Preliminary methodology for calibrating holding limits

ERPB meeting – Item 3

10 December 2024

Digital euro project

Purpose of today's discussion

- The ECB is working to develop a methodology for setting digital euro holding limits, balancing user experience with monetary policy and financial stability implications.
- **This presentation provides a description of the tools being developed and aims to collect feedback from ERPB members on these tools**.

<u>Nota bene</u>: this presentation and its annex have not been adopted or endorsed by ECB decision making bodies and therefore any views expressed shall not, under any circumstances, be regarded as an official position of the ECB. This content is intended solely to facilitate discussions and feedback by experts from the ERPB associations to be provided to the ECB digital euro project team.

Our framework of analysis

Framework based on the **objectives set out in Article 15.1 of the draft digital euro regulation**

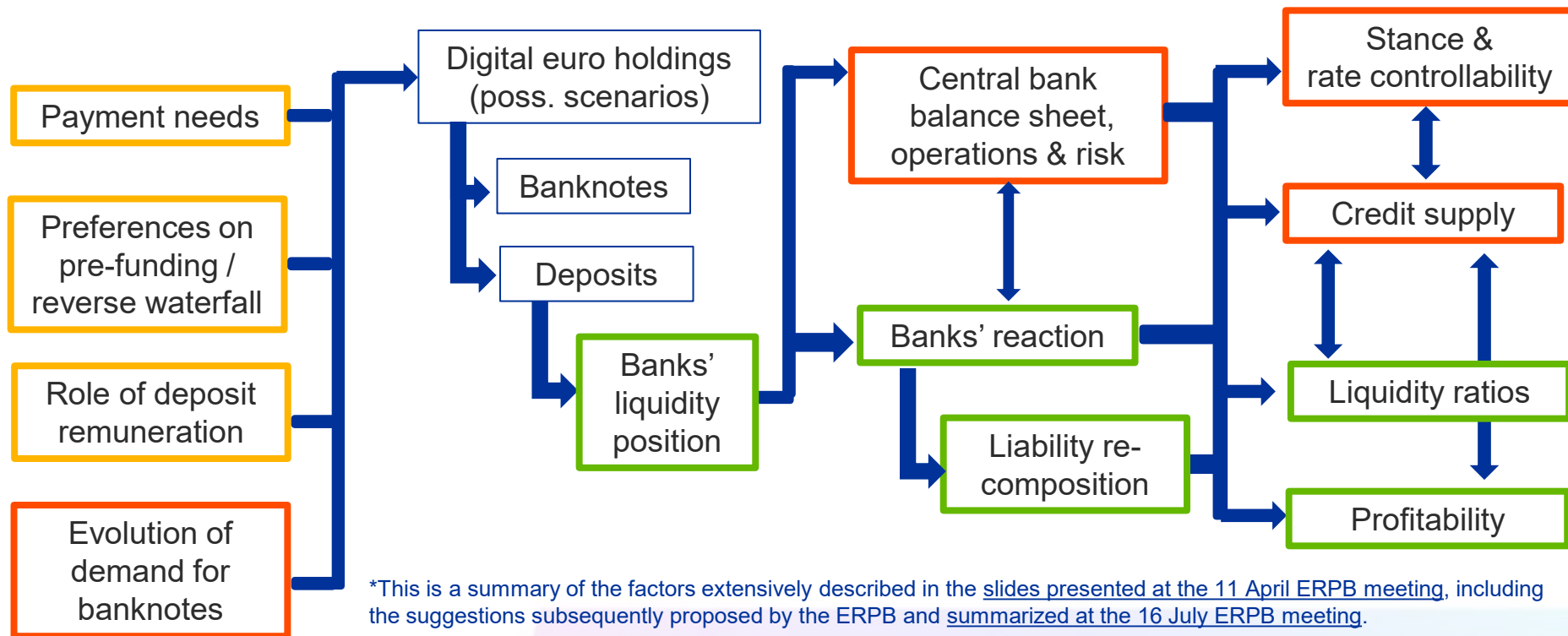**2. Ensure effectiveness of monetary policy**

1. Ensure usability as a means of payment

Holding limit

3. Ensure financial stability

Individual holding limits should be established taking into account the **public good nature** of the digital euro and **proportionality principle** (cfr. draft Regulation): restrictions should be necessary, appropriate and the least intrusive to maintain financial stability and support the effectiveness of monetary policy

Relevant factors* and interlinkages for the calibration of the holding limit

Block 1: Usability

Block 2: Monetary policy

Block 3: Fin. stability & banking supervision

Payment needs

Preferences on pre-funding / reverse waterfall

Role of deposit remuneration

Evolution of demand for banknotes

Digital euro holdings (poss. scenarios)

Banknotes

Deposits

Banks' liquidity position

Central bank balance sheet, operations & risk

Banks' reaction

Liability re-composition

Stance & rate controllability

Credit supply

Liquidity ratios

Profitability

*This is a summary of the factors extensively described in the slides presented at the 11 April ERPB meeting, including the suggestions subsequently proposed by the ERPB and summarized at the 16 July ERPB meeting.

