

Discussion of

# **A Macroeconomic Model of Central Bank Digital Currency**

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# This paper

- ◆ Studies the introduction of a central bank digital currency (CBDC) using a rich New Keynesian DSGE model
- ◆ Assesses its welfare impact
  - in economies characterized by different steady-state policy rates
  - under different CBDC remuneration schemes
- ◆ Proposes an optimal rule-of-thumb for CBDC remuneration.
- ◆ Evaluates how MP transmission is affected by the presence of a CBDC.

# CBDC introduction: in a nutshell

- ◆ Introduce CBDC by shifting its remuneration from -100% to  $\approx 0\%$ .
- ◆ **Key trade-off:**
  - ✓ Benefits: Consumers gain from additional liquidity services and reduced bank deposit market power
  - ✗ Costs: Banks' intermediation capacity is reduced, possibly affecting lending

## ① CBDC reduces deposit market power

- ❑ Banks respond to CBDC competition by narrowing deposit spreads.

## ② Welfare gains from CBDC introduction

- ❑ Households benefit from improved liquidity and higher deposit returns, especially in low interest rate environments (where a non-remunerated CBDC is most used).

## ③ Optimal CBDC rate rule

- ❑ Rule of thumb  $i_{cbdc} = \max\{0\%, i - 1\%\}$  strikes the balance between increased liquidity benefits and moderate bank disintermediation.  
As  $i$  rises,  $i_{cbdc}$  needs to rise to curtail bank market power.

## ④ Disintermediation risk is small

- ❑ US: CBDC reduces bank lending, but welfare gains dominate in US unless CBDC is overly attractive
- ❑ EA: slightly lower welfare gains due to higher disintermediation

# Thoughts on the paper - I

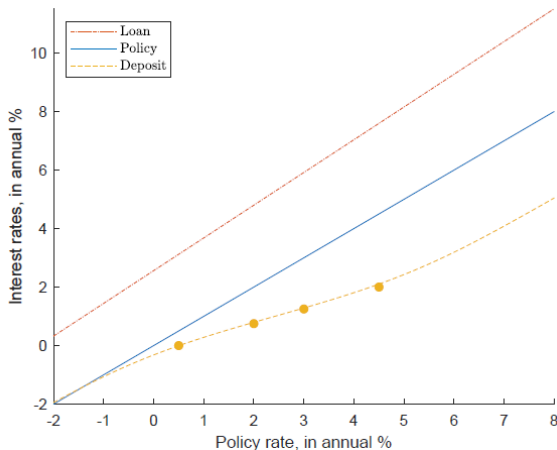
- ◆ Nice static framework to build intuition for the main trade-off. It transparently shows, with minimal structure
  - ❑ how changes in the **policy rate**  $i$  affect **deposit markdowns**  $i - i^d$   
deposit channel of MP (Drechsler, Savov, and Schnabl, 2017)
  - ❑ how introducing a CBDC affects  $i^d$  and  $i - i^d$
  - ❑ how these changes vary according to the *level* of  $i$
- ◆ Very rich and realistic NK DSGE setup that includes
  - ❑ monopolistic banks that issue deposits/extend loans and are subject to capital requirements.  
CBDC → profitability → equity → loan/equity → credit markets
  - ❑ sticky prices (Calvo), business cycle fluctuations and MP responses

## Thoughts on the paper - II

- ◆ Credible calibration of many parameters - this is a HUGE model.
- ◆ Generates realistic loan/deposit spreads as a function of  $i$ .

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- ➊ Substitution patterns between cash, deposits and CBDC
- ➋ Stocks versus flows: CBDC holdings vs. CBDC usage

# My comments

## 1. Substitution patterns

- ◆ Card, CBDC and deposit shares in the model essentially depend on
  - returns on cash (0), CBDC ( $i^{CBDC} \simeq 0$ ) and deposits ( $i^D$ )
  - parameters of the liquidity aggregator from [Balloch and Koby \(2023\)](#), extended to include CBDC

$$\mathcal{L}_t = \left( \gamma_m m_t^{\frac{\theta+1}{\theta}} + \gamma_d d_t^{\frac{\theta+1}{\theta}} + \gamma_{cbdc} cbdc_t^{\frac{\theta+1}{\theta}} \right)^{\frac{\theta}{\theta+1}},$$

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- ① Degree of substitutability  $\theta$  estimated to be very high ( $\approx 550$ ) and assumed identical for CBDC-cash and CBDC-deposits.

