Balance sheets, settlement systems and crossborder payments

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June 2024

FinTech and Cryptocurrencies - University of Cape Town

From the history of money to the art of making payments

- The history of money taught has that money has three functions: medium of exchange, unit of account, store of value
- Money is the medium by which things are exchanged, and not, the value for which they are
- Financial intermediaries facilitate payments and charge fees to do so
  - Numerous benefits: access, risk pooling, reducing information asymmetries
- The major focus of financial regulation today is ensuring banks hold enough, appropriate, high-quality capital
- Today: How are payments get made? What does the payment infrastructure look like? How are crossborder payments made?

Balance Sheets

Balance sheets

- A balance sheet is a summary of the assets, liabilities and equity of a business at a particular point in time
- A balance sheet has 3 components

Assets	Liabilities	Equity
Real estate	Debt	Investment
Equipment	Loans	Earnings
Patents / trademarks / IP		

Balance sheets

- Assets are *owned* by the bank
- Liabilities are *owed* by the bank
- Equity *owns* the bank
- **Key:** All balance sheets, must balance. How? The accounting equation

$$\textbf{Assets} = \textbf{Liabilities} + \textbf{Equity}$$

- Why? Everything the company owns (assets),

Balance sheets

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$$\textbf{Assets} = \textbf{Liabilities} + \textbf{Equity}$$

- Why? Everything the company owns (assets), been produced by people or funded by loans (liabilities) or must have been provided by owners (equity)

A bank's balance sheet

Assets	Equity and Liabilities

• Reserves
• Cash
• Securities/Bonds
• Loans
  • Company
  • Consumer
  • Real estate
  • Other
• Other assets
	• Deposits
	• Debt
	  • Inter-bank loans
	  • Central bank loans
	  • Other
	• Shareholder equity

How does double-entry bookkeeping work?

- Activities that relate to the balance sheet, are broken into seperate accounts
- There are asset, liability and equity accounts
- At all times, the accounting equation must hold
- We replace the concept of “In” and “Out” with “Debit” and “Credit”

Double-entry rules

Debit the reciever, credit the giver

Accounts	Action	Entry
Assets	Increase	Debit
	Decrease	Credit
Liabilities	Increase	Credit
	Decrease	Debit
Equity	Increase	Credit
	Decrease	Debit

Settlement systems

Money enables payments

- Yesterday we introduced the concepts of money and financial intermediaries
- We said that a key role of money is to faciliate transactions by making it easier to buy and sell goods
- Put differently, money enables payments
- Today we turn our attention to how payments work and how financial intermediaries facilitate these payments
- We'll cover a number of examples, each increasing in complexity.
  - Starting with a basic payment between two parties all the way through to cross-border payments

Payments

- Payments and payment systems are the plumbing of the economy
- For most of modern history, payments were uninspiring
- This has changed in the last 20-30 years: debit cards, mobile payments, crypto, CBDCs
- Payments are big business
  - In 2022, $8.7 trillion worth of digital payments made
  - In 2022, payment revenue accounted for 36% of total bank revenue

