Should Central Banks Issue Digital Currency?

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Money

▸ **Money (M1) has two distinct forms:**

    ▸ currency: issued by the central bank, physical (paper)

    ▸ bank deposits: claims on private banks, → electronic

Cash use in Sweden

Source: Payments in Sweden 2019, Sveriges Riksbank

The shift toward electronic payments …

    … has implied a shift away from central bank liabilities and toward private liabilities

▸ **Policy makers are concerned about consequences for:**

    ▸ contestability in payments markets, reliability (Wirecard)

    ▸ financial inclusion

    ▸ monetary policy (esp. if private liability is in distinct units → Libra)

CBDC

▸ In response, many central banks are considering issuing *digital currency (CBDC)*

  ▸ BIS: 40+ central banks are studying the possibility of CBDC

  ▸ China has a large-scale pilot underway

▸ Could take one of several forms:

  ▸ a cryptographic token ("FEDcoin")

  ▸ or simply allowing individuals to have accounts at the central bank

    ▸ perhaps with account services provided by private banks

    ▸ or through a narrow bank holding 100% reserves ("synthetic CBDC")

▸ We focus on the broad economic effects of a CBDC

  ▸ which are likely invariant to the specific implementation

One (major) concern

▸ **If many bank depositors shift to holding a CBDC instead…**

  ▸ how will that affect banks' funding costs?

  ▸ bank lending? aggregate investment?

▸ **This issue is commonly raised in policy discussions:**

"[A] flow of retail deposits into a CBDC could lead to a loss of low-cost and stable funding for banks."

BIS (2018)

"A consequence could be higher interest rates on bank loans."

Mersch (ECB, 2017)

"[D]o the benefits … get outweighed by the negative consequences of the central bank disintermediating a large part of bank business models?"

Meaning et al. (BoE, 2018)

Q: Is the possible disintermediation of banks a serious concern?

  ▸ specifically: is it a reason not to issue CBDC?

▸ Disintermediating banks sounds bad, but …

▸ The central bank would be offering a better medium of exchange

  ▸ could be used in a wider range of transactions (including online)

  ▸ could potentially bear interest

▸ Why isn't that a *good* thing?

  ▸ seems like a way to implement Friedman's optimum quantity of money

⇒ The answer is not so obvious (→ need a model)

What we do

▸ Construct a model in which:

    ▸ bank deposits are used as a medium of exchange

    ▸ and therefore give banks a "low-cost source of funding"

    ▸ banks use this funding to invest in productive projects

▸ Introduce a CBDC into this environment

    ▸ an alternative medium of exchange to bank deposits

    ▸ pays interest at a rate chosen by the central bank

▸ Show that it can lead to "disintermediation of banks"

▸ But can nevertheless raise output and welfare

    ▸ emphasize that the interest rate on CBDC is a new policy tool

Literature

▸ There is a growing literature on the topic of CBDC

  ▸ expository: Bech and Garratt (2017)

  ▸ discussions: BIS (2018), Berentsen (2018), Bordo and Leven (2017), Engert and Fung (2017), Fung and Halaburda (2016), Kahn, Rivadeneyra and Wong (2018), Ketterer and Andrade (2016), and others

  ▸ policy speeches: Broadbent (2016), Mersch (2017), others

  ▸ plus BIS, IMF and central bank reports, many blog posts, etc.

  ▸ models: Barrdear and Kumhof (2016), Brunnerneier and Niepelt (2019), Davoodalhosseini (2018), Andolfatto (2019), Chiu et al. (2019), Williamson (2019)

▸ However, the basic macroeconomic impacts are still not well understood

  ▸ research is still in the early phases

Outline

1. Introduction

2. Sketch of the model

3. Equilibrium (without CBDC)

4. Introducing CBDC

5. Discussion

2. Sketch of the model

Setup

▸ **Dynamic GE model based on Lagos & Wright (2005)**

    ▸ alternating centralized and decentralized markets (CM & DM)

    ▸ matching/information frictions ⇒ need for a medium of exchange

▸ **Types of agents**

    ▸ buyers   produce in CM; consume in DM

    ▸ sellers   produce in DM; consume in CM

    ▸ banker/firms   borrow, invest and produce CM good

    ▸ central bank   issues currency   (consolidated public sector)

▸ **I will focus on a few key features of the model**

    ▸ ignore paper currency (details in paper; see also Williamson, 2019)

