remuneration, ease of use, distrust in the banking system, existing e-payment users, and privacy, integrating insights from global CBDC implementations and structured interviews with experts in the Spanish banking sector. In response to this outflow, banks will likely respond in three different ways: using excess liquidity, issuing bonds or increasing deposit remuneration. We quantified the increase in funding costs in each scenario and the results suggest that although the funding cost effects will be relatively small, Spanish banks should strategically respond to potential shifts in deposit dynamics as the Digital Euro evolves, considering various scenarios and their implications for the banking sector.

JEL Classification: E51, E52, G21.

KEYWORDS

CBDC, adoption rate, funding costs, Digital Euro, Digital Euro holding limit, deposit outflows.

RESUM

El llançament de l'euro digital (CBDC Europea) probablement induirà als dipositants espanyols a transferir part dels seus fons a aquesta moneda digital. Aquest moviment representarà una reducció dels dipòsits (passius) en els bancs, la qual cosa influirà en els costos mitjans de finançament dels bancs comercials espanyols. L'estudi se centra principalment a analitzar la taxa d'adopció dels dipositants espanyols en diversos escenaris, amb l'objectiu d'estimar la quantitat total d'euros digitals convertits. Hem considerat factors com la remuneració de l'euro digital, la remuneració dels dipòsits, la facilitat d'ús, la desconfiança en el sistema bancari, els usuaris existents de pagaments electrònics i la privacitat. Això inclou la integració de perspectives d'implementacions globals de CBDC i entrevistes estructurades amb experts en el sector bancari espanyol. Davant aquesta disminució de fons, és probable que els bancs responguin de tres maneres diferents: utilitzant liquiditat excedent, emetent bons o augmentant la remuneració dels dipòsits. Hem quantificat l'increment en els costos de finançament en cada escenari i els resultats suggereixen que, encara que els efectes en els costos de finançament seran relativament petits, els bancs espanyols haurien de respondre estratègicament a possibles canvis en la dinàmica de dipòsits a mesura que l'euro digital evoluciona. És important considerar diversos escenaris i les seves implicacions per al sector bancari.

Classificació JEL: E51, E52, G21.

PARAULES CLAU

CBDC, taxa d'adopció, costos de finançament, euro digital, límit de tinença de l'euro digital, fugida de dipòsits.

1. Introduction

In the current landscape of global finance, the potential launch of Central Bank Digital Currencies (CBDCs) has emerged, reshaping the characteristics of monetary transactions and financial systems. This research goes into the Digital Euro, a CBDC initiative pushed by the European Central Bank (ECB), aiming to provide a digital alternative to physical cash within the Eurozone.

The introduction of the Digital Euro, carries implications for the commercial banking sector in the form of increased funding costs. Therefore, this project aims to assess the potential impact of the implementation of the Digital Euro on the Spanish banks' funding costs. Our investigation will focus on determining the scale of the deposit outflows and the banks' possible funding alternatives to cover up the deposit loss to eventually determine the funding costs increase.

Our evaluation will be conducted through the formulation of multiple models, aiming to estimate several key variables. These include:

- 1) Potential Digital Euro adoption rate of Spanish depositors.
- 2) Amount of deposits per person that would be converted into Digital Euros.
- 3) Amount of Spanish deposits converted into Digital Euros (expressed as a proportion).
- 4) Change in funding costs given the deposit outflow for three alternative funding sources.

By acquiring precise values for each of these variables, we intend to estimate the collective impact on the average increase in funding costs of the Spanish banking system.

Therefore, we want to highlight that throughout the analysis there are two types of data: actual values of variables found in existing literature or databases and values that constitute our own assumptions and estimates, which have been validated with experts during interviews.

Firstly, to provide an estimate of the potential deposit outflows (i.e. deposits converted into digital euros), we developed a model (*Figure 1*) with the main variables being: the amount of persons adopting the Digital Euro, and the average Digital Euros held per person.