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Anticipating the environment in which the digital euro will be introduced

The methodology requires specifying different scenarios to assess the impact of the digital euro. **Key considerations** to incorporate into the analysis are:

- Anticipating **how the financial sector might change**, including **how digitalisation is reshaping it** (e.g., change in deposit stickiness, instant payments, stablecoins, etc)

- Evaluating the **usage of cash going forward**

- Anticipating the **liquidity environment**, making the methodology **robust** to future evolutions (e.g. to less ample central bank liquidity)

Common assumptions

Hypothetical digital euro introduction under **different holding limits and scenarios**

- Range of holding limits
    1. As per SSM data collection bucketing for retail deposits in Significant Institutions (SIs)

- Scenarios for deposit outflows (as also suggested by ERPB members)
    1. Business-as-usual: contained deposit outflows – digital euro as a means of payment
    2. Flight-to-safety: system-wide outflows due to a loss of confidence in the banking system (unrelated to digital euro and abstracting from crisis reaction by ECB)

Nota bene: Idiosyncratic bank run already feasible and even faster due to digitalisation, so not specifically modelled given limited marginal impact of digital euro

Scenarios for deposit outflows

Sample: Q1 2024, 2009 banks, of which 112 SIs and 1897 LSIs* from SSM supervisory data**

and ad-hoc SSM Distribution of Retail Deposits data for 98 SIs (i.e., those with retail deposits)

Deposit outflows under business-as-usual

Predicted based on digital euro demand estimates/scenarios (building on <u>Lambert, et al., 2024</u>, to be further refined with data points coming from Block 1, see slide 9)
- SIs: estimated average digital euro holdings multiplied by number of unique eligible sight depositors and adjusted for depositor balances (by bucket, based on SSM data)
- LSIs: projected share of deposit outflows of small market lenders (to be further refined with ongoing LSI data collection)

Deposit outflows under flight-to-safety

Maximum possible outflows of retail sight deposits
- SIs: maximum eligible retail sight deposits based on current bucketed balances and adjusted for (est.) multiple accounts and shared accounts (by bucket, based on SSM data)
- LSIs: maximum share of deposit outflows possible of small market lenders (to be further refined with LSI data)

*LSIs = Less Significant Institutions
**COREP/FINREP

Block 1: Usability – objectives and tools

1 Study **users' ability to make payments with digital euro, i.e. cover their consumption**, under different holding limits

We use **survey data** from the <u>Household Finance and Consumption survey</u> to analyse the consumption distribution (and complement this with analysis on income, following feedback by ERPB members)

We follow a two-step approach
1. We include a) "**amount spent on consumer goods and services**" (covering utilities, food, childcare, and health care expenses); b) **"expenses on trips and holidays"** and **"amount given as alimony, charity etc."** (each adjusted in terms of monthly and individual expenditures).*
2. We additionally include **additional funds available for individual consumption** and add them to step 1 (to include additional potential use cases for digital euro spending).

* Work in progress: **rent, loan repayments, and mortgage payments currently not included** - expected to significantly increase individual monthly consumption.

Block 1: Usability – objectives and tools (cont.)

2   Investigate **user preferences**, esp. in terms of pre-funding over reverse waterfall (including **heterogeneity across users**)

We conduct **ad-hoc survey on users' behaviour and their money demand** to tackle structural difficulties in comprehending user behaviour.

Critical (as also noted by ERPB members) **but challenging**, due to the inability to directly compare with traditional payment methods and the fact that user behaviour is not only heterogeneous but also evolves over time:

- results can be used to **cross-check the monthly expenses** figures and **provide further data points** that can **help model the scenarios**

Survey is **representative of the euro area population**: individuals aged 18+, targeting 1,000 individuals per euro area country (with three countries involving 500 respondents).

Respondents are provided with **basic information** about the digital euro, helping participants provide informed responses.

