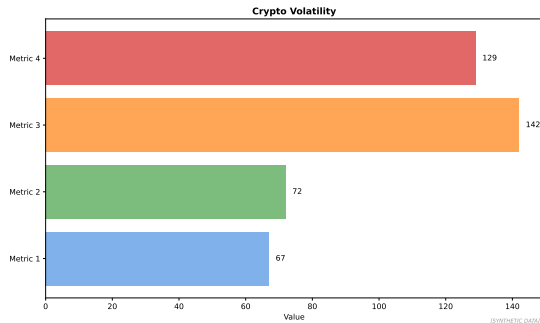


## Lesson 22: Stablecoins and Terra/Luna Case Study

### Module 2: Blockchain Fundamentals

Digital Finance

# The Volatility Problem



## Challenge:

- BTC, ETH too volatile for everyday transactions
- Cannot price goods, pay salaries, or lend in volatile assets
- Need stable unit of account

**Solution:** Stablecoins – cryptocurrencies pegged to stable assets (typically USD)

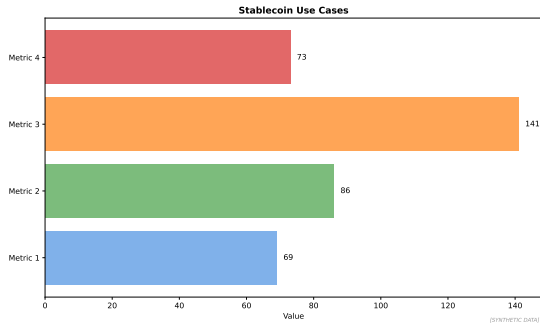
# What is a Stablecoin?

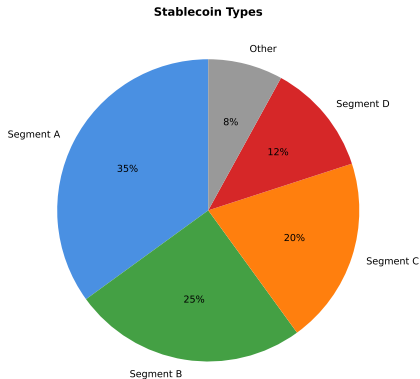
## Definition:

- Cryptocurrency designed to maintain stable value
- Typically pegged 1:1 to fiat (USD, EUR)
- Combines crypto benefits with price stability

## Use Cases:

- Medium of exchange
- Store of value (short-term)
- DeFi collateral
- Trading pairs (BTC/USDT)
- Remittances





[SYNTHETIC DATA]

## Three Main Types:

- ❶ **Fiat-Collateralized:** Backed by USD reserves (USDT, USDC)
- ❷ **Crypto-Collateralized:** Over-collateralized with crypto (DAI)
- ❸ **Algorithmic:** No collateral, algorithmic supply adjustment (UST – failed)

# Fiat-Collateralized: Tether (USDT)

## Mechanism:

- 1 USDT = **\$1** in bank reserves
- Custodian holds fiat
- Users trust issuer's solvency
- Mint: Deposit **\$1** → receive 1 USDT
- Redeem: Burn 1 USDT → receive **\$1**

## Challenges:

- Centralization (single point of failure)
- Audit transparency (Tether controversy)
- Regulatory compliance

Fiat Collateralized Flow



[SYNTHETIC DATA]

# Tether Controversy: Are Reserves Real?

## Claims:

- Tether claims 1:1 backing since 2014
- Market cap: \$100B+ (2024)

## Controversies:

- Lack of audits (only attestations, not full audits)
- NYAG investigation (2021): Admitted reserves not fully in cash (commercial paper, crypto)
- \$41M settlement, barred from New York trading
- 2024 breakdown: ~85% T-bills, ~10% repo, ~5% other

