

Central Bank Digital Currencies - Benefits versus Costs

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The views expressed herein are those of the authors, and should not be attributed to the Bank of England or the Reserve Bank of Australia.

1 Introduction

- The emergence of the distributed ledger technology (DLT) and of Bitcoin was a watershed moment in the history of 'e-monies'.
- It may, for the first time, be technically feasible for central banks to offer universal access to their balance sheet.
 - Existing centralized RTGS systems: Not robust for universal access.
 - New decentralized DLT systems: Can potentially solve this problem.
- Question: Is universal access economically desirable?

2 What is a Central-Bank Digital Currency (CBDC)?

- **Access to the central bank's balance sheet.**
- **Availability:** 24/7.
- **Universal:** Banks, firms and households.
- **Electronic:** For resiliency reasons, probably using DLT.
- **National-currency denominated:** 1:1 exchange rate.
- **Issued only through spending or against eligible assets:** Government bonds.
- **Interest-bearing:**
 - To equate demand and supply at 1:1 exchange rate.
 - Second tool of countercyclical monetary policy.
- **Coexisting with the present banking system.**

3 The Model

3.1 Overview

- Based on Benes and Kumhof (2012) and Jakab and Kumhof (2015, 2018).
- The non-monetary model elements are standard.
- Households:
 - Deposits: Created by banks.
 - CBDC: Created by central bank.
 - Deposits and CBDC jointly serve as medium of exchange.
- Banks: Create new deposits by making new loans.
- Government:
 - Fiscal policy.
 - Traditional monetary policy.
 - CBDC monetary policy.

3.2 Monetary Policy - The Policy Rate

- Standard forward-looking Taylor rule for the interest rate on reserves.
- This element is identical to the current policy environment.

3.3 Monetary Policy - CBDC

3.3.1 Quantity Rule for CBDC

- Fix the quantity of CBDC, let CBDC interest rate clear the market.
- Countercyclicality: Remove CBDC from circulation in a boom.

3.3.2 Price Rule for CBDC

- Fix interest rate on CBDC, let the quantity of CBDC clear the market.
- Countercyclicality: Pay lower interest rate on CBDC in a boom.

4 Steady State Effects of the Transition to CBDC

- Assumptions:
 - Issue CBDC against government debt.
 - Magnitude: 30% of GDP.

- Results:

	Steady State Output Effect
1. Lower Real Policy Rates	+1.8%
2. Higher Deposit Rates Relative to Policy Rates	-0.9%
3. Reductions in Fiscal Tax Rates	+1.1%
4. Reductions in Liquidity Tax Rates	+0.9%
Total	+2.9%

