

On Digital Currencies

Research and Policy Seminar
Egyptian Center for Economic Studies

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May 4, 2026

Where Do We Stand?

- Digital currency / Cryptocurrency: a currency that only exists in digital form.
- Many privately issued **cryptocurrencies**. Most prominent: **Bitcoin**, Ethereum.
- Some are “stablecoins” and pegged to, say, the U.S. Dollar. Example: Tether.
- Cryptocurrencies are illegal and frowned upon in Egypt:
 - ▶ Central Bank and Banking System Law No. 194 of 2020.
 - ▶ Prohibits trading, promoting or issuing crypto-assets w/o CBE license.
 - ▶ Fatwa: in 2018, Egypt’s Dar al-Ifta classified cryptocurr transact. as *haram*
- Some central banks plan to introduce a **Central Bank Digital Currency** or **CBDC**.
 - ▶ The Bahamas (“Sand Dollar”), Nigeria (“eNaira”), Jamaica (“JAM-DEX”), Eastern Caribbean Currency Union (“DCash”).
 - ▶ Advanced pilots: China, e-CNY, India Digital Rupee.
 - ▶ Europ. Parliament’s Committee on Econ. and Mon. Affairs (ECON) votes 2026/06/23.
 - ▶ Egypt: plans for e-pound by 2030.

The Origin

Bitcoin:

Satoshi Nakamoto (2008), "Bitcoin: A Peer-to-Peer Electronic Cash System," www.bitcoin.org.

A list of fascinating issues:

- New Technology: Blockchain.
- Cryptography. Can it survive quantum computing?
- Game theory aspects.
- Proof of work vs proof of stake: governance.
- IO of Bitcoin mining.
- Empirically: Blockchain data.

Not the topic today.

This talk

A. A taste of my research. Monetary & financial theory.

- 1 Theory of Cryptocurrency Pricing: **Schilling-Uhlig, “Some Simple Bitcoin Economics”, JME 2019.**
- 2 Consequences of widespread cryptocurrency use: **Benigno-Schilling-Uhlig, “... Impossible Trinity”, JIE 2022.**
- 3 Central bank digital currencies: **Schilling - Fernández-Villaverde - Uhlig, “CBDC: when Price and Bank Stability Collide”, JME 2024.**

B. On Stablecoins in the U.S.

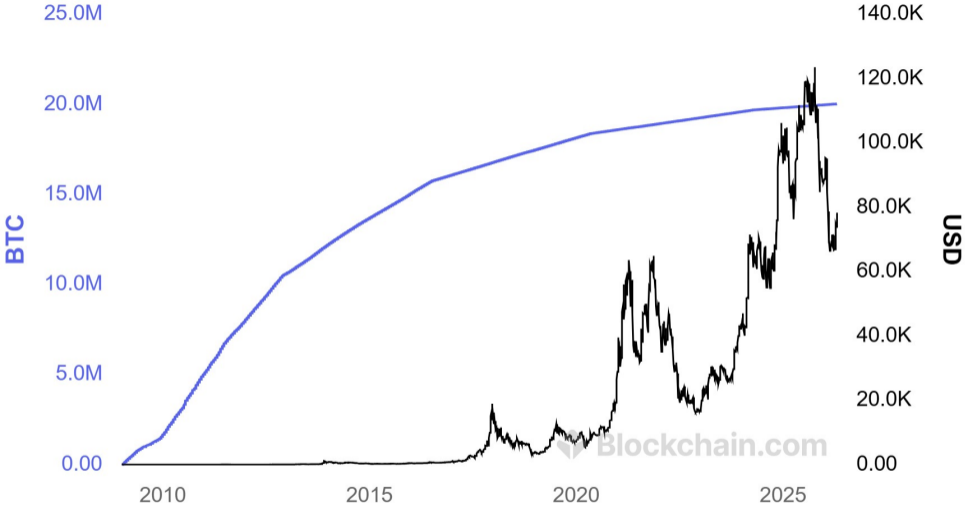
1. Schilling - Uhlig, “Some Simple Bitcoin Economics”

Observations and a Question

- Bitcoin supply: very smooth, converging (“halving events”).
- Bitcoin price: very volatile.
- Current (April 26, 2026) price: $Q = 78,000$ Dollar per BTC

Question: What is the expected Bitcoin price five years from now?

Bitcoin Quantity and Price, 2009-01-09 to 2026-04-26



Source: <https://www.blockchain.com/charts/total-bitcoins>

2024-04-19: block rewards halved to 3.125 BTC



Halving Event: No visible impact on price.

Data: Bitcoin Quantity and Price, 2024-02-04 to 2024-08-04

Top 100 private cryptocurrencies by market cap.



- Total Market Cap: \$ 2,600 B, April 26, 2026
- Compare to currency in circulation in U.S.: \$ 2,415 B, October 2025
- Source: coin360.com, <https://fred.stlouisfed.org/series/CURRCIR>

Key Questions and Getting Answers

Key Questions:

- 1 Q: What determines the Bitcoin price? $Q > NPV(\text{Dividends}) = 0$?
- 2 Q: Can Bitcoin be a medium of exchange, despite price volatility?
- 3 Q: What are monetary policy implications?

Getting Answers:

- 1 Schilling-Uhlig, JME 2019: a **novel model** of an endowment economy with two intrinsically worthless currencies (Dollar, Bitcoin) as possible medium of exchange.
- 2 Assumption: perfect substitutability, no transaction costs.
- 3 Imperfect substitutability, transaction costs: **AEA P&P May 2019**.

Answers

- 1 A **novel model** of an endowment economy with two competing, but intrinsically worthless currencies (Dollar, Bitcoin) serving as medium of exchange.
- 2 “Fundamental pricing equation”. Special case: **Bitcoin price is martingale**.
- 3 “**No speculation**” theorem.
- 4 **Volatility does not invalidate medium-of-exchange function**.
- 5 **Bitcoin block rewards are** not a tax on Bitcoin holders: they are **financed with a Dollar tax**.
- 6 **Real Bitcoin disappearance**
- 7 We characterize and **construct equilibria**.
- 8 **Bitcoin production** via the proof-of-work competition, welfare implications, taxation of Bitcoin production.

