What Keeps Stablecoins Stable?

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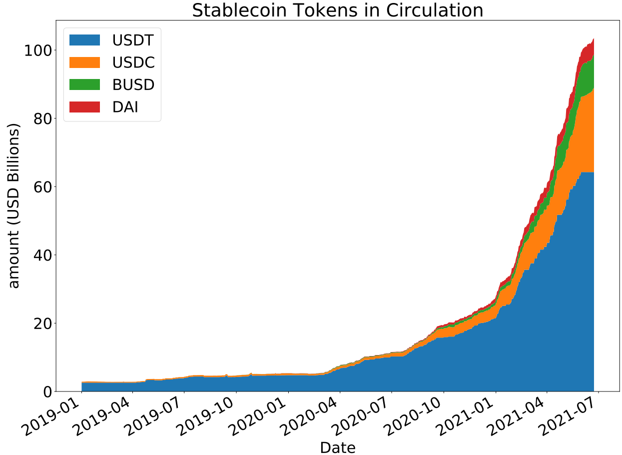
NY Federal Reserve Conference, September 23, 2022

Stablecoin systems and properties

- Stablecoins operate on the blockchain and are pegged at parity to the US dollar.
- Two systems of collateral: **National-Currency backed** or **Cryptocurrency backed**, with the former predominating.
- **Vehicle currency**: They serve as vehicle currencies for trading crypto assets generally due to a reduction in intermediation costs by operating on the blockchain
- **Use in DeFi applications**: Stablecoins used as vehicle on Uniswap (DEX) and DeFI lending protocols to earn high savings rates (eg. Compound)
- **Alternative payments**: Remittance and cross-border payments. Residents in developing countries may use stablecoins to evade capital controls/high inflation.

Stablecoin Ecosystem

This paper: Centralized (dollar-backed) stablecoins, led by Tether.



Stablecoin Arbitrage Design

- Considerable debate on what best describes the design and function of stablecoins:
    1. Fixed exchange rates?
    2. ETFs?
    3. Money market funds?
    4. Private bank notes?
    5. Narrow or fractional reserve bank?
- **Research Questions**:
    1. How is the peg maintained given the absence of a central bank?
    2. What design elements can increase the stability of the peg?
- **Contribution**: Posit arbitrage mechanism in which issuance is decentralized through private investors.
- **Arbitrage Design**: Efficiency reforms of (i) Migration to Ethereum blockchain and (ii) Independence of Tether treasury from Bitfinex increase peg stability by increasing access to arbitrage trades.

Data Sources

Blockchain explorers

- Blockchains on which Tether is issued are Omni, Ethereum and Tron during our sample period (04/2017-03/2020).
- Stock of Tether in circulation is held by exchanges or the Treasury.

$$Q_{Agg,t} = Q_{EX,t} + Q_{Treasury,t}$$

- We use this to construct net flows from the Tether treasury to the secondary market.

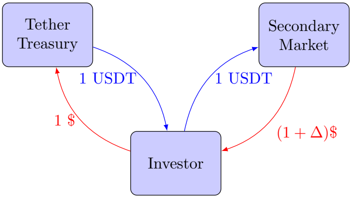
$$\underbrace{\Delta Q_{agg,t}}_{\text{grants}} = Flow_{T \to EX} + \Delta Q_{T,t}$$

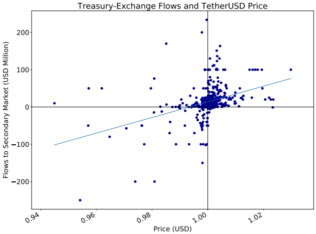
Cryptocurrency exchange prices

- Use coinapi to obtain secondary market prices for USDT/USD trading on exchanges Kraken, Bittrex and Bitfinex.

Research Findings I

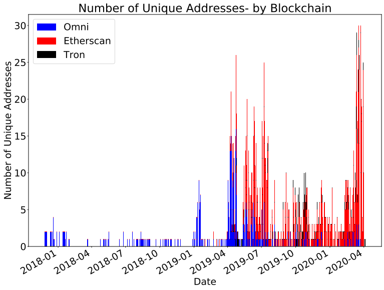
- **Arbitrage mechanism**: Stability of the Tether peg is maintained through arbitrageurs that exploit differences between the primary and secondary market price.
- If the secondary market price of Tether is above one dollar, an investor can buy Tether from the Treasury at a one-for-one rate, and sell Tether at the prevailing market rate to profit, resulting in a flow of Tether from the Treasury to the secondary market.

