The Four Types of Stablecoins: A Comparative Analysis

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Informal Systems

The Paper in a Nutshell

Research question

How can stablecoins be categorized and what are their economic advantages and disadvantages?

Method

Agent-based modeling: Simulations for each stablecoin category

Results

Danger of crash after demand shock greater for stablecoins with endogenous & centrally managed collateral

Research Question: Motivation

Fast growth of stablecoins

Increasing demand for stablecoins & number of stablecoins

Market cap of stablecoins has risen to over $ 180 bn in few years

Crash of Stablecoin TerraUSD & recent USDC depeg

How stable are stablecoins?

What are the differences between various types of stablecoins?

Limited knowledge about stablecoins

State of the literature

Research Question: Literature

Moin, Sekniqi, and Sirer (2020):
Peg, collateral, mechanism and method to receive the reference price information

Klages-Mundt and Minca (2021):
Rebase, Seigniorage Share and Partial-Collateral

Zhao, Li, and Yuan (2021):
Custodial and non-custodial stablecoins

Kahya, Krishnamachari, and Yun (2021):
Degree of centralization; fiat, asset-backed or fiat equivalent stable digital currencies, crypto-collateralized and algorithmic stablecoins

Many other classifications: E.g., Clark, Demirag, and Moosavi (2019), Berentsen and Schär (2019)

Stablecoin Matrix: Categorization of Stablecoins

	Centralized	Decentralized
Exogenous	Tether, USDC	Dai
Endogenous	Terra	Synthetix

First dimension: Collateral value

- Exogenous: External source (e.g., gold that is held in reserve)
- Endogenous: Internal source (i.e., from a crypto asset that is part of the same ecosystem such as Terra)

Second dimension: Collateral management

- Central entity/mechanism manages pooled collateral and decides when to expand and contract supply
- Individuals manage their own collateral decentrally and mint and burn stablecoins to adjust supply

Method: Agent-Based Simulation of the 4 Types of Stablecoins

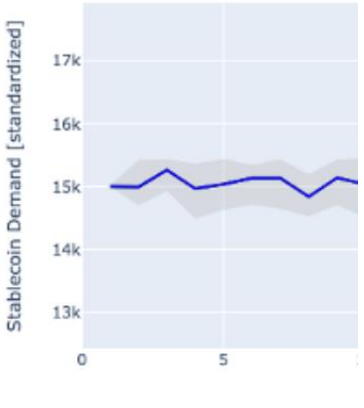
Monte Carlo experiment to test stability conditions and incentives

Focus of the simulation

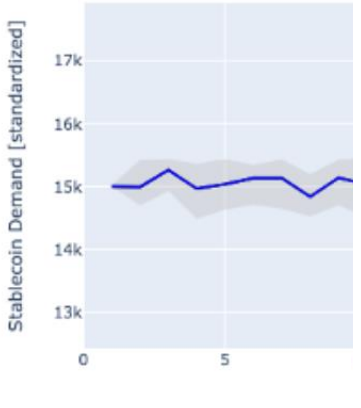
- Agents: User, investor, and issuer
- Assets: Stablecoins, collateral, peg
- Demand of users: Depends on collateral level, fees, and randomness
- Price of collateral: Exogenous (simulated) & endogenous (discounted future earnings)
- Price stablecoin: Demand / supply

Data: Simulated using Geometric Brownian Motion (Monte Carlo experiment)

