Stablecoin Self-Regulation

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[1]The opinions are the author's and do not necessarily reflect those of the Federal Reserve Board or its staff

Fix ideas

- Stablecoins are crypto assets that peg their value to a reference asset (e.g. the USD)
- Stablecoins differ in their stabilization mechanisms:
  - collateralized (USD Coin, Tether...)
  - uncollateralized/algorithmic (Terra Classic USD...)
- Consider USD Coin (USDC):
  - *"USDC is always redeemable 1:1 for US dollars"*
  - i.e. issuer (Circle) has an obligation towards USDC investors

Goal of the paper

- Study the fragility of stablecoins (SC) issuers, who
  1. are subject to limited commitment to honor obligations
  2. coexist with issuers of other forms of debt (trad banks)

- Proposals reducing issuers' incentives to default on obligations
  - *Segregated*: a mechanism for each *Institution*
    - Two essential elements absent in current legislative initiatives
    - These elements $\sim$ CCPs risk management: Fund & Margins
  - *Merged*: same mechanism for issuers with same *Activity*
    - Analyze spillovers to traditional banks
    - Cross subsidization by banks to SC issuers

Motivation: why do we care

- SC grew in mkt cap (to $160bn) and turnover in 2020-2024
- SC issuers perform liquidity transformation $\sim$ banks
  - similarly fragile if won't maintain reserves to honor redemptions
- Policy makers' concern about their fragility and impact on the economy and traditional financial mkts
  - fear of CP fire sales during USDT (Tether) depeg (May 2022)
  - runs: USDC (Circle) depeg during SVB crisis (March 2023)
- Policy proposals in the US ranged from requiring SC issuers to hold a banking license to making them subsidiaries of insured depository institutions but without access to FDIC

Motivation: incentive to honor redemptions is key

- SC issuers have tried to self-regulate or tie their hands by relying on other institutions for safekeeping
  - For example, Circle:
    - holds reserves in BlackRock, BoNY Mellon, with regular attestations of reserves covering circulating USDC
    - is regulated as a licensed money transmitter under US state law, with financial statements audited annually
- because SC issuers are not trusted to repay/redeem

$$\Downarrow$$

Model: Lack of commitment/strategic default on obligations

Economic mechanism

- Key friction:
  - lack commitment to maintain reserves to honor redemptions
    - absconding/diverting assets, modeled as default on obligations
  - applies to both Trad banks and SC issuers
- Key difference:
  - probability that default/diverting assets goes **undetected**

    $\sim$ disclosure requirements, supervision
  - SC issuers can more easily default without being caught
  - self-regulation proposal takes this as given and designs a framework to reduce issuers' incentives to default/divert assets

Model: New Monetarist, as in Carapella-Williamson (2015)

- Time is discrete and infinite, 2 subperiods: CM, DM
- 2 Sectors: crypto (c) and traditional (t)
- 3 types of consumption goods
  - in CM: X_t, perishable (settlement good)
  - in DM: x_t^i, $i = c, t$, perishable (consumption/investment good)
- 2 types of agents in each sector:
  - issuers (buyers) and investors (sellers)
  - continuum $[0, 1]$ each
  - infinitely lived

Model

- Issuer i:
  - can produce CM-good X_t using labor H_t
  - wants to consume in CM and DM

$$E_0 \sum_{t=0}^{\infty} \beta^t [X_t - H_t + u(x_t^i)]$$

- Investor i:
  - can produce DM-good x_t^i using labor h_t
  - wants to consume in CM

