

The International Monetary System: Disruption and Opportunities

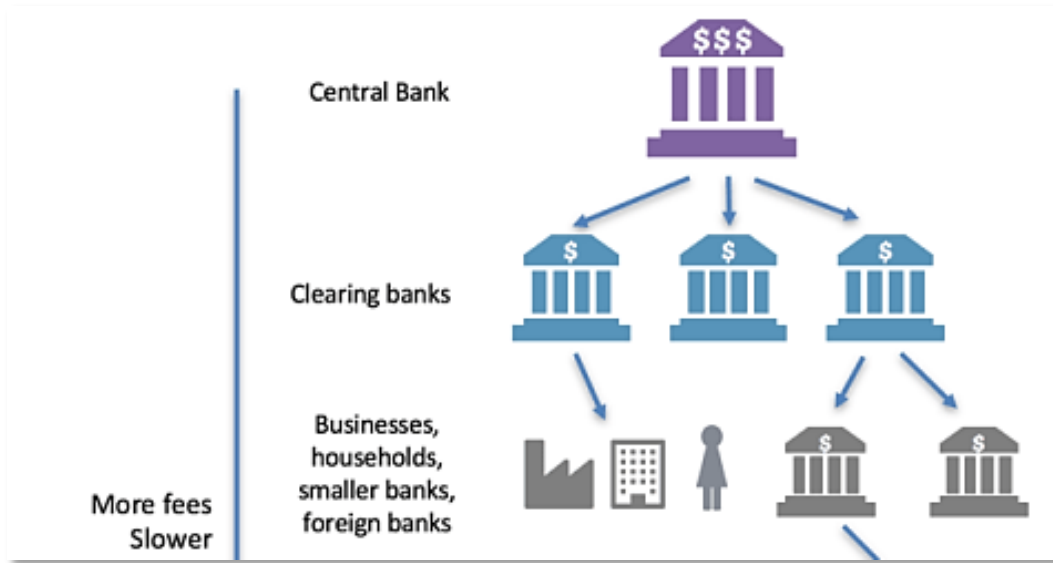
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Financial Services Agency and CARF Joint Symposium
“Exploring the Current State of Financial Administration
with the Academic Community”

The Traditional Domestic Financial Ecosystem and Its Evolution with Altered Banking/Intermediation



❖ Evolution and access

- Crises can instigate change

❖ Key question: Non-bank financial entities

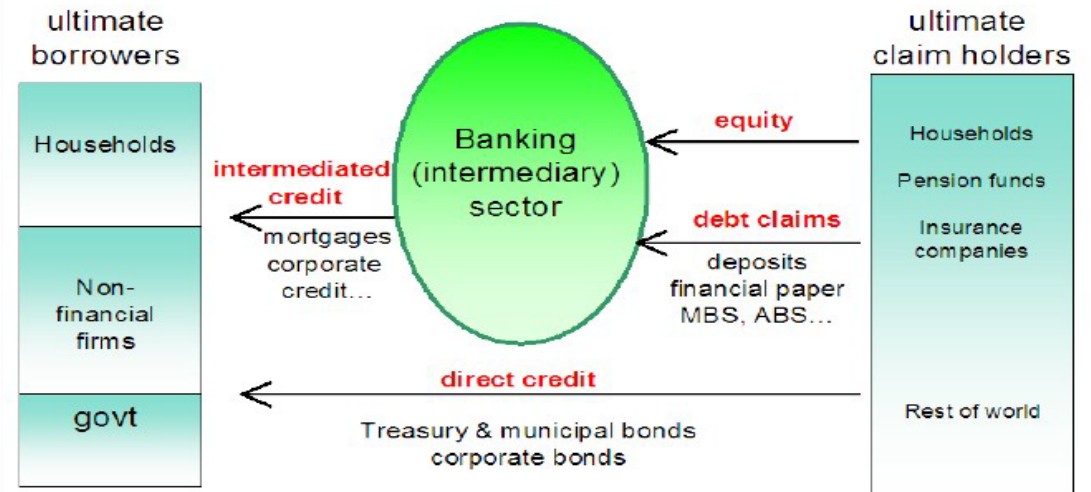
- Exclusion? Where to put the newest entities connecting real and financial, e.g., digital innovators and fintechs

❖ Key question: Technologies

- How can/should new technologies change the domestic picture, in an optimized design?

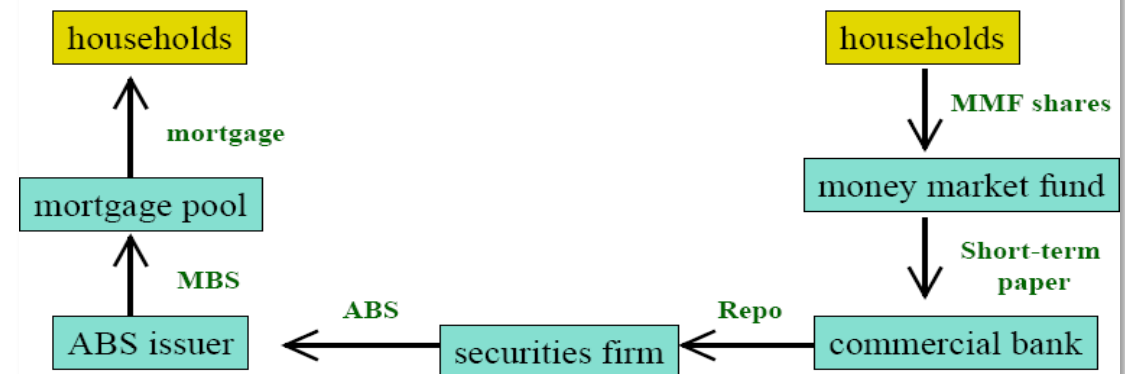
Traditional, Central Bank: Commercial banks as key, with Central Bank at the top; a 2-tier system, with others typically multi-tiered. Some CB's still think this way