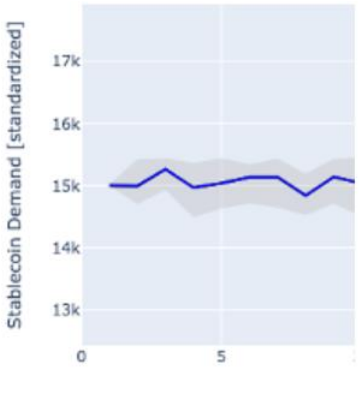
Results: Demand I



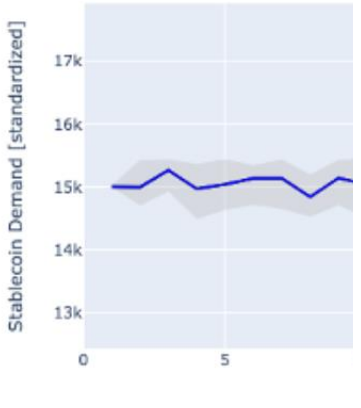
Tether-like stablecoin



Dai-like stablecoin



Terra-like stablecoin

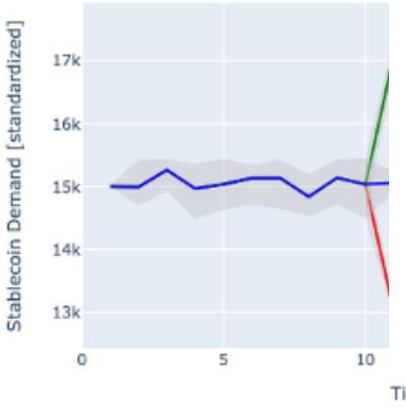


Synthetix-like stablecoin

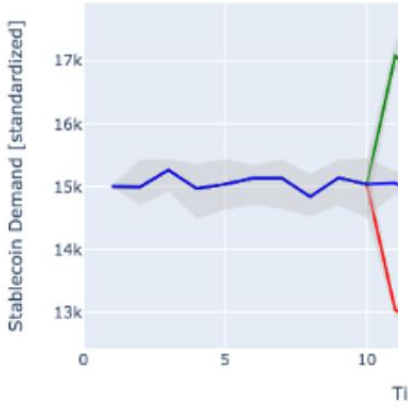
Legend:

- Positive shock
- No demand shock
- Negative shock

Results: Demand II



Tether-like stablecoin



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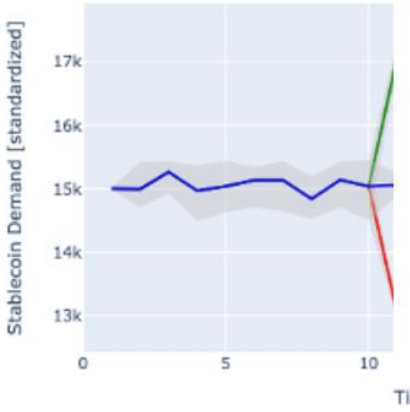
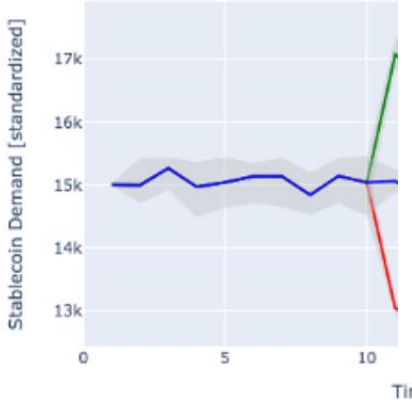


Terra-like stablecoin



Synthetix-like stablecoin

Legend:

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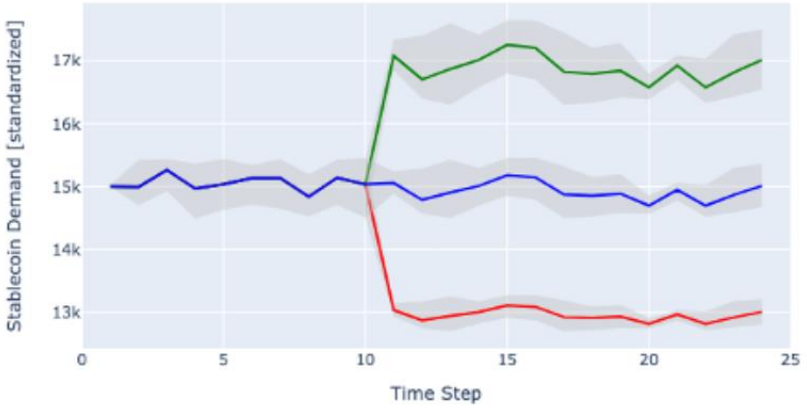
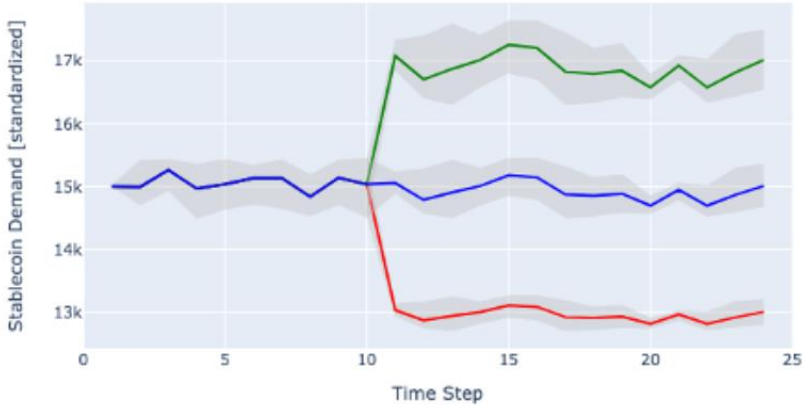
- Negative shock