Buyers

▸ Buyers use bank deposits to make purchases

▸ Choose a quantity d of deposits based on:

  ▸ anticipated transaction needs and opportunities

  ▸ and attractiveness of the medium of exchange

▸ Focus on: interest rate $1 + r$

▸ Deposit demand is:

  ▸ increasing in $1 + r$

  ▸ vertical at $1 + r = \frac{1}{\beta}$

    ▸ because of quasi-linear preferences
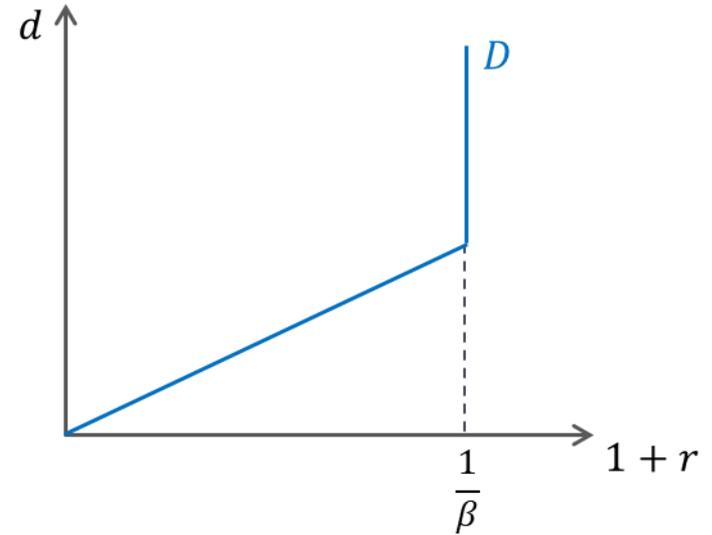
Banker/firms

▸ Bankers each have access to a productive project

   ▸ requires fixed input → normalize to 1

   ▸ generates output γ_j in the next period (heterogeneous)

   ▸ $\gamma_j \sim [0, \bar{\gamma}]$ with cumulative distribution G and density function g
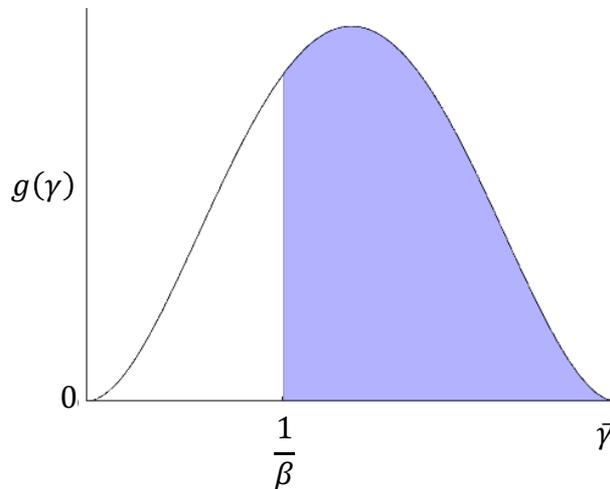
⇒ diminishing returns to (aggregate) investment

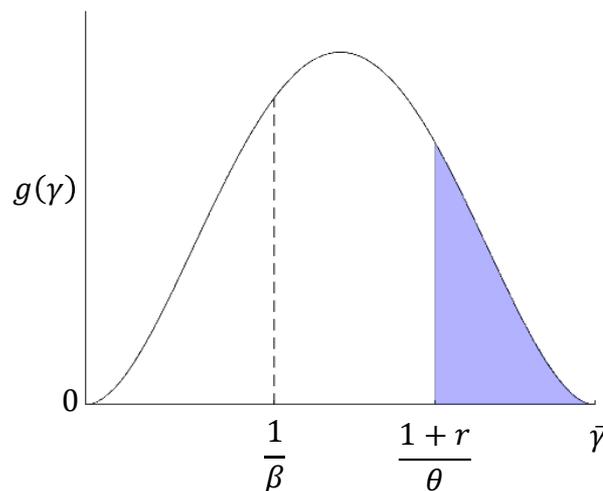Efficiency: fund (only) those projects with $\gamma_j > \frac{1}{\beta}$