Figure 1. Stylized Financial System



Shadow banking: Non-bank financial institutions, post-crisis, better regulated, accepted as integral part of financial system, traditional now outdated- but not until crisis happened

Figure 6. Long Intermediation Chain



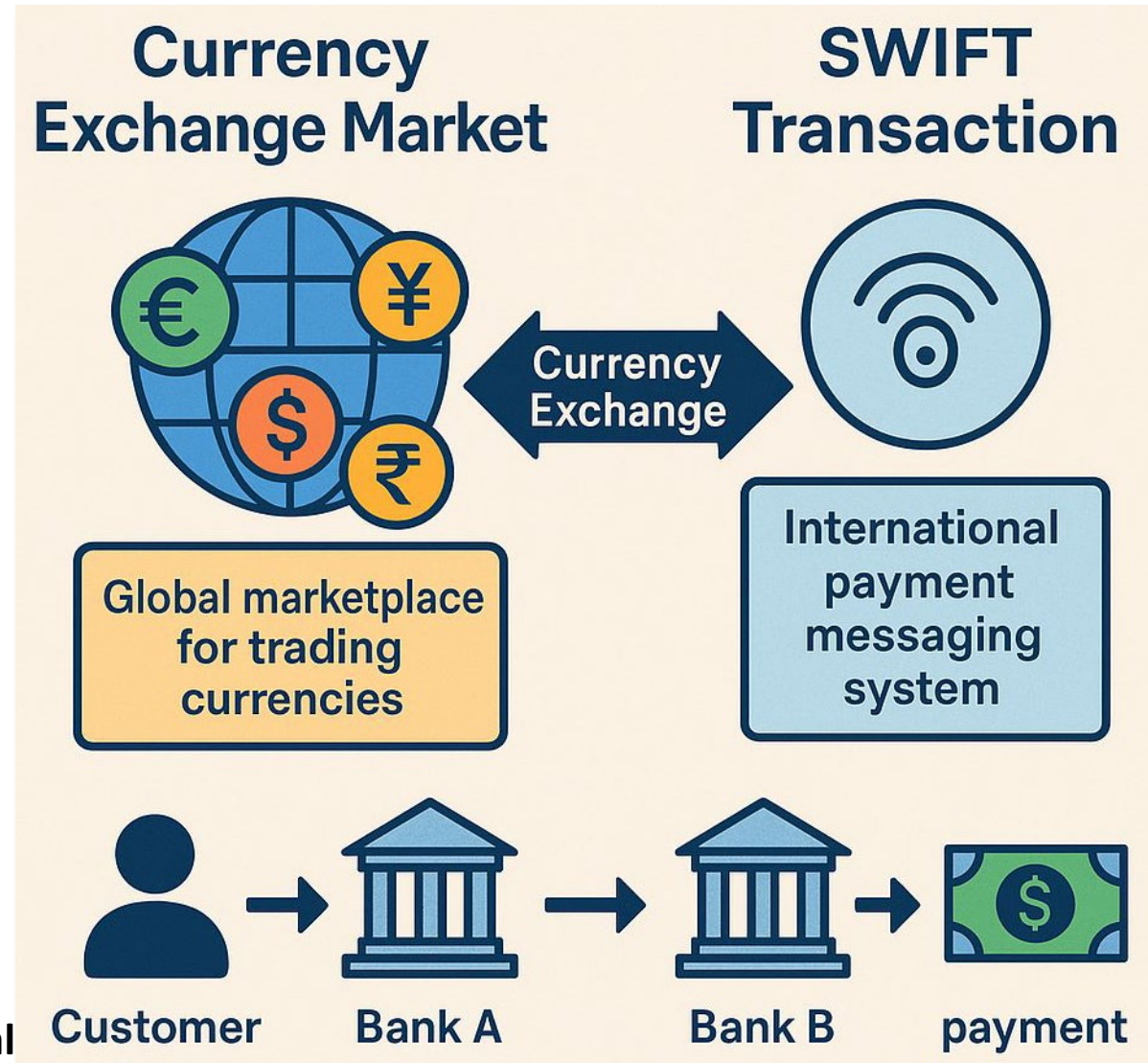
International Money and Payments: FX Ecosystems

- ❖ **Large banks, correspondent banking, SWIFT, concentration among currencies, favoring some countries**
 - The Cross-border problem, G20 goals, Peer-to-Peer (P2P) remittances cost an average of **2.6%** and are slow
 - Climbing above 8% in Sub-Saharan Africa
 - Traditional inter-dealer OTC FX market (innovation around the edges)
 - **Dominant currencies:** USD, Euro, Yen, Pound
 - With a large Eurodollar role
 - **CLS Settlement not comprehensive** (18 countries)
 - **Central bank swaps with USD limited** to 14 countries, Yen to appx. 9

Key question: Technologies

How can/should new technologies change the international

picture, in an optimized design?



Stable Coins -- Disruption or Integration? Strategic Games or Collaboration? Nash vs Soln' to "planner's problem"

❖ Use of US dollar stablecoins internationally is growing

- A symptom of inefficient legacy? An instigator of change?
- Parallel 24/7 financial infrastructure
- Perhaps up to **23% of global remittance flows**

❖ United States

- Christopher J. Waller, FRB Board of Governors
 - "[Another] use case ... the 'stablecoin sandwich' [Envision either].....stablecoin providers operating within potentially different combinations of blockchain networks... **multiple, competing eco-systems...** [or] **A stablecoin market** featuring a high degree of interoperability..."
- US Executive Order, explicit on new technologies: blockchain, distributed ledgers, smart contracts, encryption
- **Promoting US private sector companies.** A larger disruptive force beyond stable coins.