Results: Demand III



Tether-like stablecoin



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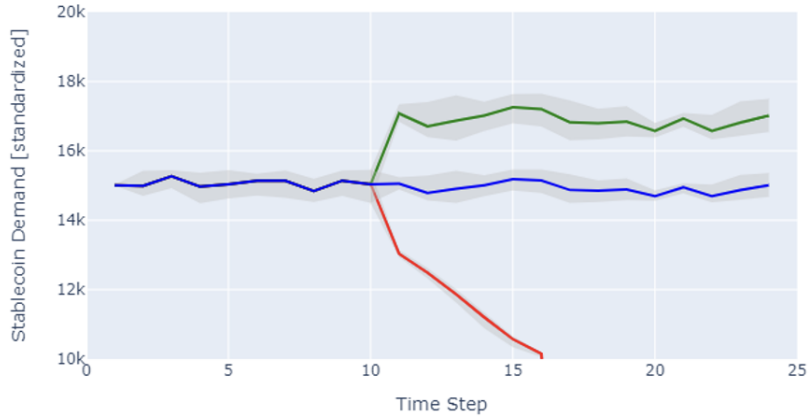
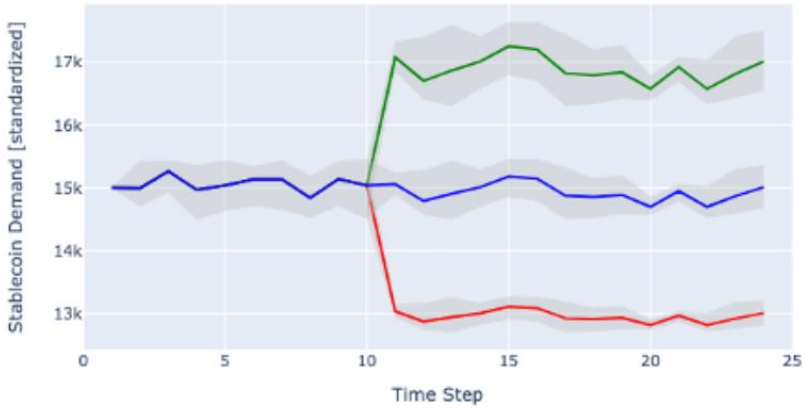


Terra-like stablecoin



Synthetix-like stablecoin

Legend:

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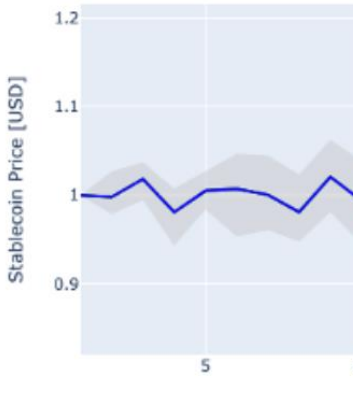
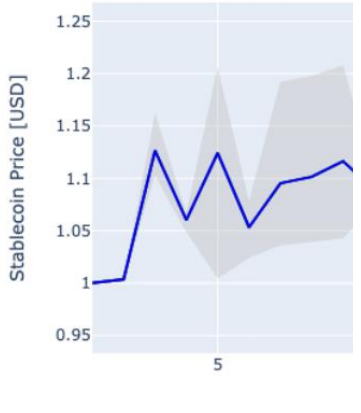
- Negative shock