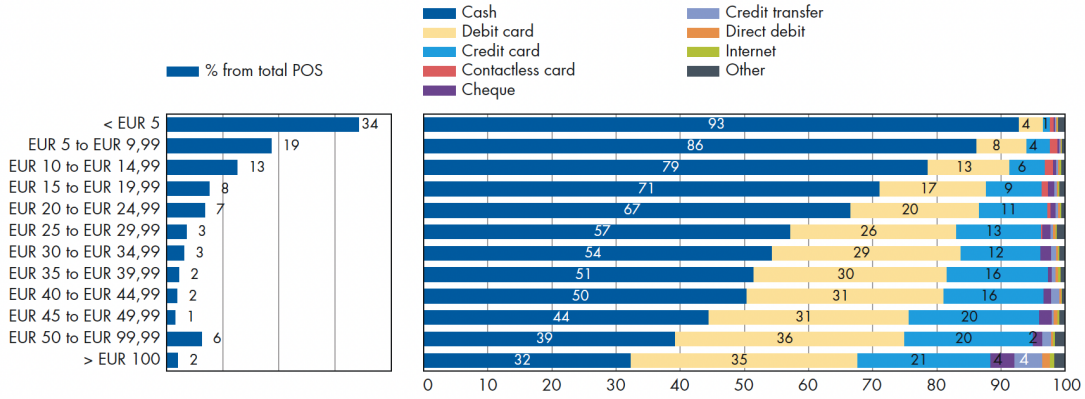
Payment system

Changes in the payments ecosystem have ushered in four eras of payments business models.

Timeline

	Paper Era: Pre-1960s	Plastic Era: 1960s–90s	Account Era: 1990s–2020s	Decoupled Era: 2020s
Transactions	Cash, checks, and wire transfers	Cash, checks, wire transfers, and physical cards	Instant transfers, A2A, and virtual cards	Interoperable and open, platform, and decentralized
Sources of economic differentiation	Balances and deposits	Transaction fees	Relationships and transfer fees	Convenience, security, and low fraud incidence
Distribution channels	Physical (eg, branches)	Physical and ATMs	Physical, ATMs, online, mobile, and digital wallets	Physical, ATMs, online, mobile, embedded, and metaverse
Technology	Telegram	Automated Clearing House (ACH)	Applications and instant payments	Platform as a service (PaaS), tokenization, generative AI, and open/API banking

How do people pay



The interbank funds transfer systems

- In the classic model of a financial system, banks facilitate payments
- We call the system banks use to transfer money, the **interbank funds transfer system**
- Two types of systems
- (1) Wholesale funds transfer systems
  - Infrequent, low volume, large and time critical payments
  - Mainly financial market transactions
- (2) Retail transfer systems
  - Frequent, large volume, small payments
  - POS transactions, EFTs, cheques etc.

Key concepts in interbank funds transfer systems

Transfer of information and processing

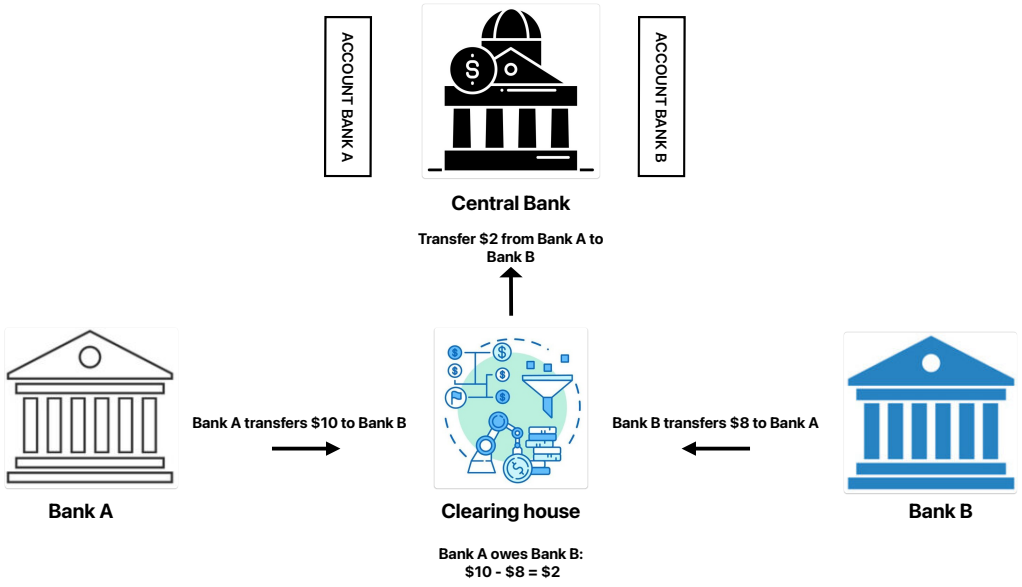
- A funds transfer is proceeded by a message, called a **payment order** requesting the transfer of funds to the payee
- These are typically credit transfers - both payment order and funds is sent from the bank of the payer to the bank of the payee
- However, they can also take the form of debit transfers (e.g debit orders)
- Once payment order is recieved, it is **processed** - identity, account and funds verification. Also reffered to as **clearing**
- Once cleared, these payment orders represent a binding payment obligation