▸ Bankers live for two periods, must borrow to fund projects

   ▸ issue deposits at interest rate: $1 + r$ ⇒   profit $= \gamma_j - (1 + r)$

Financial friction

▸ Banker can only credibly pledge a fraction θ of its output

   ▸ as in Kiyotaki & Moore (1997), others

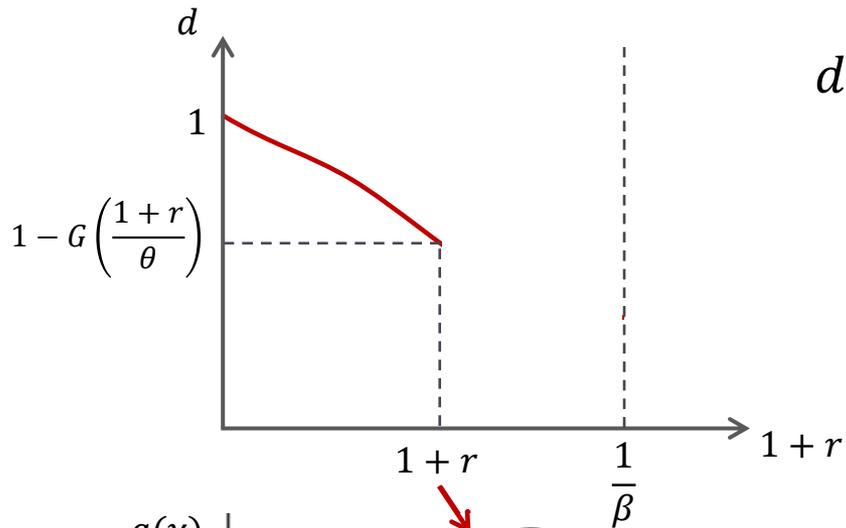▸ Banker j is funded if

$$1 + r \leq \theta \gamma_j$$

   ▸ $\theta < 1 \Rightarrow$ some profitable projects are not funded
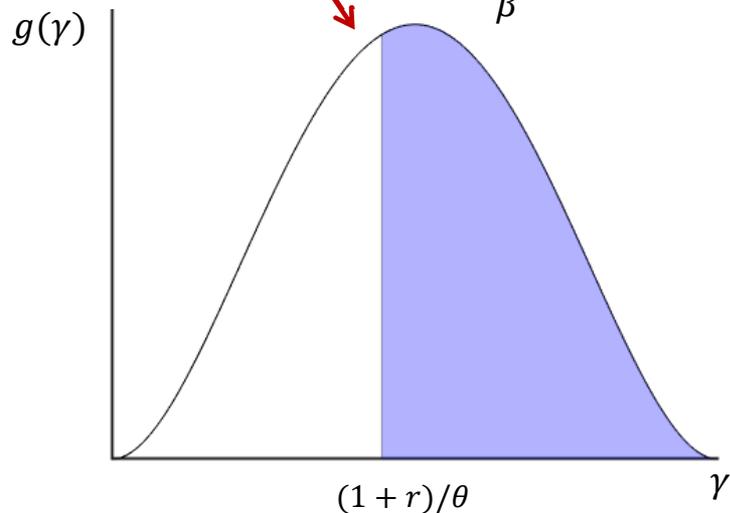
3. Equilibrium (without CBDC)