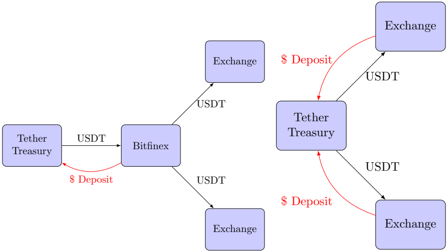




Research Findings II

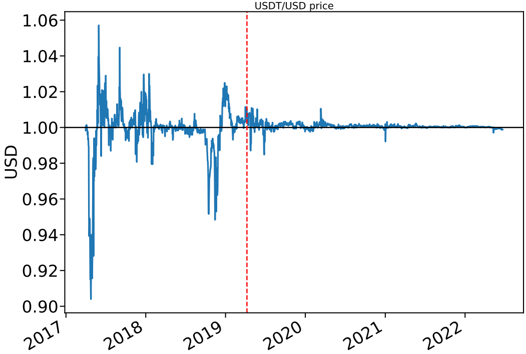
- Introduction of Tether to Ethereum Blockchain in April 2019
- Motivation: increased speed, efficiency of deposit process, network of ERC20 tokens and investors.
- Greatly increased access of investors to directly deposit dollars with the Treasury.





Research Findings III

- Empirically, we observe a two-sided distribution, premiums due to safety during crypto crashes, and discounts due to collateral concerns.
- Increase in peg efficiency since Tether's 2019 migration to the Ethereum blockchain.



Empirical Tests

We provide the following tests of the arbitrage mechanism:

1. Decentralization of Issuance: Variance decomposition to show that supply-based distribution declines following migration to the Ethereum blockchain.
2. Decentralization and peg efficiency: Did increased investor access to arbitrage trading lead to increased efficiency of the peg?
3. Arbitrage Flow: Does $Flow_{T \rightarrow EX}$ have a stabilizing effect on peg, with positive flows associated with a narrowing of peg price deviations?
4. Arbitrage Profits: Matching high-frequency timestamp of deposits and redemptions with secondary market prices, are systematic profits earned by arbitrageurs on the Omni and Ethereum Blockchains?

1. Decentralization of Issuance

- To quantify the independence of Tether from Bitfinex, we conduct a simple variance decomposition of Tether flows

$$var(\Delta {Q_t}^i) = cov(\Delta Q^i_{T,t}, \Delta {Q_t}^i) + cov(\Delta Q^i_{Bitfinex,t}, \Delta {Q_t}^i) + cov(\Delta Q^i_{Other,t}, \Delta {Q_t}^i)$$

- The decomposition gives us a useful proxy for demand versus supply changes in issuance.
- On the Omni blockchain, supply changes dominate: the Treasury and Bitfinex account for 86.3 per cent of flows.
- On the Ethereum blockchain, demand changes dominate: the variance of flows explained by other investors rises to 67.2 per cent.

2. Decentralization and Peg Efficiency

- We divide periods into pre (04/17-03/19) and post (04/19-04/20):
- We find increased efficiency of the peg (deviations in BP).

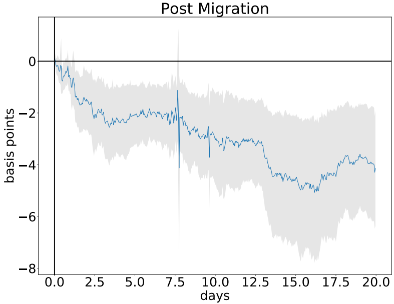
Period	Mean	SD	Min	Max	Half-Life (days)
Pre Ethereum Blockchain	-28.2	97.2	-505	298	6.5
Post Ethereum Blockchain	-0.9	47.2	-298	119	3.3

- We conduct a series of robustness tests on the structural break in peg stability.
- We exploit the migration to the Ethereum blockchain as a plausibly exogenous variation in increased access to Treasury.
- We use a Difference-in-Difference framework comparing peg efficiency of Tether to other stablecoins that did not undergo a migration.