❖ European Union

- Christine Lagarde, President, European Central Bank
 - "...99% of stablecoins are denominated in US dollars... **digital euro is a strategic priority... help safeguard Europe's bank-based financial and monetary system.**"
- EU member states **promoting international integration:** Italy, Germany, Spain and Belgium + Agora and other international platforms
- **Building new infrastructure:** In short-run, Pontes, linking DLT to payments (legacy infrastructure) and building longer run Appia, single ledger or interconnected ledgers.
- **Likely also reacting to innovative consortia of private sector global banks** (issue is the governance and a public option)

❖ China

- BIS, IMF, and World Bank mentioning **Asymmetric Capital Account Liberalization** and **Administrative Quantitative Controls**
- Finance Minister Lan Fo'an, at the PBoC's China Development Forum 2026 on Strategic Openness
 - Placed a greater emphasis on "**openness and shared benefits,**" calling for **deepening multilateral financial cooperation** to "inject stability" into the global economy

Metric	Stablecoins (Annualized 2024-25)	Credit Cards (Visa + Mastercard)
Raw "On-Chain" Volume	~\$27.6 Trillion	~\$25.5 Trillion
Adjusted "Real" Volume*	~\$5.5 – \$7.6 Trillion	~\$25.5 Trillion
Market Leader	USDT (Tether)	Visa

Domestic blockchain infrastructure as a leading example of Central Bank innovation, Korea's BOK

DLT-Based Programmable Digital Currency System: Interbank Settlement for Tokenized Bank Deposits and Digital Assets

❖ Wholesale Legacy System: A hybrid RTGS

- BOK-Wire+, the payment system, simultaneous settlement algorithm
 - Uses absorbing Markov chains to identify which banks are absorbing liquidity – so as to prioritize
 - The overdraft risk: BOK-Wire+ manages this via intraday repo and collateralized overdrafts, government bonds

❖ Wholesale CBDC, Clearing for tokenized commercial bank deposits on a Distributed Ledger, Hangang

- Fiat money and tokenized bank deposits are issued on Hangang
- In the DLT, those funds are "locked" in the BOK's core and programmed with redemption rules.

❖ Tokenized deposit used by the public

- Trial, 81,000 participants at retailers, eliminates card and interchange fees
- A SME's contract invoice is paid the moment of sale or a delivery is confirmed, bypassing the traditional waiting period

❖ Wholesale and Retail are part of an Integrated System

- banks as last mile provider, transactions processed in the ledger are ultimately settled by central bank money

❖ Programmability enhanced functionality (live trial)

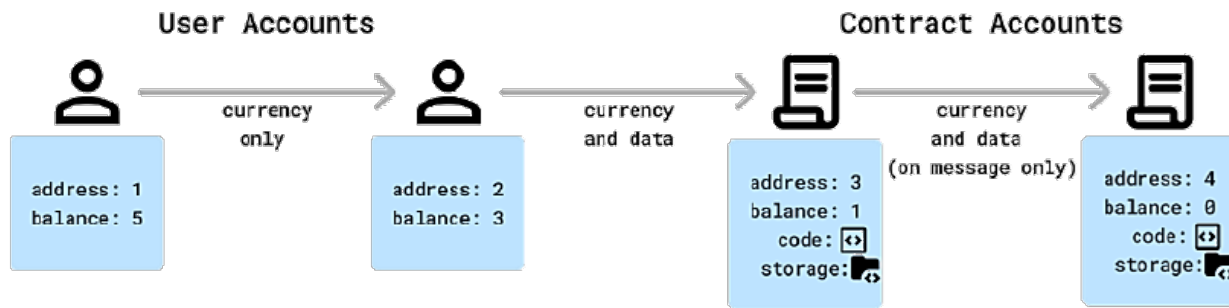
- **Example: Conducted smart contract-based voucher initiatives related to the public's livelihood, covering cultural events, youth-oriented events, and subsidizing EV charging infrastructure**
- **Smart contracts automatically enforced usage rules such as conditional payments, automated settlement upon delivery confirmation, scheduled payments**

❖ Digital Assets (simulation, proof of concept)

- **Carbon credit settlement (on chain, trading is off chain)**
- **Digital Environmental, Social, and Governance (ESG) bonds and Digital Sustainability-Linked Bonds (D-SLB)**
- **Monetary Stabilization Bonds (MSBs) in the form of non-fungible tokens (NFTs)**

The Power of New Technologies

Smart Contract Code, a Fundamental Building Block: A Radical Departure



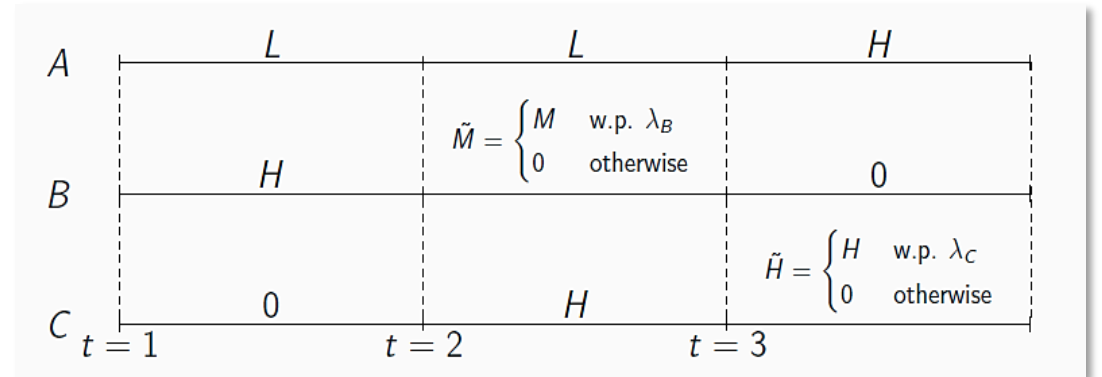
❖ Difference from Stable Coins: Assigning rights to digital assets with stipulations in the code

❖ Two types of accounts

- Externally owned accounts have an address and balance
- Contract accounts also, but with code and data storage

❖ Contract accounts receive transactions and update their state and send other transactions

- Can only initiate transactions as a response to another transaction, all consistent with the code
- All automated



Lee, Martin & Townsend (2023) "Optimal Design of Tokenized Markets" and "Zero Settlement Risk Token Systems"