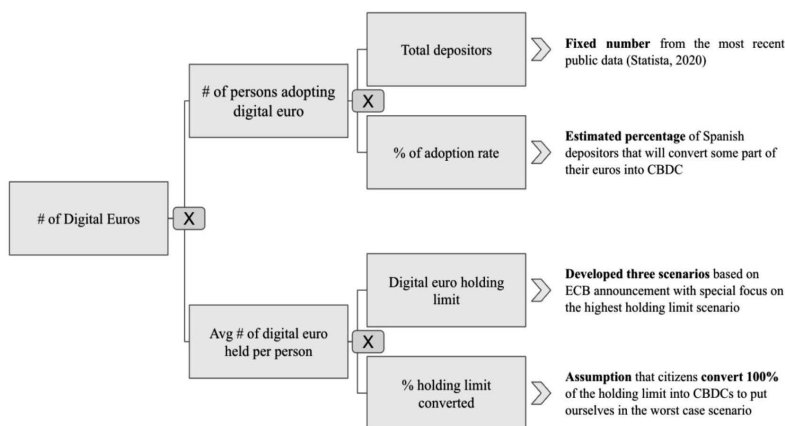


Figure 1. Simplification of the model (# as for number of units, X as for multiplication).

To estimate the potential willingness to adopt of Spanish depositors, we conducted an analysis of existing Central Bank Digital Currency (CBDC) implementations worldwide, to determine the most relevant variables impacting the adoption rate in each previous case studied. After identifying a long list of variables, we leveraged our interview to filter and adapt the variables to the Spanish banking sector resulting in a short list that shaped the adoption rate calculation model: Digital Euro remuneration rate, deposit remuneration rate, easiness to use, distrust on the banking system, existing e payments users, and privacy.

The model aims to obtain the adoption rate by assigning weights to each variable and multiplying them by their respective rate of completion. The completion rate has been assessed by taking the current value of each variable and comparing it against their respective feasibility interval.

To compute the average amount of Digital Euro converted per person, we have proposed 3 scenarios: low (500€), mid (2000€) and high (3000€). We also assumed that depositors will convert the 100% of the holding limit. Thus giving us 3 different possible scenarios for Digital Euros held per person.

Continuing, we multiplied depositors by the average amount converted per depositor to obtain the total amount of Digital Euros converted (i.e. deposit outflow). All of this with the sole purpose of computing the % of deposit outflow in the Spanish banking system for each holding limit. Nonetheless, this work, following a contingent approach, focuses mainly on evaluating the impact in the worst-case scenario with the highest holding limit, 3000€.

Following this, we leveraged ECB and Banco Central de España data to extract the average funding structure of Spanish banks (*Table 3*), and their respective funding costs. Then, with the percentage of deposit outflow, we have estimated the potential increase in funding costs. This increase has been computed by, first estimating the amount of funding that will be need to be covered due to outflow, and second proposing 3 different potential funding alternatives, with different costs mix, to cover the deposits lost:

- 1) **Using excess liquidity/reducing the balance sheet:** In which the % reduction of the deposits is subtracted from the percentage representing the deposits, and afterwards a reweighting is conducted to know the new percentages each founding source has.
- 2) **Getting new funds in the capital market through bonds:** In which the % reduction of the deposits is covered by 5-7 years maturity bonds and taking into account an additional 2% spread.
- 3) **Increased deposit remuneration and capital market funding combined:** In which the increase of deposit remuneration incentivizes some deposits to stay reducing the outflow amount, and the amount of deposits lost is covered by the same bonds as case 2.

2. Analysis of previous use cases and key variable identification

Recently, there has been an increase in global interest in digital currencies which according to the BIS show us that 86% of central banks are actively exploring Central Bank Digital Currencies (CBDCs), leading to diverse pilot tests and launches worldwide. Some of these cases that we analyzed are the Bahamas Sand Dollar, Nigeria's eNaira, the Chinese eCNY, out of which we could find common features, outcomes, and variables that affect each project's success on its launch.

The main goal of these projects was to modernize financial systems, enhance transaction efficiency, promote financial inclusion, and simplify cross-border transactions while reducing informality through traceability. In addition, common design features included the use of a two-tier system, integrating blockchain or distributed ledger technology for security and transparency, and exploring alternative models such as single-tier retail or intermediated/two-tiered CBDCs.