**Risk:** Bank run scenario – if everyone redeems simultaneously, can Tether honor?

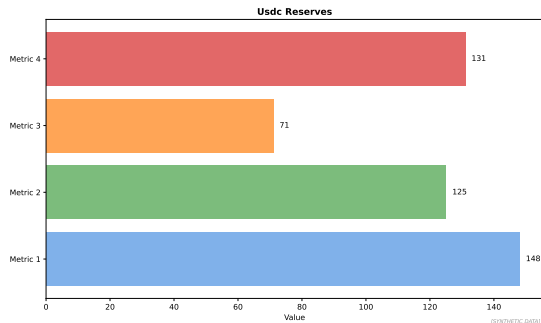
# USDC: Regulated Alternative

## Circle (issuer):

- US-based, regulated
- Monthly audits (Grant Thornton)
- 100% reserves (cash + short-term Treasuries)
- Transparency dashboard

## Advantages:

- Higher trust (full audits)
- Institutional adoption
- Regulatory clarity



**2023 SVB Crisis:** \$3.3B stuck in Silicon Valley Bank (depegged to \$0.87 briefly, recovered)

Dai Mechanism



[SYNTHETIC DATA]

## Mechanism:

- 1 Deposit ETH (or other crypto) into Maker vault
- 2 Mint DAI (over-collateralized, e.g., 150% ratio)
- 3 If collateral drops below threshold, liquidated
- 4 To reclaim collateral, repay DAI + stability fee (interest)

**Decentralization:** No single custodian, governed by MKR token holders



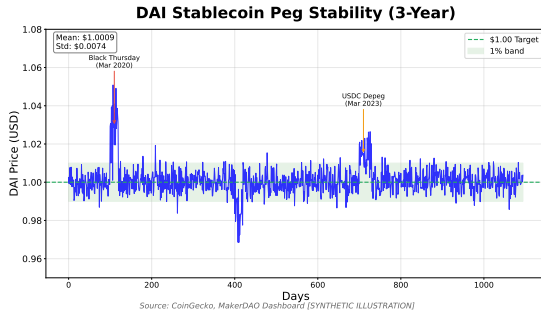
# DAI Stability Mechanisms

## Peg Maintenance:

- **DAI < \$1:** Raise stability fee (reduce supply)
- **DAI > \$1:** Lower stability fee (increase supply)
- **DAI Savings Rate (DSR):** Interest for holding DAI

## Collateral Types:

- ETH (primary)
- WBTC, USDC (centralized, controversy)
- Real-world assets (RWA)



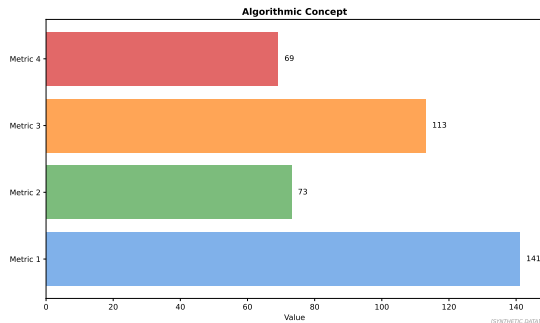
# Algorithmic Stablecoins: The Dream

## Vision:

- No collateral required
- Pure algorithmic supply/demand
- Fully decentralized
- Scalable without capital lock-up

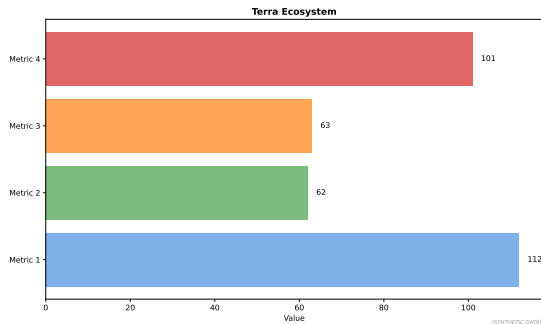
## Mechanisms:

- Rebase (Ampleforth): Change token supply
- Seigniorage (Basis, Empty Set): Issue/burn shares
- Dual-token (Terra/Luna): Arbitrage mechanism