- ❖ A has the asset and wants liquidity: asset lending = liquidity borrowing. Further asset lending and liquidity borrowing (this could be back office treasury management or Repo)
- ❖ B as "intermediary" between A and C
- ❖ A and B meet first. Then B and C. If B has the asset, C can bargain, implement a hold up problem. Asset as Owned.
- ❖ Under ERC 20, stipulations for Digital Coins, protect B and helps makes market, A and B can agree on conditions for B to potentially sell to C at a later stage and not otherwise
- ❖ B and C later meet. B cant tells the ERC20 smart contract to transfer 1 unit from A's account to C if B wishes. **No hold up**
- ❖ B does not hold the asset on its balance sheet, the contract has it, but B has control rights through the code

The Conceptual Sea Change: Dynamic Ledgers, Commitment, Atomic Settlement at the Time of Trade

❖ Dynamic Ledgers, over dates and state

- The balance sheets of financial accounts are not simply static snapshots at various points in time
- Dynamic representation of assets as in **Arrow-Debreu securities** (can be traded in markets)

❖ Atomic Settlement (commitment and trade same time)

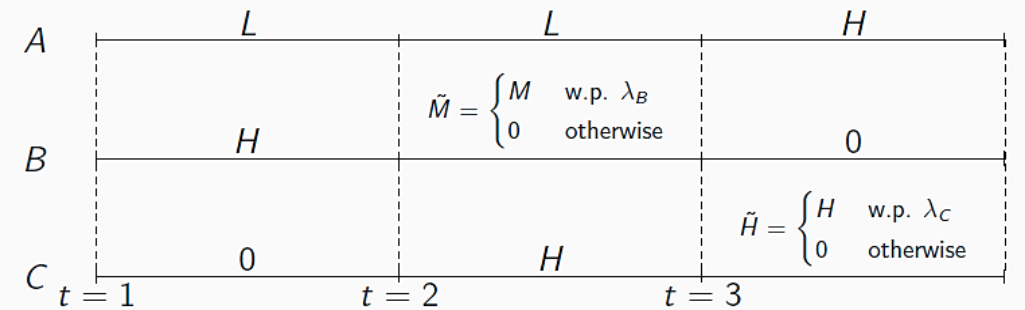
- Though contracts and trades are agreed at initial dates and executed at subsequent dates, settlement is instantaneous

❖ Ownership vs. Rights, Code can “own” the asset

- B does not have to buy the asset in order to sell it
- Likewise, to conserve on liquidity, an agent can lend money if contracted to receive it without having it in advance

❖ Generalizations: Divisibility, Composability, Consistency, and Multilateral (including chains and tracking)

- Assets can be divided into pieces
- Contracts composed together, consistent with one another
- Economizing on collateral, lend it out with stipulations, and track all claims, amounts and timing
- Chains: Includes promises of one person backed by promises of another, building on an anchor, and so on. No fails



Lee, Martin & Townsend (2023) "Optimal Design of Tokenized Markets" and "Zero Settlement Risk Token Systems"

Possible Future Implementations: Model-Driven Extensions & Architectural Possibilities

**This is where the academic research kicks in
MIT lab, LEAD**

Multilateral Trade and Settlement Algorithms

Programmable Optimized Hybrid Credit and Insurance linked to a Ledger

Multilateral Algorithms, Clearing of Debt Obligations, Improve on Traditional

❖ Examples of objects to be cleared, its quite general

- Interbank clearing algorithms
- EU overdue accounts payable, reaches 1/2 the amount of debt
- Supply chains: SME debt intermingled with larger firms, as in an explicit, true for debt obligations much more generally
- Medieval Trade Fairs, recontre in unit of account ghost currency
- Walrasian general equilibrium model: Clearing credit and debits

❖ Solution

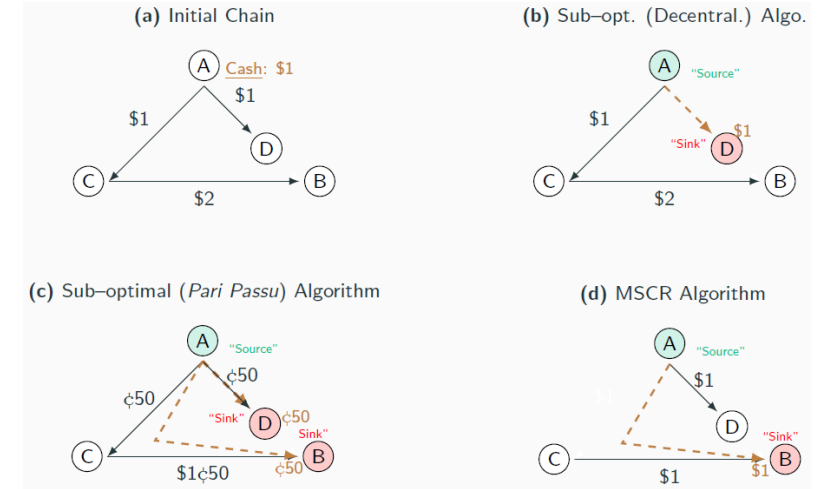
- An **obligation matrix**. A **directed flow graph**. Bilateral obligations over all participants/nodes. **Starting point is what each nodes owes or is owed.**
- **Multilateral Algorithm: Max flow maximizes flow through chains, as if from source to sink, through pseudo liquidity in the code, leaving internal closed cycles which can be set off – not real liquidity**
- Then maximize additional clearing with minimum use of real liquidity by injection into open chains, induced by discounts, the good way

❖ **Implemented: Italian data**, InfoCert monthly, approximately 45,000 firms per year. **Clear 12% of debt with pure off-set, and 50% of debt with 18% of liquidity owed as pre-paid-LSM**

