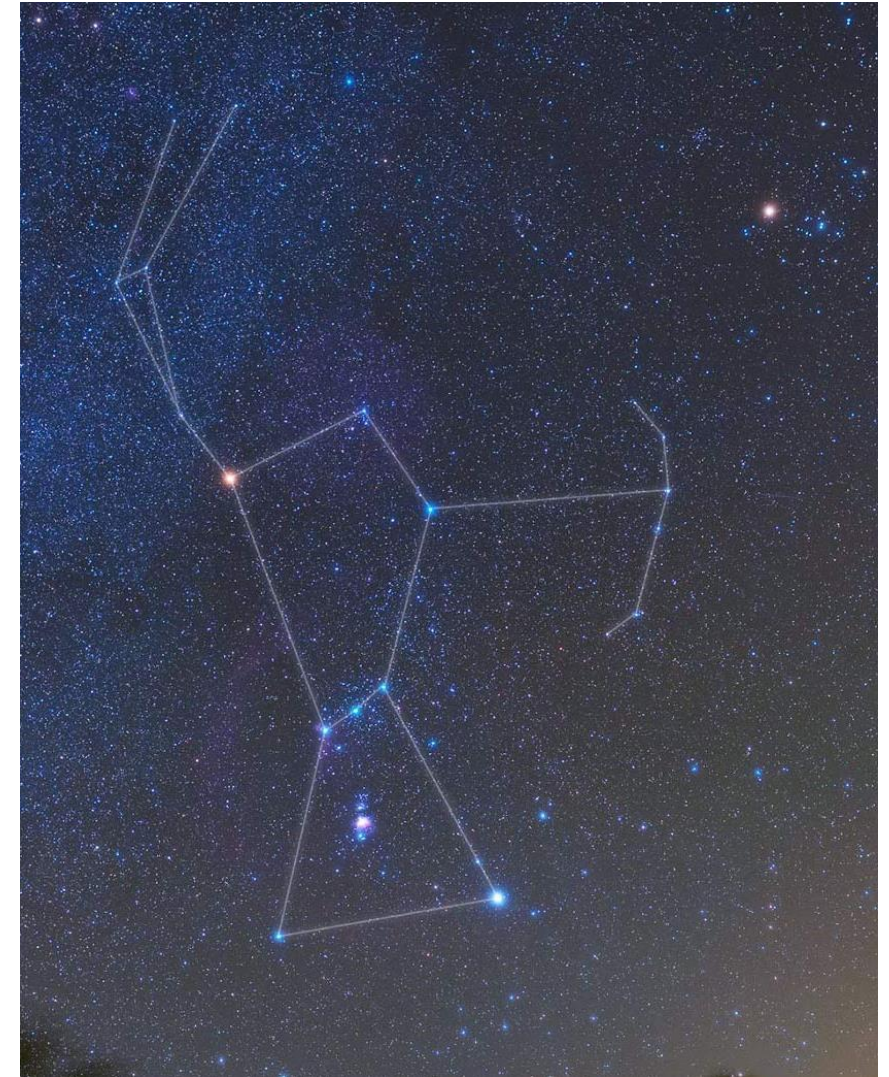


Making or breaking the peg? Predicting the Betelgeuse moment of stablecoins

WORK IN PROGRESS

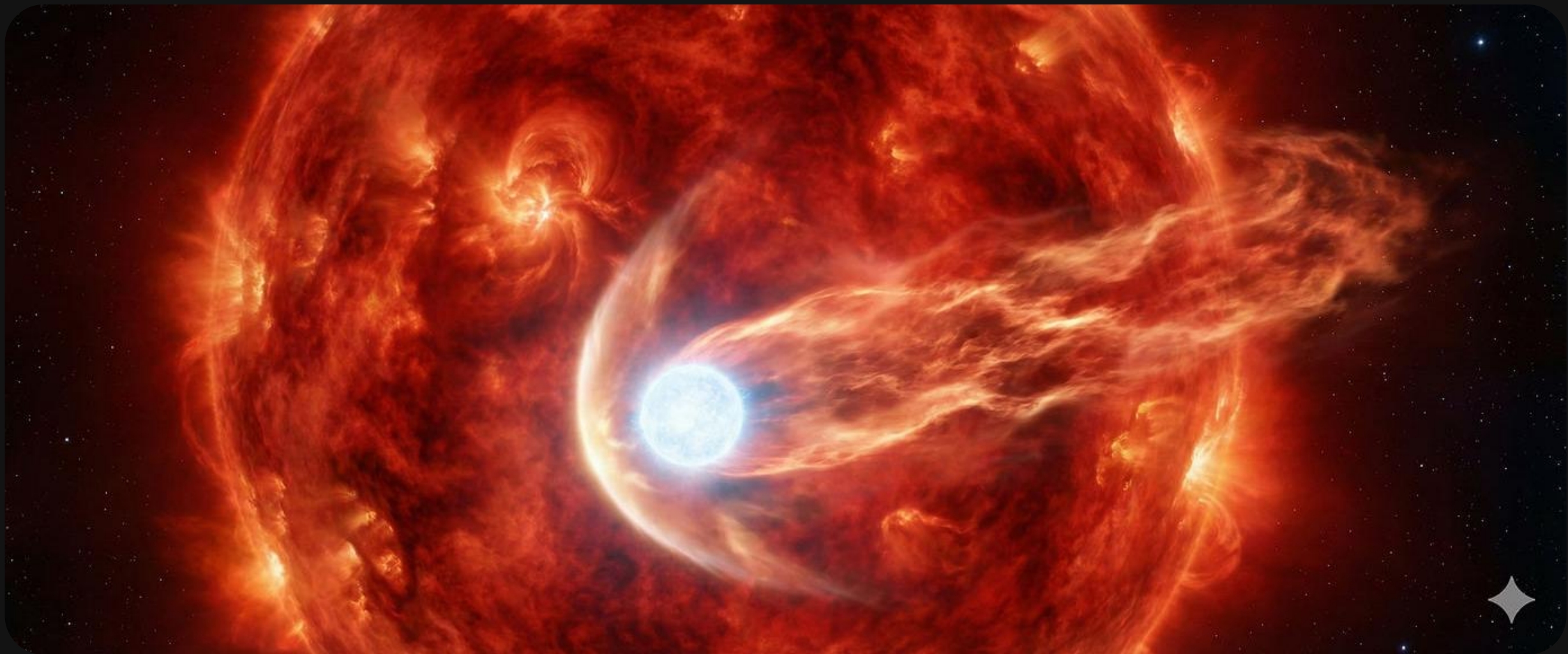
24th Seminar on Financial Market Infrastructures
Helsinki, Finland, 27-28 August 2026



Similarities between Betelgeuse and stablecoins?

- Around for short time relatively to sun/fiat
- Blew up rapidly (diameter/market-cap)
- Unexpected jumps in brightness/value
- Difficult to predict "the event" (supernova/depeg)





But wait, there is more...

