Should Central Banks Issue Digital Currency?

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CBDC

▸ A *central bank digital currency* is:

	Cash	Reserves	CBDC
a liability of the central bank	✔	✔	✔
in electronic form	✖	✔	✔
can be held by anyone	✔	✖	✔

▸ Our focus is not on crypto or blockchain *per se*

▸ a CBDC could be a cryptographic token ("FEDcoin")

▸ or it could simply be allowing accounts at the central bank

▸ perhaps with account services provided by private banks

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

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

Why now?

‣ CBDC has been technologically feasible for many years

  ‣ why is there suddenly so much interest?

1. Declining use of cash in transactions

  ‣ concern in some countries that cash may disappear (Sweden)

  ‣ desire to maintain contestability in payments markets

2. Prevent a shift into private crypto/digital currencies

  ‣ see: policymakers' reaction to Libra

3. Improve the effectiveness of monetary policy

  ‣ if CBDC pays interest, more directly pass-through of policy changes

  ‣ if cash is phased out, could remove lower bound on interest rates

One (major) concern

▸ **If many bank depositors shift to 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?

▸ Answer is not so obvious

▸ If a CBDC competes with bank deposits as medium of exchange ...

"Why isn't competition a good thing here?"

Hansen (lunch yesterday)

▸ If CBDC is an attractive medium of exchange (incl. interest bearing) ...

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

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 make loans to productive firms

▸ Introduce a CBDC into this environment

  ▸ an alternative medium of exchange to bank deposits

  ▸ pays interest at a rate chosen by central bank

▸ Show that it does lead to "higher interest rates on bank loans"

▸ 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

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

  ‣ plus BIS and IMF reports, many blog posts, etc.

‣ **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. Results

2. Sketch of the model

Setup

- Dynamic GE model based on Lagos & Wright (2005)
    - some goods are traded in a centralized market
    - other goods are traded bilaterally
        - matching/information frictions ⇒ need for a medium of exchange

- Types of agents
    - households   work; make purchases
    - firms   invest and produce
    - banks   intermediate between households and firms
    - central bank   issues currency   (consolidated public sector)

- I will focus on a few key features of the model
    - some misrepresentation; see the paper for full details

Households

▸ Households 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

    ▸ easiness of use, safety, etc.

▸ Focus on: interest rate $1 + r_D$

▸ Deposit demand is:

  ▸ increasing in $1 + r_D$

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

    ▸ because of quasi-linear preferences
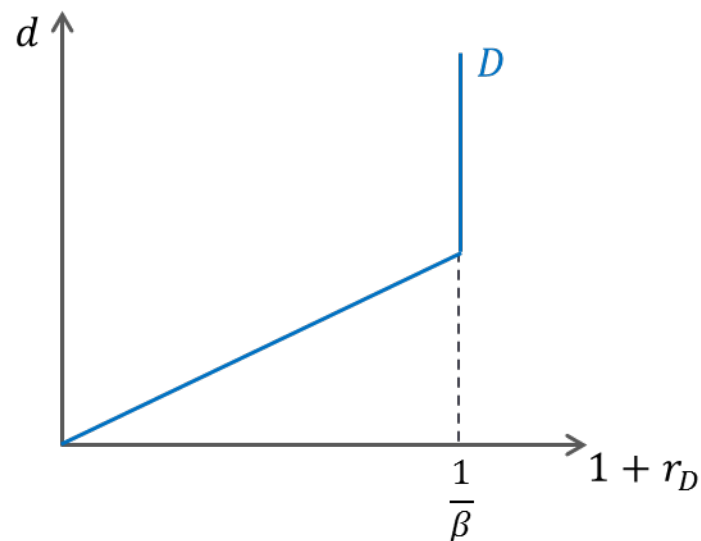
Firms

▸ **Firms have access to many different productive projects**

    ▸ each requires fixed input → normalize to 1

    ▸ generates output γ_j in the next period (heterogeneous)