Key concepts in interbank funds transfer systems

Settlement

- Once a payment order has been recieved and cleared, settlement can take place
- Settlement discharges the obligation of the payer bank to the payee bank in respect of the transfer
- Once settlement is initiated, it is irrevocable and unconditional
- Settlement typically takes place in one of two places
  - A transfer across the books of a bank via a **clearing house** in the case of retail transfers
  - A transfer across the books of the **central bank** in the case of wholesale transfers

The mechanics of clearance and settlement



Settlement systems

- Interbank funds transfer systems can be classified in several ways
- Settlement systems differ in *when* and *how* they settle
  - When? At the end of each day **(designated-time/deferred)**, or after each transaction **(continuous)**?
  - How? Settle net balance **(net)** or settle each transaction **(gross)**?

Settlement characteristics	Gross	Net
Designated-time (deferred)	Designated-time gross settlement	Designated-time net settlement (DNS)
Continous (real-time)	Real-time gross settlement (RTGS)	Not applicable

- For many years, most banks utilized a **DNS** settlement system
- Today, **RTGS** settlement systems are commonplace

The mechanics of net settlement

- Consumer A transfers an amount, a, to Consumer B at 10:00
- Consumer B transfers an amount, b, to Consumer A at 11:30

Consumer A			
Account Bank A	X - a	Equity	X
Bank A			
Other assets	X	Deposits Consumer A	X - a

Consumer B			
Account Bank B	X - b	Equity	X
Bank B			
Other assets	X	Deposits Consumer B	X - b

- At the end of the day, the central bank clears

Central Bank			
Other assets	X	Deposits Bank A	X - a + b
		Deposits Bank B	X + a + b

- Net payments are settled

Consumer A			
Account Bank A	X - a + b	Equity	X
Bank A			
Other assets	X	Deposits Consumer A	X - a + b

Consumer B			
Account Bank B	X - b + a	Equity	X
Bank B			
Other assets	X	Deposits Consumer B	X - b + a

The advantages of net settlement

- Easier liquidity management
  - Netting of transactions requires smaller net payments and less capital/liquidity
- Reduces the number of transfers
- Delegating clearing and settlement allows for multilateral settlement
  - Transactions can be netted across multiple institutions resulting in fewer transfers
- Transaction can be reversed within a window of time
  - As settlement happens at a given time each day, transactions can be revered before then

The disadvantages of net settlement

- Transactions take time to clear
- Complex clearing, especially for multilateral settlement
  - Scope for errors
- Silo record keeping
- Concentrates settlement risks
  - Settlement risk concentrated at a single point in the day
  - If issues arise, little time to address them

Gross settlement

- Consumer A transfers an amount, a, to Consumer B at 10:00

Consumer A			
Account Bank A	X - a	Equity	X
Bank A			
Deposits with Central Bank Other assets	X - a X	Deposits Consumer A	X - a
Central Bank			
Other assets	X	Deposits Bank A Deposits Bank B	X - a X + a
Bank B			
Deposits with Central Bank Other assets	X + a X	Deposits Consumer B	X + a
Consumer B			
Account B	X + a	Equity	X

- Consumer B transfers an amount, b, to Consumer A at 11:30

Consumer B			
Account Bank B	X - b	Equity	X
Bank B			
Deposits with Central Bank Other assets	X - b X	Deposits Consumer B	X - b
Central Bank			
Other assets	X	Deposits Bank A Deposits Bank B	X + a X - a
Bank A			
Deposits with Central Bank Other assets	X + a X	Deposits Consumer A	X + a
Consumer A			
Account A	X + a	Equity	X