Logic of the Model

- Consider risk neutral, impatient sellers and buyers.
- Suppose Dollar inflation is zero.
- At t ,
 - ▶ Suppose $E[Q_{t+1}] > Q_t$.
 - ▶ Seller would only accept Bitcoin, not Dollar.
 - ▶ Suppose $E[Q_{t+1}] < Q_t$.
 - ▶ Seller would only accept Dollar, not Bitcoin.
- **Martingale** result: $Q_t = E_t[Q_{t+1}]$.
- With risk adjustment: $Q_t = E_t[\mathcal{M}_{t+1}Q_{t+1}]/E_t[\mathcal{M}_{t+1}]$.
- Note: this equation also holds for the Dollar, $Q_t = Q_{t+1} = 1$.
- Note: **not** “asset pricing” $Q_t = \beta E_t[Q_{t+1}] = E_t[\mathcal{M}_{t+1}Q_{t+1}]$.
- Impatience: better spend monies now for buying than to “hodle”.
- Result: **no speculation theorem**. All monies are always spent.
- Caveat: data. They are not. What is amiss?
- Appendix: theory imposes (nearly) no restrictions on Q_t volatility.

Bitcoin block rewards are financed by Dollar taxes

Consider two economies a, b , which differ in the growth paths for the Bitcoin quantity.

- The central bank seeks to achieve the same path for prices.
- Quantity theory:

$$\begin{aligned}P_t y_t &= D_t^a + Q_t B_t^a \\ &= D_t^b + Q_t B_t^b\end{aligned}$$

or, more simply:

$$\begin{aligned}P y &= D^a + Q B^a \\ &= D^b + Q B^b\end{aligned}$$

- More Bitcoins B_t (or higher Q_t) means less D_t , keeping everything else the same.
- Same equilibrium can obtain, otherwise.
- So, if $B^b > B^a$ due to block rewards, CB pays for it: $D^b < D^a$.
- Equilibrium selection: see paper.

Schilling - Uhlig, "Some Simple Bitcoin Economics"

Key Questions and Answers

① Q: What determines the Bitcoin price? $Q > NPV(\text{Dividends}) = 0$?

A: The **price is** a (risk-adjusted) **martingale**.

Theory imposes (nearly) no further restrictions.

KAREKEN AND WALLACE (1981), MANUELLI AND PECK (1990)

② Q: Can Bitcoin be a medium of exchange, despite price volatility?

A: Yes.

"No speculation" theorem: no "hodling," all monies are spent.

Volatility does not invalidate medium-of-exchange function.

Logic: risk-adjustment in price compensates for volatility.

③ Q: What are monetary policy implications?

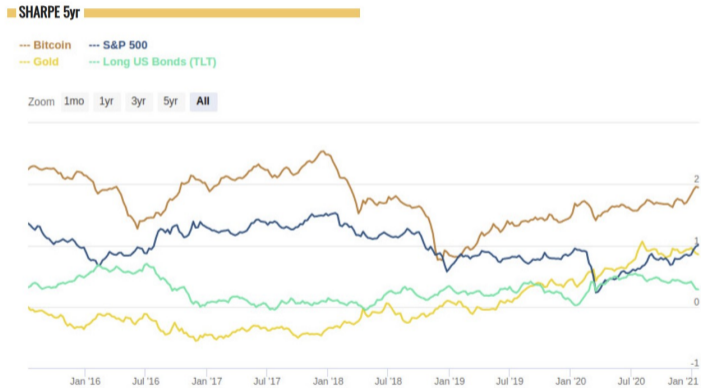
Bitcoin block rewards not a tax on Bitcoin holders, but **financed with a Dollar tax**.

Question: What is the expected Bitcoin price five years from now?

Answer: With risk neutrality, same as April 26, 2026: $Q = 78,000\$$ per BTC.

The expected future Bitcoin price: adjusting for risk

- Schilling-Uhlig (2019): price is a (risk-adjusted) martingale.
- Risk neutrality: $E[\text{price in the future}] = \text{price on April 26, 2026} = 78,000 \$$
- Sharpe Ratio. ROI of 668% over 5yrs. $E[\text{price}] = 521,000 \$$



Source: <https://casebitcoin.com/charts>

2. Benigno - Schilling - Uhlig, “Cryptocurrencies, Currency Competition, and the Impossible Trinity”

Question: What are the monetary policy implications of introducing global currencies?

Motivation: Libra or Diem.

Focus on: medium of exchange (not: store of value, unit of account).

Answer:

- **Old:** “Impossible Trinity” (Mundell-Fleming). With free capital flows, one cannot both have independent monetary policy and a pegged exchange rate.
- **New, here:** With free capital flows and a global currency circulating alongside national currencies, the monetary policy interest rates are equalized and the exchange rates are risk-adjusted martingales.
- **Crypto-Enforced Monetary Policy Synchronization** or **CEMPS** .
- Escape options unpleasant: ZLB or abandon national currency.
- Additional restrictions arise, if the global currency is asset backed.
- The “Impossible Trinity” becomes even less reconcilable.
- Journal of International Economics, vol. 136, May 2022

The Model: A Minimalistic, General Structure

- discrete time, $t = 0, 1, 2 \dots$
- 2 countries
- 3 currencies: home H, foreign F, global G.

Four assumptions:

- 1 Nominal stochastic discount factors in each country.
- 2 Central banks set nominal interest rates for national currencies.
- 3 Free (or: complete) capital markets.
- 4 Money offers liquidity services.

Main Result

Suppose:

- The national currencies are used in their countries.
- Global currency is valued $Q_t, Q_t^* > 0$.
- Global currency used in both countries.

