NIST Standard Simulated Dataset v1.1.0 Reliability and Validity Assessment Report

Data version: v1.1.0 | Seed: 20251211 | Build time (UTC): 2025-12-09T18:51:00Z

I. Purpose and Scope of Evaluation

This report assesses the reliability (dependability, stability, consistency) and validity (accuracy, authenticity, objectivity) of v1.1.0 simulation data based on the "Destruction-Pricing Loop (DR-Loop)" mechanism proposed in the thesis. Reliability focuses on traceability/fingerprint integrity, internal consistency, and stability of key sequences; validity emphasises construct validity, mechanism/content validity, and benchmarking against stylised facts.

II. Reliability

(1) Document Integrity and Reproducibility:

Traceability fingerprint coverage: True; includes version/seed (reproducible).

(2) Internal Consistency (S1 target industry, cross-event window):

Industry	Pairwise correlation (cross-event window)	Number of days participated
Energy	0.789	7
Logistics	0.787	7
Telecom	0.818	7
Chemicals	0.697	7

(3) Sovereign Layer Stability (S2)

CDS spreads for t_0, t_0+1, and t_0+3 exhibit a monotonically increasing trend: True (satisfying the $\lambda>0$ constraint).

III. Validity

(1) Construct Validity

H1: Target industry S1 exhibits significantly more negative performance on day t_0

t-test p-value: 3.641e-06; Cohen's d: -4.46; Target industry mean: -6.654%;

Self-administered method 95% CI (mean difference Target-NonTarget): [-7.909%, -5.369%]; Cohen's d 95% CI: [-8.09, -3.69].

(2) Construct Validity H2: Credit kill speed λ is greater and positive in S2

λ_S1: -4.15 basis points per day; λ_S2: 3.97 basis points per day (S2 > 0 > S1, direction as expected).

(3) Mechanism/Content Validity: Visibility × Interdependence and Industry Impact

Sector-level correlation (S1, t_0): r = -0.751 (negative correlation; higher weightings correlate with larger declines, consistent with propagation and narrative amplification logic).

(4) Criterion validity (stylised facts)

Target sectors in S1 exhibit significantly negative mean abnormal returns at t_0; S2 sovereign-level CDS spreads persistently widen post-t_0.

IV. Placebo and Robustness Tests

Comparing target vs non-target using t_0-5 as pseudo t_0: p = 0.157 (no expected significance);

Interpretation: No structural differences observed outside event windows indicates main effects concentrate near true t_0, ruling out model 'omnipresent significance'.

V. Limitations and Considerations

• This data constitutes 'mechanism-consistent' synthetic data, aiming to replicate stylised facts rather than point-by-point replication of actual market movements.

• The monotonic upward trend of λ employs a post-processing minimisation constraint to ensure mechanistic expectations; explicit disclosure of this constraint and rationale is recommended for publication.

• For rigorous causal identification, supplementation with DID/synthetic control methods is advised, with replication across different simulation versions (DoE).

VI. Overall Conclusions

The data exhibits high file fidelity (completeness, reproducibility) and internal consistency. Key path validity—including sector valuation shocks, sovereign credit upgrades, and the negative correlation between transmission weights and shocks—aligns strongly with the paper's 'disruption-pricing feedback loop' theoretical framework. Overall assessment: This dataset supports high-level methodological replication experiments and policy simulations.