... we also give you a **Siwarha** for free.



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The views expressed are those of the authors and do not necessarily represent the views of their institutions.

Stablecoins: Rising significance & risks

Rapid growth:

- scale ~**\$300 billion** (April 2026)
- USDT & USDC ~90% of market cap.

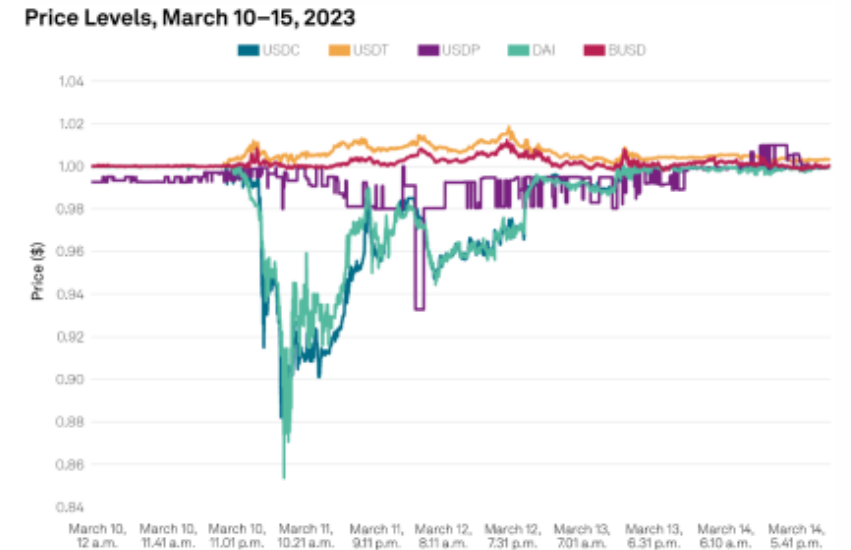
Crucial role:

- trading, DeFi and payments increasingly rely on stable value.

Run risk:

- USDC fell to ~\$0.87 in Mar 2023 after reserve uncertainty.