Proposition 0.1 (Crypto-Enforced Monetary Policy Synchronization)

- *The liquidity services in Home and Foreign are equal $L_t = L_t^*$*
- **The nominal interest rates on bonds are equal $i_t = i_t^*$**
- *The nominal exchange rate between home and foreign currency is a martingale wrt to the risk-neutral probabilities*

$$\tilde{\mathbb{E}}_t[S_{t+1}] := \frac{\mathbb{E}_t[\mathcal{M}_{t+1}S_{t+1}]}{\mathbb{E}_t[\mathcal{M}_{t+1}]} = S_t \quad (1)$$

$$\tilde{\mathbb{E}}_t^*[S_{t+1}^*] := \frac{\mathbb{E}_t[\mathcal{M}_{t+1}^*S_{t+1}^*]}{\mathbb{E}_t[\mathcal{M}_{t+1}^*]} = S_t^* \quad (2)$$

Furthermore,

$$\tilde{\mathbb{E}}_t[Q_{t+1}] = Q_t \quad \text{and} \quad \tilde{\mathbb{E}}_t^*[Q_{t+1}^*] = Q_t^* \quad (3)$$

Economic Mechanism

A INTRODUCTION OF GLOBAL CURRENCY CREATES GLOBAL COMPETITION BETWEEN NATIONAL CURRENCIES

- Currency competition at home: Home \Leftrightarrow Global
- Currency competition abroad: Foreign \Leftrightarrow Global
- Transnational currency competition: Home \Leftrightarrow Foreign (through Global)

B DIRECT COMPETITION BETWEEN BONDS

- Local competition: Home currency \Leftrightarrow home bond
- Local competition: Foreign currency \Leftrightarrow foreign bond
- Global competition: Home bond \Leftrightarrow Foreign bond ($i = i^*$)

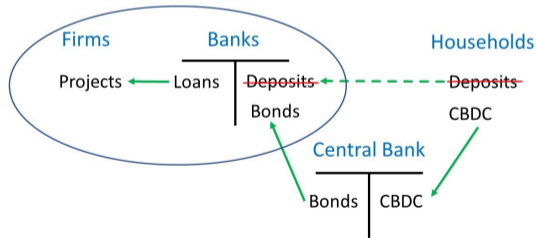
3. Central Bank Digital Currency or CBDC

Schilling- Fernández-Villaverde - Uhlig, “Central Bank Digital Currency: When Price and Bank Stability Collide”, JME 2024 July.

- Many central banks will introduce a **CBDC**.
- A CBDC is an (interest bearing) account held by households at the central bank. (Barrdear and Kumhof, 2016)
- This re-awakens fundamental issues of monetary economics:
- **Why do agents accept fiat money?**
 - ▶ Agents do not care for fiat money per se, but for real goods.
 - ▶ They accept money as a temporary store of value.
 - ▶ **Monetary trust:** money can purchase goods in the future.
 - ▶ Trust may evaporate and agents may abandon the currency.
- **Objectives of a Central Bank**
 - 1 Commit to **price stability** under many circumstances.
 - 2 **Efficiency**, i.e. implement the socially optimal allocation.
 - 3 Assure **monetary trust**.
- We study the tension between these three objectives.
- Specific to CBDC? No, but particularly salient.

CBDC vs Banking

- Diamond-Dybvig (1983): Banks intermediate between liquid household deposits and illiquid investment projects.
- CBDC accounts may replace deposits ...
 - 1 ... unless they are sufficiently unattractive (ECB) or
 - 2 ... unless HH re-invest CBDC again at banks (Duffie) or ...
 - 3 ... Central Bank re-funds banks or projects (Brunnermeier-Niepelt).
- Our paper: the last option, thought through to the end.
- For simplicity:
 - ▶ Households no longer hold deposits, only CBDC.
 - ▶ CB does the (Diamond-Dybvig) intermediation. No banks.



The CBDC Trilemma

In our model: Only HH, CB, projects. CB is financial intermediary.

Key Mechanism

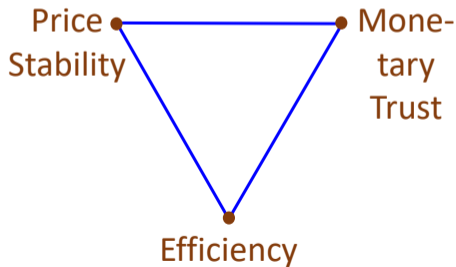
- Nominal Diamond-Dybvig (1983) model for a CB and its CBDC.
- Central bank can always deliver on its nominal obligations.
- But: CB runs can happen: “spending run” on available goods.

Three competing objectives:

- 1 Traditional: **Price Stability**
- 2 Optimal risk sharing: **Efficiency**
- 3 Financial stability: **Monetary Trust**

Key Result: **CBDC Trilemma**

Of the three objectives, the central bank can only achieve two.



No run

t=0

t=1

t=2



Run

t=0



t=1



t=2



Summary Remarks

Monetary-finance-theory aspects of digital currencies. Three papers:

- 1 Theory of Cryptocurrency Pricing: **Schilling-Uhlig, “Some Simple Bitcoin Economics”, JME 2019.**
- 2 Consequences of widespread cryptocurrency use: **Benigno-Schilling-Uhlig, “... Impossible Trinity”, JIE 2022.**
- 3 Central bank digital currencies: **Schilling - Fernández-Villaverde - Uhlig, “CBDC: when Price and Bank Stability Collide”, JME 2024.**

A lot more can and should be done! Wide-open canvas.

Stablecoins in the U.S.

USDC



Tether



© Harald Uhlig
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University of Chicago
January 2026

GENIUS Act

- **G**uaranteeing **E**ssential **N**ational **I**nfrastructure in **U**S-**S**tablecoins, July 18th, 2025
- Stablecoin:
 - designed as means of payment/settlement.
 - stable value (in U.S. Dollar), convertible.
 - **not allowed to pay interest.**
- Permitted Issuers:
 - subsidiaries of depository institutions.
 - non-bank F.I., approved by OCC or a state (<10B).
 - Stablecoin Certification Review Committee (Treasury, Fed, FDIC).
- **Compliance** with Bank Secrecy Act, AML, CFT
- **1-1 reserves:**
 - physical currency,
 - **demand deposits,**
 - U.S. Treasury bills,
 - approved Repo's.



Trump: “very stable genius”

Issues

- **Not allowed to pay interest:**
 - Net Interest Margin (NIM) between assets and liabilities: where will it go?
 - Competition would result in interest on stablecoins.
 - Coinbase pays interest on USDC “deposits”.
 - Could be made default in wallets. Circumvent!
- **Compliance:**
 - Tether (USDT), others plan to comply.
 - “Privacy” advantage of non-compliant stablecoins.
 - Criminal use / reluctance of TradFin to enter.
 - Non-compliant stablecoins will remain in use.
- **1-1 reserves:**
 - Rules out algorithmic stablecoins.
 - DAOs, tokenized reserves? Probably not.
 - **NOT: master account at the Fed. Run-prone!**
- **Demand deposits:**
 - SVB collapse, Circle deposits backing USDC.



