DeFi-ying the Fed?

Monetary Policy Transmission to DeFi Rates

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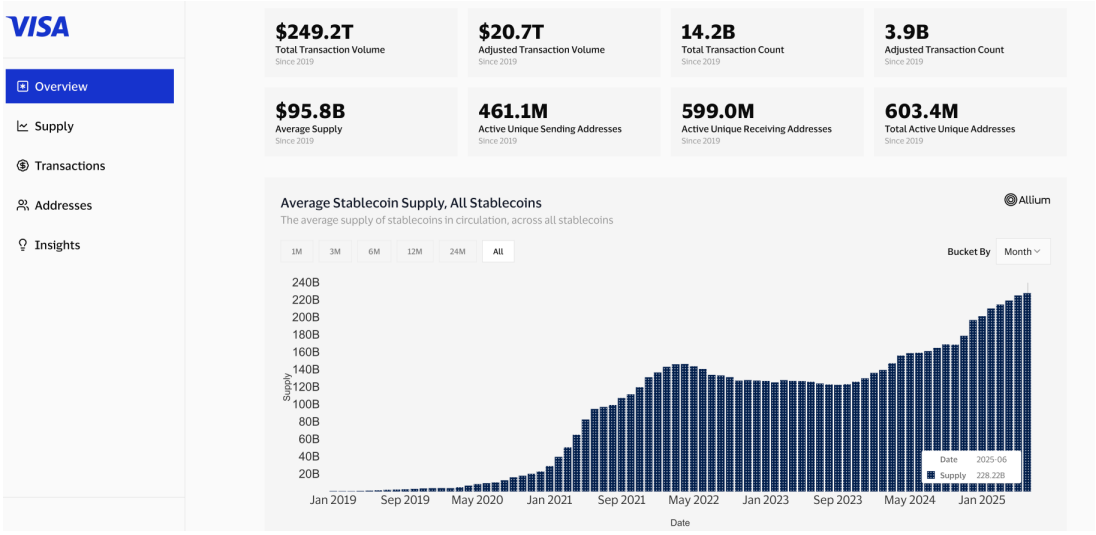
The Rise of Stablecoins



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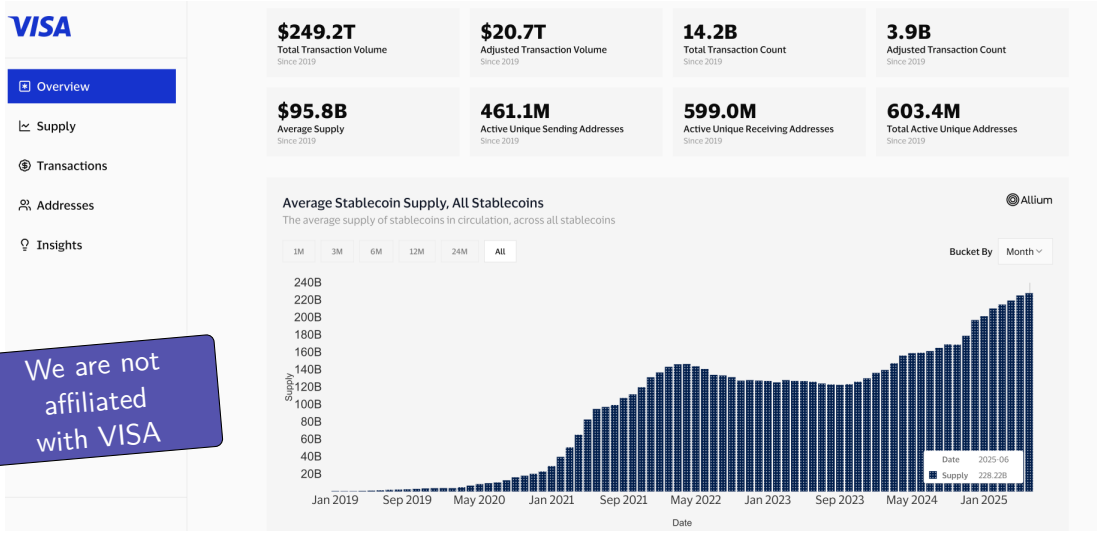

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Monetary Policy Transmission