The advantages of gross settlement

- Faster transactions
- Reduces settlement risk
  - Real-time settlement restricts settlement risk to the point of transactions
- Safety - transctions are no longer grouped together
  - Large grouped payments pose a greater cybersecurty risk

The disadvantages of gross settlement

- More transactions to process
- Amplies operational or technical failures
  - Downtime or interruptions to the payment system can be destabalizing
- Introduces liquidity risk
  - Institutions need to have sufficient capital on hand to settle at any point

Cross-border settlement

Global transfers and settlement

“The holy grail of cross-border payments is a solution allowing cross-border payments to be

- immediate,
- cheap,
- universal, and
- settled in a secure settlement medium.

The search for such a solution is as old as international commerce and the implied need to pay... after more than thousand years of search, the holy grail of cross-border payments can be found within the next ten years” - European Central Bank (2022)

Challenges around global transfers

“Cross-border payments sit at the heart of international trade and economic activity. However, for too long cross-border payments have faced four particular challenges:

- high costs,
- low speed,
- limited access, and
- insufficient transparency.

Faster, cheaper, more transparent and inclusive cross-border payments would have widespread benefits for supporting economic growth, international trade, global development and financial inclusion. ” - Financial Stability Board (2021)

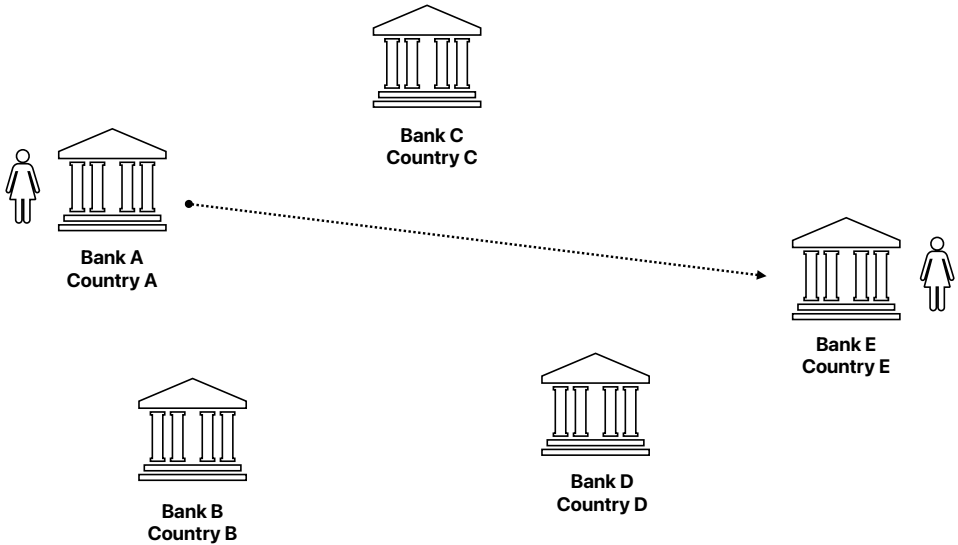
High costs and low speed. Why?

- Long transaction chains
- Currency conversion
- Time zone differences
- Exchange controls
- Anti-fraud and anti-money laundering