Results: Price I



Tether-like stablecoin



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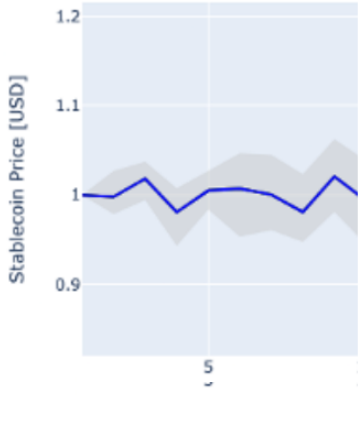
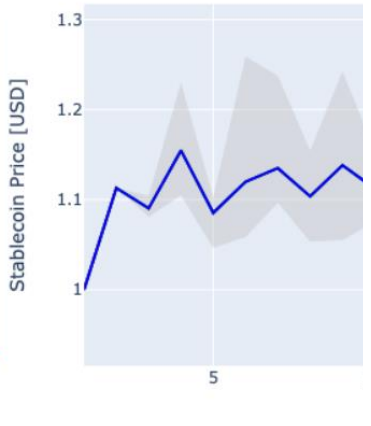
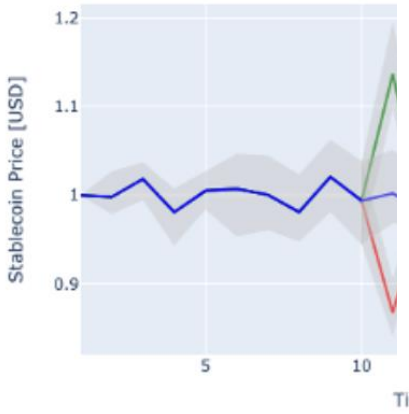