❑ This may or may not be accurate: cash-like vs deposit-like CBDC.  
([Nocciola and Zamora-Pérez, 2024](#))

| Feature                   | Cash | Deposits | CBDC |
|---------------------------|------|----------|------|
| Widespread acceptance     | ✓    | ✗        | ✓    |
| Interest bearing          | ✗    | ✓        | ✗    |
| Offline usability         | ✓    | ✗        | ✓    |
| Anonymity/privacy         | ✓    | ✗        | ✓    |
| Peer-to-peer transfers    | ✓    | ✗        | ✓    |
| Budgeting                 | ✗    | ✗        | ✓    |
| Theft/security protection | ✗    | ✓        | ✓    |

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- ❑ Could a nested CES design resembles more closely the actual post-CBDC configuration of liquidity services?

$$L_t^i = \left[ \gamma_m \cdot m_t^{\frac{\theta_i+1}{\theta_i}} + \gamma_{cbdc}^i \cdot cbdc_t^{\frac{\theta_i+1}{\theta_i}} \right]^{\frac{\theta_i}{\theta_i+1}}, \quad i \in \{cash, dep\}$$

$$\mathcal{L}_t = \left[ \alpha_{cash} \cdot (L_t^{cash})^{\frac{\eta+1}{\eta}} + \alpha_{dep} \cdot (L_t^{dep})^{\frac{\eta+1}{\eta}} \right]^{\frac{\eta}{\eta+1}}$$

- ❑ Would alternative substitution patterns affect the results?
- ❑ Would a cash-like CBDC generate less disintermediation?

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## 2 Calibration of $\gamma_m, \gamma_d$ and $\gamma_{cbdc}$ is crucial

- Set  $\gamma_m = \gamma_{cbdc}$  exploiting hypothetical survey questions asked to a sample of German households by [Bidder, Jackson, and Rottner \(2024\)](#).  
*"Please assume that you have a digital euro account that you can use to hold digital euro. You would receive no interest on this digital euro account. How much of the € 1,000 per month would you now deposit into your digital euro account, hold as cash, deposit into your regular current account at your bank, or invest in other financial instruments? "*

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### ② Calibration of $\gamma_m$ , $\gamma_d$ and $\gamma_{cbdc}$ is crucial

- ❑  $\gamma_m = \gamma_{cbdc}$  to reflect that in the subsample of potential adopters the cash and D€ share were roughly equal. Does this imply that  $M_t/Y_t = CBDC_t/Y_t$  after the CBDC is introduced?
- ❑ Imperfect adoption (e.g. due to inertia/switching costs) and acceptance of CBDC should be captured by  $\gamma_{CBDC}$
- ❑ Transitional dynamics related to staggered technology adoption may play a role ([Alvarez et al., 2023](#))
- ❑ Can the introduction of a CBDC lower  $\gamma_m$  (merchants stop accepting cash because they prefer CBDC?)?

# My comments

## 2. CBDC holdings vs. CBDC usage

- ◆ Focus of the model is on CBDC **holdings** (stocks)
  - ◆ But CBDC “success” also depends on its **usage** as a means of payments (flows)
  - ◆ A missing ingredient: velocity of money!  
Not easy to incorporate in a large-scale DSGE model...
  - ◆ CBDC may have very high velocity!
    - ❑ Programmable transfers from deposit account, reverse waterfall functionality
    - ❑ Exploit CBDC advantages as a payment method without holding a large stock (to avoid high opportunity costs in the presence of no remuneration)
- CBDC could provide substantial liquidity/payment services with even less disintermediation: it depends on its design.

# Taking stock

- ◆ A great paper with a rich and realistic model
- ◆ Nice and credible quantitative evaluation of the trade-offs involved in CBDC introduction
- ◆ Timely and relevant analysis of the optimal CBDC remuneration
- ◆ Some words of caution: model has to abstract from
  - ❑ payment method and cash management decisions
  - ❑ imperfect acceptance of payment methods
  - ❑ dynamic adoption choices in the presence of network effects
- ◆ All of these features of the problem make the outcome more uncertain and the nuances of CBDC design more relevant

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# References I

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