

CBDC 'preliminaries'

Digital Assets - Week 4 (Pre-record)

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Types of money

Existing digital currency

- ▶ Central Bank money: Reserves
 - Electronic deposits held by banks in accounts at Central Bank
 - Liabilities of the CB that can be used as **legal tender** to settle transactions between banks
- ▶ Private money
 - *Checking/demand deposit accounts*: held by households and firms at the banks
 - *Cryptocurrencies*: Decentralised digital tokens without an issuer that are not representative of any underlying asset or liability (e.g. **BTC**, **ETH**)
 - *Stablecoins*: Tokens with value pegged to some asset, often USD (e.g. **Tether**)

Existing non-digital currency

- ▶ Central Bank money: Notes, which are liabilities of CB that can be used by households/firms (and banks) as **legal tender**

Central bank money

- ▶ Central Bank money:
 - Cash and reserves have a fixed exchange rate of 1:1 so while they are different, they can be exchanged (by banks) at par
 - Cash earns no nominal interest while reserves might
 - Cash risky/expensive to store/produce and unsuited to geographically dispersed transactions
 - Cash is p2p, while reserve transactions are cleared through CB
 - Cash anonymous to, and non-traceable by, CB, while reserve transactions are not anonymous and are traceable
 - Cash available 24/7/365 while reserves transactions limited to business hours/working week
 - CB money is nominally riskless, being a liability of CB

'Traditional' private money

- ▶ Commercial bank deposits:
 - Can earn interest - in practice always (explicitly) positive
 - Accessed through various private sector-provided systems
 - Not legal tender but denominated *in terms of legal tender* and widely accepted (see [Shirai 2019](#) for a nice discussion)
 - Non-anonymous and transactions are traceable (by banks)
 - Available $\approx 24/7/365$ (some services not 24 hours, weekend, holidays - even if RTGS systems could handle it)
 - An IOU from a bank, which they promise to exchange at par (1:1) for CB money if requested
 - Under illiquidity/insolvency bank cannot exchange at par - so not nominally riskless (but public deposit insurance exists and banks are regulated)

Refreshing our memory on bank deposits - I

- ▶ The vast majority of money *in circulation* is created by commercial banks
 - UK: approx. 3% is cash and 97% are current account deposits
 - We use bank deposits as money - they are assets for us and liabilities for our banks
 - Because banks are 'well regulated' (and because of deposit insurance) we think of bank deposits as worth the same as cash with the same face value
 - The presumption is that the banks have assets that can back the IOUs that we are exchanging when transacting using deposit accounts

Refreshing our memory on bank deposits - II

- ▶ In the modern economy, deposits are typically created when a bank makes a loan
 - Fractional banking means that banks *expand* the money supply (relative to the amount of reserves)
 - The ability to make loans while respecting risk, profitability and regulatory constraints will **limit** the creation of money (notably the interest rate environment, capital requirements, and - traditionally - reserve requirements)
 - See nice discussions [here](#), [here](#), [here](#) and [here](#)

Transacting with bank deposits

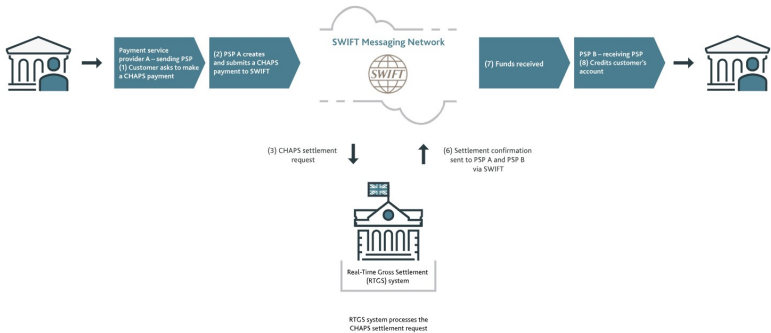
- ▶ What happens when I make a payment to someone with an account at the same bank
 - Bank debits my account and credits there
 - Settlement occurs across a single balance sheet
- ▶ What if Andrea at bank A pays Bob and bank B? (simplifying)
 - Bank A debits Andrea's account
 - Bank B credits Bob's account
 - Bank A pays funds from its reserve account (with the CB) to bank B's reserve account
- ▶ Large value interbank payments are typically settled across the central bank's balance sheet
 - Orchestrated through (details depend on country) a messaging/RTGS system

Large value payments systems

- ▶ Large value payments occur between financial institutions - possibly for 'payments' *per se* but also in support of transactions of assets
 - Due to the systemic importance of such payments and associated markets/institutions, there are very demanding **standards** that countries typically adhere to
 - For domestic systems, this tends to result in the settlement asset (money) used being reserve accounts with the CB
 - Traditionally CB money is the most liquid asset - and it also is (nominally) free of credit risk
 - Technologically **and legally**, **finality** of transactions is assured when settlement occurs in CB money (as opposed to any other settlement asset)
- ▶ To avoid credit/counterparty risks within these systems, a 'real time gross settlement' system is commonly used