Supply of deposits

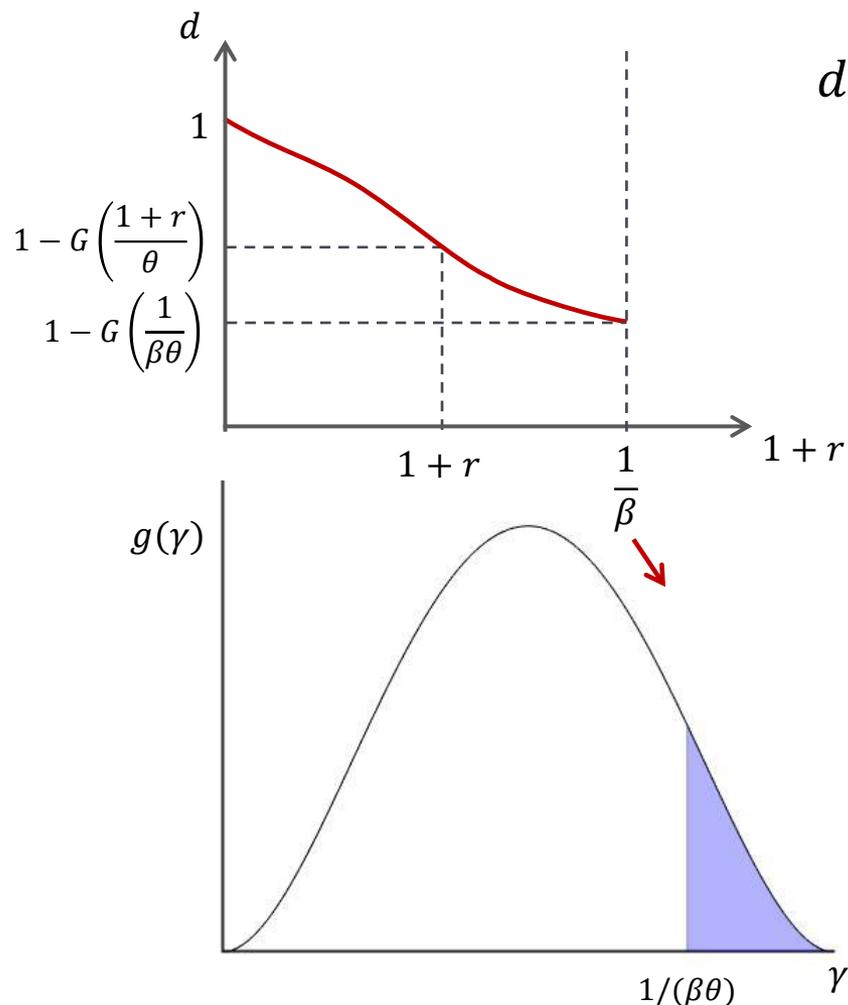▸ Supply of deposits depends on the distribution of projects

$$d^S = 1 - G\left(\frac{1+r}{\theta}\right)$$

▸ When $1 + r = 0 \Rightarrow$ all projects are funded

  ▸ supply of deposits is $d^s = 1$

▸ As r increases, fewer projects are viable

  ▸ bankers issue fewer deposits

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As r increases, fewer projects are viable

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  ⇒ supply curve slopes downward

Equilibrium

If high-return projects are scarce:

- $1 + r^* < \frac{1}{\beta}$ (liquidity premium)

  - deposits are "low-cost funding"

- d^* small → inefficient exchange
    (not pictured)

- Interpretation:

  - banks' access to low-cost funding …

  - … helps offset the θ friction
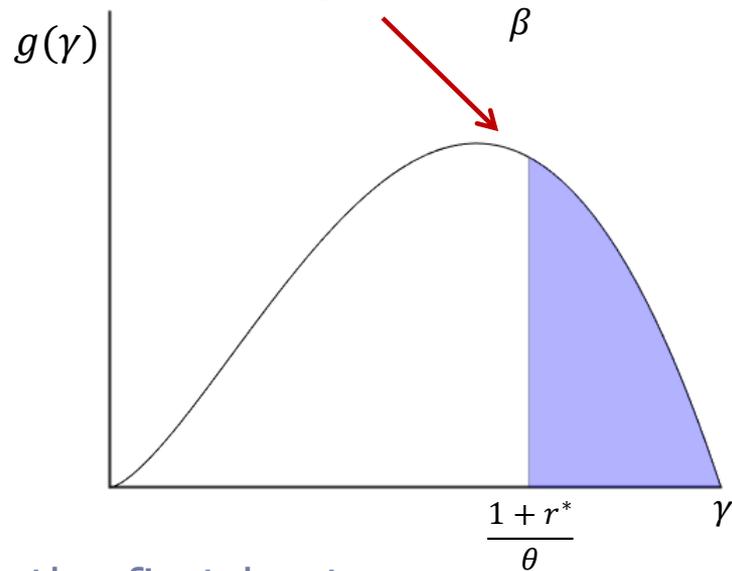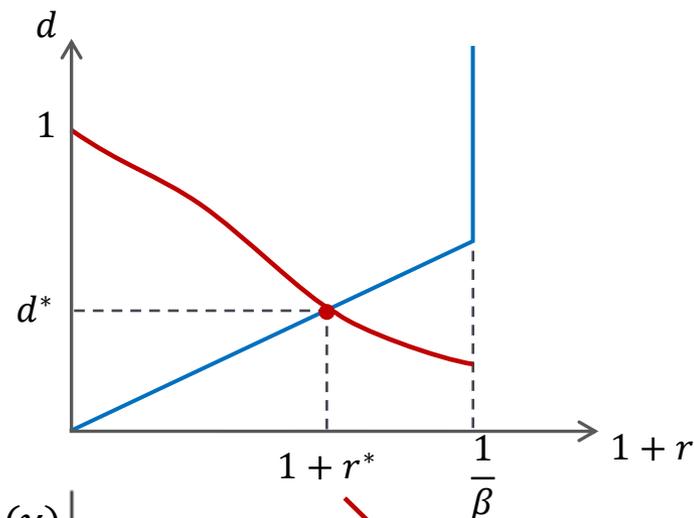
Note: if $\theta = 1 \Rightarrow$ investment cutoff is <u>below</u> the first-best