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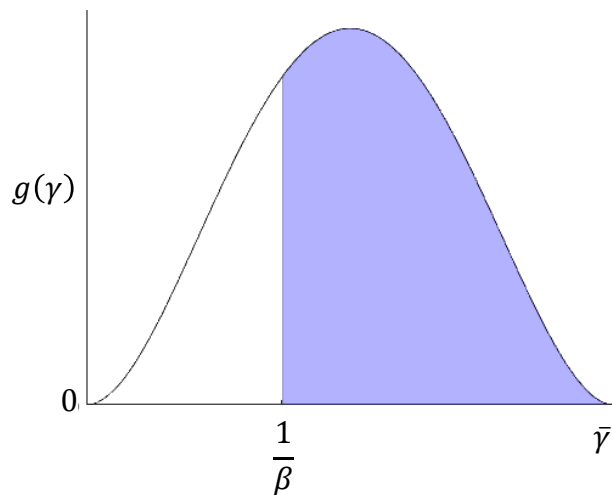
⇒ diminishing returns to (aggregate) investment

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

▸ **Firms must borrow to fund projects**

    ▸ interest rate on loan: $1 + r_L$ ⇒ profit $= \gamma_j - (1 + r_L)$

Banks

▸ **Banks intermediate**

   ▸ issue deposits to households; make loans to firms

▸ **Competition ⇒ $r_L = r_D$**

▸ **Financial friction:**

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

      ▸ as in Kiyotaki & Moore (1997), others
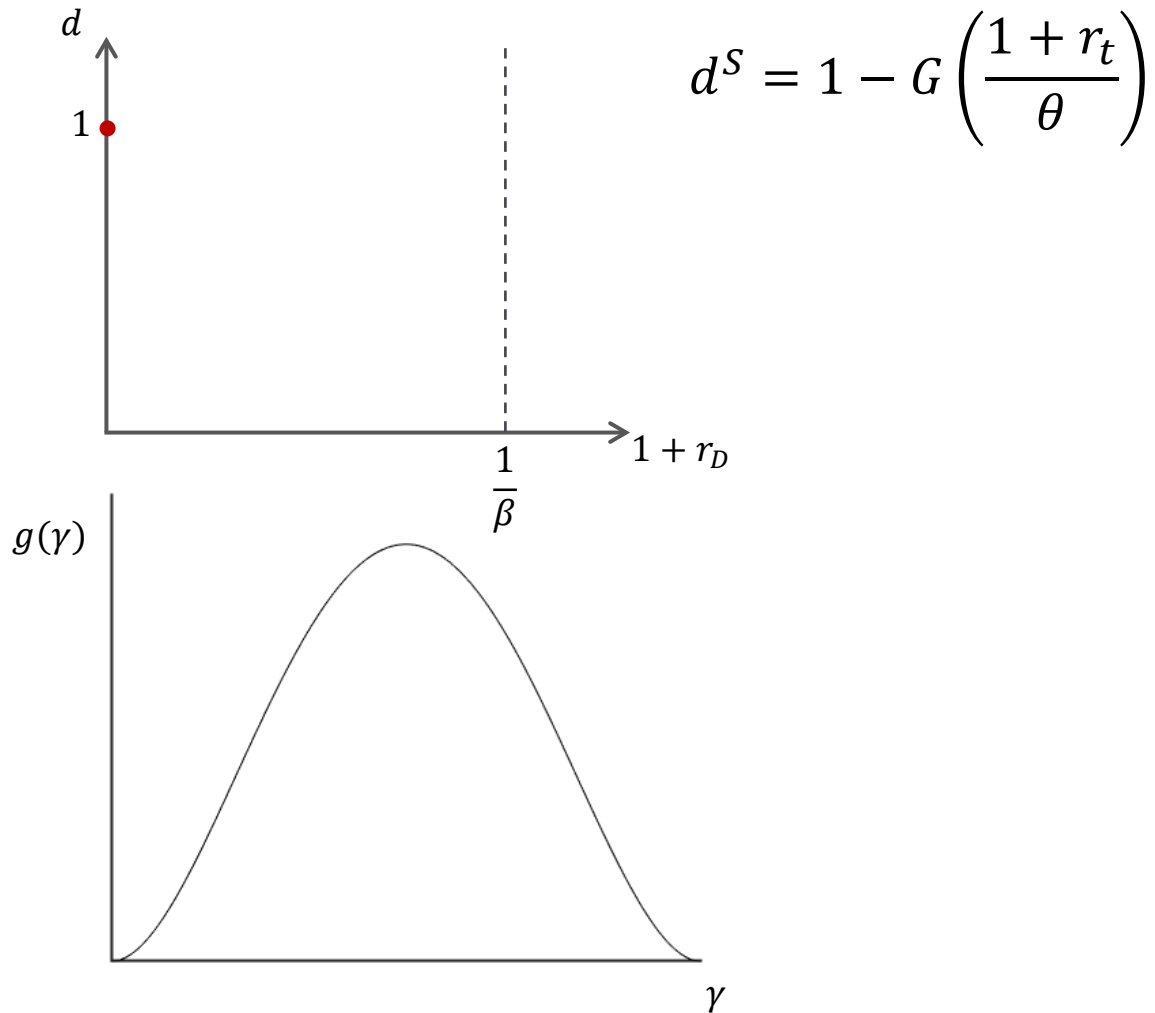
   ▸ project j is funded if