DeFi Rates

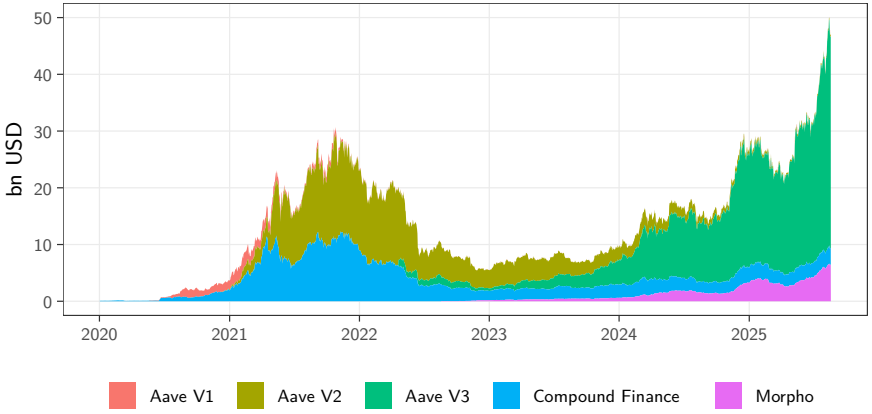
- Most stablecoins do not pay interest natively
- But can be borrowed and lent in DeFi lending protocols (AAVE, Compound...)

Monetary Policy Transmission

- Monetary policy effectiveness depends on its transmission to multiple rates
- But what about transmission to DeFi rates?

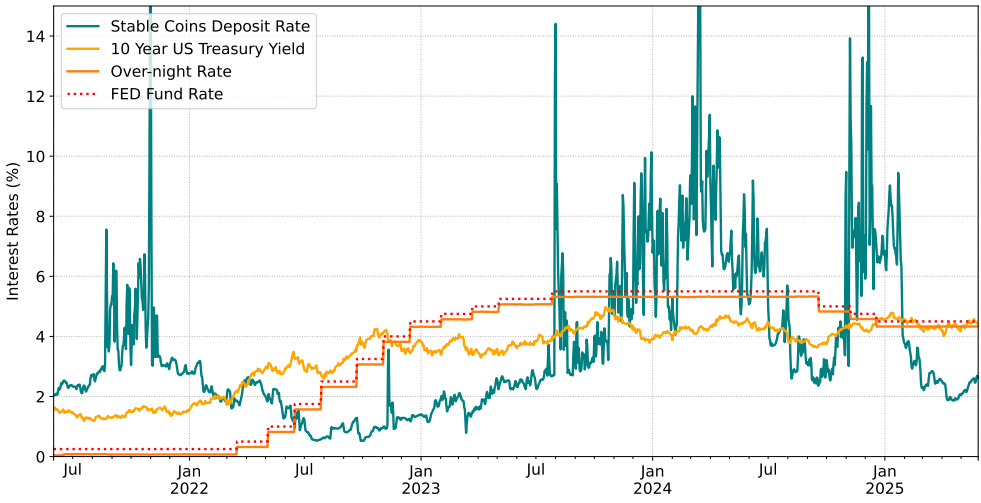
This paper: Analyze the pass-through of FED's monetary policy to DeFi rates

Deposits in DeFi Lending Protocols



The figure displays the time-series evolution of the Total value locked (TVL) in main lending protocols from Jan 2020 to Aug 2025, in billion USD. Data source: DeFiLlama.

The Recent Fed's Hiking Cycle



DeFi Lending & borrowing: A Primer

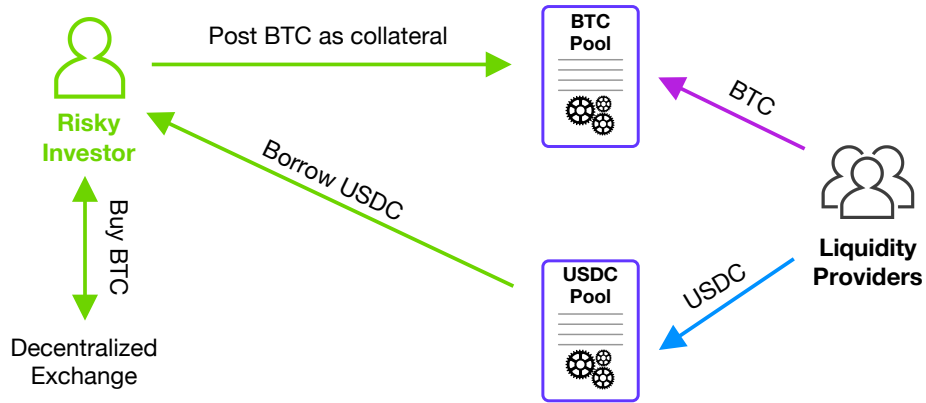
- **Liquidity Providers** (**LPs**) deposit stablecoins in liquidity pools (smart contracts)
- Other users can borrow those, posting a crypto collateral (ETH, BTC, ...)
- Loans are **overcollateralized**, with haircuts around 20% (depending on the volatility of the collateral asset)
- Each borrower has a health ratio, defined as