$$E_0 \sum_{t=0}^{\infty} \beta^t [X_t - h_t]$$

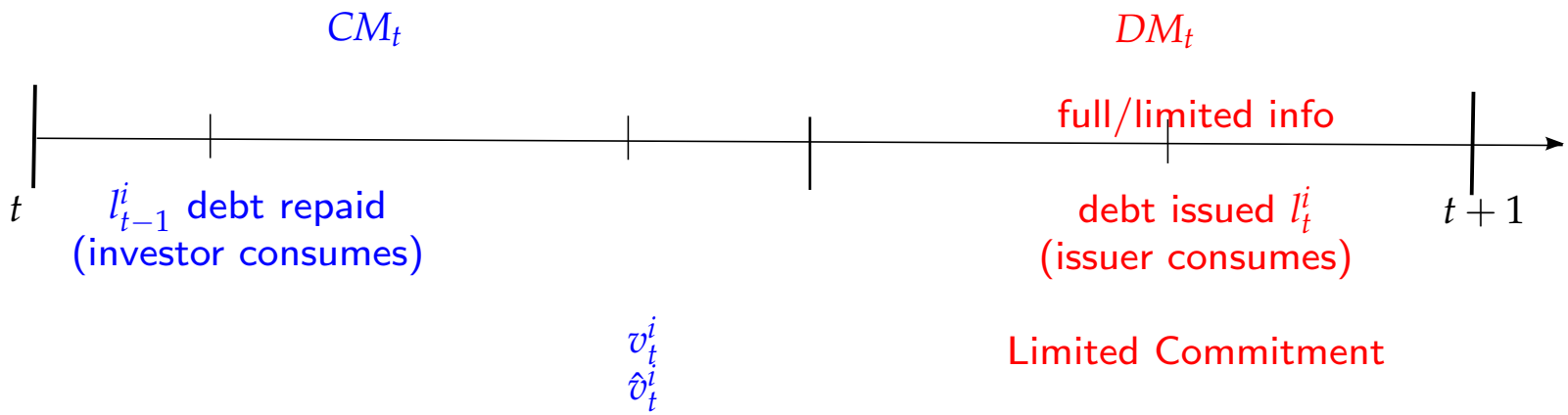
Trade in DM

- In each sector: an issuer is randomly matched with an investor
- Motive for trade:
  - temporal mismatch in production and consumption/investment
- Trading friction 1: endogenous limited commitment
  - after consumption/investment no commitment to produce
  - non-storable consumption good
- Trading friction 2: limited access to information

Trading friction 2: limited access to information

- DM trade and CM default are publicly recorded
- investor in DM may not have access to the public record
  - a fraction ρ^i of DM meetings is *limited information*
  - a fraction $1-\rho^i$ of DM meetings is *full information*
  - $\rho^c > \rho^t$: SC disclosure requirements are nonexistent so they can get away more often or can hide more info
- Interpretation of limited information:
  - attestations not being released yet, or not reliable enough

Timing



- l^i_t: debt issued by issuer to investor in DM
- v^i_t: value of a repaying issuer at the end of CM
  ($\sim$ deposit franchise to the issuer)
- $\hat{v}^i_t$: value of a defaulting issuer at the end of CM
  ($\sim$ possibly losing franchise)

Decision problem with symmetric strategies

- Full/limited info matters only for $\hat{v}$ but $x_F^i = x_L^i$
- Issuers make TIOLI offer to investors:

$$\begin{aligned} v_t^i &= \max_{\{x_t^i, l_t^i, H_{t+1}\}} && u(x_t^i) - \beta H_{t+1} + \beta v_{t+1}^i \\ &\quad s.t. && x_t^i \leq l_t^i \\ &&& l_t^i \leq \beta H_{t+1} \\ &&& \beta H_{t+1} \leq \beta(v_{t+1}^i - \hat{v}_{t+1}^i) \end{aligned}$$

$$\begin{aligned} v_t^i &= \max_{\{x_t^i\}} && u(x_t^i) - x_t^i + \beta v_{t+1}^i \\ &\quad s.t. && x_t^i \leq \beta(v_{t+1}^i - \hat{v}_{t+1}^i) \end{aligned}$$

Punishments and Equilibria

- Symmetric stationary equilibria: $x^i, v^i, \hat{v}^i$
  - such that all issuers choose x^i and have value v^i or $\hat{v}^i$
- Off-equilibrium-path payoffs key for DM investment
  - defaulter punished $\Rightarrow$ if detected $\hat{v}^i = 0$, if undetected $\hat{v}^i \geq 0$