Selected stablecoin price levels (10-15 March 2023)



Source: Cryptorank.

Financial stability & regulatory context

- **Spillover potential:**
 - stablecoins can transmit risk beyond crypto
- **EU's Markets in Crypto-Assets regulation**
 - raises standards on reserves, liquidity and transparency
 - higher-risk designs are restricted to limit extreme depeg risk



Research question

How can we develop an early warning indicator for stablecoin depegging?

Rare but potentially disruptive events

No accepted depeg threshold or practical
EWI Inspired by Lee et al. (2025)



Stablecoin data

USD backed

- USDC
- USDT
- DAI
- USDE

EUR backed

- Stasis
- EURC
- EURCV

Imbalanced outcomes:

- Depeg events
rare

Source & type:

- CryptoCompare
- CCCAGG/CCIX
- OHLCV
- 2020 to 2025
- Minute & daily

Stablecoin data: initial focus & details



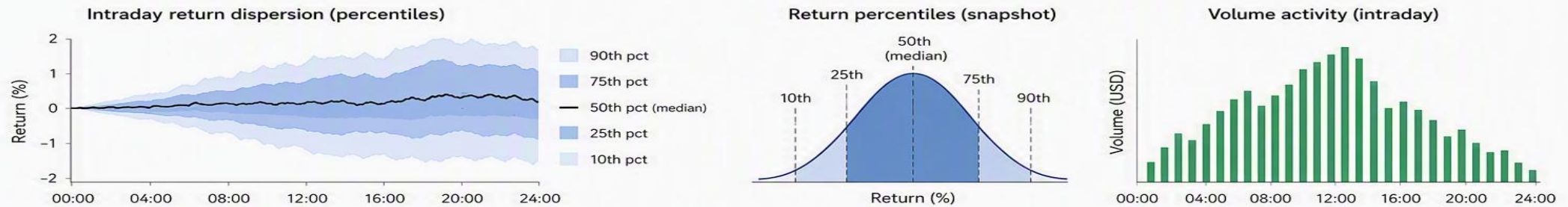
Stablecoin	# Observations (days) *	Share of dataset	Depegs (#) **	Depeg (%)	Type
USDT	2,192	30.44%	21	0.96	Fiat-backed
USDC	2,192	30.44%	37	1.69	Fiat-backed
USDE	625	8.68%	28	4.48	Synthetic
DAI	2,192	30.44%	44	2.01	Hybrid
Total	7,201	100.00%	130	1.81	

*Hours: >170k observations; minutes: >10m

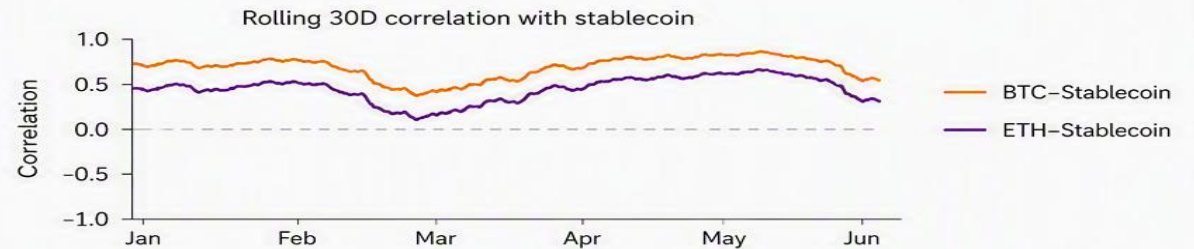
** Depegs based on static threshold

Features & other data

- Intraday dispersion, percentiles and volume activity



- BTC/ETH co-movements with a stablecoin



- DXY, VIX, Fed funds and EPU



Defining “Depegging” Events



Beyond trivial deviations: ignore routine basis-point noise.



Meaningful peg break criteria: persistent breach below threshold for N minutes.



Downward focus: asymmetric trigger for peg breaks.

Threshold Options: Static vs Dynamic

**Static : Fixed
deviation limit**

Simple but rigid

**Dynamic (percentile):
Volatility-adjusted**

Percentile: adapts to volatility, but less interpretable

**Dynamic (volume-
based): Liquidity-
sensitive**

Volume-based: liquidity-sensitive, but needs calibration.

