Central Banking for All?

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Our question

Should central banks open their deposit and lending facilities to all firms and private citizens?
All of this has happened before...

- Historically, many central banks allowed deposits by and extended loans to firms and private citizens.


- The Bank War between Andrew Jackson and Nicholas Biddle was linked directly to the operations of the Second Bank of the United States with firms and merchants.

- Sometimes, the central banks were dominant players in the commercial banking sector.

- In 1900, the Bank of Spain (*Banco de España*), with 58 branches across the nation, held 68% of total financial assets and 75% of all checking accounts in the Spanish financial sector.

- Sharp distinction between a central bank operating only with primary depository institutions and commercial banks dealing with the public at large is mainly a post-WWII development.
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1900 they had multiplied sixfold. Lastly, the Bank consolidated its privileged relationship with the Treasury. The financial agreement of 1868 whereby the Bank assumed the responsibility for collecting taxes in return for making monthly advances to the Treasury remained in place for the following 20 years, and was then renewed for a further five years. Thereafter, the renewal was discussed yearly. The Bank was also responsible for servicing public debt, including making interest payments and repayments of principal.

Figures 5.1 and 5.2 provide a cursory overview of the growth of the Bank's balance sheet. Total assets multiplied by a factor of ten between 1874 and the turn of the century. Growth then halted for a few years, for reasons to be explained later, before increasing again to reach a total of nearly 3 billion pesetas. The volume of banknotes also rose rapidly: from 71 million pesetas in 1874 to 1.6 billion by 1900 and more than 1.97 billion before the Great War.

The main factor behind the increase in the Bank's total assets was the public portfolio, government debt purchases and loans and advances to the Treasury which was in permanent need of resources to cover the yearly budget deficits. This is particularly clear in the period after 1895 when a huge amount of funds was required, first to combat the colonial rebellion in Cuba and later, in 1898, to wage the war against the United States on both the Caribbean and Pacific seaboards. When the conflicts ended, the Treasury...
...and will it all happen again?

- Arrival of digital money has reopened the debate about the role of central banks.

- In particular, through the possibility of central bank digital currency (CBDC).

- Changes in technology may justify changes in the architecture of a financial system.

- Already relevant for policy: 2018 Swiss sovereign-money initiative (Vollgeld).

- We build on a nominal contracts version of the Diamond and Dybvig (1983) model augmented with a central bank that allows for deposits by consumers.

- We also have a real economy, but I will skip it today.
Basic equivalence result and its sinister requirements

• A central bank open to all can implement the efficient banking solution in terms of producing the “right” amount of maturity transformation.

• However, this requires:
  
  • That deposits at the central bank are not “superior” (through fiscal backing or cross-subsidization) to commercial bank deposits (unless central bank invests exactly “as if” it were a commercial bank).
  
  • That the central bank knows which fraction of deposits are held for transaction purposes (money as medium-of-exchange) vs. saving (money as store-of-value).

• These two requirements can be difficult to meet in practice.

• The cleanest way out: the central bank abstains from banking services entirely.
Money and banking theory:

- **Diamond and Dybvig (1983):** Banking theory, deposit insurance, and bank regulation.
- **Lucas and Stokey (1985):** Money and interest in a cash-in-advance economy.
- **Lagos and Wright (2005):** A unified framework for monetary theory and policy analysis.
- **Brunnermeier and Niepelt (2019):** Equivalence of private and public money.
CBDC literature:

- Brunnermeier, James, and Landau (2019): The digitalization of money.
- Keister and Sanches (2019): Should central banks issue digital currency?
- Gersbach (2019): Do CBDCs make a difference?
- Boser and Gersbach (2019): A central bank digital currency in our monetary system?
CBDC policy reports:

A simple environment

- Three periods indexed by $t = 0, 1, 2$.

- In each period, there is a single good that can be used for consumption or investment.

- Each period has two sub-periods, a “morning” and an “afternoon”:
  1. In the morning, agents undertake banking transactions.
  2. In the afternoon, a goods market opens, where goods are purchased with money (a cash-in-advance constraint), and then either consumed or invested. Also, investment projects mature.

- Agents:
  1. Banks (commercial and investment).
  2. A central bank.
  3. Consumers (early and late).
Money as medium-of-exchange

- Why do we have two sub-periods?

- We want to have a model where money plays both i) store-of-value and ii) medium-of-exchange functions.

- Likely to be a critical aspect of the practical working of a CBDC.

- With a CBDC, consumers will need to hold accounts at the central bank to execute payments in place of cash payments (note: different versions of CBDCs).