3. Arbitrage Flow

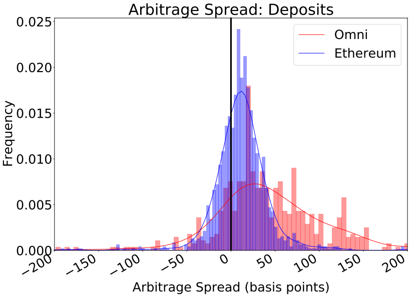
$$P_{t+h} - P_{t-1} = \alpha + \beta_h Flow_{T\to \text{EX}} + controls_t \qquad h = 1, 2, ...$$

- Trace effect of $Flow_{T\to EX}$ on Tether/USD price across horizon h (controls include feedback effects from prices and flows).
- Post Ethereum blockchain: A 1 std deviation change (7.5 million USD) flows leads to a 5 basis point change in Tether price (supply up, price down).



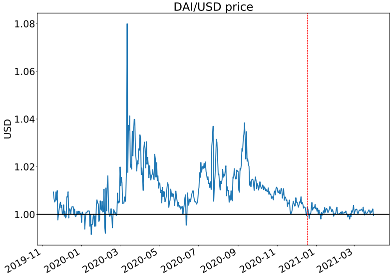
4. Arbitrage Profits

- We compute arbitrage spreads as the difference between the primary and secondary market price net of transaction costs.
- **Democratization of arbitrage access**: Smaller arbitrage profits and deposit size on Ethereum blockchain relative to Omni.
- Arbitraged spreads – matching trades with deviations – shrink from an average of 69 basis points on Omni to 27 basis points on Ethereum.



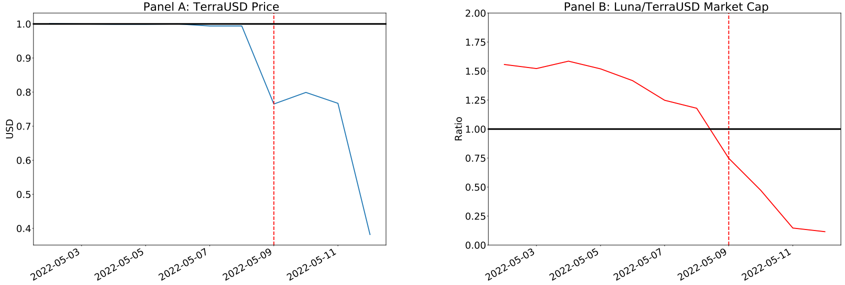
Other applications: DAI

- DAI is a decentralized stablecoin backed by cryptocurrency collateral (typically ETH).
- **Problem**: Risky collateral leads to an unstable peg, lack of a primary-secondary market arbitrage mechanism!
- **Solution**: Peg stability module in December 2020, allows investors to swap the USDC stablecoin for DAI at a 1:1 rate.



Other applications: TerraUSD

- TerraUSD is an algorithmic stablecoin backed by Luna, a native token of the Terra blockchain.
- **Problem**: A downward spiral of Luna and TerraUSD prices in May 2022 meant there was insufficient Luna to redeem TerraUSD at par.
- **Solution**: Legislation to ban stablecoins that are unbacked or backed by collateral native to its blockchain.



Policy Implications

Full collateralization and liquid reserves

- Increased regulations for stablecoin to be fully backed by sufficiently liquid reserves, or have a backstop such as insurance provided by a central bank.
- Proof of reserve systems and real-time audits can increase transparency and reduce risk of stablecoin runs, when redemptions exceed liquid reserves.

Increasing access to primary market

- Regulatory frameworks should increase access to arbitrage trades, by extending the set of participants that can deposit/withdraw with the issuer when the capital of existing participants is low.

Concluding Remarks

How is the peg maintained given the absence of a central bank?

- In contrast to central bank reserve management, peg retention works through the actions of arbitrageurs.

What design elements can increase the stability of the peg?

- Migration of Tether from the Omni to Ethereum blockchain in 2019 and decentralization of issuance led to an increase in peg efficiency.
- Find additional support for other applications like the DAI peg stability module.
- Arbitrage mechanism works conditional on full collateralization with liquid reserves and efficient access to the primary market.

Thank You