Silicon Valley Bank Collapse
March 10, 2023

Winners

- **TradFi**

- Traditional banking system made sure that stablecoins will be like banks: KYC, AML, ...
- Non-anonymous.
- Freeze-function
- Centralized
- No interest on stablecoins
- No FDIC insurance
- No Fed master account

- **Coinbase / Circle / USDC**

- designed for compliance from the start.
- GENIUS is tailor-made for it

- **Paypal / PYUSD**

- Coinbase model



2nd place

- **Tether / USDT**

- Not yet compliance-ready.
- Announcement Sept 12, 2025
- Will issue GENIUS-compliant **USA₹**
- Bo Hines as CEO for USA₹
- “expand its stablecoin offerings”

[Tether Unveils USA₹, its Planned U.S.-Regulated Dollar-Backed Stablecoin, and Will Appoint Bo Hines as CEO of Tether USA₹ - Tether.io](#)

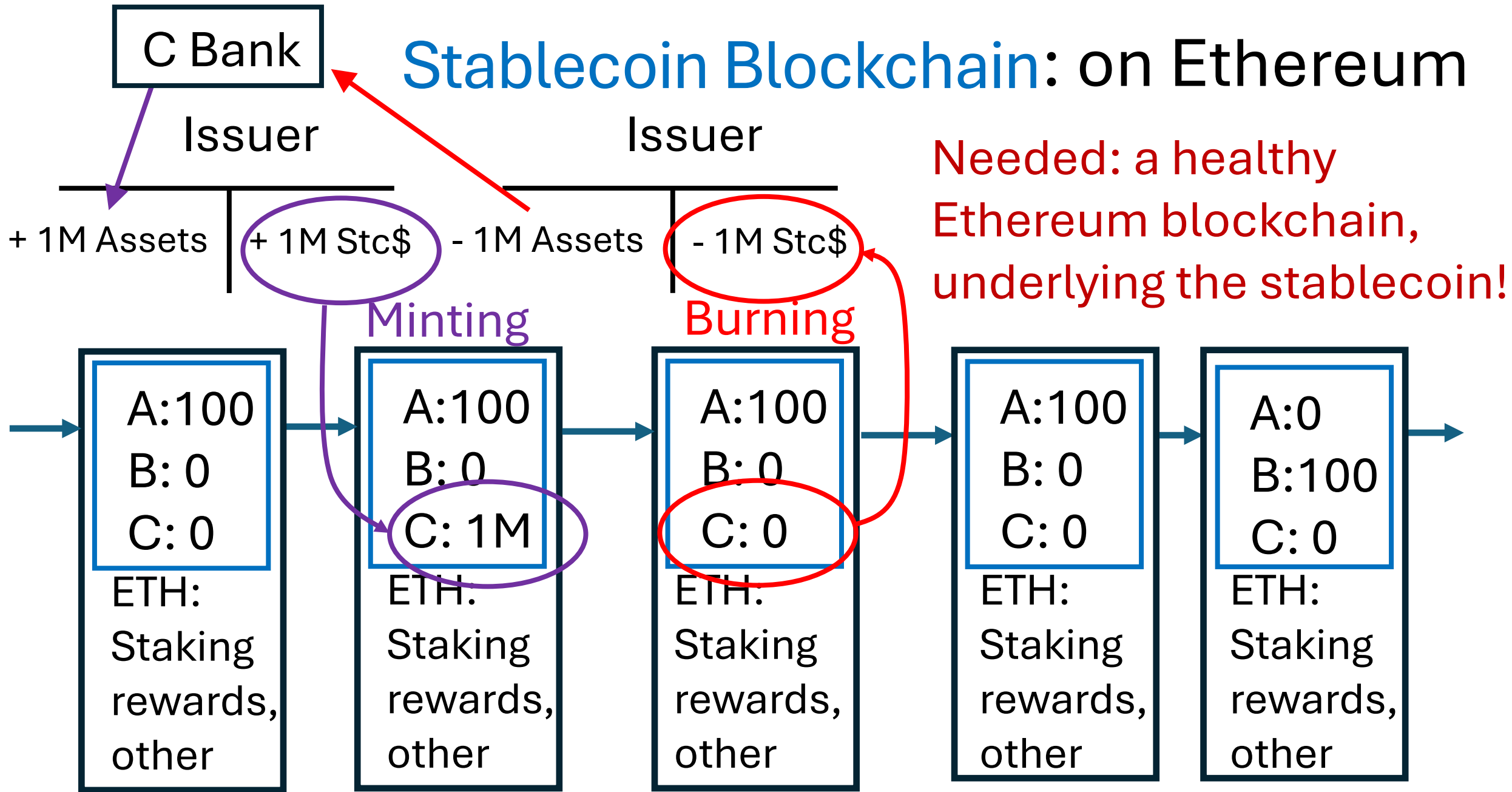


Losers

- **DAO / DAI**
 - Decentralized issuance of tokens against tokenized collateral w smart contracts monitoring collateral value
 - MakerDAO / Sky
 - But: USDS, launched in 2024, can add freeze functionality, perhaps more
- **Liquidity / LUSD**
 - cannot possibly comply
- **Algorithmic stablecoins**
 - Terra-Luna
- **DeFi**
 - decentralized finance
 - anonymous

