

Stablecoin Depeg Risk Signals: Feature Engineering Framework

1. Introduction

Stablecoin failures often emerge from a combination of market panic, structural weakness, liquidity withdrawal, and accelerating negative feedback loops. To predict and monitor potential depegging events, we categorize engineered features into five major signal groups representing different dimensions of systemic stress.

2. Panic & Pressure Signals (Volume Metrics)

These features capture immediate trader behavior when fear begins entering the market.

- **volume_spike_peg_stress**

Flags situations where trading volume surges simultaneously with peg deviation. This distinguishes healthy liquidity from panic-driven exits or coordinated runs.

- **volume_vs_24h**

Compares current trading volume against the previous 24-hour average. Extreme spikes (5x–10x) often indicate early exits by whales or insiders.

- **taker_sell_ratio**

Measures the proportion of sell-initiated trades. A high value implies traders are aggressively selling at market price rather than waiting for favorable execution.

- **volume_imbalance**

Evaluates dominance between buy and sell orders in the order book. A sell-heavy imbalance signals erosion of liquidity supporting the \$1.00 peg.

- **large_trade_anomaly**

Detects abnormal whale-sized transactions. Major depegs are typically initiated by large institutional movements rather than retail traders.

3. Structural Damage Signals (Price & Peg Metrics)

These metrics quantify direct instability in the stablecoin's peg defense system.

- **peg_deviation**

Measures the absolute distance from the \$1.00 peg, representing the system's real-time health.

- **peg_deviation_max_180m**

Tracks the worst deviation within the last three hours. Deep temporary drops indicate fragile liquidity even if recovery occurs.

- **peg_deviation_std_180m**

Captures short-term volatility. High instability suggests arbitrage mechanisms are failing to maintain equilibrium.

- **low**

The lowest traded price within the observation window, revealing the true liquidity support level.

- **below_peg**

Binary indicator showing whether the asset is trading below \$1.00, often triggering automated selling and psychological panic.

4. Exodus Signals (Market Cap & Supply)

These indicators measure capital leaving the ecosystem rather than merely rotating within markets.

- **circulating_supply_percent_change_1d**

A key bank-run indicator. Rapid supply contraction suggests large-scale redemptions for fiat or collateral.

- **market_cap_percent_change_1d**

Tracks total ecosystem valuation. Sharp declines reflect loss of confidence.

- **mcap_to_volume_24h**

Represents velocity of capital movement. High turnover implies a “hot potato” effect where participants rapidly transfer risk.

5. Velocity Signals (Acceleration)

Market crashes are nonlinear processes. These features measure how quickly conditions deteriorate.

- **percent_change_1h**

Captures short-term momentum. Even small hourly declines are significant for stablecoins.

- **price_accel_1h_24h**

Measures acceleration by comparing short-term and longer-term price changes, identifying emerging feedback loops.

- **peg_stress_1pct_3h**

Counts how often the price exceeds a 1% deviation within three hours. Repeated breaks imply exhausted stabilization mechanisms.

6. Context Signals (Volatility & Market Trends)

These features provide environmental context surrounding a potential depeg event.

- **close_std_180m**
Measures general price instability over a three-hour window.
- **trade_size**
Tracks average transaction size. Sudden increases indicate institutional or smart-money exits.
- **daily_range**
Difference between daily high and low prices, reflecting liquidity depth and uncertainty.
- **volume**
Represents total trading activity. High volume provides the energy required for systemic peg breaks.

7. Conclusion

Together, these five signal categories form a comprehensive framework for detecting early warning signs of stablecoin instability. By combining behavioral, structural, liquidity, acceleration, and contextual indicators, the system enables proactive monitoring and predictive modeling of depeg risk events.