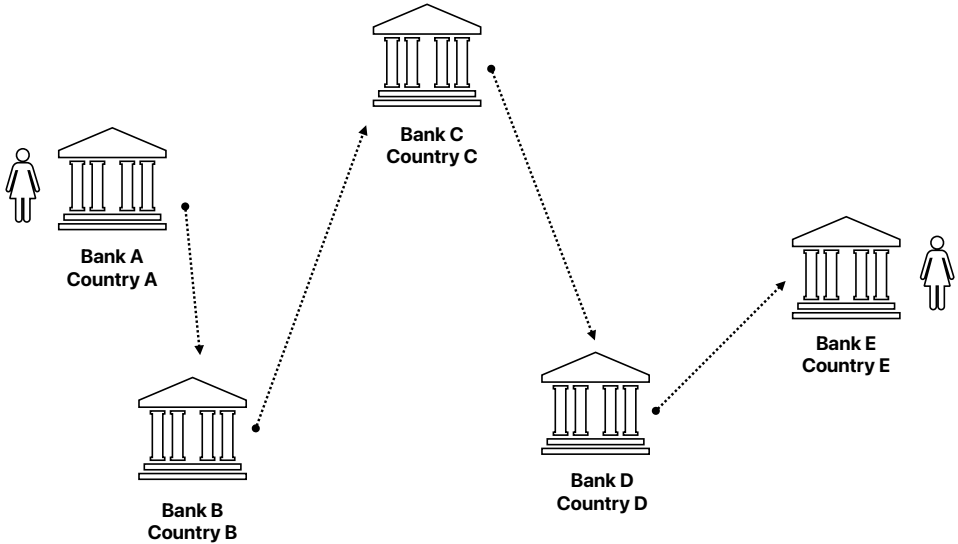
Long transaction chains

- Many settlement systems require a number of parties involved in order to enact a payment
- Cross border settlements have typically been enacted via nostro and vostro accounts
- Nostro account $\rightarrow$ a bank account that a domestic bank has with a foreign bank in foreign currency
  - Domestic banks money deposited at a foreign bank
- Vostro account $\rightarrow$ a bank account that a foreign bank holds for a foreign domestic bank in foreign currency
  - Domestic banks money held at a foreign bank
- For money to move from Country A to B, it must do so via Nostro accounts

Long transaction chains



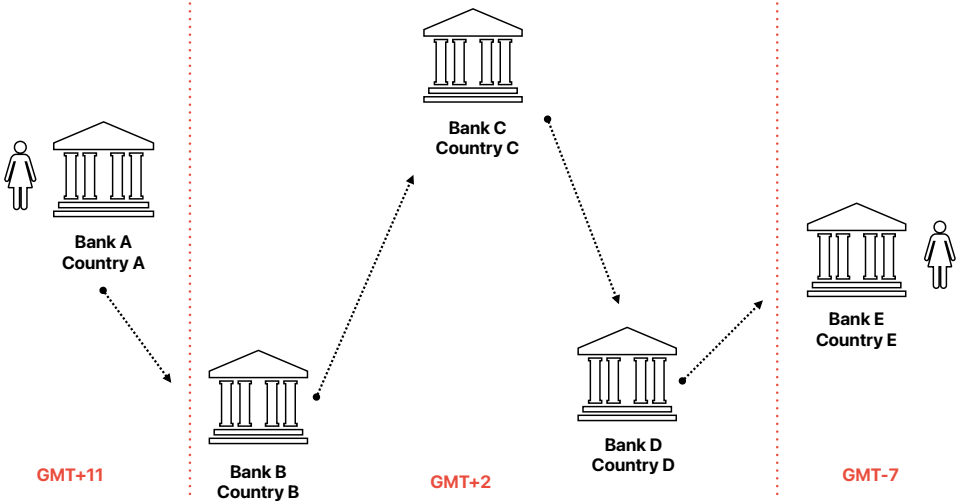
Long transaction chains



Time zone differences and currency risk

- Every example we considered so far, assumed Country A and Country B were in the same time zone
- However, imagine two countries (Japan and USA) where the overlap in bank operating hours is small (1-2 hours)
- This can signifantly increase processing time
- This also influences *currency risk*
- Question of authority (who handles the currency conversion) and timing (when does the conversion occur)
- How is currency risk managed?