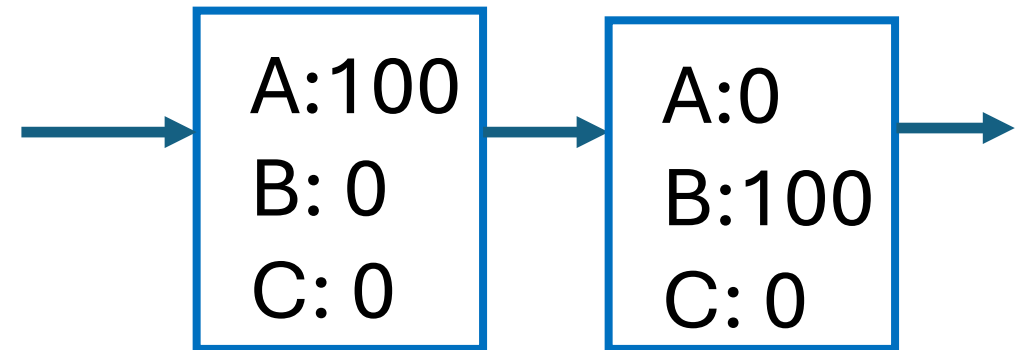


Stablecoin Blockchain: on Ethereum



Stablecoin Blockchain

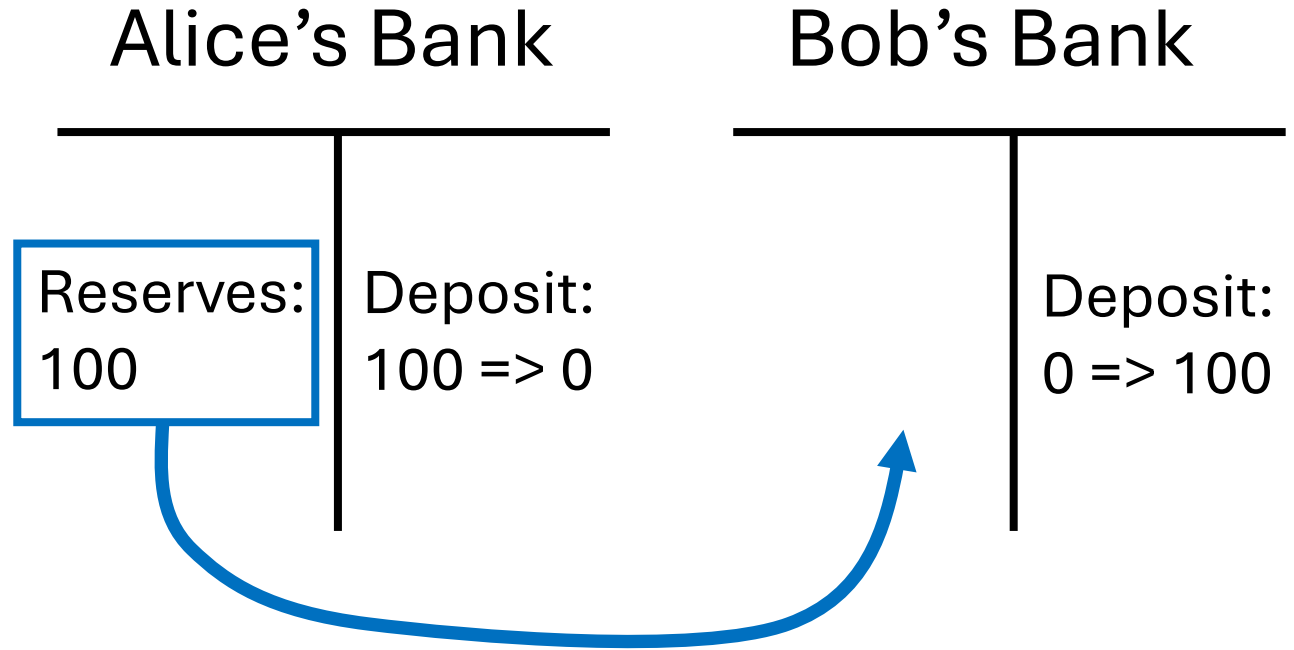
Stablecoin Blockchain:



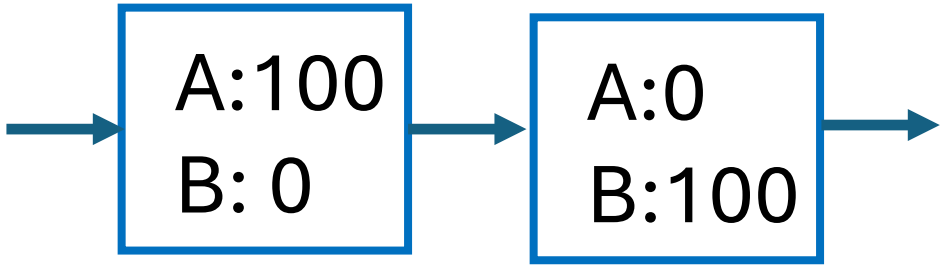
Bank Deposits/Credit Cards vs Stablecoins



Deposits at Banks:



Stablecoin Blockchain:

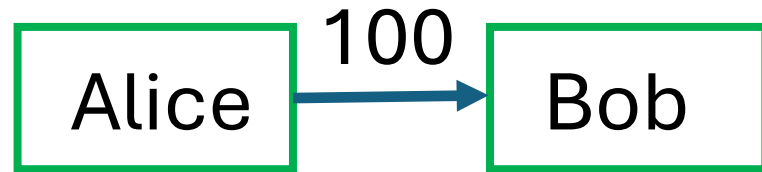


- Similar to “within bank.
- Across chains?
 - blockchain bridges?
 - exchange agents? Others?
 - ultimately: reserve transfers
- **Interchangeability tricky!**