Reasons for Steady State Output Gains

1. Lower real interest rates:

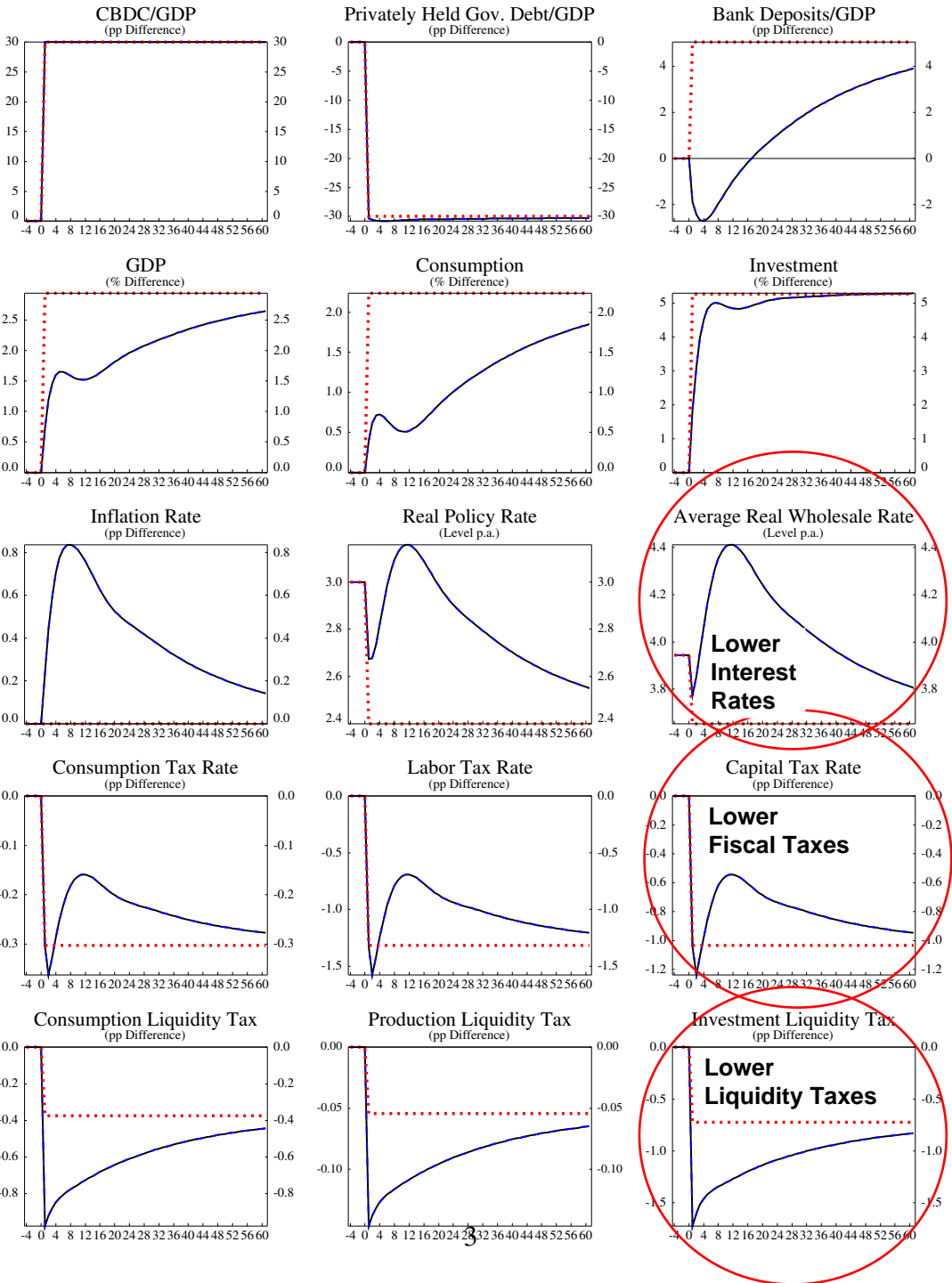
- Assumption: CBDC issued against government debt.
- CBDC is not defaultable, government debt is.
- CBDC carries a lower interest rate than government debt.

2. Lower fiscal tax rates:

- Much larger central bank balance sheet.
- Therefore much larger seigniorage flows.
- Also: Lower interest costs (see above).
- Assumption: Seigniorage is used to reduce distortionary taxes.