RTGS

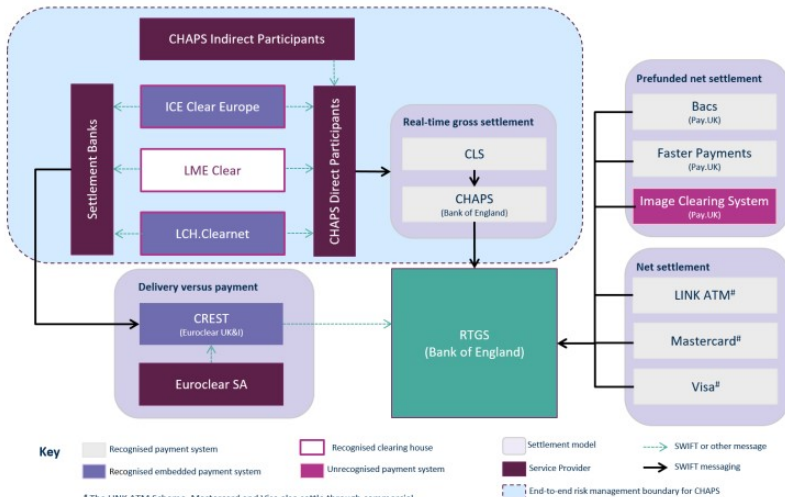
- ▶ RTGS systems clear and settle payments (essentially) on a deal-by-deal basis, rather than netting out during the day, and then settling the net position end-of-day
 - Very complicated and demands enormous liquidity
 - Might reduce the trades that occur, but if they occur, they occur more safely
 - Liquidity demands somewhat alleviated by 'liquidity savings mechanisms'
 - Examples: Hong Kong and United Kingdom



Bank of England's CHAPS system - making use of RTGS Source: [Bank of England](#)

RTGS and securities settlement

- ▶ RTGS systems often are used for the cash leg of securities settlement
 - Interlink with 'Central Security Depositories' and other Financial Market Infrastructure (FMIs)
 - CSDs in turn integrate with market trading venues/exchanges
 - In the **UK**, the CSD is **CREST** (run by Euroclear UK and Ireland)



Interlinkages between RTGS, CHAPS and Financial Market Infrastructures Source: Bank of England [here](#) and [here](#)

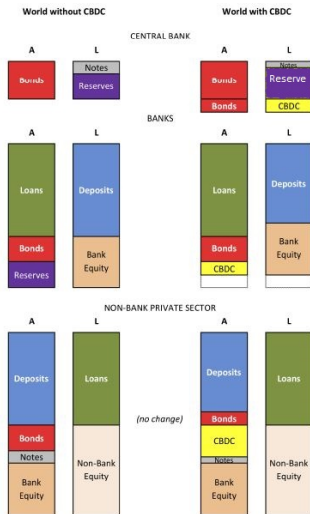
'Novel' private money

- ▶ Private cryptocurrencies and stablecoins:
 - Not necessarily a liability of a centralized authority (be that a Central or commercial bank) - though some are (Circle, Tether)
 - Issued according to the relevant protocol/algorithm of the currency ('mining' in bitcoin, minting for stablecoins)
 - Transactions monitored, verified and recorded in a decentralized fashion within a 'distributed ledger' - often implemented through a blockchain
 - Pseudonymous but traceable
 - 'Instantaneous' p2p transactions
 - Available 24/7/365
 - No regulatory framework or anything like deposit insurance

Where does CBDC fit in?

- ▶ Where does CBDC fit in?
 - In a sense, it's already there, in the form of reserves
 - Many commentators regard CBDC as a 'reserves for all' system (not just for banks)
 - See early work from the BoE ([Meaning et al 2018](#))
 - This is a very useful way to think of CBDC - abstracting from the (substantial!) implementation details
- ▶ In fact, consensus is forming around a CBDC that does *not* pay interest and converts at par with cash and reserves
 - In that case, it can further be thought of as 'digital cash'
- ▶ There may be separate forms of CBDC for firms and households (**retail** or 'general purpose') as opposed to banks/financial institutions (**wholesale**)

CBDC and CB balance sheet



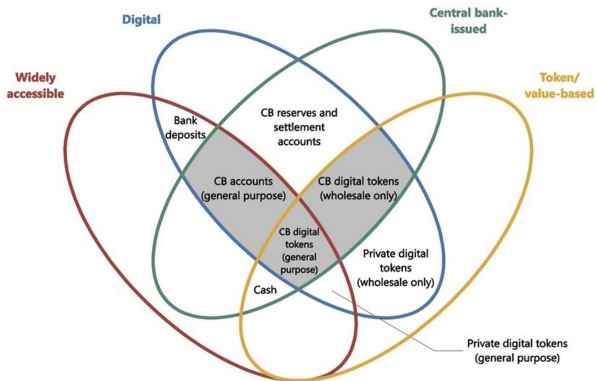
Simplified balance sheets of CB, commercial banks and non-bank private sector - pre and **(possible)** post CBDC introduction. Source: [Meaning et al \(2015\)](#)