**Reality:** All pure algorithmic stablecoins have failed (Basis, Iron, Terra)

# Terra/Luna: The \$60 Billion Collapse



## Ecosystem (Pre-Collapse):

- **UST:** Algorithmic stablecoin (target \$1)
- **LUNA:** Volatile token, absorbs UST volatility
- **Anchor Protocol:** 20% APY on UST deposits (unsustainable)
- **Market Cap (May 2022):** UST \$18B, LUNA \$40B

## Design:

- 1 UST always redeemable for \$1 worth of LUNA (protocol guarantee)
- Arbitrageurs maintain peg through minting/burning

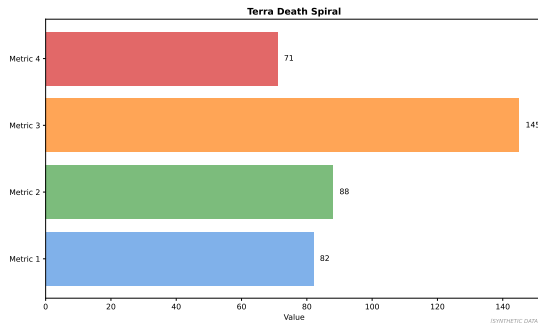
## Case 1: $UST < \$1$ (e.g., \$0.98)

- ① Buy 1 UST for \$0.98
- ② Burn 1 UST  $\rightarrow$  mint \$1 of LUNA
- ③ Sell LUNA for \$1
- ④ Profit: \$0.02 per UST (reduces UST supply, restores peg)

## Case 2: $UST > \$1$ (e.g., \$1.02)

- ① Burn \$1 of LUNA  $\rightarrow$  mint 1 UST
- ② Sell 1 UST for \$1.02
- ③ Profit: \$0.02 (increases UST supply, lowers price)

# The Death Spiral: May 2022



## Timeline:

- **May 7:** Large UST withdrawals from Anchor, slight depeg to \$0.98
- **May 8–9:** Panic selling, UST drops to \$0.60, LUNA minted to absorb
- **May 10–11:** Hyperinflation of LUNA (supply: 350M → 6.5T), price collapses
- **May 12:** UST at \$0.10, LUNA near \$0, blockchain halted

# Why Did Terra Collapse?

## Structural Flaws:

- **Ponzi Dynamics:** Anchor's 20% APY funded by LUNA inflation (unsustainable)
- **Circular Dependency:** UST backed by LUNA, LUNA value derived from UST demand
- **No External Collateral:** Pure faith-based system
- **Bank Run Vulnerability:** Confidence loss → redemptions → LUNA dilution → further confidence loss

## Trigger:

- \$2B UST withdrawn from Anchor (possibly coordinated attack)
- Luna Foundation Guard's \$3B BTC reserves insufficient to defend peg

**Aftermath:** \$60B market cap evaporated, lawsuits, Do Kwon (founder) arrested in Montenegro

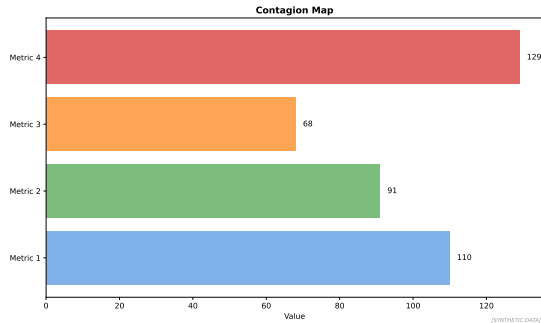
# Terra Collapse: Contagion Effects

## Direct Victims:

- Retail investors lost life savings
- South Korean adoption was high
- Pension funds, institutions exposed

## Broader Contagion:

- 3AC (Three Arrows Capital) hedge fund collapse (LUNA exposure)
- Celsius, Voyager bankruptcies (domino effect)
- Crypto market crash (2022 bear market)