Even though adoption challenges are prevalent and adoption is slow mainly due to factors such as limited use cases, slow uptake, easiness to use, the trust on the banking system and privacy issues, promising potential is evident, particularly in CBDCs like China's e-CNY and France-Switzerland's Digital Euro project, which have secure and efficient settlement capabilities

with a cautious exploration approach. The most important factors that determined the success of the analyzed countries are the ones we eventually use in our model shown in *Table 1*.

Estimation total deposit outflow

To perform the deposit substitution estimation we have defined a model that allowed us to have a clear roadmap to reach the amount of deposits converted to Digital Euros. On one side by computing the number of depositors that will decide to hold Digital Euros and on the other side, by estimating the amount converted per depositor, in order to obtain the total amount of deposits converted (*Figure 1*).

Number of depositors that will hold Digital Euro (Adoption Rate)

This paper focuses on estimating the adoption rate of the Digital Euro at launch, crucial for understanding the number of adopters and the converted Digital Euro amount. A dedicated model, informed by key performance indicators and insights from prior use cases, emphasizes variables like Digital Euro and deposit remuneration, ease of use, distrust in the banking system, existing e-payment users, and privacy. Each variable is assigned weights, measurement methods, and defined intervals for analysis, contributing to a comprehensive understanding of anticipated adoption dynamics.

	Weight	Assumptions	Min	Max	% of completion	Effect on adoption rate
Digital euro remuneration	5.00%	0.00%	0.00%	4.75%	0.00%	0.00%
Deposit remuneration	30.00%	96.92%	95.00 %	100.00%	38.40%	11.52%
Easiness to use	30.00%	84.00%	0.00%	100.00%	84.00%	25.20%
Distrust on the banking system	10.00%	1.27	0.00	5.00	25.40%	2.54%
Existing e-payments users	20.00%	9,940,000	0	38,626,717	25-73%	5.15%
Privacy	5.00%	3	0	5	60.00%	3.00%
						47.41%

Table 1. Values assigned to the variables affecting the Adoption Rate.

Determining the adoption factors for the Digital Euro involves considering key variables which are shown in our final model (*Table 1*). Remuneration, onboarding, ease of use, and existing e-payment users carry significant weight in influencing the adoption rate. Conversely, trust in the banking system and privacy have lower importance. The analysis accounts for potential changes in Digital Euro remuneration, introducing a new variable for deposit remuneration, and assesses ease of use through the percentage of digital banking users. Distrust in the banking system is quantified based on a trust index score. Existing e-payment users amount to nearly 10 million, reflecting over 25% daily FinTech tool usage among depositors. Privacy considerations are based on meeting established requirements, mirroring the approach for onboarding. This condensed analysis provides valuable insights into the factors shaping Digital Euro adoption.

After the thorough analysis of each variable and calculating a weighted average out of this model, we obtain the effect on the adoption rate, which will be 32.29% upon launch, meaning that almost a third of the depositors in Spain will adopt the Digital Euro when it is launched, which amounts to almost 12.5 million individuals the commercial banks will have to support in the transition to the Digital Euro.

This number is highly sensitive to potential changes in the interest rate at which the Digital Euro is remunerated and at the rate at which deposits are remunerated, these are two topics still under discussion with high volatility and highly on the world economic situation that could alter the results of the analysis.

Average amount of Digital Euro held per person

After having the amount of Digital Euro users, and in order to compute the amount of deposits converted, we had to determine the amount of Digital Euro that would be converted per user. This value is highly linked to the use case that wants to be achieved by the ECB when launching the Digital Euro (e.g. the substitutive of cash, an international payment method, etc.), and consequently, the holding limit that will be set for individual users.

