

L39: Case Study - Terra/Luna Collapse

Module E: DeFi Ecosystem

Blockchain & Cryptocurrency

December 2025

- Understand the Terra/Luna mechanism (UST stablecoin + LUNA token)
- Analyze the Anchor Protocol's 20% APY promise
- Trace the death spiral timeline (May 2022)
- Identify systemic risks and warning signs
- Extract lessons for DeFi stability and sustainability

Key Components:

- **UST (TerraUSD):** Algorithmic stablecoin pegged to \$1
- **LUNA:** Native token of Terra blockchain, used to stabilize UST
- **Anchor Protocol:** Lending platform offering 20% APY on UST deposits
- **Terra Blockchain:** Layer 1 built on Cosmos SDK

Creator: Do Kwon (Terraform Labs)

Peak Market Cap (April 2022):

- UST: \$18 billion
- LUNA: \$40 billion
- Combined: \$58 billion ecosystem

Collapse (May 2022): Both UST and LUNA went to near-zero in 72 hours.

The UST-LUNA Mechanism

Algorithmic Stability: UST maintains \$1 peg through arbitrage with LUNA.

Mechanism:

- 1 **Mint UST:** Burn \$1 of LUNA, mint 1 UST
- 2 **Burn UST:** Burn 1 UST, mint \$1 of LUNA

Arbitrage Examples:

If UST > \$1 (e.g., \$1.05):

- Burn \$1 LUNA, mint 1 UST
- Sell 1 UST for \$1.05
- Profit: \$0.05 per UST
- Effect: UST supply increases, price falls back to \$1

If UST < \$1 (e.g., \$0.95):

- Buy 1 UST for \$0.95
- Burn 1 UST, mint \$1 LUNA
- Profit: \$0.05 per UST
- Effect: UST supply decreases, price rises back to \$1

Problem: Mechanism only works if LUNA has value.

Death Spiral Logic:

- 1 UST depegs below \$1 (e.g., \$0.90)
- 2 Arbitrageurs burn UST, mint LUNA
- 3 Massive LUNA supply increase (dilution)
- 4 LUNA price crashes
- 5 Confidence in UST collapses (if LUNA worthless, UST unbacked)
- 6 More UST selling, deeper depeg
- 7 Cycle repeats, accelerating downward

Analogy: Like a central bank defending currency by printing more currency (hyperinflation).

Critical Insight: Pure algorithmic stablecoins have no demand floor. Once confidence breaks, irrecoverable.

Anchor Protocol: The 20% APY Trap

Promise: Earn 20% APY by depositing UST.

How It Worked:

- Users deposit UST into Anchor
- Anchor lends UST to borrowers (collateralized by staked LUNA, ETH)
- Borrowers pay interest (10-15%)
- **Gap:** Anchor subsidized difference to reach 20% (unsustainable)

Subsidy Source:

- Terraform Labs treasury (LUNA token sales)
- Yield Reserve (depleting over time)

Red Flag:

- Yield reserve burning \$50-100M per month
- Projected to run out by mid-2022
- Community votes to reduce APY rejected

Why 20% APY Was Unsustainable

Math Doesn't Add Up:

Anchor's Revenue:

- Borrow interest: 12% APY on \$4B borrowed = \$480M/year
- Other income: Minimal

Anchor's Expenses:

- Deposit interest: 20% APY on \$14B deposited = \$2.8B/year

Annual Deficit:

$$\$2.8B - \$480M = \$2.32B \text{ shortfall}$$

Conclusion: Anchor was a Ponzi-like scheme. New deposits paid old depositors until subsidy ran out.

Warning Sign: No sustainable business model can pay 20% in a low-rate environment.