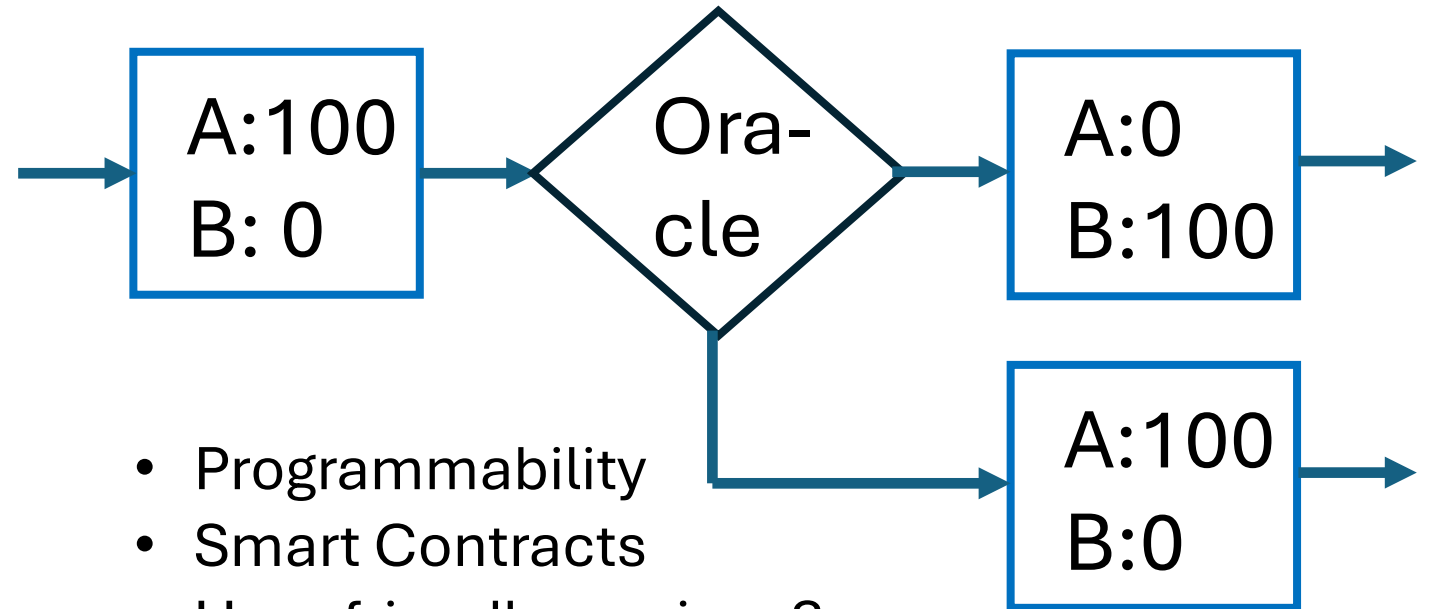
Cash vs Stablecoins



Cash:



Stablecoin Blockchain:

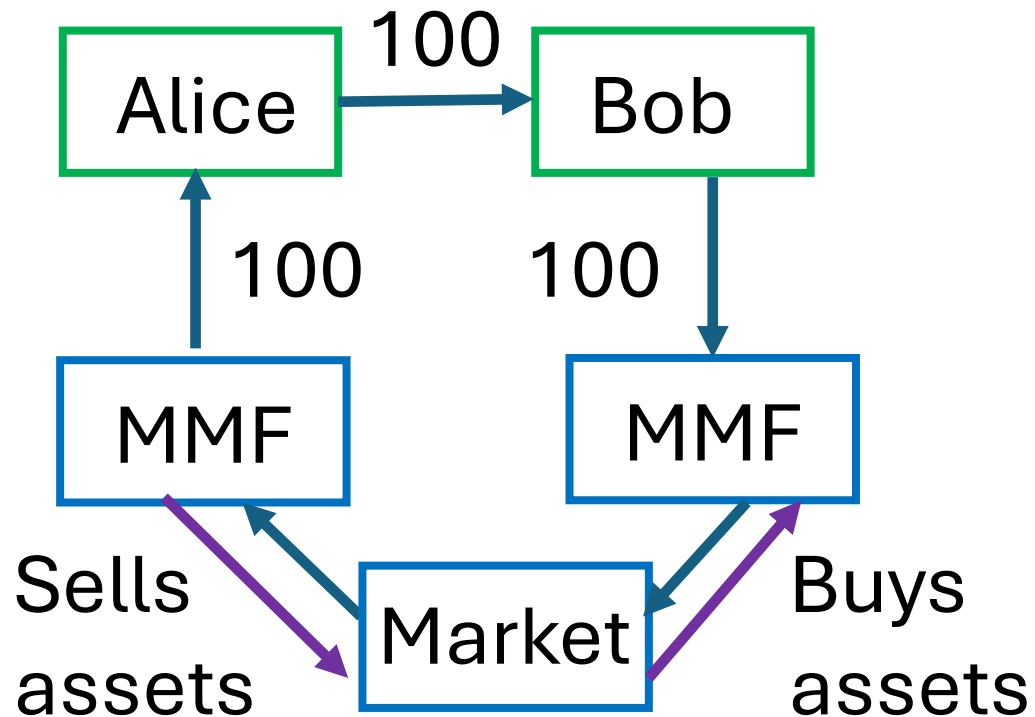


- Programmability
- Smart Contracts
- User-friendly versions?

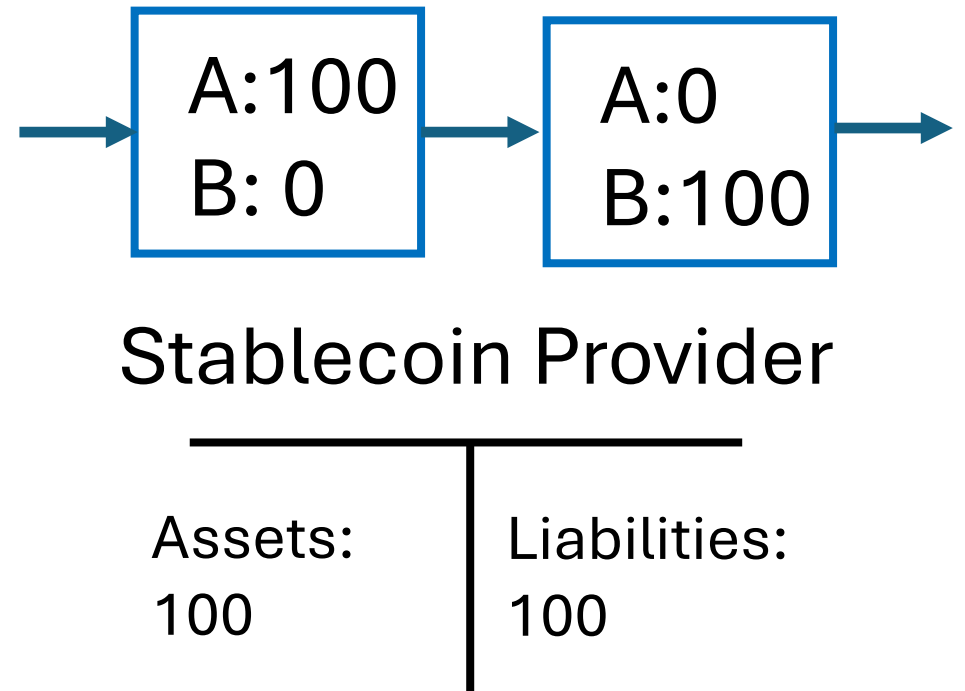
Money Market Funds vs Stablecoins



Money Market Funds:



Stablecoin Blockchain:



Use Cases

1. Trading:
digital assets for digital assets. Tokenization.
2. Payments: automatic, B2B, ...
3. Store of value: interest payments?
4. Credit and lending:
Tokenized assets and liabilities
5. Smart contracts / agentic commerce.
6. Alternative to bank deposits:
convenient, flexible.
7. Transfers:
Anonymous: circumvent KYC.
Cross-border!