Block 2: Monetary policy – objectives and tools

1 Analyse **impact of digitalisation on demand for banknotes**, so to understand possible substitution between the two

We analyse **key trends** (using macro data and the SPACE* survey) to inform about the "likely" value of conversion of banknotes into digital euro. Key aspects to consider:

- So far, progressive and moderate **return of banknotes** to bank deposits due to the **increasing digitalisation of transactions**.

- **Potential future impact of digitalisation on storage of value** (e.g. role of stablecoins), complex to assess.

We use a Bayesian vector autoregression (BVAR) model **to identify key drivers of banknote holdings growth:**
- looking at factors that are typically linked to storage of value: opportunity costs (-), uncertainty (+), liquidity (+)
- And considering that storage of value accounts for most of the banknote stock.

*SPACE = Study on Payment Attitudes of Consumers in the Euro area

Block 2: Monetary policy – objectives and tools (cont.)

2   Analyse **impact on loan supply** due **to bank balance sheet adjustments**

We look at **two channels**
- changes in **funding costs** and **profitability** (input obtained from block 3)
- **evolution of reserves**

We **adapt models currently** used from regular policy work on loan supply
- Macroeconometric time series model (BVAR) estimated on the euro area (e.g. quarterly GDP, inflation, loans to non-financial corporations, change in credit standards (BLS), etc).
- Dynamic Stochastic General Equilibrium models calibrated on the euro area (e.g. based on Darracq Pariès et al., 2011)
- Microeconometric estimates

Derive **estimates robust to model and estimation uncertainty**, complemented by meta-analysis of the literature

Block 2: Monetary policy – objectives and tools (cont.)

3 — Analyse **impact** stemming from the creation of new liquidity-absorbing autonomous factor **on relative position of euro short-term rate (€STR) in the rate corridor**

We evaluate **€STR implications across projected Eurosystem balance sheet scenarios**, accounting for the ECB's **new operational framework announced in March 2024**

We estimate **paths for banks' (excess) liquidity holdings** after deposits outflows (see common assumptions).

Impact depends on the amount of liquidity:
– provided via **structural operations** (see discussion in slide 5)
– demanded by banks via borrowing through **standard refinancing operations** (i.e. short-term central bank funding). Borrowing is estimated conditional on liquidity already provided though structural operations (see above)

The impact also depends on the specific parameters and assumptions used in the scenarios

Block 2: Monetary policy – objectives and tools (cont.)

4   Analyse **collateral availability and scarcity** for given deposit outflows

We inquire (as also requested by ERPB members) whether **banks hold enough unencumbered eligible assets** after haircuts to obtain, in response to deposit outflows,

- central bank funding simulated as described in Block 3 (bank level, using supervisory data)
- excess liquidity holdings estimated as described on previous slide (aggregate level)

We assess if collateral encumbrance could lead to **collateral scarcity**, by:

- analysing **collateral / government bond encumbrance** on aggregate, assuming all deposit outflows are replaced by secured funding
- determining prevailing **Eurosystem footprint** in government bond markets - assets previously held/pledged - using detailed market data;
- We compare encumbrance level and new Eurosystem footprint **against historical benchmarks.**

Block 3: Financial stability and banking supervision - objectives and tools

(1) **Analyse** the impact on **banks' liquidity**

We simulate banks' reaction to deposit outflows using a **constrained balance sheet optimization model** (Meller and Soons, 2023)

Dataset:

- We use **bank-level data for 112 SIs and 1897 LSIs** from COREP/FINREP,

- We combine data with SSM-administered **data for 98 SIs on deposit distribution and internal liquidity target, to be further augmented with LSIs data in the future** (see slide 7)

For a given outflow of retail deposits, a bank chooses its balance sheet adjustment with the aim of maximizing profits by solving:

$$\max_{\Delta R_i, \Delta STS_{ijk}, \Delta MTS_{ijk}, \Delta MLTS_{ijk}, \Delta LTS_{ijk}, \Delta ST_{ij}, \Delta MT_{ij}, \Delta MLT_{ij}, \Delta LT_{ij}, \Delta STSCB_{ik}, \Delta LTSCB_{ik}, \Delta STCB_{il}, \Delta LTCB_{il}, \Delta SPSTCB_i, \Delta SPLTCB_i, \Delta STS_{jik}, \Delta MTS_{jik}, \Delta LTS_{jik}, \Delta ST_{ji}, \Delta MT_{ji}, \Delta LT_{ji}} (\Delta INC_i - \Delta CF_i)$$

subject to bank specific constraints and interbank market clearing conditions

Block 3: Financial stability and banking supervision - objectives and tools (cont.)