4. Introducing CBDC

What is a CBDC?

▸ CBDC is a form of outside money that can potentially:

  ▸ earn interest at rate r_E (positive or negative)

  ▸ be used as a substitute for bank deposits

▸ Interest rate r_E places a lower bound on the deposit rate

  ▸ if $r < r_E$: households hold no deposits

  ▸ shift entirely into CBDC

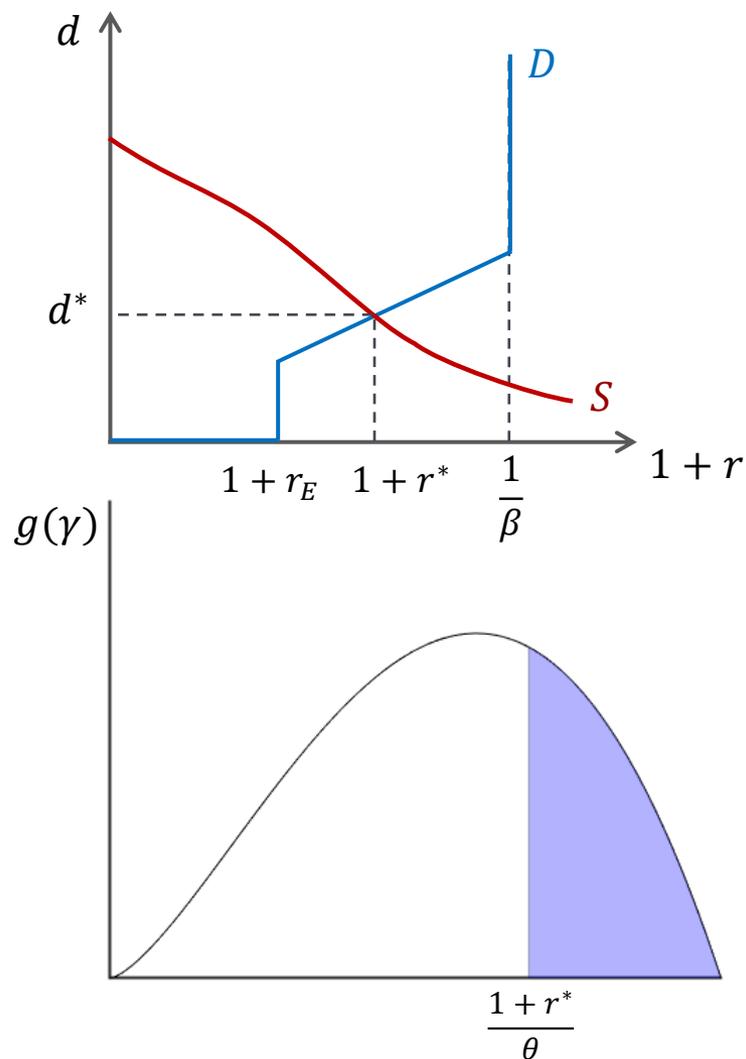Q: What are the equilibrium effects of introducing CBDC?