Threshold Calibration & Selection

Validating on stress events:

Stress events: TerraUSD, FTX collapse, USDC-SVB run

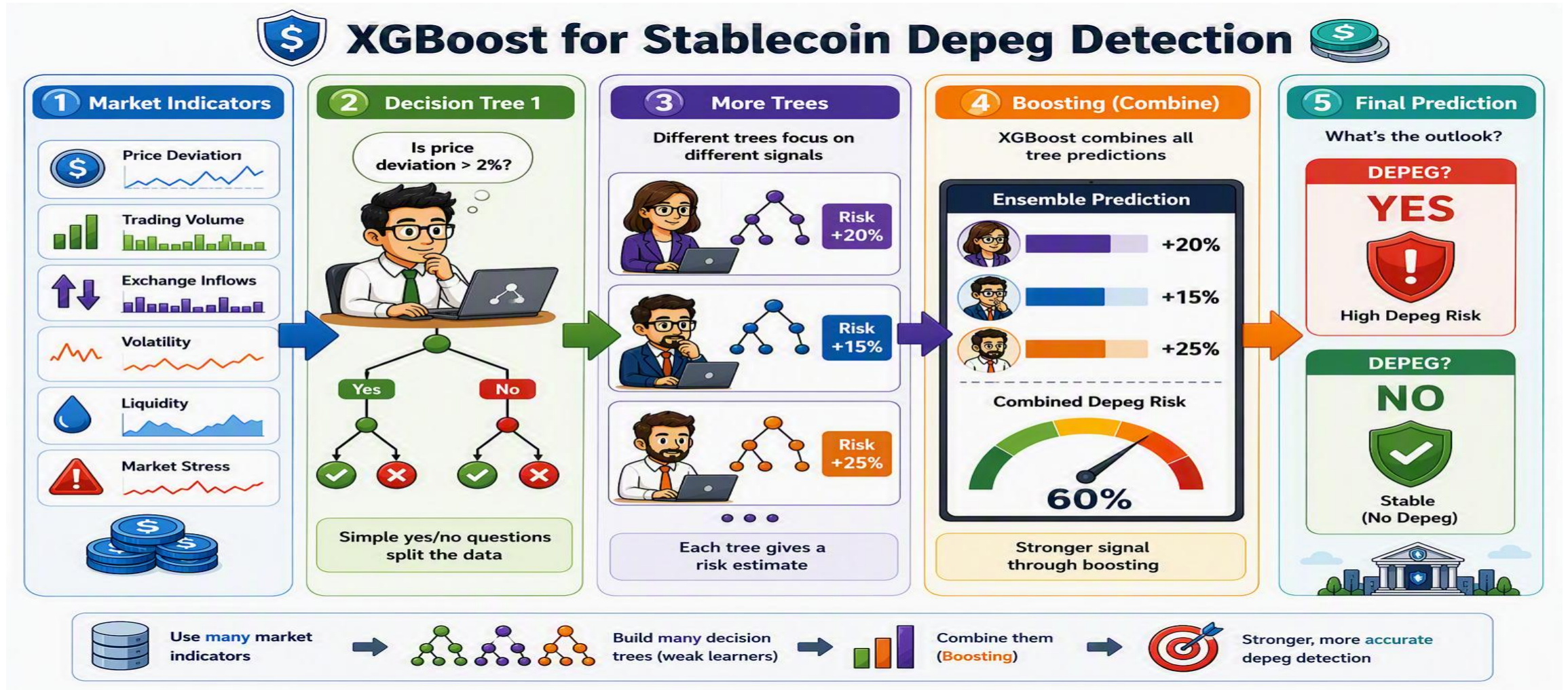
Comparative findings:

Volume-based threshold captured breaks with fewer false alarms.

Robustness:

Combining signals may improve robustness.