$$HF = \frac{\text{Collateral Value} \times \text{Liquidation Threshold}}{\text{Borrowed Value}}$$

- If $HF < 1$, the collateral assets are eligible for liquidation

Decentralized Leverage

- **Risky investors** use these overcollateralized loans to take leveraged positions on crypto assets (BTC, ETH, ...)



DeFi Rates

DeFi lending rates are set automatically, based on the **utilization rate**

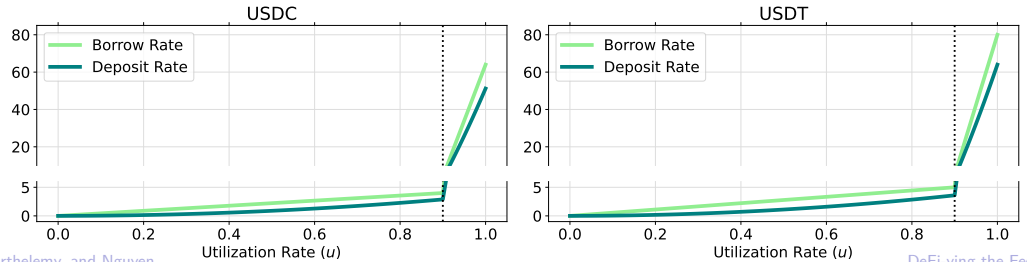
$$u = B/S = \text{Borrowed amount/Supplied amount}$$

Borrow Rate:

$$f(u) = \begin{cases} \alpha + \beta \frac{u}{\bar{u}} & \text{if } u < \bar{u} \\ \alpha + \beta + \beta' \frac{u - \bar{u}}{1 - \bar{u}} & \text{if } u \geq \bar{u} \end{cases}$$

In Aave V3, $\alpha = 0$ and $\beta = 0.065$ $\beta' = 0.2$

Deposit Rate: $u \cdot f(u)$



A Simple Model of MP passthrough to DeFi rates

Environment in a nutshell

- Two dates: $t \in \{0, 1\}$
- The risk-free rate is denoted by $\rho^\star$
- Two types of investors: **liquidity providers** (LPs) and **risky investors**
- Two digital assets: a **risky crypto-asset** ($\mathcal{N}(\rho_U, \sigma_U)$) and a **stablecoin**
- A DeFi protocol: lending and borrowing stablecoin
- LPs deposit a quantity S and face an opportunity cost $\rho^\star$
- Risky investors borrow a share of these tokens B
- Defi lending rate is $uf(u)$ with $u = B/S$ and borrowing rate $f(u)$

Model - Supply and Demand Equations

Liquidity Providers

$$\max_{S \geq 0} \quad (uf(u) - \theta\psi - \rho^\star)S - \frac{\theta(1-\theta)}{2}\gamma\psi^2 S^2$$

Implying the supply curve:

$$S = \max\left\{0;\ \frac{uf(u) - \rho^\star - \theta\psi}{\theta(1-\theta)\gamma\psi^2}\right\}$$

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Risky Investors

$$\max_{U,B \geq 0} \quad (1 + \rho_U(\rho^\star))U - (1 + f(u))B - (1+\rho^\star)W' - \frac{\gamma'}{2}\sigma_U^2 U^2$$

s.t. $W' + B \geq U, \quad (1 - h_U)U \geq B$

Implying the demand curve:

$$S = \frac{1}{u}\min\left\{\frac{\rho_U(\rho^\star) - f(u)}{\gamma'\sigma_U^2} - W';\ \frac{1-h_U}{h_U}W'\right\}$$