3. Lower liquidity tax rates:

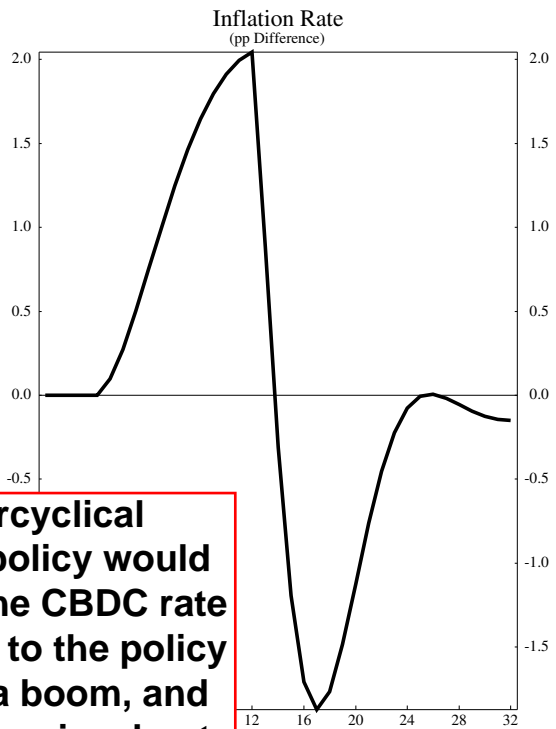
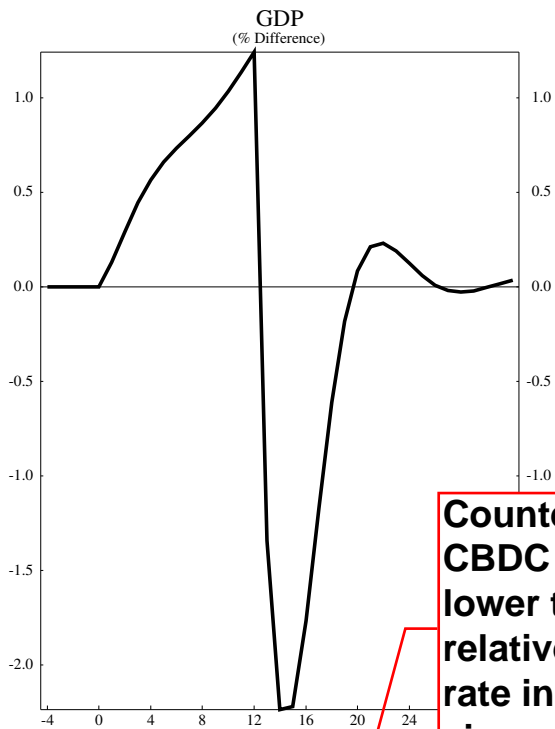
- Modern money is 95%+ created by private banks.
- This is costly: Spreads, regulation, bank market power, collateral.
- CBDC can significantly reduce these costs.
- Result: Greater money supply at reduced cost.



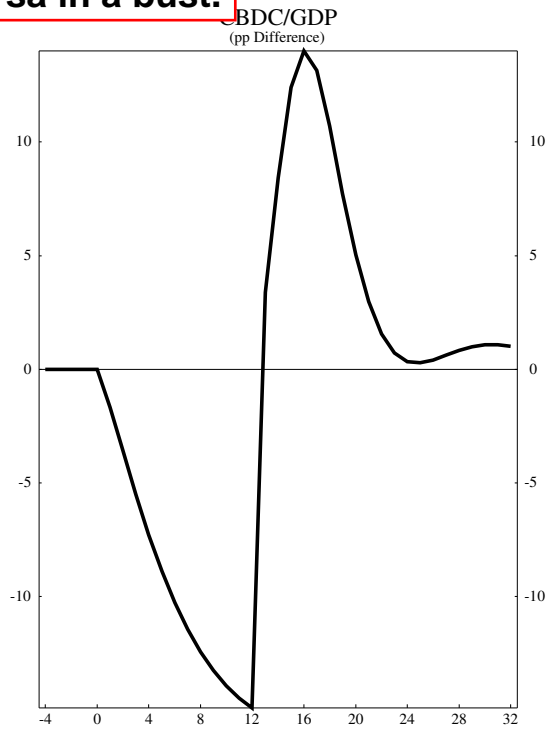
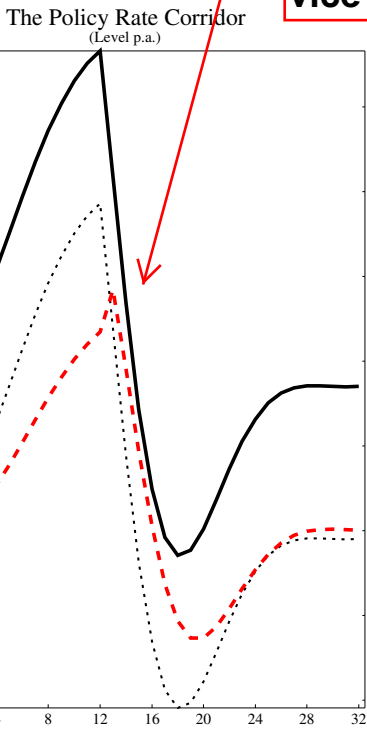
Transition to Steady State with CBDC

solid line = actual transition ; dotted line = change in long-run steady state

5 Countercyclical CBDC Rules



**Countercyclical
CBDC policy would
lower the CBDC rate
relative to the policy rate in a boom,
and vice versa in a bust.**