Therefore, we decided to proceed by analyzing three possible scenarios considering the following holding limits:

- **Low:** Having the Digital Euro as a form of “pocket-cash” with a lower holding limit, it’s assumed that users would convert the entirety of their Digital Euro holdings up to this limit.
- **Mid:** Aiming to align with the EU standard literature, a limit of 2,000€ is proposed, correlating with the Spanish net monthly salary. This conservative approach, although unlikely for citizens to surpass their salary in conversions, is employed to assess worst-case possibilities.
- **High:** Reflecting the Eurosystem’s agreed limit of 3,000€, considered high by Spanish standards, this scenario is included for comprehensive analysis.

For each holding limit there is a different outcome in terms of % of household deposits as seen in *Table 2* in which we can see that, in a worst-case scenario, where the highest limit is considered, the percentage of household deposits substituted is 5.57%, just 4.64% above the “pocket-cash” scenario. This poses a minimal threat to the Spanish banking system, with manageable consequences on the banks’ cost structure, as further elaborated in the analysis.

	Holding limit	# of digital EUR (in millions)	% of household deposits
Scenario LOW	500.00 €	9,155.83 €	0.93%
Scenario MID	2,000.00 €	36,623.30 €	3.71%
Scenario HIGH	3,000.00 €	54,934.95 €	5.57%

Table 2. Three Scenarios based on Holding Limits.

Estimation of the funding cost impact

This study analyzes the potential changes in funding costs of the Spanish banking sector, focusing on the “HIGH” scenario, where the highest household deposit limit (3000€) is assumed to be converted into digital currency at the ECB. Our goal is to assess how funding costs may vary based on potential financing options for banks. The analysis centers on the average funding structure and costs for Spanish banks, exploring how different financing alternatives could impact overall funding costs. The initial distribution of funding sources is illustrated below, with data taken from the Banco de España and ECB reports:

Funding source ¹	Weight	Interest rate (%)	Funding source
Deposits (M3)	59%	3.08 ²	The average interest rate that banks pay to depositors.
Other deposits	16%	3.58 ³	The cost of funds for other deposits, i.e. the average interest rate that banks pay to depositors on these types of accounts.
Bonds issued	10%	4.25 ⁴	The cost of funds for bonds, i.e. the average interest rate that banks pay to bondholders.
Equity issued	7%	11.50 ⁵	The cost of capital for equity, i.e. the average return that banks expect to generate on equity investments.
Central bank credit (MRO rate)	8%	4.50 ⁶	The cost of central bank funds, i.e. the interest rate that banks pay on loans from the central bank.
Weighted average overall costs (%)		3.98	

Table 3. Initial distribution of funding sources in Spanish Commercial banks and corresponding int. rate.

Evaluation of alternative financing sources

We’ll explore how banks might respond to a decrease in household deposits through three alternatives:

- 1) Reducing Balance Sheet/Using Excess Liquidity:** Banks may shrink their balance sheets by the lost deposit amount. This entails revenue loss from deposits and client margin. Additionally, there's the impact of lost remuneration from depositing excess liquidity in the ECB. This approach is contingent on sustainable liquidity buffers.
- 2) Capital Market Funding:** Seeking funds from capital markets is another option. However, the average cost of bonds is higher than deposit costs, resulting in increased expenses. Moreover, with a higher adoption rate, securing funds becomes pricier due to increased scarcity and investor demand.
- 3) Increasing Deposit Remuneration and Capital Market Funding:** Banks might raise deposit remuneration to retain clients, coupled with obtaining funds from capital markets. This dual strategy impacts funding costs, considering both the switch of funds and the increase in remuneration.

Each alternative has implications for the financial landscape, and the analysis will reveal the varying impacts on funding costs for the banks.

Conservative Scenario Approach

Having exposed the three different scenarios and their potential impact on the bank's funding costs to have a broader view, we now focus on our main objective of the project: see how the average funding costs change using *Table 3*, which shows the distribution of funding sources and their respective costs.

The total deposit outflow calculated (5.57%) represents a value of 3.29% of the total funding sources of the Spanish commercial banks if standardizing it. As a result, after the deposit outflow the proportion of Deposits as a funding source decreases to 55.71%, and the commercial banks have to recover the outflow of funding sources.