Symmetric stationary equilibria

In limited info meetings (w.p. ρ^i) *defaulting* issuers can issue debt

- Value of defaulting issuer at end of CM: $\hat{v}^i = \frac{\rho^i u(x^i)}{1-\beta}$
- Incentive constraint is slack $\Rightarrow x^i = x^*$ (first best)
- Incentive constraint binds $\Rightarrow x^i = \beta(v^i - \hat{v}^i) < x^*$, and solves:

$$x^i = \beta(1-\rho^i)u(x^i)$$

  - higher ρ^i (crypto sector) $\Rightarrow$ lower x^i if IC binds
  - IC binds in a larger set of economies (ie $x^* > \beta(1-\rho^i)u(x^*)$)
  - $\hat{v}^i > 0$ IFF $x^i > 0$

Self-Regulation

Incentive compatible mechanism has two essential components:

1. **voluntary** contribution to a mutualization fund in the CM: τ_t^i
   - any payment to mechanism s.t. the same IC as private agents
   - *survivors' pay rule*
2. sells 1-period membership titles B_t^i at price q_t^i in CM
   - membership title entitles the issuer to issue 1 unit of debt to be repaid by the mechanism ($\sim$ insured debt)
   - i.e. B_t^i paid by *all* members of the mechanism

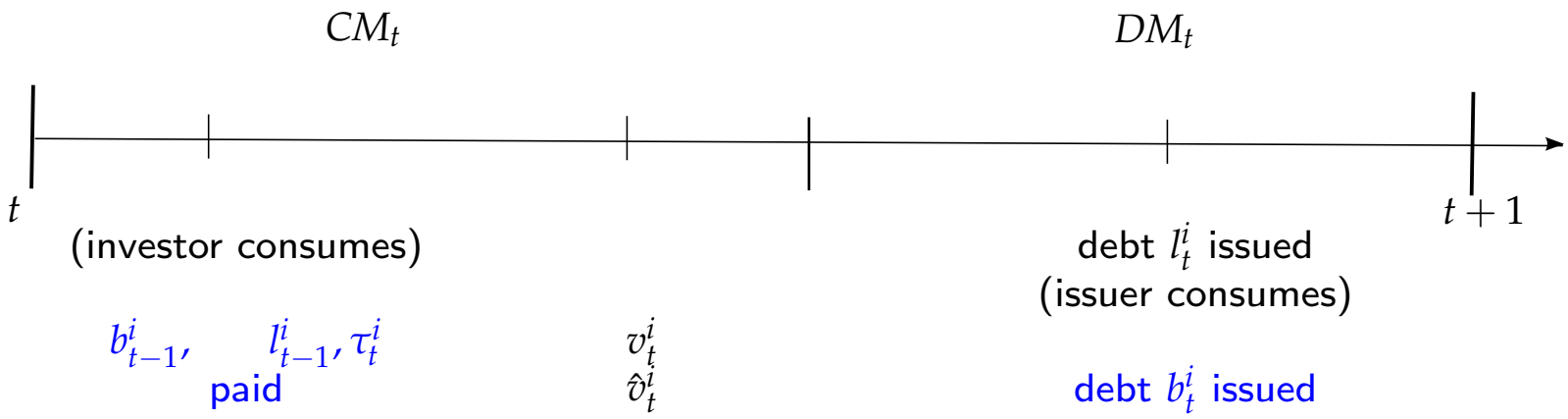
Resource constraint:

$$\tau_t^i + q_t^i B_t^i = B_{t-1}^i$$

Segregated vs Merged

- Segregated: separate mechanisms for SC issuers and banks
  - similar mechanisms but separate mutualization schemes and markets for membership titles
  - τ_t^i, B_t^i, q_t^i for $i = c, t$
- Merged: pool SC issuers with banks
  - one mutualization scheme for traditional and crypto sector
  - trad and crypto sector buy membership titles in same mkt
  - same τ_t, B_t, q_t for $i = c, t$