$$\boxed{1 + r_L \leq \theta \gamma_j}$$

   ▸ some profitable projects will not be funded
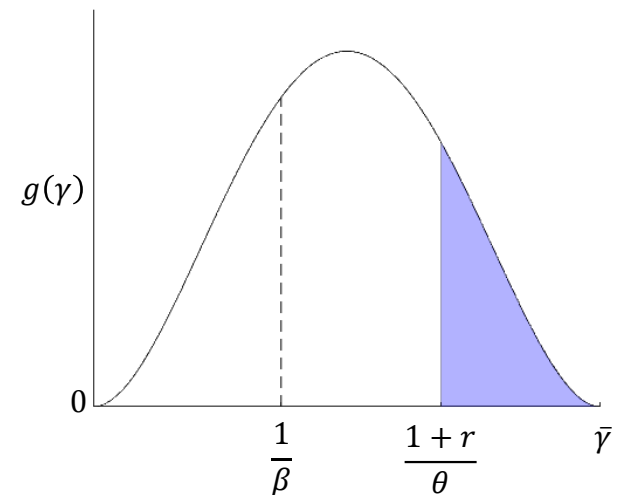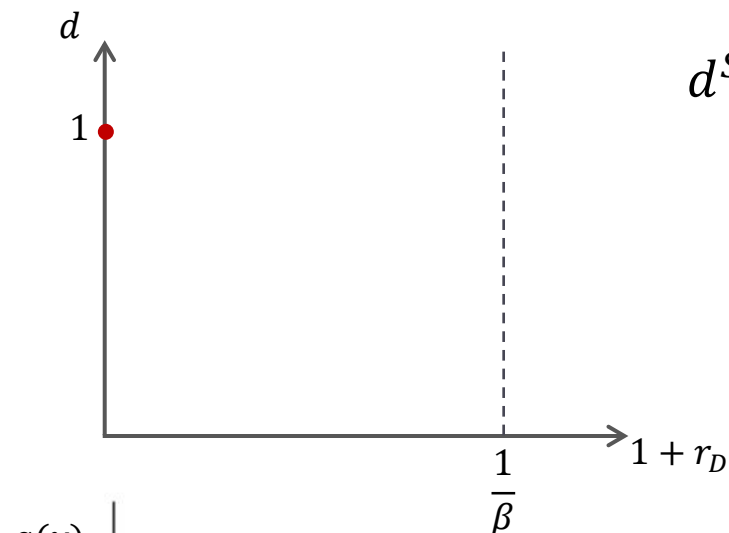
3. Equilibrium (without CBDC)