CBDC and CB balance sheet

Comments on diagram:

- ▶ Essentially simplifies by treating all reserves as (wholesale) CBDC after introduction - and subtly implies a distinction between retail and wholesale (this is yet to be decided)
- ▶ Appears to assume that the commercial banking sector shrinks somewhat (see other pre-record) - which may not necessarily be the case though, on balance, is plausible
- ▶ Appears to assume that non-bank private sector (households and firms) substitute their portfolios out of notes and into (retail) CBDC
- ▶ CB balance sheet has expanded, implying that CBDC was issued through a form of 'open market operation', buying bonds from the private sector (e.g. from pension funds and thus, implicitly, from households, for example)
- ▶ The reference to 'token/value-based' (rather than 'account based') is somewhat dated

Definitions



The money flower: a taxonomy of money (and money-like instruments). Source: [BIS \(2018\)](#)

Cross-border payments - Correspondent banking

- ▶ **International** transactions/settlement often relies on 'correspondent banking'

the provision of a current or other liability account, and related services, to another financial institution, including affiliates, used for the execution of third-party payments and trade finance, as well as its own cash clearing, liquidity management and short-term borrowing or investment needs in a particular currency

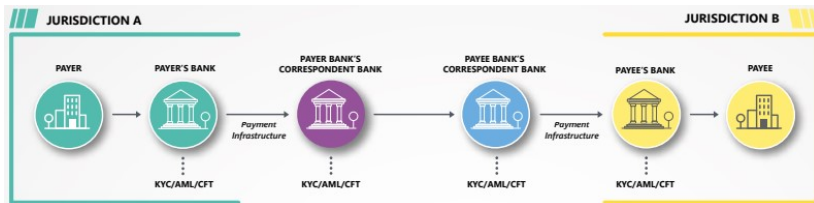
- ▶ To do business in a foreign currency jurisdiction, a bank would use an intermediary 'correspondent' bank, rather than establishing its own branches
 - Holds '**nostro**' accounts with the correspondent (vostro from the perspective of the correspondent)
 - Especially useful for small banks who a) can't establish a presence abroad and/or b) don't want the complexity of connecting (via **SWIFT**, say) with a wide variety of banks...
 - ...instead just connect with a correspondent bank as a hub

Cross-border payments - Correspondent banking

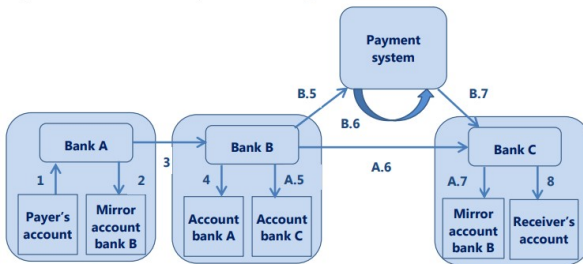
*Let's take the case of a French bank making payments in yen for one of its clients. This bank will be forced to open an account with a Japanese bank (correspondent bank). The account opened by the French bank is a so-called "**nostro**" account, which will record the French bank's foreign currency holdings and ensure the proper execution of its foreign currency transactions (yen in our example).*

*Similarly, a Japanese institution that needs to make a payment in euros will have to open an account with a European bank, of which it will become the client bank. The account opened by the Japanese correspondent is called a "**vostro**" account.*

- Societe Generale



Traditional correspondent banking flow. Source: [BIS \(2023\) - mBridge brochure](#)



1. Debiting of payer's account with bank A
2. Crediting of bank B's mirror account with bank A, which is kept for accounting purposes
3. Payment message from bank A to bank B via telecommunication network
4. Debiting of bank A's account with bank B (loro account)

A. Use correspondent bank only

5. Crediting of bank C's account with bank B
6. Payment message from bank B to bank C via telecommunication network
7. Debiting of bank's B mirror account with bank C, which is kept for accounting purposes
8. Crediting of receiver's account with bank C

B. Involvement of payment system

5. Payment message from bank B to payment system
6. Settlement via payment system
7. Payment message from payment system to bank C
8. Crediting of receiver's account with bank C

More detailed/realistic correspondent banking flow. *Source: BIS (2016) - Correspondent banking*

Correspondent banking problems

- ▶ Correspondent banking long seen as costly and slow, and yet has resisted reform
 - Long chains of intermediaries, different verification (KYC/AML) standards \Rightarrow exposure to currency risk, corruption and confusion
 - Fees accumulated at each stage (explicit costs)
 - Often unable to employ 'straight-through processing' (STP) - so revert to costly and slow manual approach (explicit costs and implicit - through currency and counterparty risk, liquidity buffering)
 - For developing countries, difficulties in accessing correspondent banking networks can make remittances especially expensive - and limit borrowers' access to liquidity and funding
- ▶ Improving this system is one of the most promising applications of (wholesale) CBDC and tokenization
 - See main lecture(s) and [here](#)