- But consumers may also hold these accounts to obtain banking (i.e., store-of-value) services.
Commercial vs. investment banking

- Commercial banks:
  - Offer nominal demand deposit contracts to consumers.
  - Use proceedings to invest in real short and long assets.

- Investment banks:
  - Financed by some outside investor interested in maximizing profits in period 2.
  - Thus, they chose only to operate the long-term technology.
  - Traditional investment banks, but also industrial banks (common in Continental Europe, Japan, and South Korea), or other investment vehicles such as retirement funds.
  - Investment banks could also compete for commercial deposits. However, in equilibrium, consumers do not find it optimal to deposit with them.
  - Possible extension: differences in regulation between commercial vs. investment banking.
Investment technologies

- Banks have access to two types of real investment technologies: a short-term technology and a long-term technology.

- The short-term technology (short asset) takes one unit of the good in the afternoon of $t = 0, 1$, and converts it into one unit of the good in the afternoon of $t + 1$.

- The long-term technology (long asset) takes one unit of the good in the afternoon of 0 and transforms it into $R > 1$ units of the good in the afternoon of 2.

- However, if the long asset is liquidated prematurely in the afternoon of 1, it pays off $\kappa \in (0, 1)$ units of the good for unit invested.

- You can think about the short-term technology as storage (i.e., a bank vault) and the long-term technology as a production project.
Deposit contracts

- Commercial banks offer nominal deposit contracts \((\hat{C}_1, \hat{C}_2)\) to consumers.

- In the morning of period 1, the banker pays \(\hat{C}_1\) to a consumer on-demand.

- In the morning of period 2, the banker pays \(\hat{C}_2\) to a consumer on-demand.

- Bank uses deposits to buy goods to invest in short and long assets.

- Banker consumes left-over resources at the end of the afternoon of period 2. Banker seeks to maximize such consumption (which cannot be negative).
• Two aspects of a central bank:


2. Taking deposits from consumers and lending proceedings in the wholesale market (“central banking for all”).

• We will characterize first the economy where the central bank only engages in “business-as-usual” monetary policy.

• Then, we will move to study “central banking for all.”
“Business-as-usual” monetary policy

- The central bank issues $M_t$ units of money to each consumer in the morning of period $t$ as a within-period loan.

- This loan is returned to the central bank interest-free at the very end of period $t$.

- Perfect foresight for the sequence of $M_t$.

- One can think of these transactions as short-term repos if there was an outside security changing hands between the central bank and the consumers.

- This is a reasonable approximation of how the ECB operates.
Consumers

- $[0, 1]$-continuum of *ex ante* identical consumers, each endowed with one unit of the good in period 0.

- The consumer’s utility function:

  $$U(c_0, c_1, c_2) = \begin{cases} 
  u(c_0) \text{ with probability } 1 - \mu, \\
  u(c_1) \text{ with probability } \mu \lambda, \\
  u(c_2) \text{ with probability } \mu(1 - \lambda),
  \end{cases}$$

- Common case in the previous literature: $\mu = 1$.

- $u : \mathbb{R}_+ \to \mathbb{R}_+$ is strictly increasing, strictly concave, and continuously differentiable.

- Each consumer learns whether she is or not a period-0 consumer in the morning of that period.

- Conditional on not being a period-0 consumer, she learns privately whether she is a period-1 or period-2 consumer in the morning of period 1.

- Consumers have access to the short asset.
A “conventional” cash economy: Morning of period 0

- Each consumer is endowed with one unit of the good (this assumption could be generalized with a production technology).
- The central bank lends out $M_0$ units of money to each consumer.
- We think about this money as physical cash.
- Consumers deposit a fraction $\mu$ of $M_0$ in commercial banks, while they keep the remainder to make date-0 consumption purchases in the afternoon.
A “conventional” cash economy: Afternoon of period 0

- Commercial banks use the received cash to purchase goods from consumers.

- Commercial banks invest $y$ of the purchased goods in the short-term technology and $1 - y$ in the long-term technology. In equilibrium, $y$ is the socially optimal amount of investment in the short asset, $y^*$.  

- Consumers make their purchases.

- We impose that the entire money stock will be spent and, thus,

$$M_0 = P_0$$

- Since consumers are also the sellers, each holds $M_0$ units of money at the end of the period.

- With that, the consumers repay the beginning-of-period loan from the central bank.
A “conventional” cash economy: Morning of period 1

- The central bank lends out $M_1$ units of money to each consumer.

- The commercial banks obtain a within-period money loan:

$$L_1 = \mu \lambda \hat{C}_1$$

from the consumers, where we assume $L_1 \leq M_1$.

- Impatient depositors seek to withdraw $\hat{C}_1$ units of money per unit of money deposited in period 0.