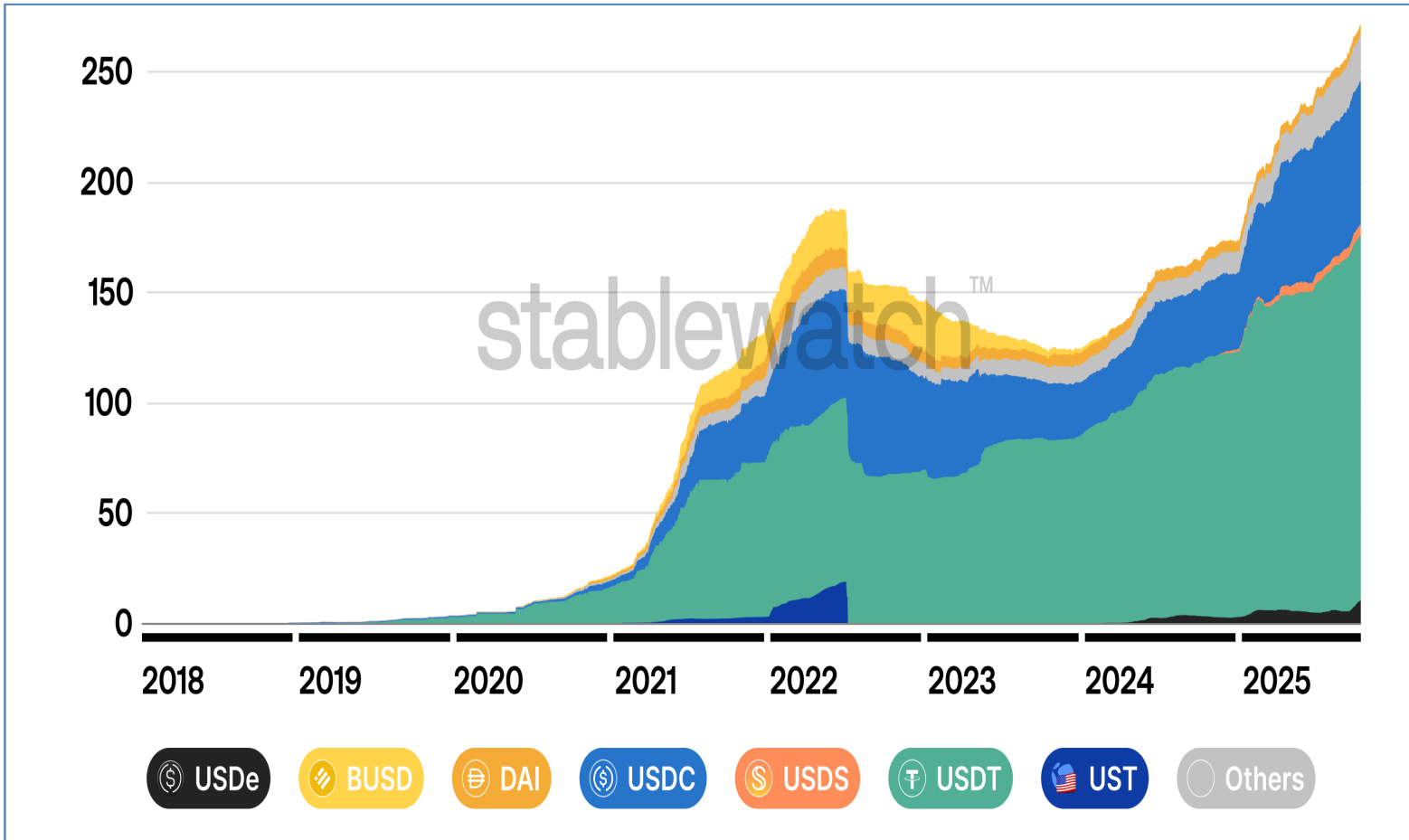


Tokenization

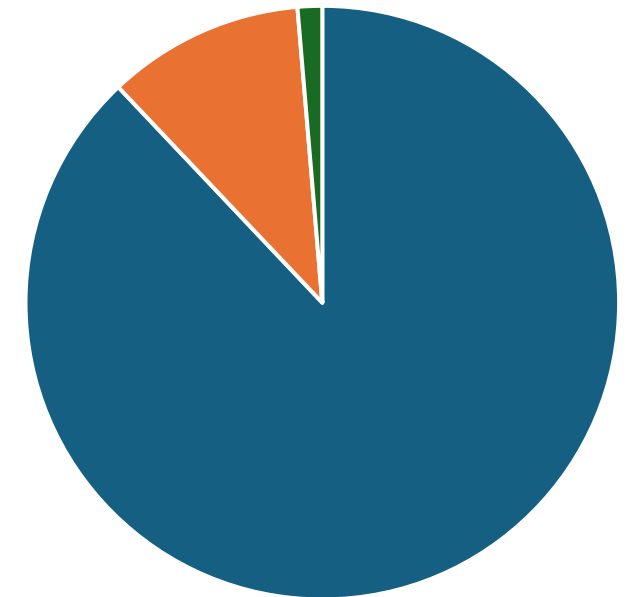


Cross-border payments

Stablecoin Market



Stablecoins vs M1



M1 Currency in Circ Stablecoins

The Future: Two Views

Stablecoins: a niche

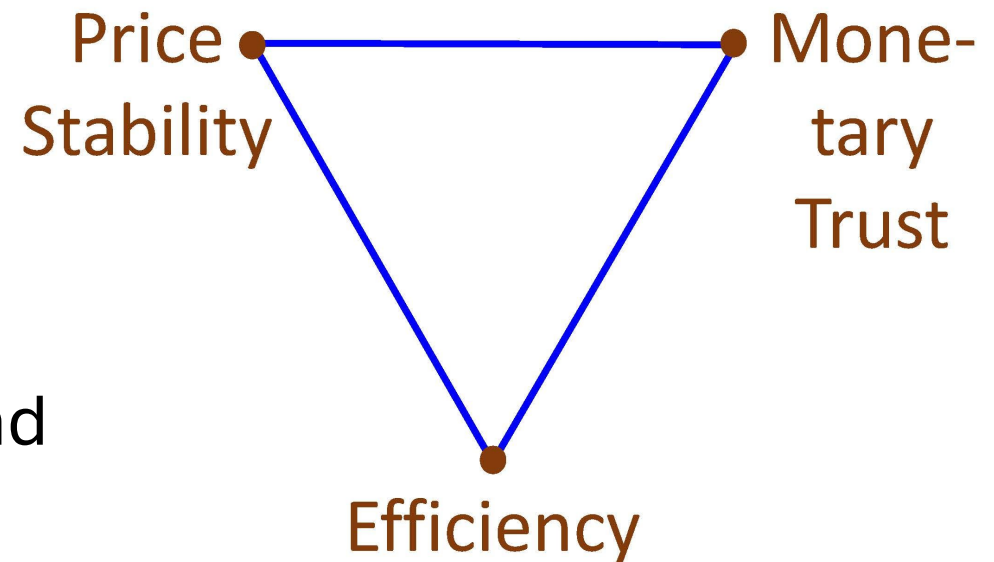
- No reason to switch to stablecoins, when you have credit cards and bank deposits.
- Cute toy for niche applications.
- Attractive for tech-savvy customers.
- Banks will keep their deposit base.

Stablecoins take over

- No reason to have credit cards and bank deposits, when you can have stablecoins.
- Stablecoins offer many more possibilities than traditional means of payments.
- **Banks will lose deposit base.**

The Stablecoin Trilemma

- Similar to “**CBDC Trilemma**” in Schilling - Fernández-Villaverde – Uhlig, JME 2024.
- If stablecoins replace bank deposits, how will banks be able to continue maturity transformation?
- **Choice 1:** they don't. Just hold treasuries. **Distorted demand pro treasuries!** But: not **efficient**.
- **Choice 2:** short-term assets finance bank long-term liabilities. But: can lead to runs and break-down of **monetary trust**. SVB.
- **Choice 3:** short-term assets finance bank long-term liabilities. If need be, the CB injects liquidity. But: danger to **price stability**.



Runs

- What happens, if stablecoin holders lose trust and seek to convert?
- Officially: no FDIC backing, no Fed backing.
- But “systemic exceptions” will likely be found.
- I expect the Fed to step in and buy treasuries.
- Implicit backing.
- Might this erode monetary policy?
- More thought should be devoted to this “ticking time bomb”.



SVB collapse March 10, 2023

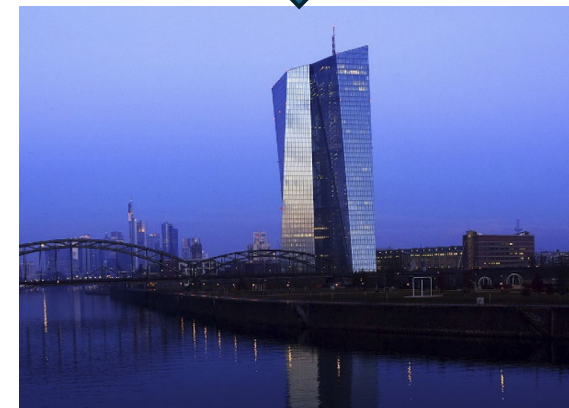
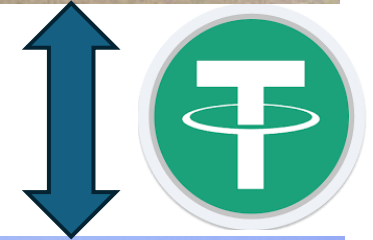


International Monetary Policy

- Benigno-Schilling-Uhlig, JIE 2022
- Consider a widely globally circulating US-Dollar Stablecoin, i.e.
 - in use in U.S.
 - in use in a foreign country – say EU
- Suppose people are indifferent between using that or the local currency as a means of payment
- If US-Stablecoin keeps value better, they will only use that.
- This forces the **monetary policy** in the EU to **synchronize** with U.S. monetary policy, in order to keep its own money in use.