To conduct our analysis, we have considered 3 possible reactions from banks:

Case 1 - Using excess liquidity/ reducing balance sheet

Reaction: In this response scenario, banks might utilize liquidity reserves stored at the Central Bank to offset the entire outflow of deposits. This action would result in a reduced balance sheet and an opportunity cost in lost interest remuneration from depositing their funds in the ECB.

Effect on funding costs: As a direct consequence, the use of reserves alters the distribution of funding sources, and the average interest rate rises to 4.976%, a 0.05% increase from the initial rate.

	Weights after adoption	Reweighting	Interest rate
Deposits (M3)	55.71%	57.61%	3.08
Other deposits	16.00%	16.54%	3.58
Bonds issued	10.00%	10.34%	4.25
Equity issued	7.00%	7.24%	11.50
Central bank credit (MRO rate)	8.00%	8.27%	4.50
	96.71%	100.00%	4.011
Increase in average interest			0.03

Table 4. Effect on funding costs - Using excess liquidity.

Associated risks and objectives that should be accounted in further studies:

In considering the opportunity cost effect, it's noteworthy that the excess reserves banks deposit at the Central Bank (4% remuneration) and potential lost revenues from clients (e.g., credit card commissions) are factors outside the study's scope, which primarily focuses on costs.

Factors affecting this strategy include changes in regulations and the macroeconomic environment, influencing banks' liquidity buffer preferences. However, the negligible amount of capital to be substituted makes significant changes in risk preferences unlikely to impact this option significantly.

Furthermore, the strategy of using reserves may lead to less absolute remuneration of deposits. With clients holding smaller deposits, banks will need to remunerate these accounts less in absolute terms, a consideration, especially in periods of high interest rates.

Case 2 - Get funding from capital markets

Reaction: Given the regulatory implications and the possible effects it would have on the Net Stable Funding Ratio (NSFR), we discard the option

that banks will substitute deposit outflow with interbanks funding and assume they will make use of capital markets. In particular, we consider a scenario where there would be the issuance of 5-7 year senior unsecured bonds at an average cost of funding of 5.2%.

Effect on funding source distribution and cost: In terms of funding distribution, this would translate to an additional 2.84% assigned to New Bonds issued with an interest of 5.2%. Overall, this would lead to an average interest of 4.05%, 0.07 percentage points above the original state.

Funding source	Weight	Interest rate
Deposits (M3)	55.71%	3.08
Other deposits	16.00%	3.58
Bonds issued	10.00%	4.25
Bonds issued after launch	3.29%	5.20
Equity issued	7.00%	11.50
Central bank credit (MRO rate)	8.00%	4.50
Weighted average overall costs (%)	100.00%	4.05
Increase in average interest		0.07

Table 5. Effect on funding costs - Issuing bonds.

Associated risks and objectives that should be accounted in further studies:

In a crisis scenario, where deposits might be less remunerated, there could be a surge in Digital Euro adoption, necessitating banks to issue more bonds. This occurs in a context of source scarcity, potentially leading to higher bond interest rates.

This situation aligns with the earlier point about reduced absolute remuneration for deposits. Additionally, there could be divergence in the cost of bonds or the choice of financing instruments, potentially becoming more expensive due to increased spread.

Even though for the analysis conducted we have mainly focused on describing the worst case scenario corresponding to the high holding limit,

we want to summarize the possible outcomes given the three different scenarios, as well as the three possible reactions of the commercial banks' mentioned above.

	Holding Limit		
Average cost of funding	low	mid	high
Excess Liquidity	3.985	4.000	4.011
Capital Markets	3.992	4.026	4.050
Deposit Remuneration + Capital Markets	4.538	4.554	4.613

Table 6. Summary of results (in interest %) of funding cost.

As you can see in *Table 6*, the cost of funding for commercial banks increases as the holding limit becomes higher. The intuition is that, the higher the holding limit, more deposits will be substituted into Digital Euro, and therefore the banks will have to cover a larger portion of outflows with more expensive funding sources.