  ▸ how should the central bank set r_E?
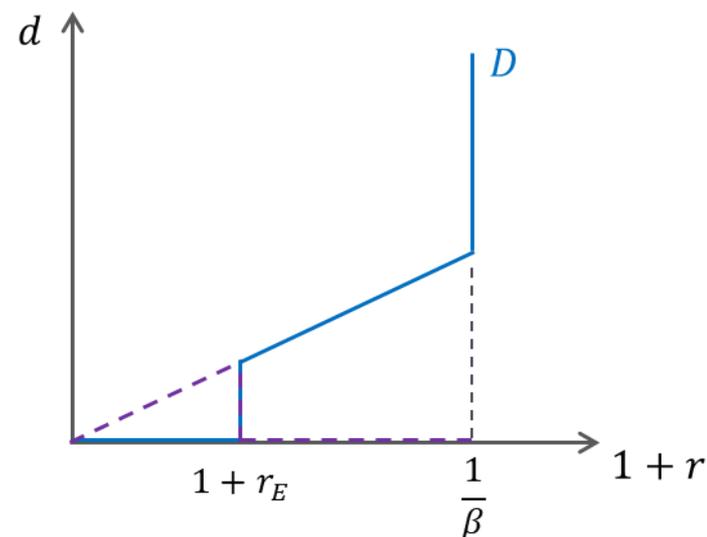
Equilibrium with CBDC

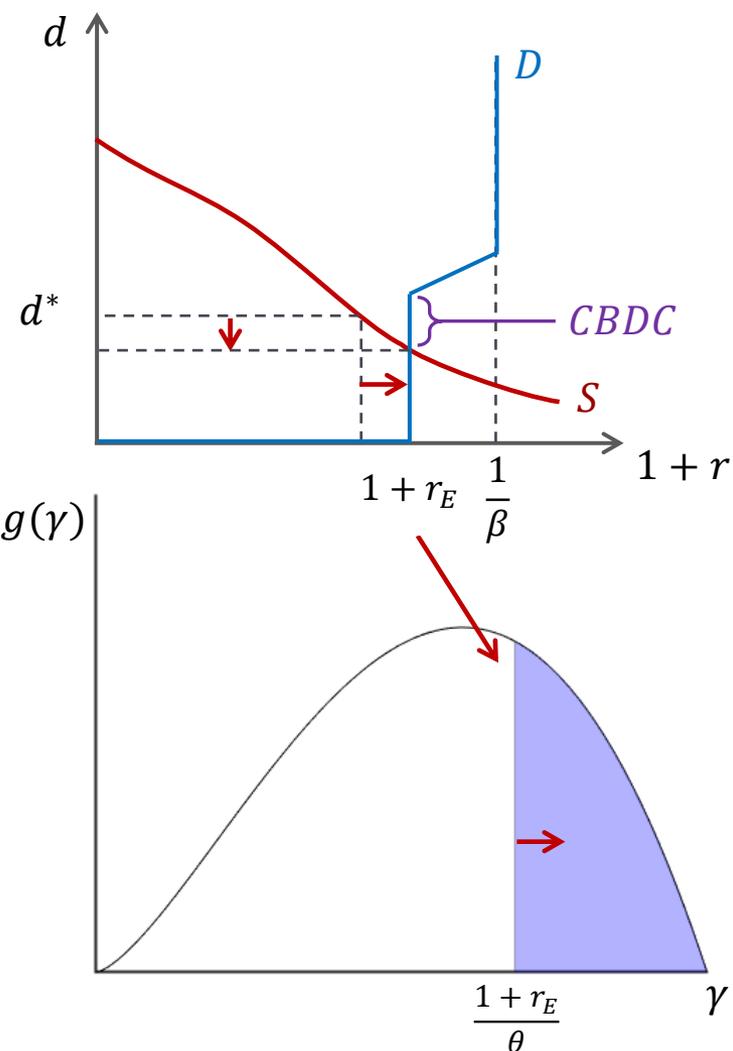If $r_E < r^*$:

No effect on equilibrium

Equilibrium with CBDC

If $r_E > r^*$:

▸ deposit rate increases to r_E

▸ quantity of deposits falls

▸ investment cutoff $\hat{\gamma}$ increases

    ▸ quantity of bank investment falls

    ➡ we have constructed a model in which "disintermediation" arises

However:

▸ Total liquid balances (deposits plus CBDC) <u>increase</u>

    ⇒ increased in efficiency in exchange

Optimal policy

▸ **In setting r_E, central bank faces a tradeoff**

  ▸ higher → more disintermediation, decrease in investment

  ▸ but also more DM trade, closer to optimum quantity of money (Friedman)

▸ **Optimal policy: set the interest rate r_E to manage this tradeoff**

  ▸ r_E is a new (and useful) policy tool

▸ **CBDC is most valuable when:**

  a) the liquidity premium is large (r^* is low)

    ▸ good projects are scarce; private supply of money is far below optimum

  b) investment frictions are small (θ is high)