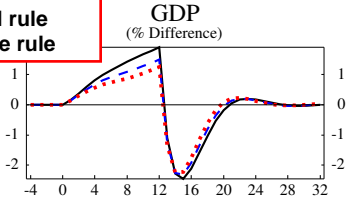


Credit Cycle Shock - Price Rule - Policy Rate Corridor

Bottom Left: Nominal Policy and CBDC Rates

Solid Line = Policy Rate, Dotted Line = Policy Rate minus Fixed Spread, Dashed Line = CBDC Rate

- Solid line = fixed rule
- Dashed line = cyclical rule
- Dotted line = aggressive rule



6 Four Key Design Principles for CBDC

1. CBDC pays an adjustable interest rate
2. No on-demand convertibility of reserves into CBDC
3. No on-demand convertibility of bank deposits into CBDC
4. CB only issues CBDC against eligible securities

6.1 CBDC Pays an Adjustable Interest Rate

- r^{policy} (policy rate) does not equal r^{cbdc} (CBDC rate):
 - Reserves and CBDC both provide a risk-free store of value.
 - But CBDC is also a medium of exchange, with convenience yield cy .
 - Arbitrage:

$$r^{policy} = r^{cbdc} + cy$$

- Arbitrage by banks would not cause r^{policy} and r^{cbdc} to converge.
- The central bank can therefore set r^{policy} and r^{cbdc} separately.
- **This allows the CBDC market to clear through interest rates, without large balance sheet or price level fluctuations.**

6.2 No On-Demand Convertibility of Reserves into CBDC

- Assume single bank guarantees CBDC-reserves convertibility:
 - Depositors who want to run can transfer their deposits to this bank.
 - Incoming deposits are accompanied by a reserve gain for this bank.
 - This bank can exchange the reserves for CBDC at the CB.
 - Then it can pay out the depositors in CBDC.
 - Other banks are forced to settle outflows in reserves.
- **This can become a “run through the back door”.**
- **It will not happen if the CB does not exchange reserves for CBDC.**
- Additional benefits:
 1. CB can keep controlling reserves and thereby the policy rate.
 2. CBDC can have different functionality from reserves.
 3. CB gains a second policy tool in the CBDC interest rate.

6.3 No On-Demand Convertibility of Deposits into CBDC

- Why is convertibility dangerous?
 - Guarantee by banks is only credible with back-up from CB.
 - But CB guarantee is unlimited lender of last resort commitment.
 - **This allows near-instantaneous system-wide runs to CB money.**
 - Scale of LoLR support is potentially much larger than in traditional run.
- Why is convertibility unnecessary for parity?
 - It is sufficient for CB to match CBDC demand and supply.
 - Investors can obtain additional CBDC against eligible securities at par.
- Is convertibility necessary for confidence in bank deposits?
 - How does the opening of the door to bank runs ensure confidence?
 - Confidence is ensured through regulation, deposit insurance, etc.

6.4 CB only Issues CBDC against Eligible Securities

- Principally government securities.
- This is standard practice for issuance of government money today.

The Private CBDC-Deposits Market

- Banks can choose whether to convert deposits to CBDC.
- But in addition to banks there is a private CBDC-deposits market:
 - Agents can freely trade deposits against CBDC in this market.
 - The private market can freely obtain additional CBDC at the CB.
 - But only:
 - * At the posted CBDC interest rate.
 - * Against eligible securities.
- A run on the entire banking system via CBDC becomes impossible.

7 Conclusions

- CBDC has significant benefits \implies further research is worthwhile.
1. Steady state efficiency:
 - Lower interest rates, higher seigniorage, more and cheaper liquidity.
 - Increase in steady-state GDP could be as much as 3%.
 2. Business cycle stability:
 - Second policy instrument.
 - Improved ability to stabilize inflation and the business cycle.
 3. Financial stability:
 - CBDC should reduce many financial stability risks.
 - But if it is not designed well it may introduce others.
 - The “run risk” can be mostly eliminated by sound system design.
- Critical issue: Design of a smooth transition.