Long transaction chains



Exchange controls

- $\rightarrow$ government-imposed restrictions on the purchase and sale of currencies
- Imposed in many countries in the world, especially in emerging markers
- In such countries, all incoming and outgoing payments require the payer and payee to report the reason for the payment to their respective central bank
  - In SA, for example, Regulation 3(1) of the Exchange Control Regulations prohibits any person from transferring funds out of South Africa without the approval of the SARB
- This can lead to significant delays, especially for larger amounts

Anti-fraud and anti-money laundering

- Two features of cross-border payments that induce significant regulatory costs
- (1) AML/CFT $\rightarrow$ Anti-money laundering and countering the financing of terrorism
  - Financial Action Task Force (FATF) $\rightarrow$ international regulatory watchdog that oversees compliance with anti-money laundering rules
  - In the news recently: South Africa's greylisting
- (2) KYC $\rightarrow$ Know your customer requirements
  - Requirement for financial institutions to verify the identity of their customers and the legitimacy/legality of their payments and source of funds

Limited access and insufficient transparency. How and why?

- Countries with developed banking sectors are more likely to have extensive banking networks globally
  - In regions like Africa however, a lot of global banking goes via major countries (e.g. South Africa)
  - Large regulatory burden of AML/CFT/KYC makes global banking unprofitable in poorer countries
- Long processing times mean it is unclear when money will be transferred
- Currency risk means uncertainty as to the amount of money that will arrive in the payee's account
- High costs associated but no transparency about how/where those costs are borne

Searching for the holy grail of cross-border settlement

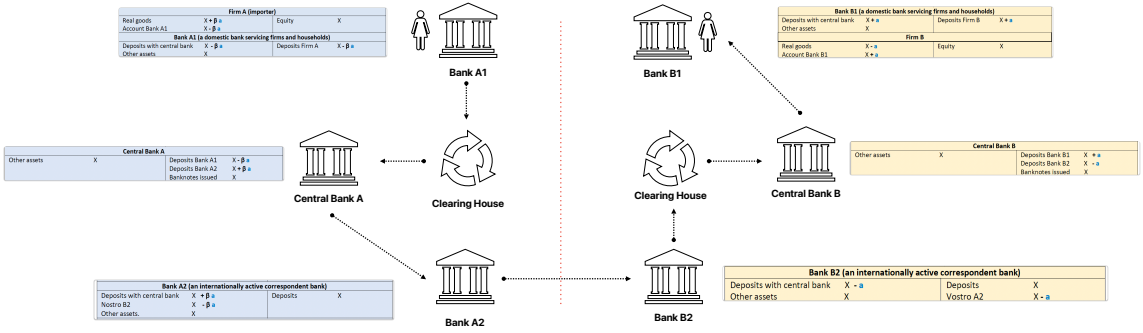
Towards the holy grail

- “after more than thousand years of search, the holy grail of cross-border payments can be found **within the next ten years**” - European Central Bank (2022)
- We’ll look at 6 types of settlement systems that hold promise
  - Correspondant banking
  - Using a subsidiary FX bank
  - Regional RTGS
  - FinTech payment providers
  - Cryto, Stablecoins
  - CBDC

Correspondant banking

- The ‘conventional’ model
  - Transfer of funds via nostro accounts
  - Requires an internationally active correspondent bank
- Innovation of instant payments has made this process significantly faster and removed settlement risk