Supply of deposits

‣ Supply of deposits depends on the distribution of projects

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

Supply of deposits

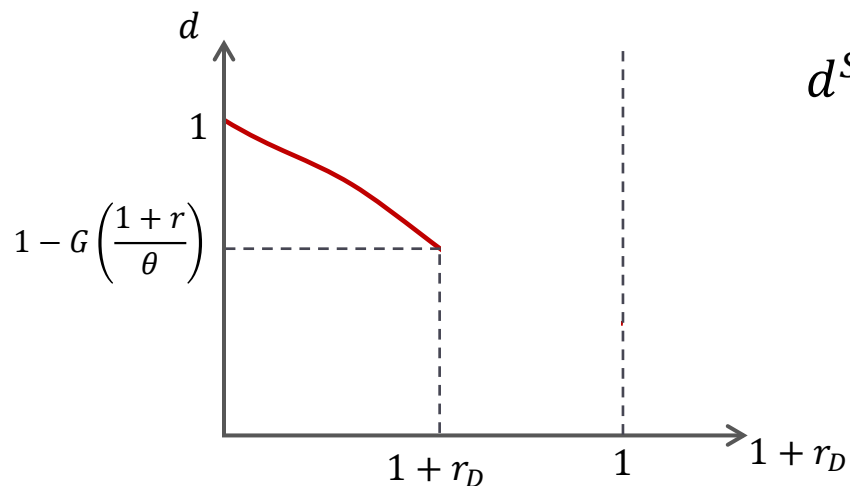▸ Supply of deposits depends on the distribution of projects

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

▸ When $1 + r_t = 0 \Rightarrow$ all projects are funded
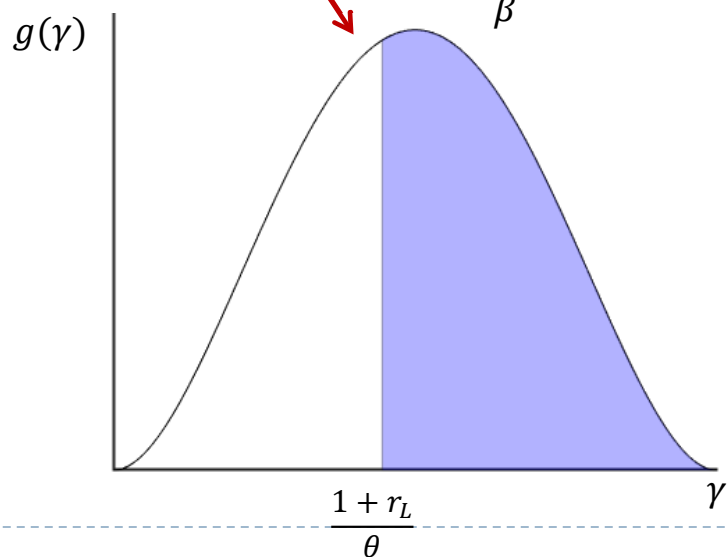
▸ supply of deposits is $d^S = 1$
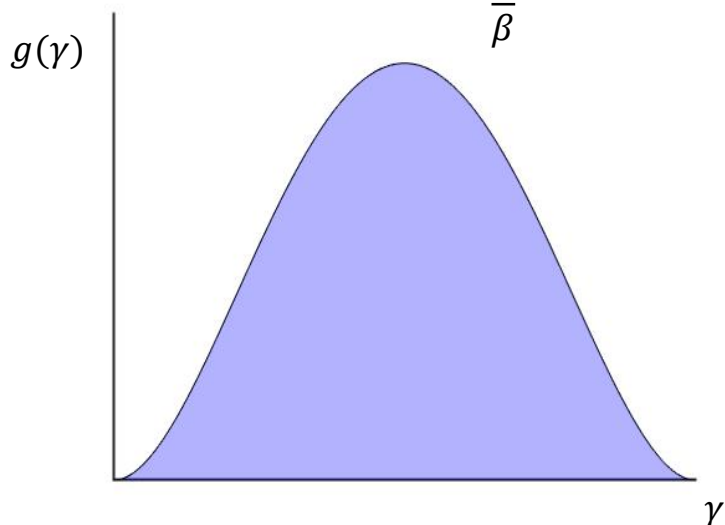
Supply of deposits