Furthermore, regardless of the holding limit assigned for individuals, the proposed combined response of “Increased deposit remuneration and partial financing in capital markets” is the most expensive, representing the highest increase in interest. Thus leading the banks to not consider this as a viable option as the effect on funding costs would be severe and it would erode the banks' bottom line.

The second most expensive option would be to issue bonds to cover the deposit outflow. This will also be dependent on the ECB monetary policy and in a potential Crisis scenario, where the interest rate at which the bond would be emitted could be further stressed.

Therefore, to minimize the funding cost impact, banks should respond by using the excess liquidity to cover the deposit outflow, since it would be the cheapest option across all holding limits.

Average cost of funding	Holding Limit		
	low	mid	high
Excess Liquidity	0.005	0.020	0.031
Capital Markets	0.012	0.046	0.070
Deposit Remuneration + Capital Markets	0.558	0.574	0.633

Table 7. Summary of results (in interest %) of the increase in funding cost.

Nevertheless, as mentioned before, it is important to assess the potential opportunity cost in terms of lost revenue, coming from the interest earned from the Central Bank for depositing the excess of reserves there, as well as the potential loss of clients. Also, liquidity buffers might be affected and trigger regulatory concerns, especially in less favorable macroeconomic conditions. However, this assessment is outside the scope of our project, which focuses only on the impact on the cost side.

Finally, it is worth mentioning that raising money in the capital markets in an environment where the ECB is providing special quantitative easing instruments to commercial banks, could also be a reasonable option. This would lower the risk to potential tougher regulatory scrutiny and help avoid the loss of revenue caused by using excess liquidity at a not much higher cost.

3. Conclusions

Central Bank Digital Currencies (CBDCs) mark a pivotal step in the evolution of monetary systems, offering a digital counterpart to traditional national currency and very impacting positively by advancing in the matters of digitization of payments, financial inclusion, reduced transaction costs, enhanced monetary policy, regulatory oversight, innovation and currency stability.

The European Central Bank's (ECB) introduction of the Digital Euro aims to address these objectives while simultaneously distancing itself from existing private solutions, such as stablecoins. However, the advent of CBDCs introduces a set of challenges and risks affecting various stakeholders, including consumers, merchants, distributors, and public bodies.

When scrutinizing the risks associated with Spanish commercial banks, we conservatively consider a worst-case scenario where the holding limit

will be set at 3,000€, where results suggest that the effect on funding costs is anticipated to be small, with a maximum increase of 0.547% in interest compared to the pre-launch scenario. Furthermore, in scenarios where the Digital Euro functions primarily as “digital pocket cash” or if the adoption rate falls below expectations due to exogenous factors, the impact on funding costs will remain even more negligible (i.e. a minimal increase of 0.009%).

Our conclusions recommend that banks strategically cover deposit outflows with excess liquidities for optimal cost-effectiveness. However, it’s crucial to consider opportunity costs in each bank’s response, especially regarding excess liquidity, as this could impact our conclusions. Despite the early stage of the Digital Euro’s development, our flexible model adds value by adapting to changes in foundational data, allowing exploration of scenarios beyond the project’s scope, such as crises or shifts in banks’ risk preferences.

We provide a broad view of the Spanish banking industry, but a detailed examination of specific banks is needed. Considering the industry’s consolidation after the financial crisis, the impact on individual banks may be minimal. Additionally, our analysis assumes uniform responses, but different approaches by each bank

The Digital Euro’s success depends on the ECB effectively motivating Payment Service Providers (PSPs) for higher adoption. Additionally, the ECB’s unconventional monetary actions, potentially injecting more liquidity into commercial banks, could reshape the landscape, influencing our funding cost analysis.

In summary, Central Bank Digital Currencies (CBDCs), like the Digital Euro, will change how we handle money and are going to influence commercial banks’ business models. Our study focused on Spanish banks and found that, despite potential challenges, the impact in terms of increase on their funding costs is likely going to be minor. We look forward to see the material effects of these innovations in the subsequent implementation phase and we remain expectant to see how the results of our analysis could change subject to European Central Bank’s specific decisions on the design and implementation and the individual response of commercial banks.

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