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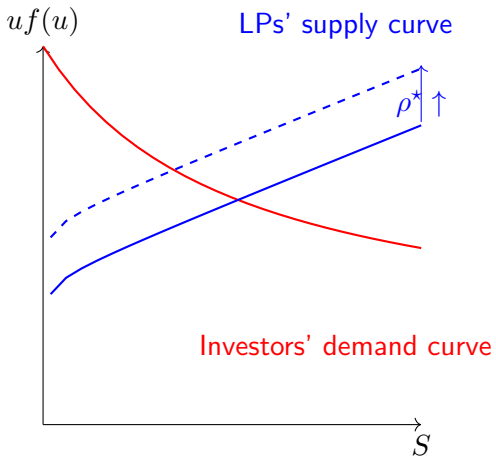
The unique interior equilibrium satisfies

$$\frac{uf(u) - \rho^\star - \theta\psi}{\theta(1-\theta)\gamma\psi^2} = \frac{1}{u} \cdot \frac{\rho_U(\rho^\star) - f(u) - W'\gamma'\sigma_U^2}{\gamma'\sigma_U^2}$$

Two Monetary Policy Transmission Channels

Arbitrage

$\partial \rho_U / \partial \rho^\star = 0$



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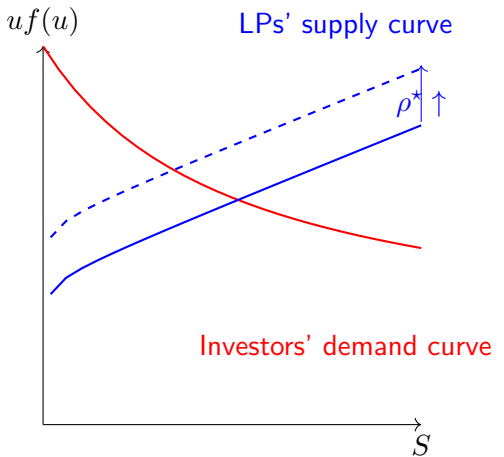
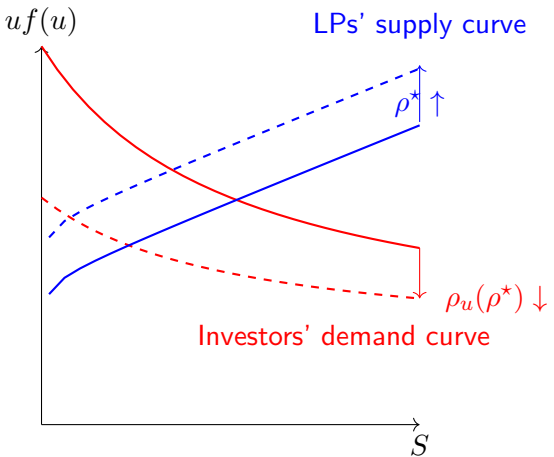


Arbitrage and Leverage
$\partial \rho_U / \partial \rho^\star < 0$



Model - Determinants of DeFi spread

MP Passthrough to stablecoin rate is higher when

- Demand for leverage does not decrease too much with Fed's rates
- LP concentration is high (extension)
- Transaction fees are low (extension)

Other determinants

- Additional risks faced by LPs (liquidation risks)
- Exogenous fluctuations in demand for leverage

Data & Empirical Strategies

- Blockchain data for 3 stablecoins (USDT, USDC, and DAI) on Ethereum
- Transactions are gathered from the AAVE v2 Lending Pool and the AAVE v3 Pool smart contracts
  - (i) **Deposit** and **Withdraw** transactions, which we use to reconstruct the historical levels of liquidity deposited in the protocol for each stablecoin
  - (ii) **Borrow** and **Repay** transactions, to reproduce the historical outstanding borrowed amounts by stablecoin
- We have more than 2.5M transactions, from May 2021 to May 2025
- Prices of ETH and BTC call and put options from *tardis.dev*

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Three empirical strategies: event study, panel regression, local projection.