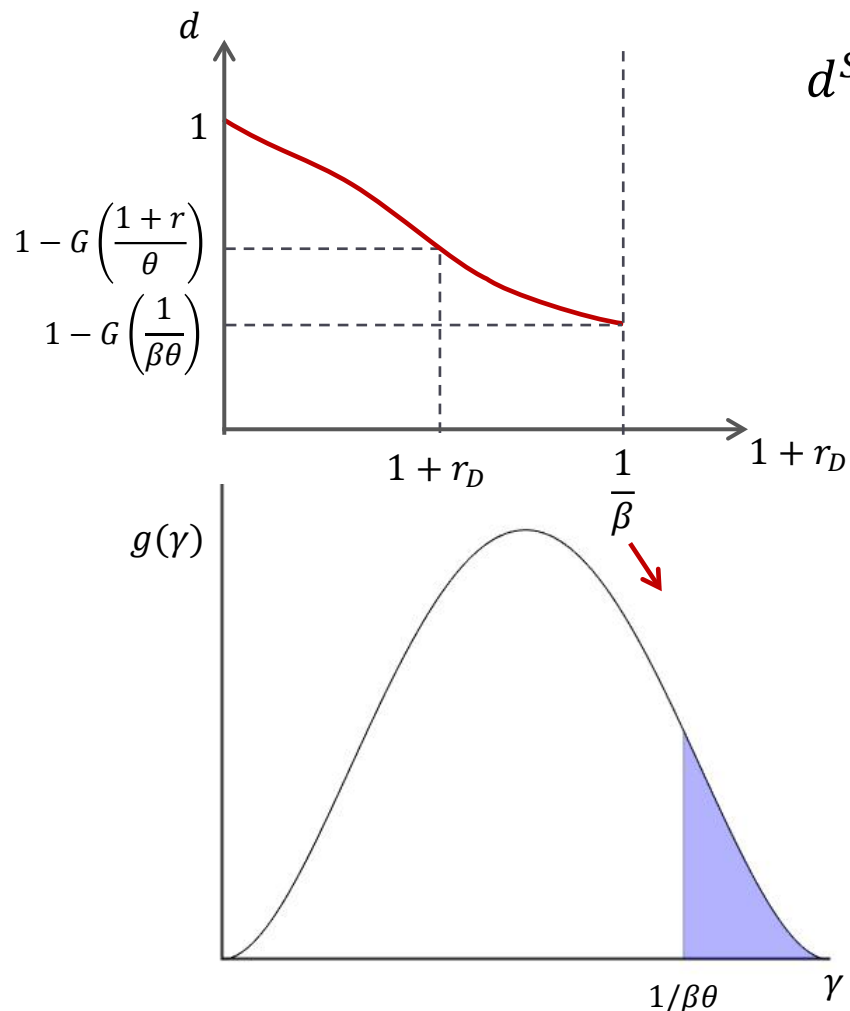▸ Supply of deposits depends on the distribution of projects

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▸ As r_t increases, fewer projects are viable

  ▸ bankers issue fewer deposits

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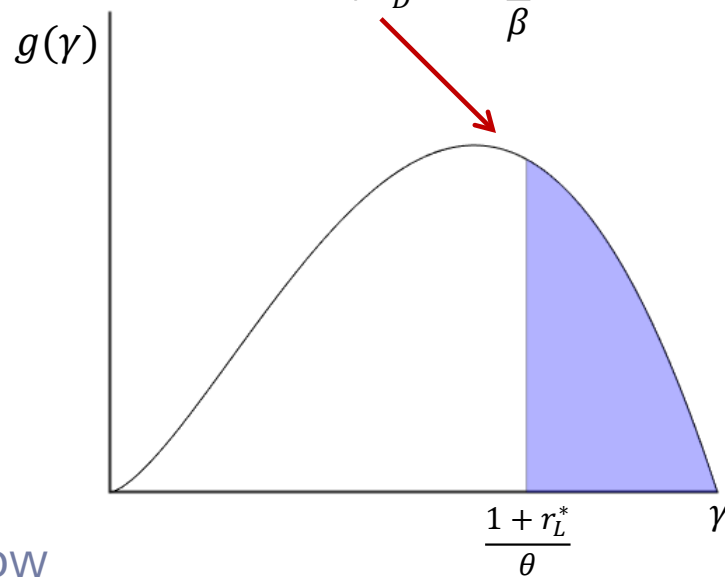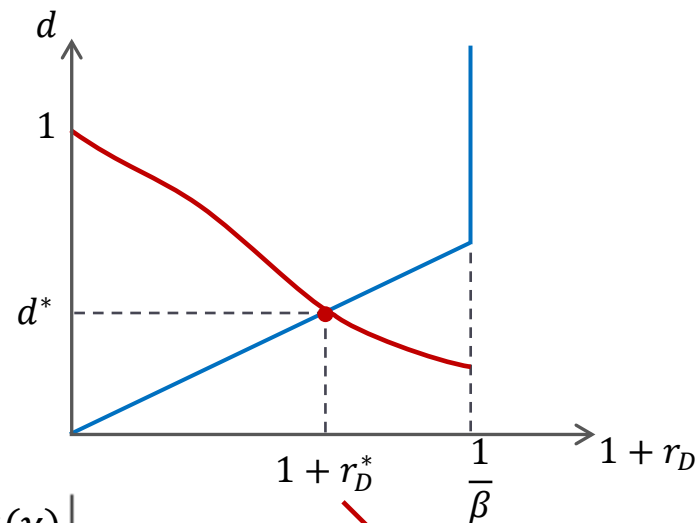
As r_t increases, fewer projects are viable