- ❶ **No Free Lunch:** 20% risk-free yield is impossible sustainably
- ❷ **Algorithmic Stablecoins are Fragile:** Require continuous growth, vulnerable to bank runs
- ❸ **Circular Dependencies are Dangerous:** UST value depended on LUNA, LUNA on UST
- ❹ **Reserves Matter:** \$3B BTC reserves inadequate for \$18B stablecoin
- ❺ **Regulation Incoming:** Failures like Terra accelerate regulatory scrutiny
- ❻ **Hubris Warning:** Do Kwon's overconfidence ("I don't debate the poor") ignored critics

**Quote:** "If UST depegs, I will personally absorb the loss." – Do Kwon (didn't happen)



### Regulatory Push:

- US: Stablecoin legislation proposed (reserve requirements, audits)
- EU: MiCA regulation includes stablecoin provisions
- South Korea: Investigated Terra Foundation

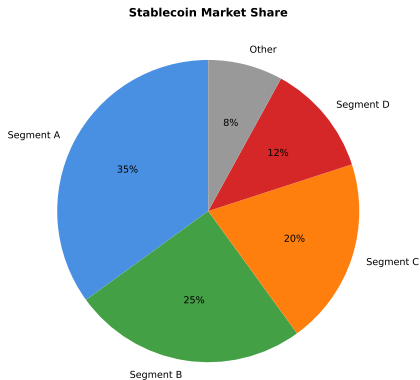
### Market Shift:

- Flight to regulated stablecoins (USDC, USDT)
- Algorithmic stablecoins lost trust (FEI, FRAX pivoted to collateralized)
- Increased scrutiny on DeFi yields

### Innovation:

- Frax: Hybrid model (partial collateral + algorithmic)
- GHO (Aave): Over-collateralized, DAO-governed
- LUSD (Liquity): Immutable, minimum 110% collateral

# Stablecoin Market Share (2024)



[SYNTHETIC DATA]

## Top Stablecoins:

- **USDT (Tether):** \$100B+ (65%)
- **USDC (Circle):** \$30B+ (20%)
- **DAI (MakerDAO):** \$5B (3%)
- **Others:** BUSD (deprecated), TUSD, FRAX, USDD

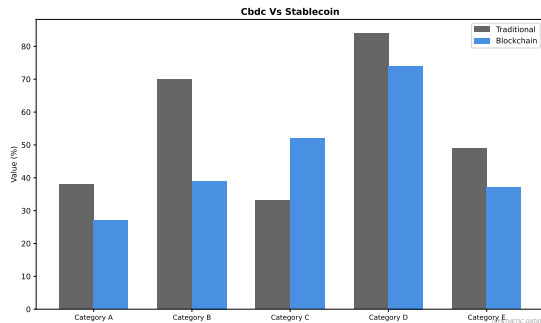
# Central Bank Digital Currencies (CBDCs)

## Concept:

- Government-issued digital currency
- Not a stablecoin (is the fiat itself)
- Centralized control
- Programmable money

## Examples:

- China: e-CNY (digital yuan)
- Bahamas: Sand Dollar (launched 2020)
- EU: Digital euro (pilot phase)
- US: Digital dollar (research)



**Concern:** Surveillance, programmable restrictions (e.g., expiry dates on money)

- **Stablecoins:** Crypto with stable value, essential for DeFi and payments
- **Fiat-Collateralized:** USDT/USDC, centralized, require trust in custodian
- **Crypto-Collateralized:** DAI, over-collateralized, decentralized but capital-inefficient
- **Algorithmic:** Terra/Luna, no collateral, death spiral vulnerability
- **Terra Collapse:** \$60B lost, Ponzi dynamics (Anchor 20%), circular dependency
- **Lessons:** Unsustainable yields, importance of real reserves, regulatory response

**Next Lesson:** Security and hacks – reentrancy, bridge exploits, best practices