Event Study

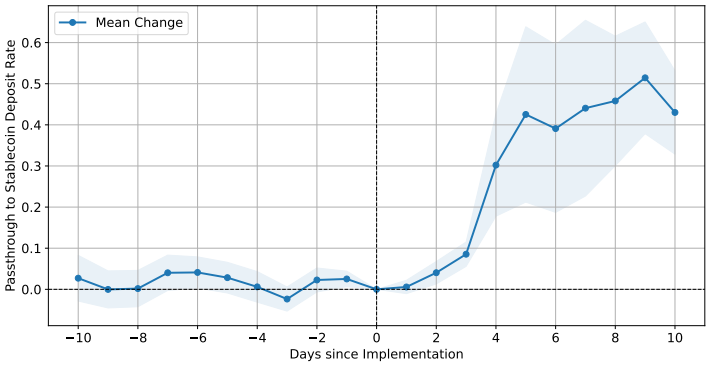

Figure: **Event study around Fed policy rate hikes**

Panel Regression

$$\begin{aligned}\text{DeFi Rate}_{ct} &= \alpha_c + \beta\,\text{Risk-free}_{ct} \\ &+ \gamma_1\,\text{LiqRisk}_{ct} + \gamma_2\,\mathbf{X}_{ct}^{\text{crypto}} + \gamma_3\,\mathbf{X}_{ct}^{\text{equity}} \\ &+ \delta\,\text{DeFi Rate}_{c,t-1} + \epsilon_{ct}\end{aligned}$$

- $\mathbf{X}_{ct}^{\text{crypto}}$: BTC Price, BTC Volatility, BTC Momentum, Gas Price
- $\mathbf{X}_{ct}^{\text{equity}}$: S&P Return, S&P Volatility, S&P Momentum, Inflation Swap, VIX
- Risk-free rate: the SOFR rate (robust to other rates)

Panel Regression - Main Results

	(1)
Dep. Variable	DeFi Rate
Risk-free	0.09
	(1.19)
Liquidation Risk	
Crypto Controls	
Market Controls	
Deposit Rate (t-1)	
Intercept	4.09***
	(13.91)
Observations	4,812
R-squared	0.00
SEs clustering	Coin and Day

Panel Regression - Main Results

	(1)	(2)
Dep. Variable	DeFi Rate	DeFi Rate
Risk-free	0.09	0.61***
	(1.19)	(12.33)
Liquidation Risk		0.08***
		(7.68)
Crypto Controls		
Market Controls		
Deposit Rate (t-1)		
Intercept	4.09***	-3.50***
	(13.91)	(-7.86)
Observations	4,812	4,812
R-squared	0.00	0.05
SEs clustering	Coin and Day	Coin and Day

Panel Regression - Main Results

	(1)	(2)	(3)
Dep. Variable	DeFi Rate	DeFi Rate	DeFi Rate
Risk-free	0.09	0.61***	0.79***
	(1.19)	(12.33)	(21.49)
Liquidation Risk		0.08***	0.04***
		(7.68)	(4.50)
Crypto Controls			Yes
Market Controls			
Deposit Rate (t-1)			
Intercept	4.09***	-3.50***	-4.14***
	(13.91)	(-7.86)	(-11.70)
Observations	4,812	4,812	4,812
R-squared	0.00	0.05	0.31
SEs clustering	Coin and Day	Coin and Day	Coin and Day

Panel Regression - Main Results

	(1)	(2)	(3)	(4)
Dep. Variable	DeFi Rate	DeFi Rate	DeFi Rate	DeFi Rate
Risk-free	0.09	0.61***	0.79***	0.67***
	(1.19)	(12.33)	(21.49)	(19.53)
Liquidation Risk		0.08***	0.04***	0.07***
		(7.68)	(4.50)	(11.08)
Crypto Controls			Yes	Yes
Market Controls				Yes
Deposit Rate (t-1)				
Intercept	4.09***	-3.50***	-4.14***	-7.79***
	(13.91)	(-7.86)	(-11.70)	(-7.50)
Observations	4,812	4,812	4,812	4,812
R-squared	0.00	0.05	0.31	0.37
SEs clustering	Coin and Day	Coin and Day	Coin and Day	Coin and Day

Panel Regression - Main Results

	(1)	(2)	(3)	(4)	(5)
Dep. Variable	DeFi Rate	DeFi Rate	DeFi Rate	DeFi Rate	DeFi Rate
Risk-free	0.09	0.61***	0.79***	0.67***	0.31***
	(1.19)	(12.33)	(21.49)	(19.53)	(6.43)
Liquidation Risk		0.08***	0.04***	0.07***	0.03***
		(7.68)	(4.50)	(11.08)	(3.50)
Crypto Controls			Yes	Yes	Yes
Market Controls				Yes	Yes
Deposit Rate (t-1)					0.55***
					(7.42)
Intercept	4.09***	-3.50***	-4.14***	-7.79***	-3.47***
	(13.91)	(-7.86)	(-11.70)	(-7.50)	(-5.11)
Observations	4,812	4,812	4,812	4,812	4,812
R-squared	0.00	0.05	0.31	0.37	0.56
SEs clustering	Coin and Day	Coin and Day	Coin and Day	Coin and Day	Coin and Day