Timeline: The Collapse (May 7-12, 2022)

May 7-8: Initial Depeg

- Large UST withdrawals from Anchor (\$2B+ in 48 hours)
- Curve 3pool (UST/USDC/USDT) imbalanced
- UST briefly drops to \$0.98

May 9: Panic Begins

- UST falls to \$0.92
- \$1B UST burned, minting billions of LUNA
- LUNA price drops 30% (\$80 → \$60)

May 10: Death Spiral Accelerates

- UST at \$0.60
- LUNA supply balloons (100M → 1B tokens in hours)
- LUNA price collapses (\$60 → \$1)

May 11-12: Total Collapse

- UST at \$0.10, then \$0.01
- LUNA at \$0.0001 (6.5 trillion tokens in circulation)
- Terra blockchain halted

The Numbers: Destruction of Value

Pre-Collapse (Early May 2022):

- UST market cap: \$18B
- LUNA market cap: \$40B
- Anchor deposits: \$14B
- Total ecosystem: \$60B

Post-Collapse (Mid-May 2022):

- UST value: \$0 (99%+ loss)
- LUNA value: \$0 (99.9%+ loss)
- Estimated losses: \$40B+ (investors, users, protocols)

Casualties:

- Retail investors: Life savings wiped out
- VCs: Jump Crypto, Three Arrows Capital (3AC later collapsed)
- DeFi protocols: Many held UST reserves, suffered losses

Luna Foundation Guard (LFG):

- Reserve fund created to defend UST peg
- Raised \$3B+ in Bitcoin, AVAX, other assets

Plan:

- If UST depegs, sell BTC to buy UST (support price)

Reality (May 2022):

- LFG deployed \$1.5B BTC to buy UST
- Ineffective: Death spiral too fast
- Lost most of the BTC (sold near bottom)
- Remaining reserves (~\$100M) insufficient

Lesson: Finite reserves cannot defend algorithmic peg under mass panic. Only collateralization works.

Three Arrows Capital (3AC) Contagion

Connection:

- 3AC was major LUNA investor
- Held billions in LUNA tokens

Cascade:

- 1 LUNA collapses (May 2022)
- 2 3AC's collateral (LUNA) becomes worthless
- 3 3AC fails to meet margin calls on other loans
- 4 Lenders (BlockFi, Celsius, Voyager) take massive losses
- 5 3AC declares bankruptcy (July 2022)
- 6 CeFi contagion spreads: Celsius, Voyager, BlockFi all fail

Impact: Terra collapse triggered \$200B+ broader crypto crash, multiple bankruptcies.

Lesson: Interconnected leverage amplifies failures. Terra was the first domino.

Quotes (Pre-Collapse):

- “I don't debate the poor.” (Twitter, responding to critics)
- “95% of stablecoins will fail, UST will win.”
- “Algorithmic stablecoins are the future of money.”

Behavior:

- Dismissed warnings from economists, DeFi experts
- Aggressive marketing (“Lunatics” community)
- Promised unrealistic yields (20% Anchor)

Legal Aftermath:

- SEC charged Do Kwon with fraud (2023)
- Interpol arrest warrant issued
- Arrested in Montenegro (March 2023)
- Facing extradition to US or South Korea

Charges: Securities fraud, misleading investors, market manipulation.

Red Flags That Were Ignored:

- ❶ **Unsustainable Yield**
 - 20% APY with no underlying revenue
- ❷ **Algorithmic Design Flaw**
 - No collateral backing, death spiral risk
- ❸ **Concentration Risk**
 - \$14B of \$18B UST locked in Anchor (78%)
- ❹ **Hubris and Dismissiveness**
 - Founder ignored criticism, attacked skeptics
- ❺ **Rapid Growth**
 - UST grew from \$2B to \$18B in 6 months (too fast)
- ❻ **Lack of Stress Testing**
 - No proven resilience during market downturns

For Investors:

- Beware of unsustainable yields (\neq 10% on stablecoins)
- Algorithmic stablecoins are experimental and risky
- Diversify across stablecoin types (don't go all-in on one)
- Hubris and dismissiveness are red flags

For Protocols:

- Overcollateralization is necessary for stability
- Stress test designs under extreme scenarios
- Don't rely on perpetual growth for sustainability
- Transparency and humility attract trust

For Regulators:

- Algorithmic stablecoins pose systemic risk
- Consider reserve requirements for stablecoins
- Protect retail investors from Ponzi-like yields

Why did DAI survive while UST collapsed?