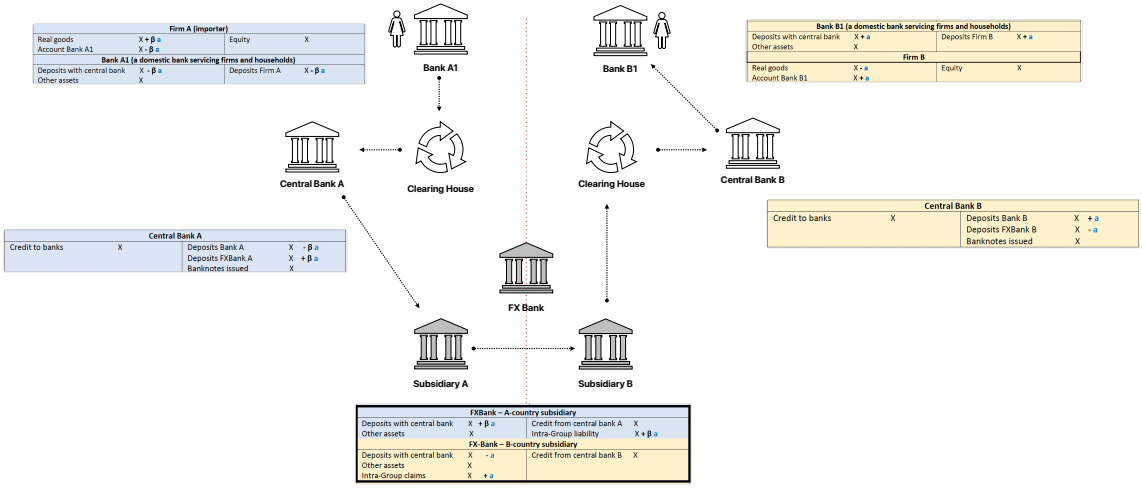
Correspondant banking



Pros and cons of correspondant banking

- Pros
  - Well-established (banking networks, kyc)
  - Diversifies the number of payment providers (increased competition)
  - Has universal reach
- Cons
  - Many intermediaries $\rightarrow$ slow and expensive
  - Transactions clear in commercial money and not, central bank money
  - When, and who to handle forex conversion?

Using a subsidiary FX bank



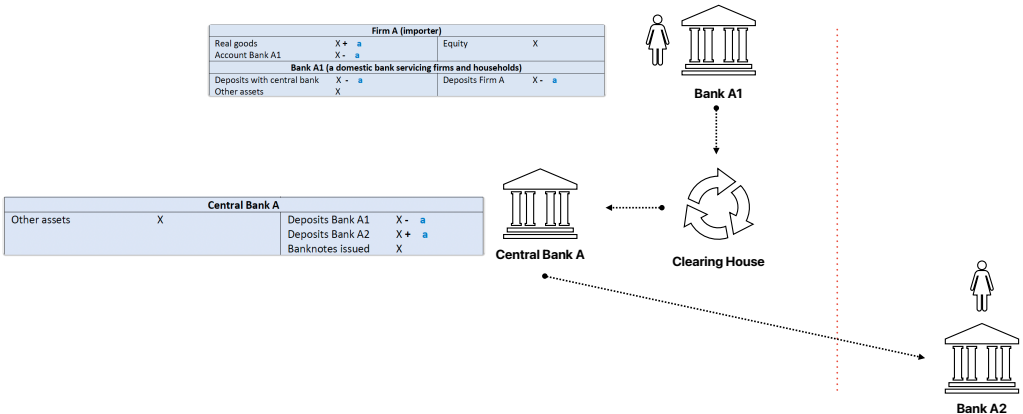
Pros and cons of subsidiary FX banks

- Pros
  - Well-established (banking networks, kyc)
  - Simpler than correspondant banking
  - Subsidiary bank handles forex conversion
- Cons
  - Requires multinational FX banks
  - Concentrates settlement risk in a small number of FX banks