Local Projections

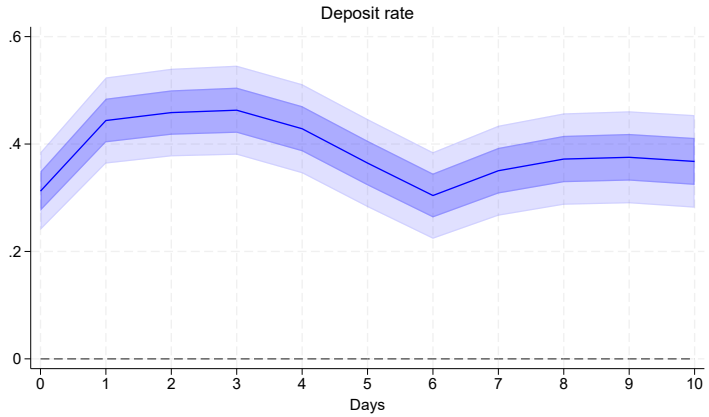

Figure: **Impulse responses of DeFi deposit rates to a 1pp shock in the risk-free rate proxied by SOFR.** The panels show impulse responses estimated using local projections with a 10-day horizon.

Passthrough Heterogeneity - Possible Factors

Possible factors affecting the passthrough:

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- **Risks / Hacks**
  Proxy: Top decile of the daily distribution of the U.S. dollar value stolen from DeFi platforms by malicious actors. Source DefiLlama.

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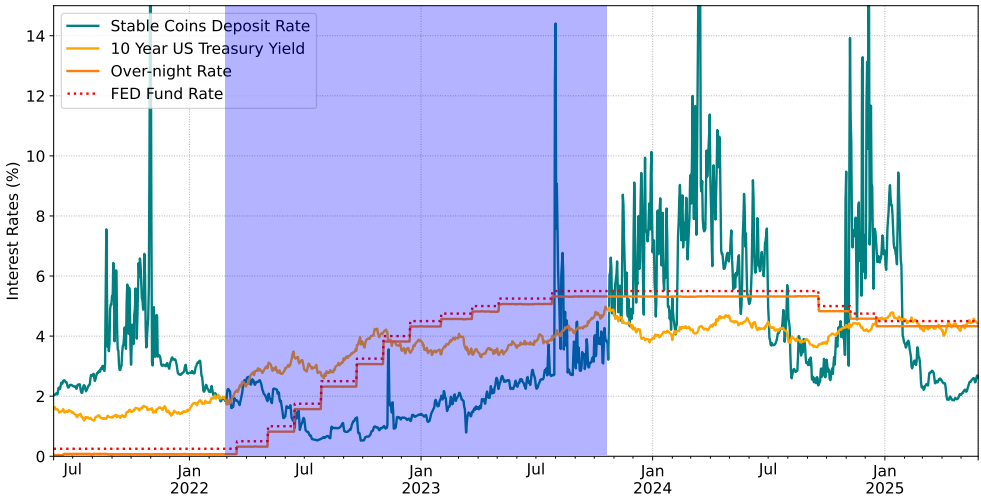
Method: Interact risk-free rate and each factor

Passthrough Heterogeneity - Results

	(1)	(2)	(3)	(4)
Dep. Variable	DeFi Rate	DeFi Rate	DeFi Rate	DeFi Rate
Risk-free	0.31***	0.31***	0.33***	0.31***
	(6.43)	(6.68)	(8.13)	(6.26)
Risk-free × High-Concentration		0.11*		
		(1.67)		
High-Concentration		0.04		
		(0.74)		
Risk-free × High-Gas			-0.32***	
			(-3.07)	
High-Gas			-0.36	
			(-1.28)	
Risk-free × High-Hacking				-0.09***
				(-2.85)
High-Hacking				-0.09
				-(0.56)

Why are DeFi rates lower than the risk-free rate?