- The withdrawals are met with the proceeds from the within-period money loans.
A “conventional” cash economy: Afternoon of period 1

- In the afternoon, the banks obtain the real payoff of their short-term technology and sell goods for cash.

- Impatient consumers and those with residual morning cash $M_1 - L_1$ are in the goods market.

- Then, by the quantity theory equation, $\mu M_1 = P_1 y$.

- The impatient consumers will be the only ones in the goods market iff $\mu M_1 = L_1$. Note how issuing too much $M_1$ works in this model.

- The bank repays its nominal loans at the end of the period, and exits the period with zero cash balances.

- The consumers again hold the entire money stock $M_1$ and use their balances to repay the central bank at the end of the period.
A “conventional” cash economy: Period 2

- The central bank lends out $M_2$ units of money to each consumer.

- The commercial banks obtain a within-period money loan from the consumers, which suffices to make their promised deposit repayments to patient depositors.

- The banks sell the proceeds from their long-term investment projects in the afternoon and repay the within-period money loans.

- Finally, the consumers repay the central bank.
Central banking for all

- Now we let the central bank offer the same kind of nominal deposit contract \((D_1, D_2)\) described above to consumers, i.e., it competes for deposits with the commercial banks.

- The central bank has access to the short-term investment technology, but no access to the long asset.

- This assumption captures the idea that private banks have a comparative advantage in monitoring loans to extract their full return (or, in an alternative formulation, in liquidating loans).

- We also assume that the central bank has no access to independent sources of taxation.

- Political-economic considerations?
Gold bars are housed in individually numbered lockers secured by three locks.
Central bank investment

- Since the central bank has no access to the long asset, it cannot compete directly with commercial banks.

- The central bank can do so indirectly, however, by using investment banks.

- The central bank buys goods for a value $x$ of each deposit (and keeps them in the short asset) and places $1 - x$ in a wholesale demand deposit in the investment bank with payments ($L_1, L_2$).

- In period 1, the central bank prints additional money to pay depositors who withdraw in the morning.

- In the afternoon, the central bank liquidates (first) $P_1x$ and (second) $L_1$ as to balance its period budget constraint (recall, no fiscal backing!).

- The investment bank liquidates some of its assets to meet the first-period payment $L_1$.

- In period 2, the investment bank receives the proceeds from the (non-liquidated) long assets and makes its second-period payment $L_2$ to the central bank.
• Bertrand competition among investment banks determines $\left( L_1, L_2 \right)$.

• Commercial banks are indifferent when offering an interbank contract.

• Thus, we assume, without loss of generality, that none is written in equilibrium.
Deposit decisions

- Consumers who do not want to consume in period-0 decide whether to bank with a commercial bank or with the central bank.

- Consumers pick the nominal deposit contract that delivers the highest expected utility.

- If both contracts offer the same utility, some fraction (undetermined) fraction will pick the central bank, and the others pick commercial banks.
The CBDC economy

- Consider the extreme situation in which all consumers bank with the central bank.

- If there are commercial banking alternatives, this can only happen if the central bank offers the efficient contract (and all consumers are indifferent at the margin).

- One might imagine that the central bank has some additional attraction due to exogenous reasons.

- Also, because the currency is digital, even period-0 consumers have a deposit in the central bank, which they will liquidate in the afternoon of that period after the central bank has made investment decisions in the long asset.
Basic equivalence result

The original efficient banking solution can be implemented by setting:

\[ x = \mu y^* \]

where \( y^* \) is the optimal choice in the commercial-banking-only model, and keeping \( 1 - \mu \) to meet period-0 payments.
The proposition may seem obvious, but it captures an important point.

One may be worried, that offering deposit contracts with central banks will impair the maturity transformation function of the commercial banking sector, resulting in fewer investments in long-term projects.

The proposition above shows that this will not be so if the central bank has enough information and is sufficiently savvy to mimic the investment strategy of a commercial bank per relying on the investment bank sector.

In fact, if the deposits in the central bank do not have any additional advantage, the competitive pressures of commercial banks will force to adopt the “right” investment strategy (conditional on knowing $\mu$).
... and a sinister counterpart

- But, if the central bank lacks information about \( \mu \) or it enjoys an additional advantage over the commercial banks (e.g., fiscal backing), we should not expect the efficient amount of maturity transformation.

- Political-economic challenges.

- The cleanest way out appears to be letting the central bank abstain from offering deposit contracts.
Central banking for none

- Should we open central banks to all?

- Our model suggests that probably no.

- In a companion paper ("Central bank digital currency and the reorganization of the banking system"), we explore the trade-off between more precise steering of the money supply allowed by the CBDC in comparison to the costs of moral hazard and self-fulfilling runs on a central bank.