    ▸ want liquidity premium to be small

5. Discussion

(1) Market power

▸ We have assumed the deposit market is competitive

  ▸ banks take $1 + r$ as given

▸ And no frictions between banks and borrowers (firms)

  ▸ equivalent to a competitive loan market

▸ If banks have market power, benefits of a CBDC can be larger

▸ Andolfatto (2018):

  ▸ r_E increases deposit rate, but not bank lending rate

  ▸ instead, bank profits decrease

▸ Chiu et al (2019):

  ▸ CBDC can reduce monopoly pricing distortions

(2) A neutrality result

- Could we introduce CBDC in a way that does not affect allocations?

- Step (i): set $r_E = r^*$

  - but ... quantity of CBDC held $= 0$

- Step (ii): CB lends to banks

  - raises total demand for deposits

  - but does not change r^* (or d^*)

  $\rightarrow$ crowds out private deposits one-for-one

- A version of the Brunnermeier and Niepelt (2019) equivalence result

  - CB can introduce CBDC without distermediating banks. However ...
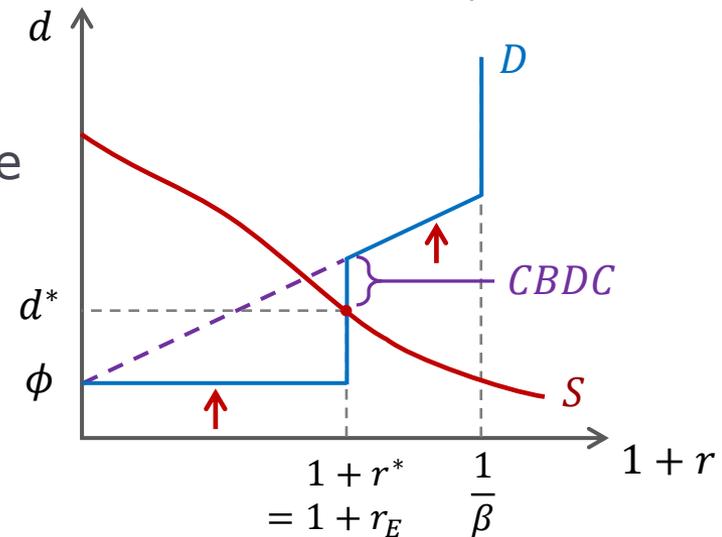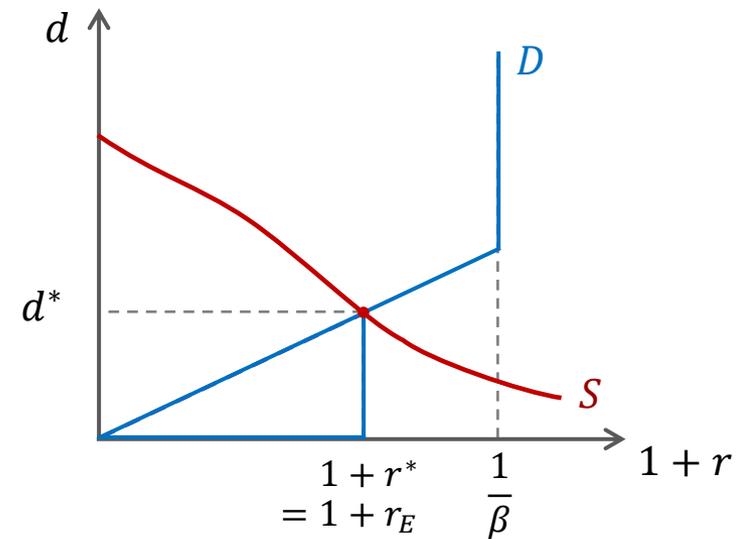
Our point

▸ Introducing CBDC gives the central bank a new policy tool, r_E

  ▸ which influences the liquidity premium, real allocations

▸ CB should <u>use</u> this tool

  ▸ disintermediation may occur but, if so, welfare is higher at r_E^*

Implication:

▸ Need to include the ability to pay interest in CBDC design

  ▸ some policy makers propose hard-wiring $i^e = 0$ → "cash-like"

  ▸ but a CBDC with $i^e \equiv 0$ can easily decrease welfare

▸ No reason to fear CDBC <u>if</u> central bank sets r_E appropriately

  ▸ need to build this feature into the design of a CBDC