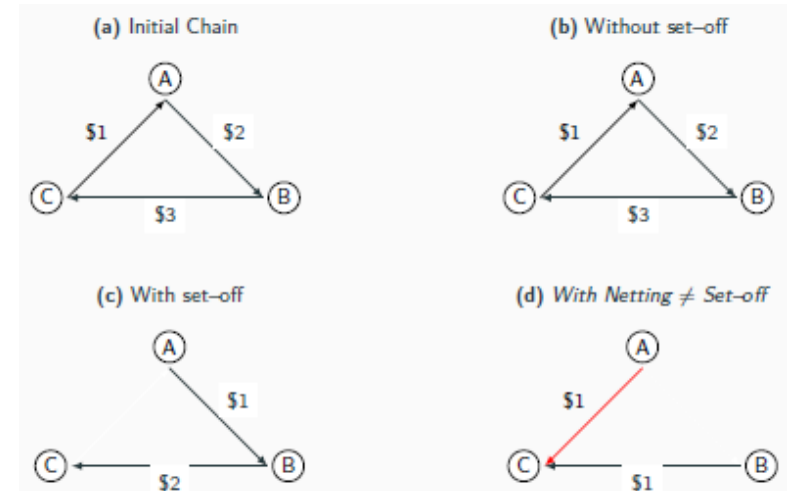
❖ Not-as-good alternatives: CCP and netting (even if traditional)

- Netting leaves node A with an obligation to pay node C – **new exposure, creates risks**. CCP requires collateral pools.

Algorithm: Cash reuse in open chains



LSM: Multilateral set-offs in closed chains



Boissay, Borio, Fleishman, Townsend, Zakrajsek, (2025)
"Multilateral Trade Credit Setoff"

Programmable Hybrid Credit and Insurance, linked to a Ledger, Extend to Mechanism Design

❖ Parametric Insurance linked to DLT.

- Combine satellite data with IoT sensor data from the SME's actual site. Could cover not just weather for farmers but also operational downtime indices, heat-related labor productivity loss, or localized flooding that halts logistics.
- Asset as a Smart contract. Can also include account receivable and SME loans, with insurance embedded.
- Outflows and inflows through commercial banks from retail to wholesale DLT platform.

❖ Limitations of Parametric Insurance: Basis risk and guidance for deeper integration

- "A concern is that this still leaves **basis risk: Divergent reality on the ground** merged with liquidity needs + **other factors not weather-related**

❖ Extend to a Mechanism Design Model with internal incentives

❖ Environment: SME: Effort z and capital level k as inputs, output q is risky with probability $(q/z, k)$; β is the discount rate

❖ Community payoff: Maximize discounted expected present value of social return with external interest rate R , subject to promise keeping w and incentive constraints

❖ Subject to constraints capturing obstacles to trade: Moral hazard, private information, limited commitment

❖ Contracts on the blockchain. Blockchain offers commitment for contracts agreed to; need because path can be time inconsistent, as with audits, or no-longer-necessary links to past messages; can allow punishment if on-chain, desired limited use of funds (the tokens).

- Contracts can be traded in an on-chain market.

❖ Contracts as objects traded in markets: public infrastructure for private competition, as in Prescott and Townsend, general competitive analysis in an economy with private information ---intermediaries as nodes do the clearing on the blockchain

- back to the integrated vision

On the ground reality, procedures: Need a fully-powered Blockchain

❖ Approach: Estimation and simulation

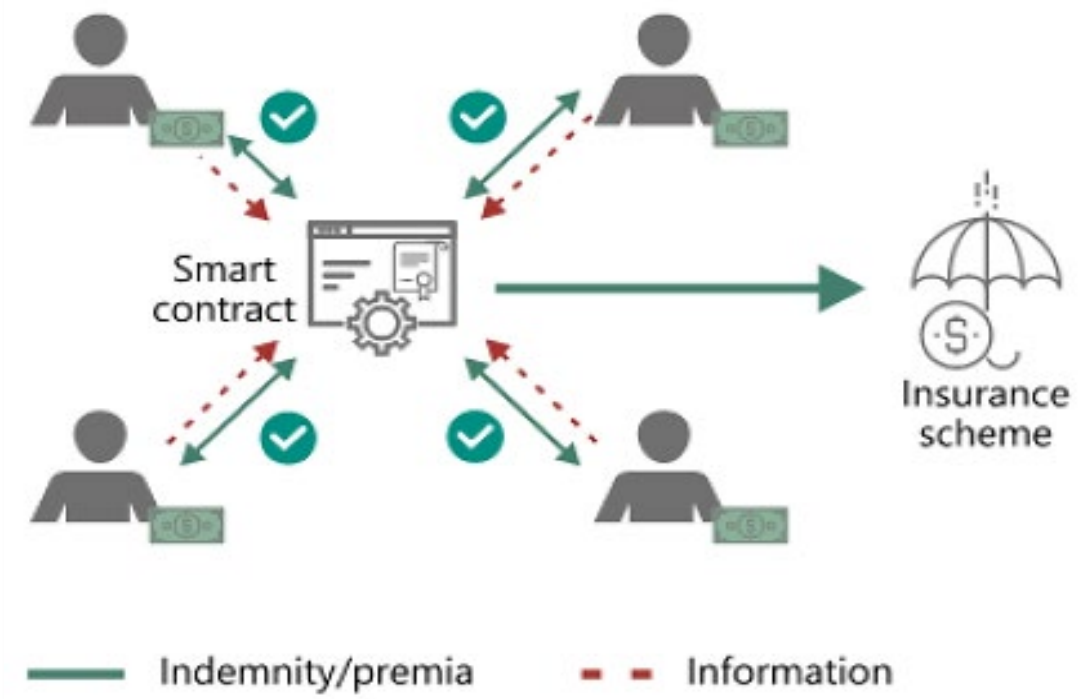
- Estimation: Use data to determine current obstacles as per previous model, with estimated parameters
 - In Townend Thai data, rural: Savings as buffer stock only
- Simulate model to estimate large gains to better contracts
 - Karaivanov, Mojon, Pereira, Townsend (2023) "Digital Safety Nets," BIS WP No. No 139