Agents Heterogeneity - TradFy Friction

- We introduce a **friction** to explain periods with DeFi rates lower than the risk-free
- We assume a fraction μ of LPs has to pay a tax τ to move from DeFi to TradFi
- Further, τ is heterogeneous across the constrained agents
- Solving for the supply curve under this friction, we get that:
  1. It is possible to observe $\rho < \rho^\star$ for prolonged periods
     (some LPs prefer to keep lending rather than getting the tax-adjusted risk-free)
  2. During periods with $\rho < \rho^\star$, the passthrough of monetary policy is positive but smaller in magnitude (for the same reason as above)

Agents Heterogeneity - Main Results

	(1)	(2)	(3)	(4)	(5)	(6)
Dep. Variable	Deposit Rate	Deposit Rate	Deposit Rate	Deposit Rate	Deposit Rate	Deposit Rate
Subset	$\rho < \rho^{\star}$	$\rho > \rho^{\star}$	$\rho < \rho^{\star}$	$\rho > \rho^{\star}$	$\rho < \rho^{\star}$	$\rho > \rho^{\star}$
Risk-free	0.29***	1.05***	0.34***	0.97***	0.31***	0.96***
	(4.48)	(7.36)	(4.91)	(6.34)	(3.62)	(7.73)
Liquidation Risk	Yes	Yes	Yes	Yes	Yes	Yes
Crypto Controls			Yes	Yes	Yes	Yes
Market Controls					Yes	Yes
Deposit Rate (t-1)	0.28***	0.47***	0.28***	0.41***	0.25***	0.41***
	(5.63)	(4.96)	(5.78)	(4.87)	(4.85)	(4.77)
Intercept	0.71***	-0.53***	0.28	-1.89***	-2.39**	-1.61*
	(2.68)	(-3.06)	(0.67)	(-5.83)	(-2.56)	(-1.76)
Observations	2,293	2,519	2,293	2,519	2,293	2,519
R-squared	0.74	0.49	0.74	0.51	0.77	0.52
SEs clustering:	Coin and Day	Coin and Day	Coin and Day	Coin and Day	Coin and Day	Coin and Day

Leverage Demand

- How can we explain those large spikes in the DeFi rates?
- As noted, DeFi lending is mainly used to take leverage
- If demand for leverage moves and supply does not react immediately, this could lead to high volatility in DeFi rates
- We construct a proxy for the intensity of leverage demand using perpetual futures (from Binance)
- Those are determined by relative demand for long and short positions

Leverage Demand - Results

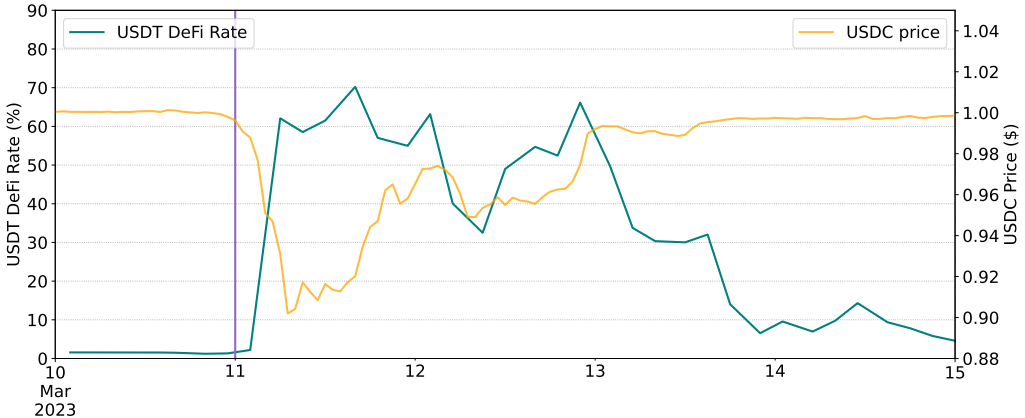
	(1)	(2)	(3)	(4)
Dep. Variable	DeFi Rate	DeFi Rate	DeFi Rate	DeFi Rate
Risk-free	0.24***	0.26***	0.22***	0.21***
	(5.32)	(6.52)	(6.08)	(5.48)
BTC Funding Rate	0.01***			
	(5.03)			
ETH Funding Rate		0.01***		
		(3.25)		
BTC Funding Rate (lagged)			0.02***	
			(5.81)	
ETH Funding Rate (lagged)				0.02***
				(7.15)
Deposit Rate (t-1)	0.54***	0.54***	0.53***	0.53***
	(7.26)	(7.17)	(7.10)	(7.26)
Intercept	-2.49***	-3.04***	-2.39***	-2.67***
	(-4.22)	(-4.93)	(-4.67)	(-4.89)