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  $\Rightarrow$ supply curve slopes downward

Equilibrium

If high-return projects are scarce:

▸ $1 + r_D^* < \frac{1}{\beta}$ (liquidity premium)

  ▸ deposits are "low-cost funding"

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

▸ Competition → r_L^* low

  ▸ low-cost funding passed to firms

  ▸ which helps offset the θ friction

Note: if $\theta = 1 \Rightarrow$ investment cutoff is <u>too low</u>

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

  ‣ households will not hold any deposits if $r_D < r_E$
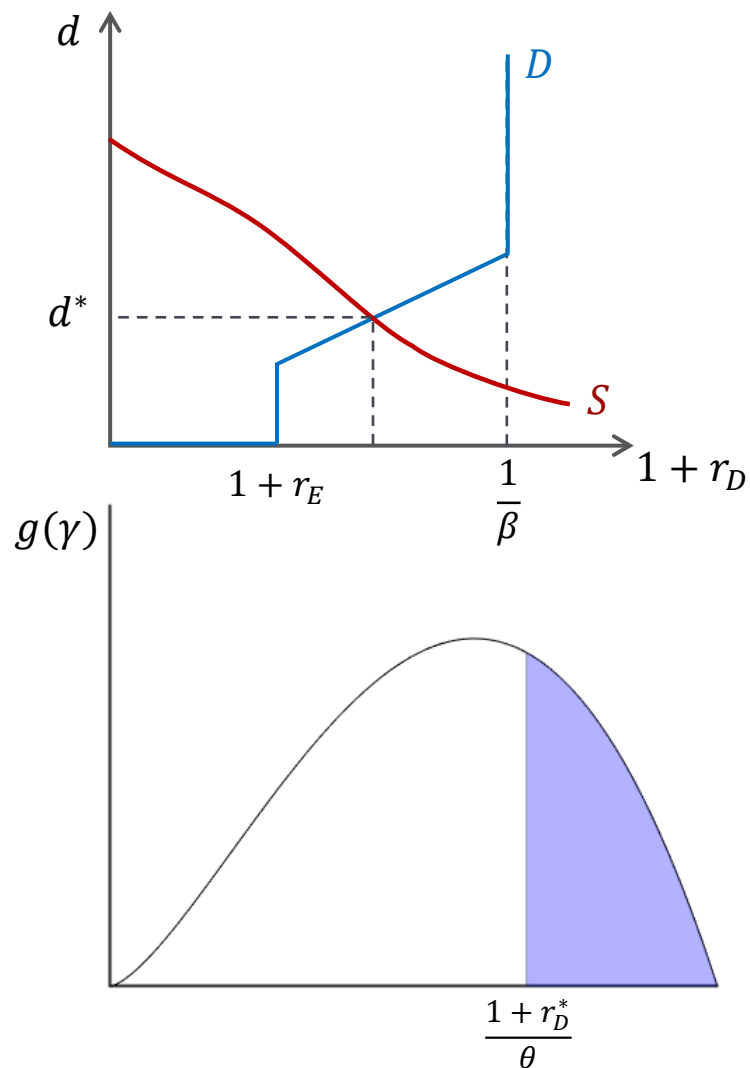
Q: What are the equilibrium effects of introducing CBDC?