❖ e-data from private sector collaborative partner in Indonesia

- risk sharing limited as estimated
- **Urban MSMEs: Risk Sharing**
 - Exploring enhanced local emergency funds on group app + better integration inter-regionally
- **Rice farmers: Credit product, but with relief at harvest**
 - Weather-based insurance (WBI), data available for parametric products, but not good enough, basis risk
 - Farmers want some kind of verification in addition to WBI

❖ Note: Better designs are not limited by exogenous product fragmentation, regulation or narrow focus on traditional use cases

- Financing, risk-sharing, and savings all integrated into the contract



❖ Incorporating all obstacles to trade into contract/platform design

- Dealing with **limited data**; **moral hazard** implications of better insurance (**in the contract**); **voluntary participation (join or not)**; **voluntary disclosure of hidden states** induced to be accurate due to incentives (**messages to the contract on the blockchain**)

Innovation at the level of Cross-Country, International featuring Hong Kong, HKMA, and mainland China

Ensemble international, Collaboration with France and Brazil, M-Bridge

- ❖ **Ensemble, featuring cross border receivables with eBL as a tokenized asset**
- ❖ **International Collaboration, with Banque de France and Banco Central Do BrazilBdF,**
 - **(for assets, DvP): Denis Beau.** Our objective with Project Ensemble is **not merely a bilateral link**. We view the interoperability between DL3S and Ensemble as a practical implementation of the **IMF's XC platform principles**. By allowing the **Euro and HKD to be swapped for tokenized assets in a single, unified workflow**, we are **effectively building a 'spoke' for a global ledger** that bypasses the friction of correspondent banking.
 - **BCB: Roberto Campos Neto.** The connection between Drex and Ensemble is symbolic of a new era. We are participating in this cross-border experimentation to help in **the creation of an integrated global financial market**. If we can connect national ledgers into a **'Unified Ledger'—as proposed by the IMF XC vision—**we achieve a common currency's efficiency **without sacrificing our monetary sovereignty**
- ❖ **M-Bridge, for FX (PvP).** HK SAR, Thailand, China Mainland, UAE, Saudi Arabia plus many observer countries and international organizations, **wCBDC** (Central Bank money)
 - **Settlement:** Moving wCBDC between different countries (FX).
 - **Facilitates the FX: Handles the currency swap for the trade in goods. moving toward "market making in quotes" ..**
 - mBridge uses a dedicated **"FX matching"** engine where banks can provide liquidity and quotes directly on the distributed ledger, allowing for instant currency swaps across central banks (still largely quotes but idea is that competition can reduce thin markets).
 - **Tokenized FX derivatives** (including spot, futures, and dual-currency deposits), a specific **Proof of Concept (POC)** proposed by **HKEX**

Hong Kong-Shenzhen Global Financial Hub

Cross-boundary:

- ❖ Featured use cases: develop robust and future-ready infrastructure to support data sharing and supply chain financing
- ❖ Eddie Yue, Chief Executive of HKMA:
 - **"Hong Kong serves as the testing ground and firewall for our country's high-quality development... playing a unique role as experimental lab..."**
 - **"The HKMA looks forward to... pioneering innovative solutions to redefine the digital finance landscape... using the Ensemble Sandbox to examine technical interoperability among tokenized assets and wCBDC."**
- ❖ Shenzhen-Hong Kong
 - The Shenzhen-Hong Kong nexus functions as an 'experimental sandbox.' It allows the country to participate in global digital finance while maintaining a robust 'firewall' to protect domestic stability.
 - **Data: The Shenzhen Data Exchange. A small merchant in Shenzhen with no footprint in HK trades places utility bills or logistics records on SZDEX. Fusion Bank, a virtual bank in Hong Kong, uses this data to get credit to that Shenzhen SME.**
 - **Supply chain, Olea joint venture: Linklogis uses its proprietary blockchain to track "Deep-Tier" suppliers that big banks usually can't reach. Standard Chartered Bank then provides the funding or "liquidity" based on those verified blockchain records.**

Possible Future Implementations: Architectural Possibilities

**Again the academic research, joint with the IMF
And in Japan**

A vision for what is possible: A Multi-Currency Exchange and Contracting Platform, XC

- ❖ **Adrian, Grinberg, Mancini-Griffoli, Townsend and Zhang (2022) IMF WP/22/21;**
 - **Tokenized CB liabilities/ assets as certificates of escrow (CEs), other liability/ assets**
 - locked and used under the terms of contracts, divisible, consistent, move efficiently across balance sheets.
 - But not trying to integrate entirely with domestic
 - **Markets in currencies, spot FX market exchange. Ramseyer et al (2023), Bruce et al (2025) limit orders on the blockchain.**
 - **Markets in contracts: Forward, borrowing and lending contracts, exchange with repurchase at interest as in FX swap market. Markets for hedging, risk management of shocks and imbalances, as in state contingent assets.**
 - **Central banks active market makers as nodes, commit to programmed facility -Cooperative agreements to share risk and/or manage FX rates – and can be encrypted.**

Pacific Island Community: a Policy Proposal

Joint work with Professor Kenichi Ueda, Nicolas Zhang

A World Bank and Japan initiative to help Pacific Island countries stay connected to the global financial system.