- Less extreme assumption: imperfect substitutability -> imperfect synchronization.



US Fed



ECB

Recap on Stablecoins in U.S.

- Genius Act 2025: legal basis for U.S. stablecoins. Heavy trad-fi influence.
- Achilles heels: no interest payments, no master account at Fed. Runs?
- Stablecoins market cap currently tiny compared to M1
- Many attractive use cases.
- Two views: stablecoins will remain a niche OR stablecoins take over.
- If stablecoins take over: dramatic changes to banking, Stablecoin Trilemma.
- International monetary policy repercussions: synchronization force.

Sources used:

- Harald Uhlig, “Stablecoins, Central Bank Digital Currencies and Policy,” in *Fintech and Digital Currencies RPN's e-book on Frontiers of Digital Assets, Currencies and Payment*, CEPR, to appear.
- Wharton Stablecoin Toolkit Project, to appear.
- Linda Schilling, Jesús Fernández-Villaverde, and Harald Uhlig (2024), “Central bank digital currency: when price and bank stability collide,” *Journal of Monetary Economics*, vol. 145 (July).
- Mike Alonso, Jon Frost and Harald Uhlig (2023), “Privacy in Digital Payments—Escaping the Panopticon,” *Georgetown Journal of International Affairs*, Volume 24, Number 2, Fall, pp. 174-180.
- Pierpaolo Benigno, Linda Schilling, and Harald Uhlig, “Cryptocurrencies, Currency Competition, and the Impossible Trinity,” *Journal of International Economics* (2022), vol. 136.

Conclusions

- Blockchain and cryptocurrencies offer intriguing possibilities.
- Countries that do not allow them to some degree will fall behind.
- Better: craft an appropriate legal framework.
- Europe: MiCA (“Markets in Crypto-Assets”):
 - 199 licensed Crypto-Asset Service Providers (CASPs)
 - 12 are banks
- Stablecoins will be legal in the U.S.
 - USDC, Tether
 - Devil is in the details.
- Several countries plan to introduce CBDC (Central Bank Digital Currency):
 - Not in U.S.
 - Europe: will vote in June 2026
 - Egypt: plans for 2030.
- Similar to Stablecoins.
- Two views: CBDCs and/or stablecoins will remain a niche OR they will take over.
- If CBDC/stablecoins take over: dramatic changes to banking.
- CBDC Trilemma / Stablecoin Trilemma.
- International monetary policy repercussions: synchronization force. Benigno-Schilling-Uhlig.

Thank you!