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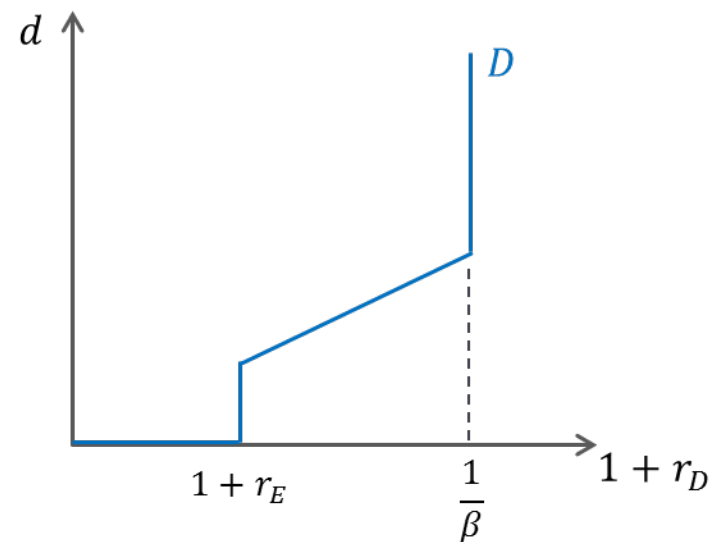
Equilibrium with CBDC

If $r_E < r_D{}^*$:

No effect on equilibrium

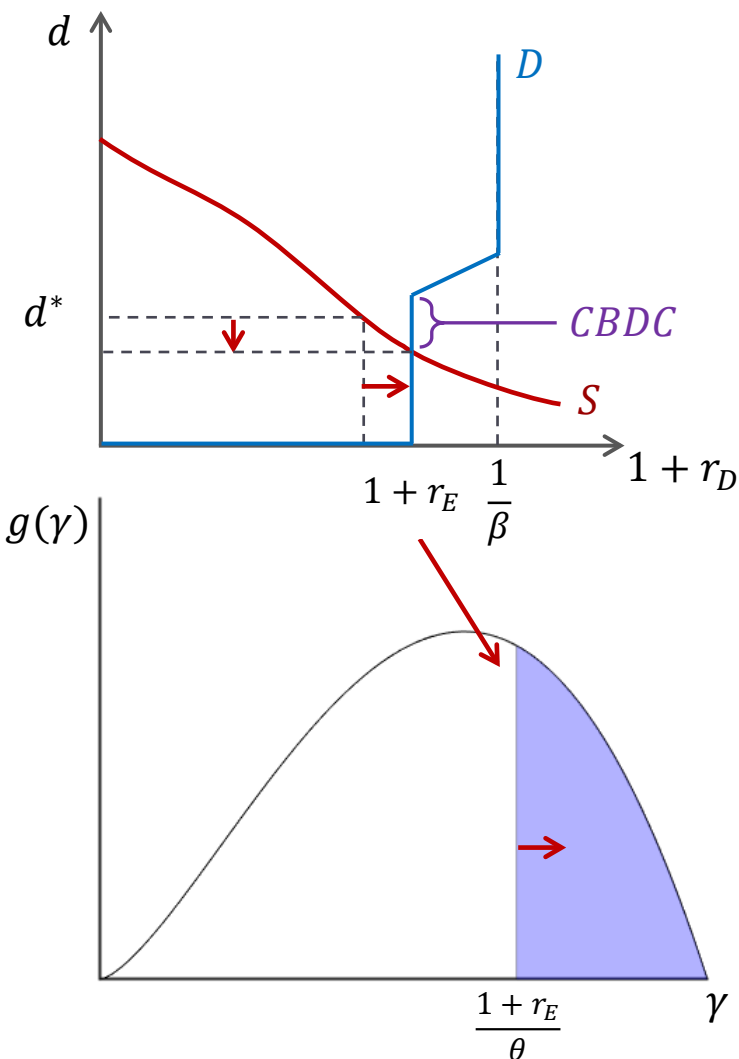# Equilibrium with CBDC

If $r_E > r_D{}^*$:

▸ deposit rate increases to r_E

▸ quantity of deposits falls

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

  ▸ quantity of bank lending falls

However:

