

A11: Cryptoeconomic Failure Analysis

Dissecting Real-World Events with Game Theory

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Learning Objectives

- Reconstruct timelines of major crypto failures
- Identify mechanism design flaws using game theory
- Analyze rational actor behavior in systemic collapse
- Propose concrete mechanism improvements

Assignment Details

- Time: 45 + 5 min presentation
- Format: Individual or pairs
- Difficulty: Medium
- Points: 10

Grading Breakdown

- Timeline accuracy: 2 pts
- Root cause analysis: 3 pts
- Mechanism improvements: 3 pts
- Presentation clarity: 2 pts

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A11:

Choose Your Event: Three Crypto Failures

Terra/Luna

May 2022

Algorithmic stablecoin
death spiral

\$40B destroyed

Key concept:
Reflexive token design,
incentive compatibility

FTX Collapse

Nov 2022

Centralized exchange
fraud & bank run

\$32B destroyed

Key concept:
Principal-agent,
moral hazard

The DAO Hack

Jun 2016

Reentrancy exploit
governance crisis

\$60M stolen

Key concept:
Incomplete contracts,
commitment devices

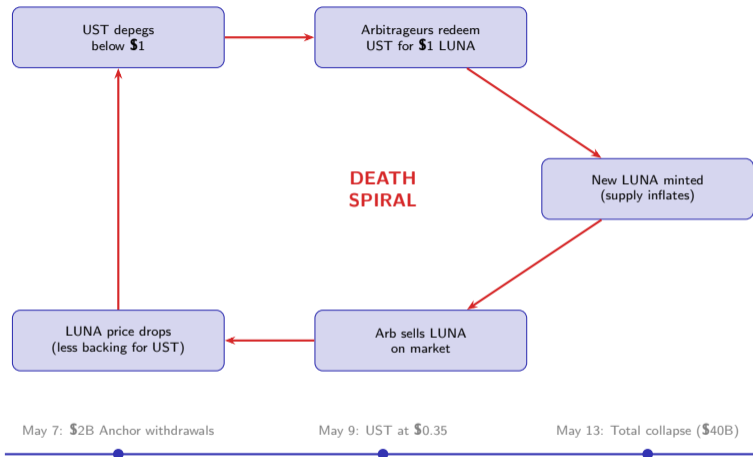
Your Task

Choose **one** event. Reconstruct the timeline, identify the mechanism design flaw using L07 concepts, and propose 2 improvements.

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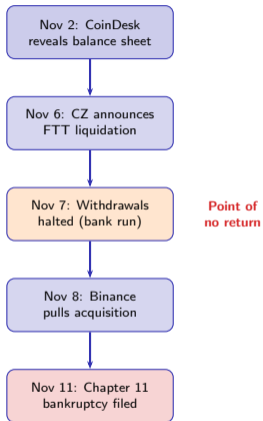
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Terra/Luna: The Death Spiral Mechanism



Key Insight

The mint-burn mechanism was **reflexive**: UST stability depended on LUNA value, and LUNA value depended on UST demand. When confidence broke, the stabilization mechanism accelerated collapse.



Payoff Matrix (Simplified)

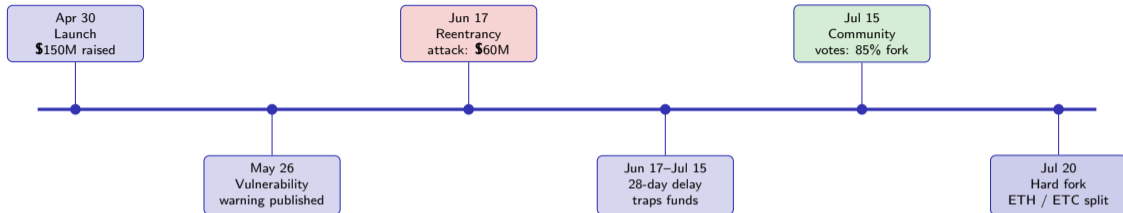
	Others Hold	Others Run
Hold	Keep funds	Lose all
Withdraw	Keep funds	Keep funds

Withdraw is a **dominant strategy**: you keep your funds regardless of what others do. Bank run is Nash equilibrium.

Core Failure

- **Principal-agent problem**: FTX custodied funds with no oversight
- **Moral hazard**: Alameda used deposits for risky trades
- **No mechanism** prevented misuse

The DAO: Code Is Law vs. Community Governance



Mechanism Design Flaws

- Reentrancy: external call before state update
- No emergency pause mechanism
- Governance too slow for security response
- 3-week warning ignored (cheap talk)

The Governance Dilemma

- **“Code is law”**: the exploit followed the code, so the attacker did nothing “wrong”
- **Community override**: 85% voted to reverse, prioritizing intent over execution
- **Result**: permanent chain split (ETH vs. ETC)

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Game Theory Toolkit

- **Nash Equilibrium:** No player can improve by unilaterally changing strategy
- **Dominant Strategy:** Best response regardless of others' actions
- **Prisoner's Dilemma:** Individual rationality → collective harm
- **Coordination Game:** Multiple equilibria; outcome depends on expectations

Mechanism Design Toolkit

- **Incentive Compatibility:** Does the mechanism reward truthful/desired behavior?
- **Commitment Devices:** Mechanisms that make promises credible
- **Moral Hazard:** Hidden actions by agents exploiting information asymmetry
- **Adverse Selection:** Hidden information attracts bad actors

Questions to Ask

- Was collapse a Nash equilibrium?
- What was each actor's dominant strategy?
- Where did individual rationality harm the collective?

Analysis Template

- ① What mechanism flaw existed?
- ② What trust assumption was violated?
- ③ What improvement changes the payoffs?
- ④ What trade-off does the improvement introduce?

Assignment Page

digital-ai-finance.github.io/crypto-economics/assignments/A11_case_study/instructions.html

All Assignments

digital-ai-finance.github.io/crypto-economics/assignments/index.html

Choose your event and start analyzing!

Phase 1: Timeline (15 min) → Phase 2: Root Cause (15 min) → Phase 3: Improvements (10 min) → Present (5 min)

Remember

Go beyond narrative. Use **Nash equilibrium**, **dominant strategies**, **incentive compatibility**, and **mechanism design** to explain *why* rational actors caused systemic failure.

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