DeFi Rates are increasing in leverage demand

Silicon Valley Bank

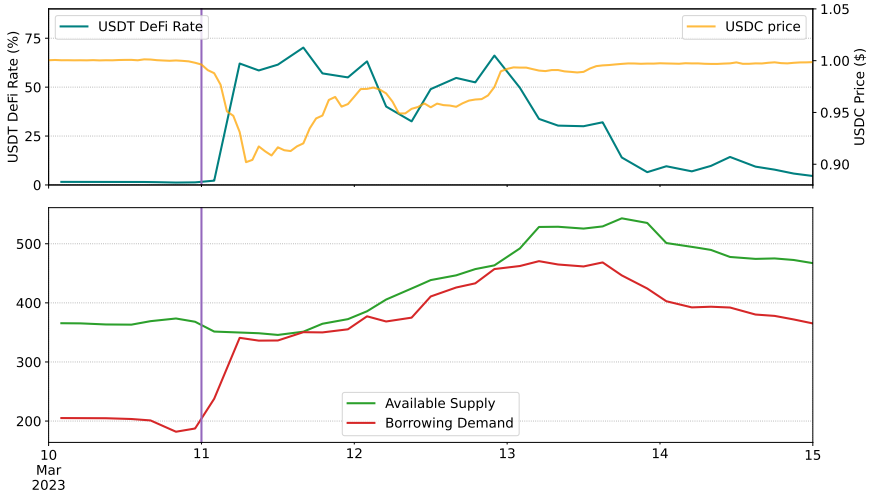
- In March 2023, the meltdown of SVB caused a temporary de-peg of USD**C**
- We use this event as an exogenous shock to leverage demand for USD**T**

Silicon Valley Bank



- DeFi rate for USDT jumped to 70% following a large demand shock

Silicon Valley Bank – Continued



- The demand shock is absorbed over time as supply adjusts slowly

Sticky adjustments in DeFi - The role of gas prices

Decay Time of Spread

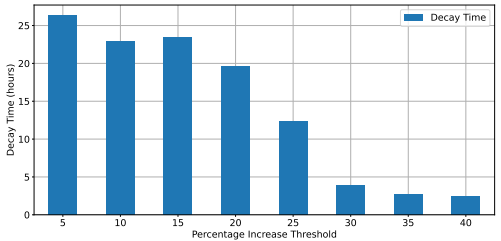


Figure: **Spread Decay:** Average hours needed for the DeFi/risk-free spread exceeding X pps to fall below X pps.

Gas Fees and Spread Persistence

Table: Regression of spread decay time (in hours) on average gas prices during the decay window. Columns report results for different spread thresholds k, including estimated coefficients (β) and R^2 values.

	Threshold	Beta	p-value	R2
0	5%	0.69***	0.00	33%
1	10%	0.38***	0.00	35%
2	15%	0.37***	0.00	50%
3	20%	0.23***	0.00	51%
4	25%	0.12***	0.00	33%
5	30%	0.03*	0.03	10%
6	35%	-0.00	0.93	0%
7	40%	-0.03	0.53	4%

Conclusion

- **Monetary policy is partially transmitted to DeFi rates**
  - Short-run passthrough is 0.3 / long-run between 0.5-0.7
  - But DeFi rates are driven also by other (crypto-related) factors
  - Limiting participation to TradFi creates a friction that impedes monetary policy pass-through
  - Supply appears not sufficiently reactive to large demand shocks

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  - But DeFi rates are driven also by other (crypto-related) factors
  - Limiting participation to TradFi creates a friction that impedes monetary policy pass-through
  - Supply appears not sufficiently reactive to large demand shocks
- **Does it Matter for Monetary Policy?**
  - At the current size of the stablecoin market probably not
  - May become more important if stablecoins are massively adopted
  - Tokenization of Real world assets (like tokenized funds, T-bills) & larger LPs may improve the passthrough and reduce large and persistent spreads

Thanks for your attention!