▸ Total liquid balances (deposits plus CBDC) <u>increase</u>
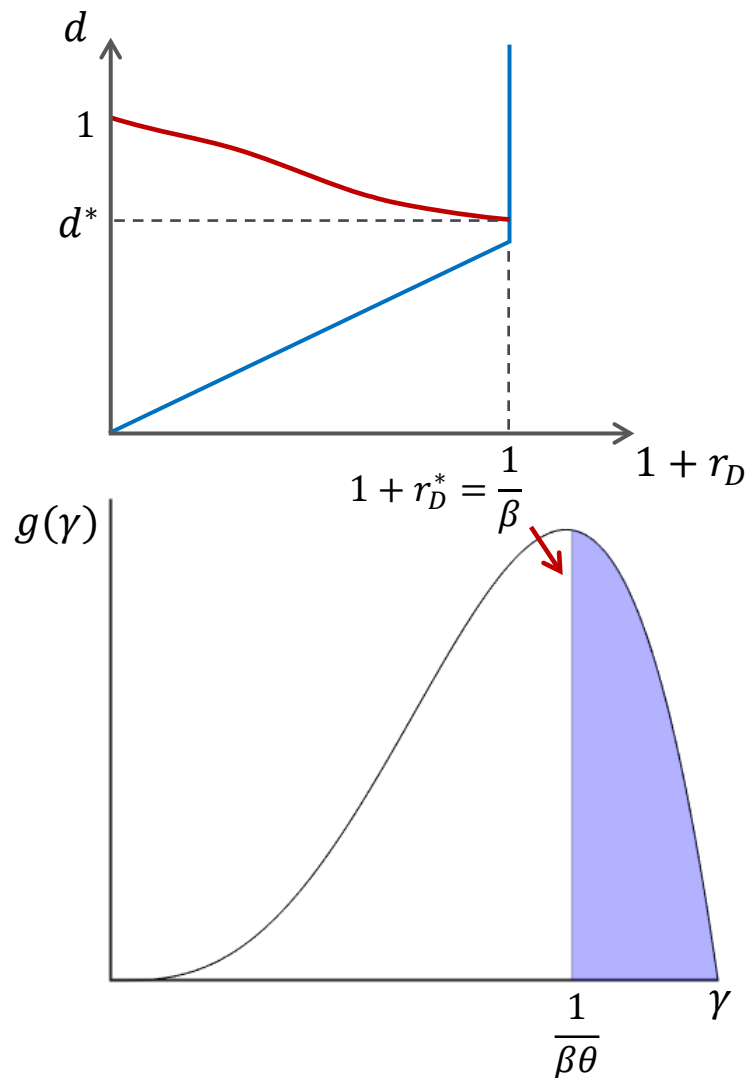
  ⇒ increased in efficiency in exchange

Note

If high-return projects are plentiful:

- $1 + r_D^* = \frac{1}{\beta}$ (same as illiquid bond)

  - deposits are not low-cost funding

- d^* is large → efficient exchange

  (not pictured)

- No reason to set $r_E > r_D^*$

  In this environment,
  disintermediation is not a concern

5. Results

Results

‣ **If CDBC is held, both r_D and r_L increase**

    ‣ banks deposits decrease, and so does bank lending

    ⇨ we have constructed a model in which the 'disintermediation' concern arises

However:

‣ **The increase in r_L lowers welfare only if $\theta < 1$**

    ‣ with no financial frictions, any disintermediation is <u>good</u>

    ‣ and there may be other (better) ways to address financial frictions

‣ **Even when $\theta < 1$ ...**

- The increase in r_D brings real economic benefits
  - closer to optimum quantity of money (Friedman)
  - increases the demand for goods from households

- If banks have market power, these benefits are larger
  - CBDC can reduce bank profits $\Rightarrow r_L$ does not increase with r_D
    - Andolfatto (2018)
  - CBDC can reduce monopoly pricing distortions
    - Chiu et al (2019)

- Central bank can manage any tradeoff using r_E
  - a new (and useful) policy tool for managing 'aggregate liquidity'

Bottom line:

▸ When r_E is chosen appropriately, CBDC never lowers welfare

  ▸ often strictly increases welfare

Implication:

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

  ▸ in our model: optimal i^e can be positive or negative

▸ Some policy makers propose hard-wiring $i^e = 0$

  ▸ a way to make CBDC more "cash-like"

  ▸ however: in some cases, zero is an attractive return (see: Europe)

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