Regulation: Timing



- l_t^i: debt issued by issuer to investor in DM
- b_t^i: insured debt issued by issuer to investor in DM
- τ_t^i: voluntary lump sum contribution levied on issuers
- B_t^i: membership titles supplied by the mechanism

with mechanism resource constraint $\tau_t^i = B_{t-1}^i - q_t^i B_t^i$

Segregated mechanism

The decision problem of issuer of type $i = c, t$ is:

$$\begin{aligned} v^i &= \max_{\{x^i, b^i, l^i\}} \left\{ -q^i b^i + u\left(x^i\right) - l^i - \beta\tau^i + \beta v^i \right\} \\ & x^i \leq l^i + \beta b^i \\ & l^i + \beta\tau^i \leq \beta\left(v^i - \hat{v}^i\right) \end{aligned}$$

with mechanism resource constraint

$$\tau^i = B^i(1 - q^i)$$

and

$$\hat{v}^i = \max\left(0, \frac{-q^i b^i + \rho^i u\left(x^i\right)}{1 - \beta}\right)$$

Segregated mechanism: Equilibrium with IC binding

$\underline{\hat{v} > 0}$ exists IFF

a. $x^* > \beta\left(1-\rho^i\right)u\left(x^*\right) + \beta^2 B^i u'(x^*)$

with x_E^i solving this at $=$, vs $x_E^i = \beta\left(1-\rho^i\right)u\left(x_E^i\right)$

b. $q^i b^i = \beta u'(x_E^i) B^i < \rho^i u\left(x_E^i\right)$

- x_E^i larger than no regulation and increases in B^i

$\underline{\hat{v} = 0}$ exists IFF

c. $x^* > \beta u\left(x^*\right)$

with x_E^i solving this at $=$

d. $q^i b^i = \beta u'(x_E^i) B^i \geq \rho^i u\left(x_E^i\right)$

- x_E^i larger than no regulation and than with $\hat{v} > 0$ (x_E^i from a.)

Intuition

- Segregated mechanism improves over no regulation:
  - B^i spread cost of default on defaulters imitating non-defaulters
    - $\tau_t^i = B_{t-1}^i - q_t^i B_t^i$
  - B^i can push value of default to 0: $\hat{v}^i = \max(0, \frac{-q^i B^i + \rho^i u(x^i)}{1-\beta})$
  - τ^i provides guarantee of payment to SC investors (SC are *liquid*, which benefits issuers who can sell more SC)
    $\Rightarrow$ issuers have more *skin in the game*
- τ^i and B^i:
  - are both essential, not present in current initiatives
  - are similar to CCPs clearing: *default fund, initial margin*

Merged Regulation

Decision problem of issuer $i = c, t$ is

$$\begin{aligned} v^i &= \max \left\{ -qb^i + u\left(x^i\right) - l^i - \beta\tau + \beta v^i \right\} \\ & x^i \leq l^i + \beta b^i \\ & l^i + \beta\tau \leq \beta\left(v^i - \hat{v}^i\right) \end{aligned}$$

with $\hat{v}^i = \max\left(0, \frac{-qb^i + \rho^i u\left(x^i\right)}{1-\beta}\right)$, mechanism resource constraint:

$$\tau = \frac{B}{2}(1-q)$$

and market clearing for membership titles:

$$B = b^c + b^t.$$

Equilibrium with both IC bind and $\hat{v}^i > 0$ for all i

- FOC for b^i: $b^i > 0 \Rightarrow q = \beta u'(x^i)$
- Both types get the same allocation x_E, solving:

$$x_E = \beta \left(1 - \frac{\rho^j}{2} - \frac{\rho^i}{2}\right) u(x_E) + \beta^2 \frac{B}{2} u'(x_E)$$

$\Rightarrow$ spillovers:

1. $x_E^t > x_E > x_E^c$, with x_E^i from segregated mechanism
2. But $b^c > \frac{B}{2} > b^t$ as they finance the same x_E differently:

$$\beta b^i = x_E + \beta \frac{B}{2}(1-q) - \beta\left(1-\rho^i\right) u(x_E)$$

t type pushed partially out of the mutualization fund and into issuing uninsured debt, as it subsidizes c type

Why are τ^i, b^i essential elements of the mechanism?