Terra-like stablecoin

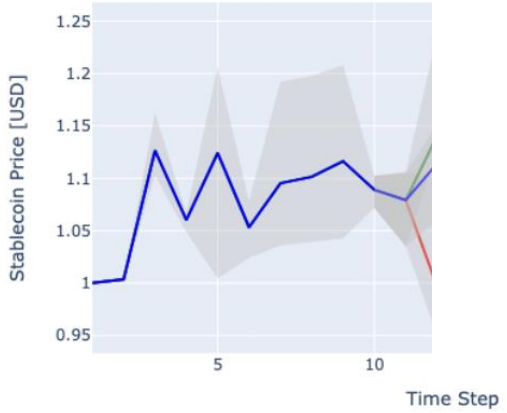


Synthetix-like stablecoin

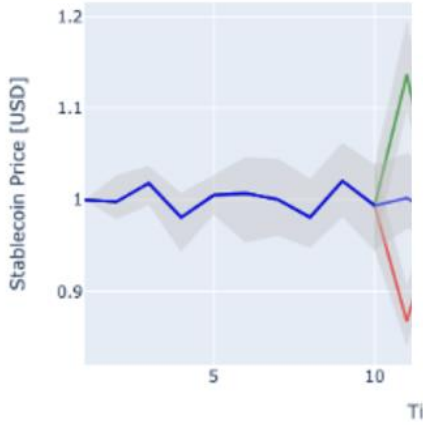
Results: Price II



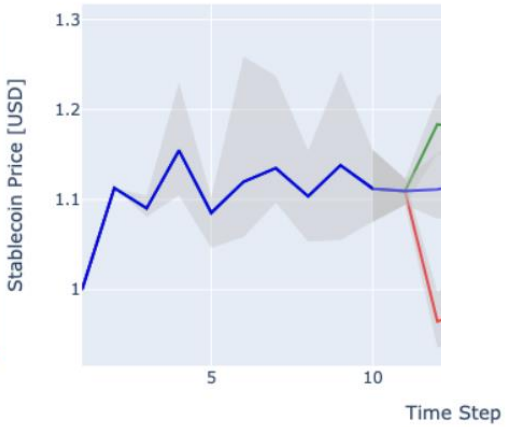
Tether-like stablecoin



Dai-like stablecoin



Terra-like stablecoin

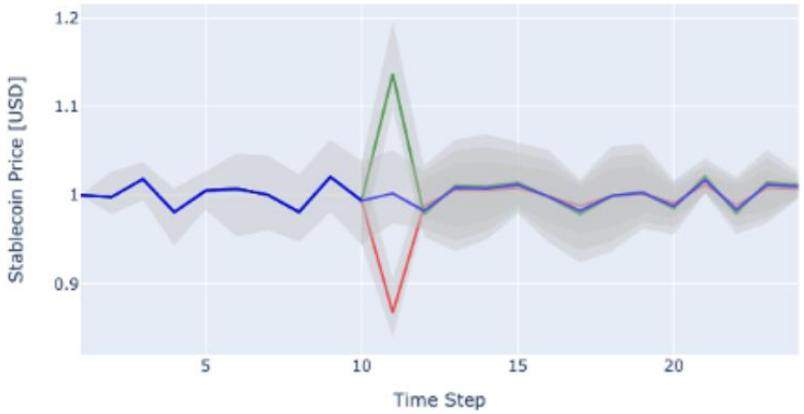


Synthetix-like stablecoin

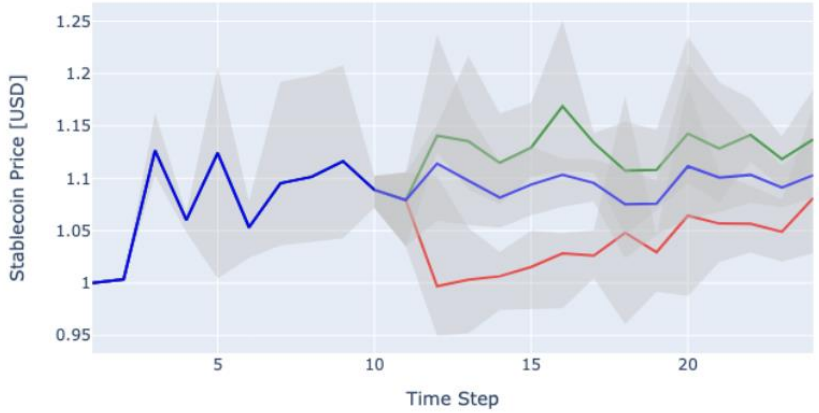
Legend:

- Positive shock
- No demand shock
- Negative shock

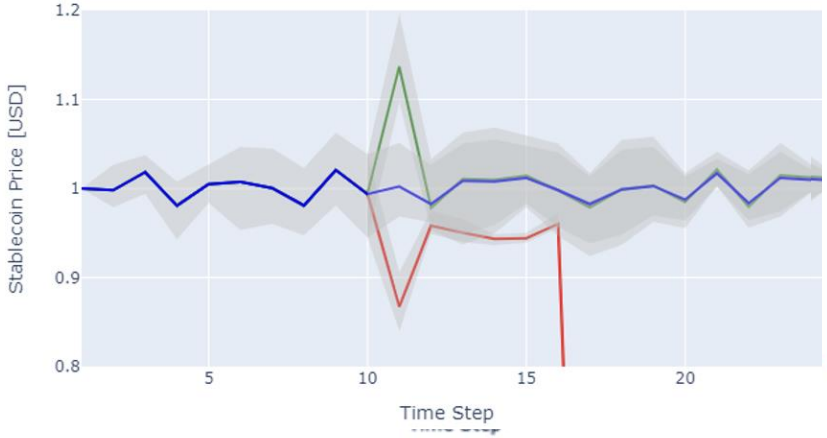
Results: Price III



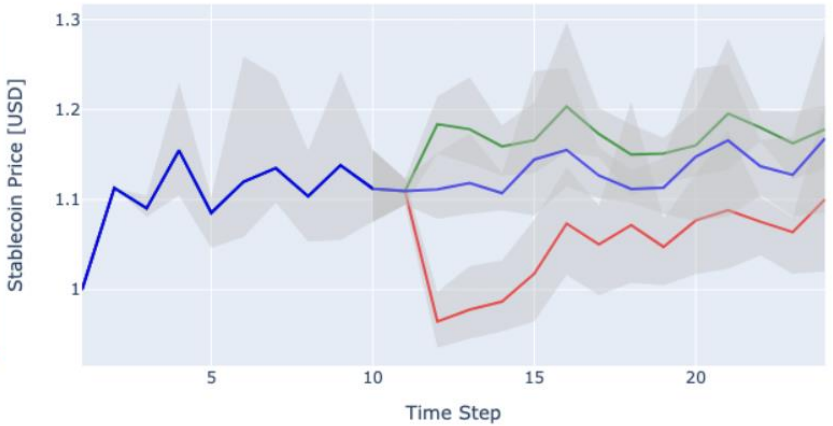
Tether-like stablecoin



Dai-like stablecoin



Terra-like stablecoin

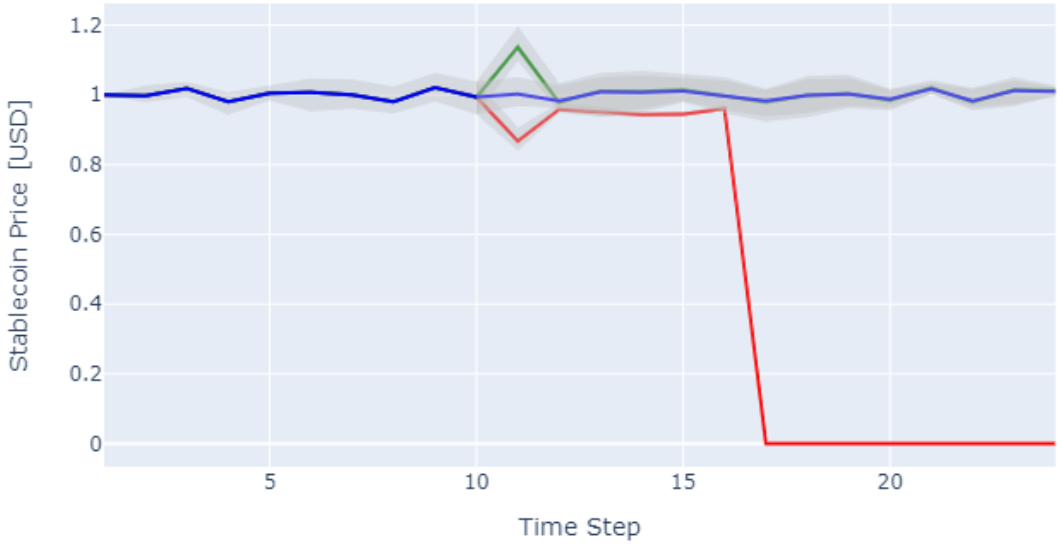


Synthetix-like stablecoin

Legend:

- Positive shock
- No demand shock
- Negative shock

Results: Price IV



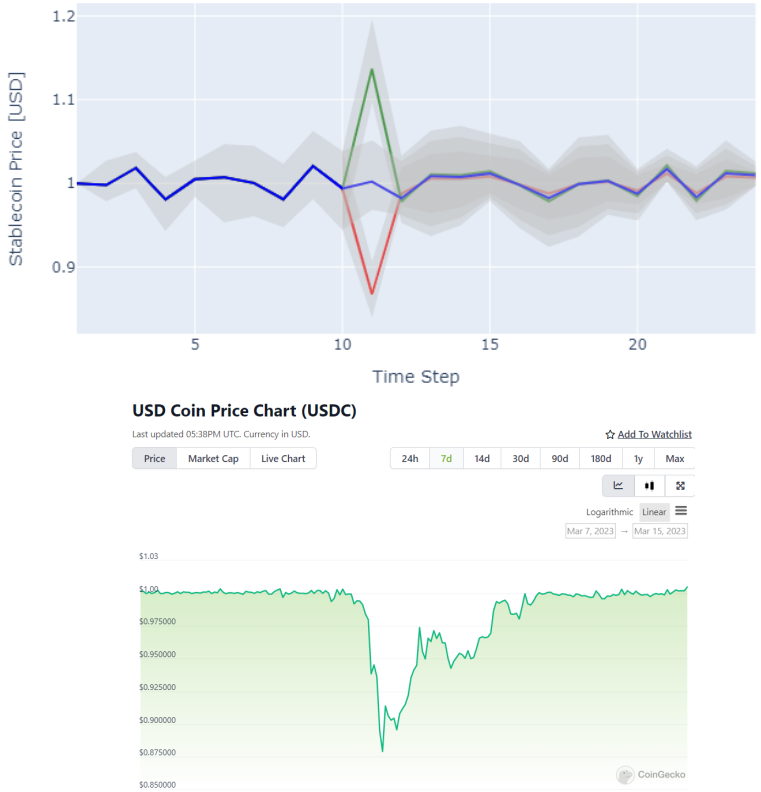
Terra-like stablecoin

1. Demand schock stablecoin ($coin_{Stable}$)
2. ↓ Demand $coin_{stable}$
3. ↓ Future profits native coin ($coin_{native}$)
4. ↓ Demand $coin_{native}$
5. ↓ Value $coin_{native}$
6. ↓ Collateral value $coin_{stable}$
7. If critical collateral level is hit:
   ↓ Demand $coin_{stable}$

→ **Danger of death spiral for stablecoins with endogenous and centrally managed collateral**

Results: Simulation vs. Reality

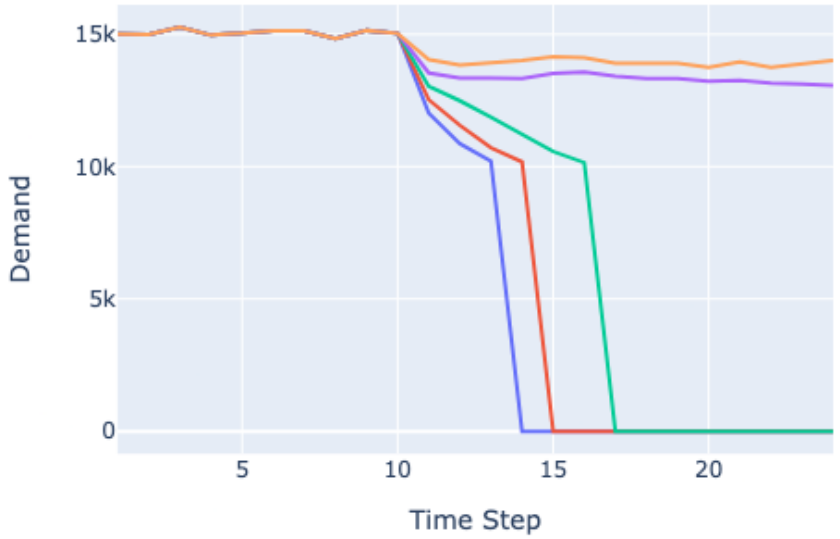
Tether-like stablecoin (exogenous & central)

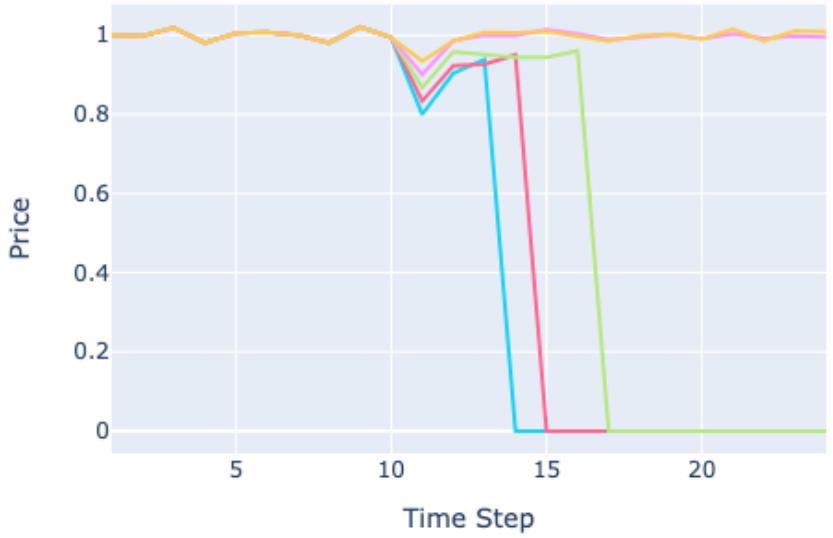


Terra-like stablecoin (endogenous & central)