Loss of correspondent banking is exacerbating other chronic issues

Response is to assess the pacific island payment system and make improvements

Pacific Island: background

❖ Pacific Inter-Island Digital Financial Infrastructure

- ❖ Historically, the Pacific operated on highly functional decentralized trust networks—such as the **Kula exchange**. It operates in the Massim archipelago (Papua New Guinea) for trade in yams, pigs, canoes and tools. Historically, these tribes did not naturally trust each other; they were deeply suspicious and prone to warfare and sorcery accusations. The Kula system evolved precisely as a game-theoretic "signaling system for peaceful relationships, with inbuilt checks against cheating—facilitating cross-border trade without a central authority. This historical systems is indicative of what a digitized token system can accomplish.
- ❖ But not universally. Modernizing this region requires recognizing that the Pacific Island Countries (PICs) are not a monolith.
- ❖ To anchor this intervention, we rely on **monetary theory with articulated micro-underpinnings**. What the BOK is doing for urban commercial invoices on Slide 6, and what the HKMA is doing for cross-border on Slide 15, 16 is exactly the architecture we proposal to solve the physical cash-out traps and resource supply chains in the Pacific

❖ The Subregional Realities (The Baseline)

- ❖ A successful technological intervention must adapt to the deeply distinct realities of three subregions. Treating them as a single entity masks the underlying problems.
- ❖ **A Cheat Sheet for Island Groupings**
- ❖ **Melanesia ("The Big Landmasses")**: Papua New Guinea, Fiji, Solomon Islands. *Think: Big populations, gold/copper mining, independent currencies (Kina, Fiji Dollar), and the ones suffering the most from the correspondent banking/FX crisis.*
- ❖ **Polynesia ("The Diaspora Triangle")**: Samoa, Tonga, Tuvalu, Cook Islands. *Think: Tiny landmasses but huge diaspora populations in NZ/Australia. They are the ones reliant on remittances, struggling with a "physical cash-out" trap, and highly exposed to cyclones.*
- ❖ **Micronesia ("The Northern Tuna Atolls")**: Kiribati, Marshall Islands, Palau. *Think: USD-dollarized economies. They are basically just vast stretches of ocean sitting on top of the world's most valuable tuna fisheries.*

The Subregional Realities (The Baseline)

Subregion	Economic Profile	Currency Dynamics	The Primary Bottleneck
Melanesia <i>(PNG, Fiji, Solomons)</i>	Resource & Population Heavy. Mining, domestic agriculture, and manufacturing.	Independent Currencies. Volatile fiat (Kina, FJD)	Correspondent Banking & FX. Severe US Dollar shortages and heavy correspondent banking withdrawal (de-risking).
Polynesia <i>(Samoa, Tonga, Tuvalu)</i>	Remittance & Tourism Dependent. Small landmasses reliant on diaspora capital	Pegged / Shared. More strictly pegged to baskets (WST, TOP or direct users of the NZD.	Cash-Out Liquidity & Climate. Mobile remittances hit physical paper-cash limits; high need for rapid disaster relief velocity.
Micronesia <i>(Kiribati, Marshall Islands, Palau)</i>	Ocean Micro-States. Massive maritime territory (Tuna), tiny land footprint, foreign aid reliant.	USD Dominated. No localized FX risk (but exposed to US monetary policy.)	Logistical Supply Chains. High shipping and communication frictions; little tracking, need to capture downstream value of natural resources and create secure payables

Problems, Progress, and Proposed Upgrades

- ❖ Some progress is occurring across the Pacific. This can serve as partial proof of concept though the current outreach is low. Most do not have access. The proposed alliance does not need to build from scratch. It must provide the algorithmic and institutional upgrades to connect together and then optimize these fragmented solutions based on applicable monetary theory with micro underpinnings
- ❖ **Cross-Border Payments: Identity and The Liquidity Trap**
- ❖ **The Problem:** Correspondent banking "de-risking" is cutting off Melanesia/Polynesia from affordable trade finance. A crisis. Meanwhile, inbound remittance receivers face a "cash-out trap"—digital money arrives, but local agents run out of physical paper notes widely used in exchange, the local currency
- ❖ **What is Happening Now:** Networks like **Stellar** are driving the pure transfer cost of digital remittances down. Domestically, digital wallets (like M-PAiSA in Fiji) are highly adopted.
- ❖ **The Missing Upgrade:**
 - **Shared Encrypted ID / KYC:** Implement a regional digital identity ledger to unilaterally satisfy AML compliance, allowing direct institutional peer-to-peer settlement without Western correspondent banks.
 - **Offline NFC Enhancements:** To break the physical cash-out trap, mobile wallets must be upgraded with Bluetooth/NFC mesh networking. This allows closed-loop, phone-to-phone stablecoin transactions between citizens and merchants even when a cyclone severs the broader internet..

Climate Risk & Parametric Insurance

- ❖ **The Problem:** Polynesia most exposed to cyclones. Post-disaster capita, not timely, gets stuck in slow sovereign treasuries. Existing insurance relies on blunt triggers (e.g., wind speed) causing "basis risk"—e.g., where an island floods, but the wind was technically too slow to trigger the payout.
- ❖ **What is Happening Now:** The Pacific Catastrophe Risk Insurance Company (PCRIC) is actively deploying satellite-triggered parametric insurance (similar to the hurricane trackers used by the Caribbean (CCRIF) and Atlantic coast states).
- ❖ **The Missing Upgrade:**
 - **Broadened Multi-Variable Oracles:** Smart contracts must ingest composite data (wind, rain sensors, and flood imagery) to eliminate basis risk and to pool risks across islands.
 - **Current Funding is from external grants** and thus no real incentive to make an insurance fund self sustaining, for example premia paid in across islands and risks pooled on the blockchain.
 - **Voluntary Incentive-Compatible Self-Reporting:** Integrate a mechanism design where citizens on the ground are economically incentivized to voluntarily report highly accurate localized damage

FX Reserve and Exchange Platform, with programmed market

- ❖ **The Problem:** Because most FX routes ultimately through the US Dollar, inter-island trade (e.g., Fiji buying from PNG) drains central bank FX reserves. Flexible pegs are difficult to maintain, e.g. secret and shifting weighted baskets. A top down problem
- ❖ **What is Happening Now:** A bottom up solution in a different context. A New Zealand fintech, **KlickEx**, successfully operates an automated digital clearinghouse for Polynesian remittances. By holding transactions in a queue, they match and net out opposing flows in a single currency without physically moving the capital.
- ❖ **The Missing Upgrade:**
 - **Algorithmic Decomposition:** Expand this logic into a sophisticated multi-country, multi-currency algorithm. The system mathematically decomposes regional commercial trade into **closed cycles** (e.g., A pays B, B pays C, C pays A) and **open chains**.
 - **Maximized Offset via Time-Delays:** By utilizing priority time-windows (allowing up to 72 hours to clear non-urgent trades), the algorithm induces maximum trade offset with minimal liquidity.
 - **Automated Market Makers (AMMs):** For the remaining un-netted open chains, decentralized AMM liquidity pools handle the FX conversions, stripping out the monopoly margins of traditional dealers and drastically minimizing the total FX reserves required to settle regional trade.