UST (Failed)

- No collateral
- Pure algorithm
- Relied on LUNA value
- Death spiral possible
- Unsustainable yield (Anchor)

DAI (Survived)

- 150%+ overcollateralization
- Backed by ETH, USDC, etc.
- Independent of one token
- Liquidations prevent death spiral
- No unrealistic yield promises

Key Difference: Collateral provides demand floor. If DAI \downarrow \$1, arbitrageurs buy DAI to repay vaults profitably.

Conclusion: Overcollateralization is inefficient but necessary for stability.

Post-Collapse Plan (May 2022):

- Abandon UST (stablecoin)
- Relaunch Terra blockchain as “Terra 2.0”
- New LUNA token (non-algorithmic)
- Airdrop to UST/LUNA holders (compensation attempt)

Result:

- Terra 2.0 launched with minimal adoption
- New LUNA price: \$6 → \$0.50 (within months)
- Community fractured, trust destroyed
- Ecosystem projects migrated to other chains

Lesson: Trust, once broken, is nearly impossible to rebuild. Rebranding doesn't erase history.

US Response:

- SEC charged Do Kwon with fraud
- Hearings on stablecoin regulation
- Proposed legislation requiring reserve backing

Global Response:

- South Korea: Investigation into Terraform Labs
- Singapore: Tightened crypto regulations
- EU MiCA: Included stablecoin reserve requirements

Industry Impact:

- Algorithmic stablecoins largely abandoned
- FRAX increased collateral ratio to 100%
- Focus shifted to fiat-backed and overcollateralized models

Long-term: Terra collapse accelerated stablecoin regulation worldwide.

Why Did People Believe?

1 Greed

- 20% APY too attractive to pass up

2 FOMO

- Fear of missing out on “next big thing”

3 Herd Mentality

- Everyone else was buying (social proof)

4 Confirmation Bias

- Ignored critics, only listened to bulls

5 Complexity

- Most users didn't understand the mechanism

6 Charismatic Leader

- Do Kwon's confidence was persuasive

Lesson: Always question high yields. If it sounds too good to be true, it probably is.

Comparison: Terra vs. Traditional Bank Run

Traditional Bank Run

- Fractional reserves (10% capital)
- FDIC insurance (\$250k/account)
- Central bank lender of last resort
- Slow (days to withdraw)
- Government can freeze

Terra Death Spiral

- Zero reserves (algorithmic)
- No insurance
- No lender of last resort
- Instant (blockchain speed)
- Unstoppable (permissionless)

Key Difference: Traditional finance has circuit breakers. DeFi operates 24/7 with no pause button.

Implication: DeFi failures can be faster and more catastrophic, but also more transparent.

Key Takeaways:

- Terra/Luna was \$60B algorithmic stablecoin experiment that collapsed in May 2022
- UST-LUNA mechanism relied on arbitrage but had no collateral backing
- Anchor's 20% APY was unsustainable Ponzi-like scheme
- Death spiral: UST depeg → LUNA hyperinflation → total collapse
- \$40B+ value destroyed, triggering broader crypto contagion (3AC, Celsius)
- Lessons: Beware unsustainable yields, algorithmic stablecoins need collateral
- Regulatory response: Accelerated stablecoin regulation globally

Next Lecture: Lab - Testnet Lending (hands-on with Aave, safe overcollateralized model).

- ❶ What structural difference between DAI and UST prevented DAI from collapsing?
- ❷ Could the Bitcoin reserve have saved UST if it were larger (e.g., \$20B)?
- ❸ Why did Anchor's 20% APY attract deposits despite being unsustainable?
- ❹ How could regulators have prevented Terra collapse without banning innovation?
- ❺ Would you invest in a new algorithmic stablecoin if it had better design?