1 **Analyse** the impact on **banks' liquidity**

Abstracting from other potential responses, under the model, the bank chooses between :

Reserve constraint

Liquidity constraints

Collateral constraint

draw down its own reserves, if reserves are not depleted and bank is not constrained by minimum Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) requirements

obtain (un)secured market funding if not collateral or LCR/NSFR constrained and there is excess liquidity in the system

"reserve redistribution"

obtain additional reserves via central bank funding

Block 3: Financial stability and banking supervision - objectives and tools (cont.)

The model allows for testing various types of **scenarios** where different assumptions on the different parameters can be assessed:

- e.g., regarding deposit outflows, liquidity preferences, interbank market frictions, funding prices, monetary policy

Model output consists of **bank-level adjusted balance sheets** after digital euro demand is satisfied. It is used

- To assess the distributional impact on individual banks and business models across various dimensions, including **liquidity metrics** (LCR, NSFR, liquidity survival period)**, SREP indicators**, and **net interest income**
- **used as an input for the analyses in Block 2**

Block 3: Financial stability and banking supervision - objectives and tools (cont.)

2 Analyse **impact of digital euro** on **banks' profitability, in particular** on **Net Interest Income (NII)**

NII impact estimated based on volume adjustments and interest rate for each balance sheet item:

r

Balance sheet optimization model → Δq → NII computation → ΔΠ
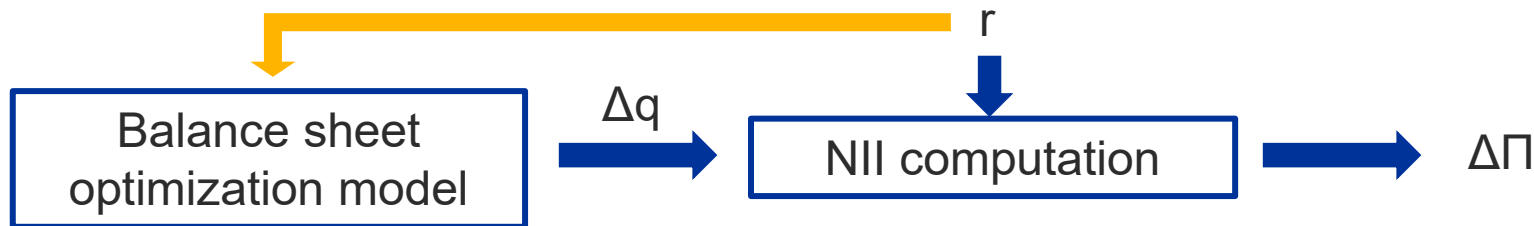
NII impact is defined, at bank level (as also suggested by ERPB members), as the change in interest income minus the change in interest expenses:

$$\Delta\Pi = \sum_i r_i \, \Delta q_i^{asset} - \sum_j r_j \, \Delta q_j^{liabilities}$$

with Π = profits, r = rates and q = quantities

Conclusion – way forward

1. Further sensitivity analyses to account for the the environment in which the digital euro will be introduced

2. Incorporation of SSM data on retail deposits and liquidity targets from LSIs

3. Refinement of scenarios / assumptions through ad-hoc survey on consumers' behaviour

4. Benchmarking of the results (e.g., impact on credit supply due to outflows) against historical episodes (e.g. usual fluctuations in deposit volumes vs bank runs) and standard SSM toolkits used by supervisors

5. Development of a holistic approach to bring everything together across the 3 blocks

6. Incorporate the internal and external feedback to fine tune the models.

ERPB technical session members are invited to:

Provide feedback on the technical presentation by 28 January 2025:
We specifically invite reflections on the:

- **common assumptions** and **calculation** of the scenarios (slides 6 and 7)
- **tools** used in the preliminary methodology for the various building blocks (for example, we would welcome feedback on slides 8 to 17)
- the **way forward** (slide 18)
- **detailed** <u>annex</u>

including reasoning for any adjustments, additions, or deletions. You may also provide suggestions on data sources**.**

Interaction with market stakeholders in 2024 and next sessions

December ERPB meeting
Preliminary methodology

February ERPB meeting

July session with banks' liquidity experts
Seminar on (i) SSM data collection; and (ii) mechanics of ECB model

*Offer for **sector-specific ad-hoc expert sessions**, specifically tailored for Banks PSPs, non-Banks PSPs, Merchants, and Consumers.*

July ERPB meeting
Summary of written feedback and follow-up

*Please signal your interest **via email by 20/12/2024***

ERPB written feedback
ERPB's members' comments on factors considered

April ERPB meeting
Factors and outlook on engagement

Thank you