1. Essentiality of loss mutualization fund
   - $\exists$ eqm with $q = 1$ and IC binding if
     - $\rho > \sigma$ (i.e.$\sim$ incentive problem severe enough)
     - $B = (\rho - \sigma)u(\beta^{1/\sigma}) > 0$
   - $\Rightarrow \tau = (1 - q)B = 0$, in all other cases $\tau > 0$ essential

2. Essentiality of revenue raising membership titles
   - titles' effect on $\hat{v}^i$ only but NOT on τ
     a. title as fixed entry cost
     b. title as marginal cost per unit of debt
   - same eqm as no regulation if $\hat{v} > 0$ but better if $\hat{v} = 0$

Hence, IC relaxed via two separate channels: τ and $\hat{v}$!

Conclusion

This paper:

- proposes a mechanism to incentivize debt issuers to honor their obligations, with two essential elements:
  1. loss mutualization fund with **voluntary** contributions
  2. costly titles to membership of the fund

     $\Rightarrow$ similar to CCP loss allocation waterfall

- analyzes its effectiveness when heterogeneous issuers are subject to *merged* regulation ($\sim$ *by activity*)
  - improves over no regulation for all issuers
  - reduces welfare for banks over a *segregated* mechanism
    - tilts banks debt issuance towards uninsured deposits

Segregated mechanism: Equilibrium with IC slack

$\underline{\hat{v} > 0}$ exists IFF

1. $x^* \leq \beta\left(1-\rho^i\right)u\left(x^*\right)+\beta^2 B^i u'\left(x^*\right)$ vs $x^* \leq \beta\left(1-\rho^i\right)u\left(x^*\right)$
2. $q^i b^i = \beta B^i < \rho^i u\left(x^*\right)$

- set of economies with IC slack larger than no regulation

$\underline{\hat{v} = 0}$ exists IFF

3. $x^* \leq \beta u\left(x^*\right)$
4. $q^i b^i = \beta B^i \geq \rho^i u\left(x^*\right)$

- set of economies with IC slack larger than no regulation and than with $\hat{v} > 0$

Merged mechanism: both IC bind and $\hat{v}^i = 0$ for all i

- Both types get the same allocation x_E, solving:

$$x_E = \beta u\left(x_E\right)$$

- Eqm exists IFF

$$x^* \quad > \quad \beta u\left(x^*\right)$$

- and, for $\hat{v}^i = 0$:

$$qb^i = \beta b^i u'\left(x_E\right) \quad \geq \quad \rho^i u\left(x_E\right)$$

- x_E same as with segregated regulation, but set of economies with $\hat{v} = 0$ in equilibrium is (weakly) smaller, as the portfolio allocation doesn't matter: $b^i|_{MR} \leq B^i|_{SR}$

Merged mechanism: at least one IC slack

One IC slack = segregated (no) regulation for binding (slack)

Both IC slack:

- $\hat{v} = 0$: equivalent to segregated regulation
- $\hat{v} > 0$:
  - $x^* - \beta b^i + \beta \frac{B}{2} (1 - \beta) \leq \beta \left(1 - \rho^i\right) u(x^*)$

    where x_E solves this at $=$
  - $\rho^i u(x^*) > \beta b^i$

    b^i increasing in $\rho^i \Rightarrow$ relative to segregated regulation

    larger set of economies with IC slack for c, smaller for t
- $\hat{v}^i > 0, \hat{v}^j = 0$: same qualitative conclusion as when $\hat{v} > 0$