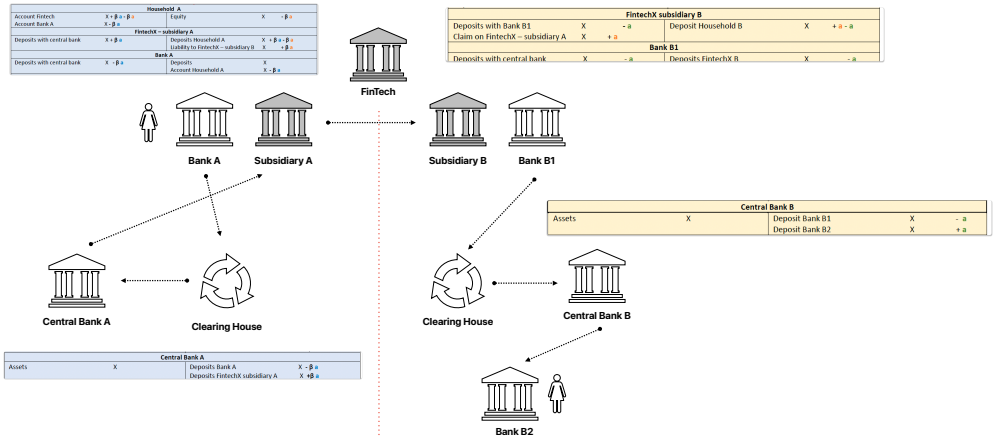
Regional RTGS

- In certain scenarios, customers may prefer to settle payments in currencies other than their own. Why?
  - Firms who conduct majority of their business in another country
  - Weak local currency
  - Dominant currency in a region (e.g South African Rand)
- This has led to the creation of Regional RTGS, managed by one central bank
  - E.g. SADC-RTGS
  - SARB manages clearing and settlement and allows banks in SADC to hold Rand accounts at the SARB

Regional RTGS



FinTech payment providers

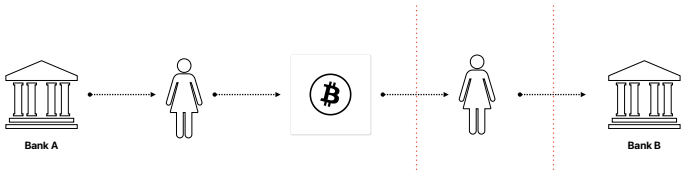


Pros and cons of FinTech payment providers

- Pros
  - Many providers $\rightarrow$ competition drives down costs
  - Especially efficient if the FinTech does not hold deposits
  - Often specialized services for specific financial services
  - Low overheads compared to banks
- Cons
  - Can low-fee income model be sustainable?
  - Often non-interoperable, closed loop solutions

Crypto and stablecoins

Crypto



Crypto with bank account

Stablecoin

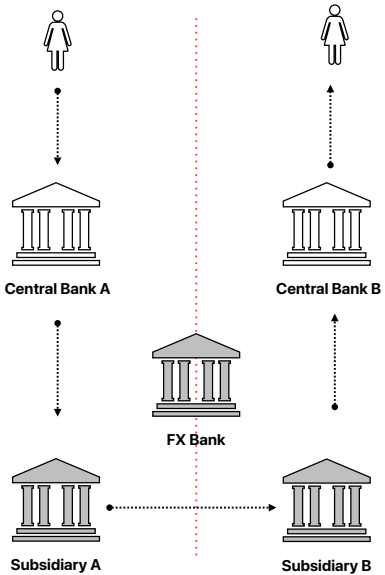
Pros of crypto and stablecoins

- Decentralized
  - No intermediaries
- Efficient
  - Payments clear in a fraction of the time
- Low to no fees
  - Lack of intermediation reduces fees
- Currency agnostic
  - Removes currency risk
- 24/7 $\rightarrow$ removes time zone risk

Cons of crypto and stablecoins

- AMT/CFT concerns
- Lack of regulatory oversight
- Does crypto meet the definition of money? $\rightarrow$ price volatility
- Threats to monetary sovereignty
- Financial stability issues
  - Large reserves required
  - Incentive to hold interest generating assets/reserves $\rightarrow$ sell-off of reserves could destabalize markets
  - Solution: hold highly liquid, safe assets $\rightarrow$ low/no interest
  - Liquidity management

Central bank digital currencies (CBDC)



Pros and cons of central bank digital currencies (CBDC)

- Pros
  - Removes the need for a bank account
  - Subsidiary bank handles forex conversion
  - Forex conversion can be handled by non-banks (non-banks can hold CBDC)
- Cons
  - Requires multinational FX banks
  - Concentrates settlement risk in a small number of FX banks
  - Requires CBDC uptake

Have we found the holy grail?

Have we found the holy grail?

- The holy grail will likely feature three solutions
  - Subsidiary FX banking (high fees!)
  - Stablecoins (high reserves required! regulatory concerns!)
  - CBDCs (uptake? high fees!)
- Key question: can we remove fees?
  - Fees are driven by costs of intermediation across border, e.g forex
- Challenge: how can we re-imagine financial services in a world where cross-border payments are instantaneous and free?