Integrated Case Study: The Tuna Supply Chain Cartel

- ❖ To see how these upgrades interlock, we apply them to Micronesia's primary asset: the Tuna fishery.
- ❖ **What is Happening Now:** The Parties to the Nauru Agreement (PNA) act as a highly effective cartel. They use the Vessel Day Scheme (VDS) combined with **Vessel Monitoring Systems (VMS)**—literally tracking the physical satellite signatures of foreign boats—to charge global fleets for access to their waters. Simultaneously, NGOs are deploying RFID tracking to trace individual fish from "bait to plate."
- ❖ **The Synthesized Solution:** Currently, the physical boat tracking, the supply chain logs, and the financial payments are entirely separate. The proposed architecture merges them.
 - As a tracked boat moves through an EEZ or unloads its RFID-logged catch, the multi-currency netting algorithm automatically triggers the cross-border invoicing.
 - Payments for fishing licenses, local dock labor, and fuel are balanced with the outward export value of the fish.
 - The supply chain itself becomes the automated financial clearing mechanism, ensuring credit and payables flow seamlessly between diverse nodes. Receipts for retail sales act as receivable used to finance inputs along the supply chain, minimizing collateral.
 - Inter regional borrowing and lending over longer periods can be backed by secured future production using Iot and VDS token transfers in the event of default. ENSO risk.

Theoretical Monetary-Micro Foundations- Digital Architecture

Pacific Reality & Setting PPTX+ 1	Theoretical Anchor / Model PDF+ 1	The Underlying Friction & Externality PDF+ 1	Engineered Architectural Overlay PPTX+ 1
<p>Melanesia (PNG/Fiji)</p> <p>Central Bank FX queues and rationing, capital controls, special facilities, targets</p>	<p>Kilenthong & Townsend (2016) Collateral & Incomplete Markets.</p> <p>Amendola et al, Townsend Xia extension- Multicurrency</p>	<p>Pecuniary Externality: Atomistic FX management of safe assets creates FX volatility, crushing collateral values state-wise.</p>	<p>Segregated FX Markets run via programmable Smart Tokens to internalize externalities. Coordinated/committed Monetary Policies to mitigate cash in advance constraint externalities</p>
<p>Polynesia (Samoa/Tonga)</p> <p>Remittance dependency trapped by fixed-rate currency pegs.</p>	<p>Hart & Zingales (2011) Multi-Country Extension private vs public liquidity given domestic investment possibilities.</p>	<p>Mundellian Trap: Forcing uniform price levels on heterogeneous real returns (R) preempts physical capital investment in the periphery.</p>	<p>Flexible rates w/Multi-Currency Netting Pools. delayed priority windows to induce maximum offset.</p>
<p>Micronesia (PNA Cartel) Selling maritime access but missing downstream value.</p>	<p>Manuelli & Sargent (2009) Turnpike of fiat money and credit with Supply Chains.</p>	<p>Spatial Friction & Contractual Incompleteness in Supply Chains, Limited borrowing/ lending</p>	<p>wCBDC Engine natively linked to VMS Satellite/RFID Oracles for atomic settlement of payment and goods delivery</p>
<p>Regional Cross-Island Risk Parametric insurance failing due to severe basis risk.</p>	<p>Underlying risk in most of the models, MS, KT, TX.</p>	<p>Intertemporal Distortion: Verifying actual damage. Forcing safe assets into escrow to back promises creates a wedge</p>	<p>Parametric Insurance paired with Incentive-Compatible Self-Reporting . integrates sea-surface temperature to hedge climate-driven catch migration</p>

Historical Precedents: Decentralized Ledgers & Clearing Networks

- ❖ *The proposed Pacific Islands' digital infrastructure is not a novel experiment; it is the modern evolution of proven historical systems engineered to bypass liquidity traps and preserve regional sovereignty.*
- ❖ **The Japanese Ryogaeshi (Edo Period, 1603–1868):** Operating in part here in Tokyo (then Edo), exchange merchants managed a highly complex trimetallic system—balancing gold in Edo, silver in Osaka, and copper for everyday use (plus rice certificates and paper money). Through the Ryogaeshi Association, they ran a sophisticated national clearing and netting network that standardized currency values, monitored debt accumulation, and acted as the vital financial bridge across heterogeneous regional economies for over two centuries.
- ❖ **The Champagne Trade Fairs (12th–14th Century):** Proved that multi-currency, cross-border wholesale trade can be completely cleared using a fictional unit of account (*Livre Tournois*) and a multilateral netting mechanism (*Recontre*). Physical coins were required to settle only a tiny fraction of residual imbalances.
- ❖ **Keynes' International Clearing Union (1944):** Shares the exact intellectual DNA of our proposed digital netting framework. It unbundled international settlement from any single nation's currency by creating a pure multilateral clearing system (*Bancor*), specifically penalizing the hoarding of surpluses to prevent systemic deflation in the periphery.
- ❖ **Community Credit Ledgers (Swiss WIR & Sardex):** When macroeconomic liquidity dries up, closed-loop ledgers sustain local trade velocity. The **Swiss WIR Bank** emerged during the Great Depression to provide vital liquidity to small businesses and continues to operate today alongside the Swiss National Bank. Similarly, Italy's **Sardex** acts as an interest-free mutual credit line; it is pegged to the Euro but strictly non-convertible, preventing capital flight and forcing the currency to act purely as a productive local medium of exchange.