Results: Sensitivity Analyses I

Magnitude of demand shock





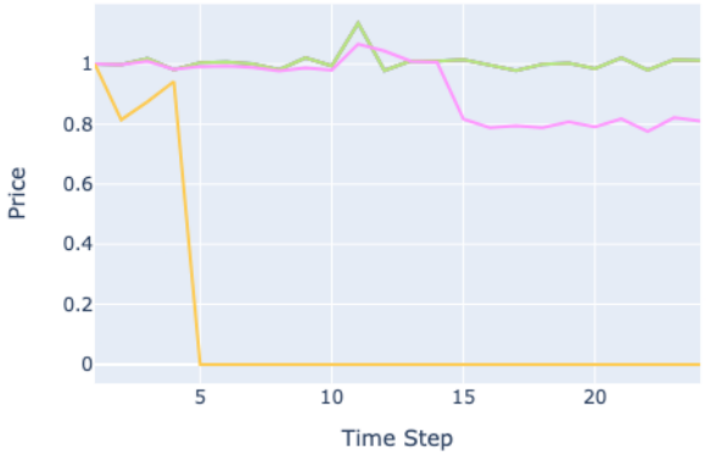
Sensitivities:
0.50
0.75
1.00
1.25
1.50

→ Consistent results, except Terra-like stablecoin, which experienced crashes only with large negative demand shocks

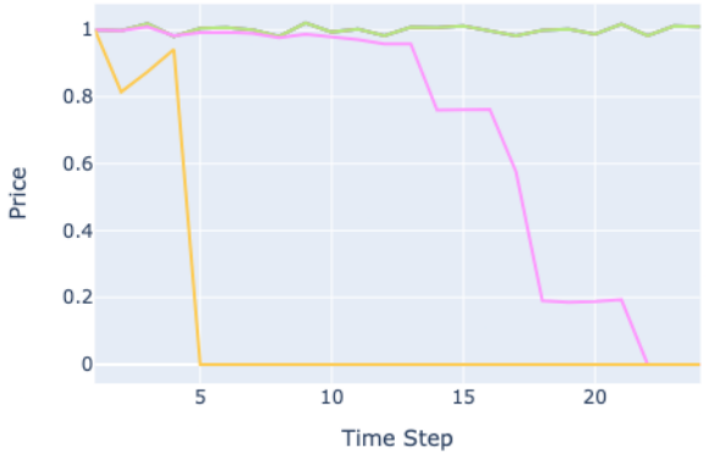
Results: Sensitivity Analyses II

Fees

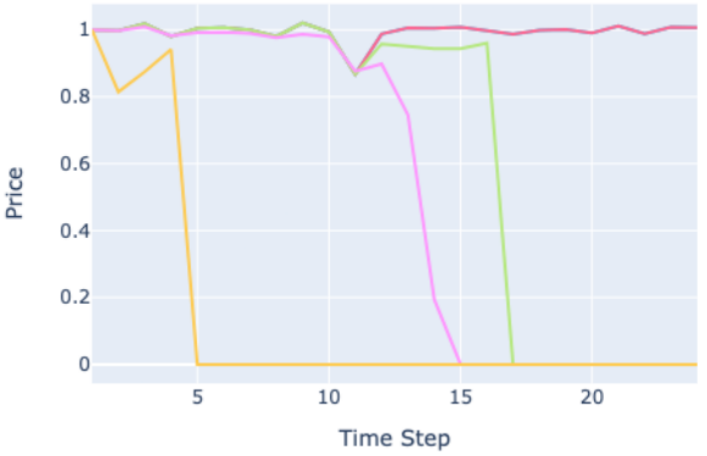
Positive shock



No shock



Negative shock



→ Little effect on demand or price for Tether-like stablecoins but influences both Dai- and sUSD-like stablecoins.

→ Terra-like stablecoins can crash due to fee changes alone, regardless of external shocks.

Conclusion

Stablecoins have different designs

Critical: What is the collateral and how is it managed?

→ "Type" of collateral has different effects on the agents and can help explain their behaviors

Which stablecoins are more stable?

→ Danger of crash greater for stablecoins with endogenous & centrally managed collateral

Policy recommendation:

→ Policy maker should in particular be **careful with stablecoins** whose collateral value is **endogenous** and **centrally managed** (Terra-like stablecoin)