Model 1: XGBoost



Model 1: XGBOOST



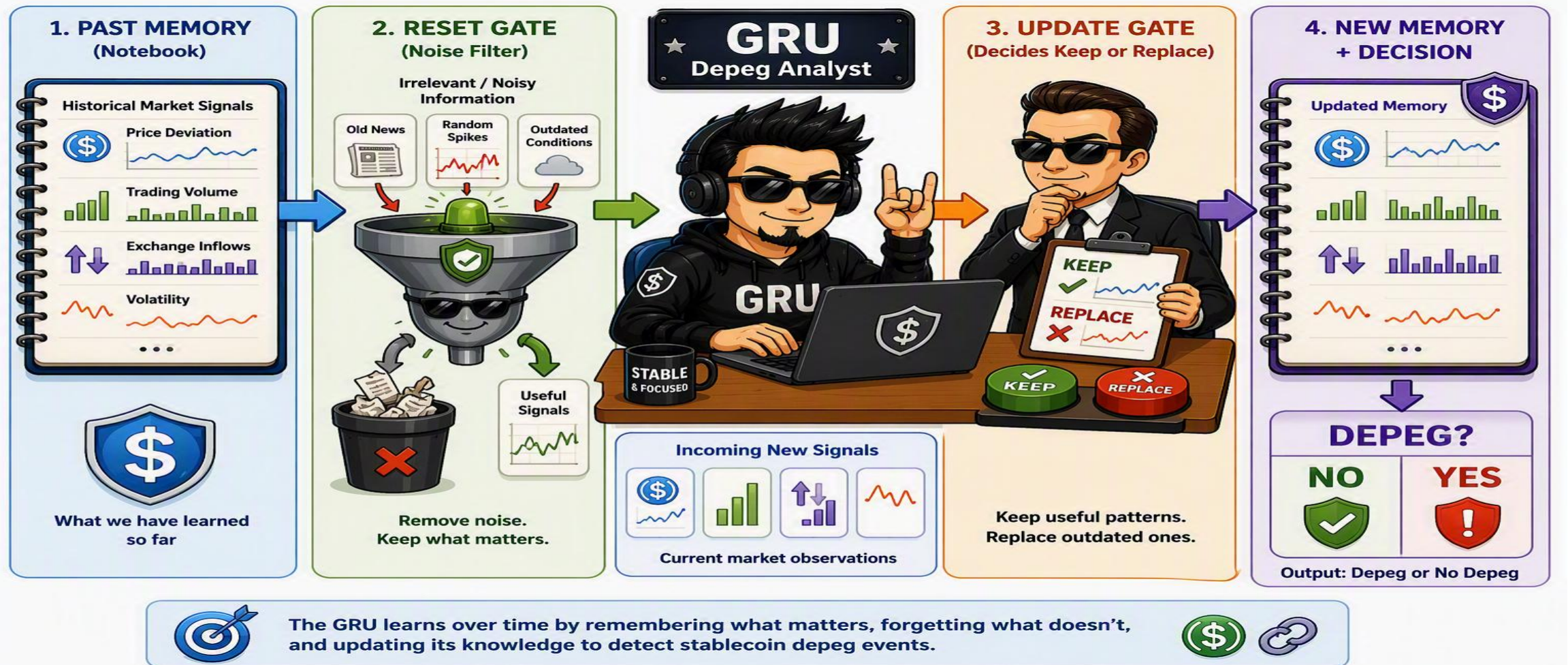
- Gradient-boosted trees for structured tabular data
- Integrates prices, volumes, volatility and macro inputs
- Useful feature-importance diagnostics
- No sequence memory; timing must be engineered

XGBoost: strengths & weaknesses

- **Benchmark** model for structured depeg prediction
- **Flexible** inputs and interpretable feature importance
- **Limited** for sequential dynamics without feature engineering



Model 2: GRU



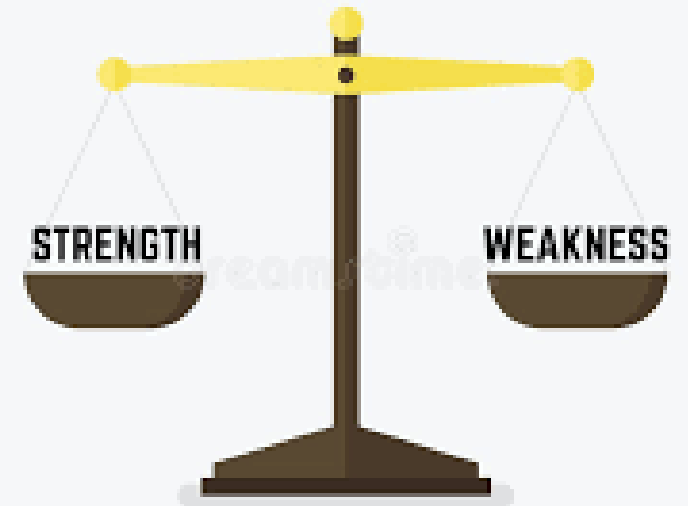
Model 2: GRU



- Learns time-dependent patterns from sequences
- Adapts to varying time scales
- Can combine market and macro context
- Potentially detects gradual depeg precursors

GRU: Strengths & Weaknesses

- Models evolving financial time-series dynamics directly
- Can capture gradual build-ups and sudden shifts
- More complex and data-hungry; overfitting risk



Evaluation strategy & metrics



Walk-forward validation to emulate live forecasting.

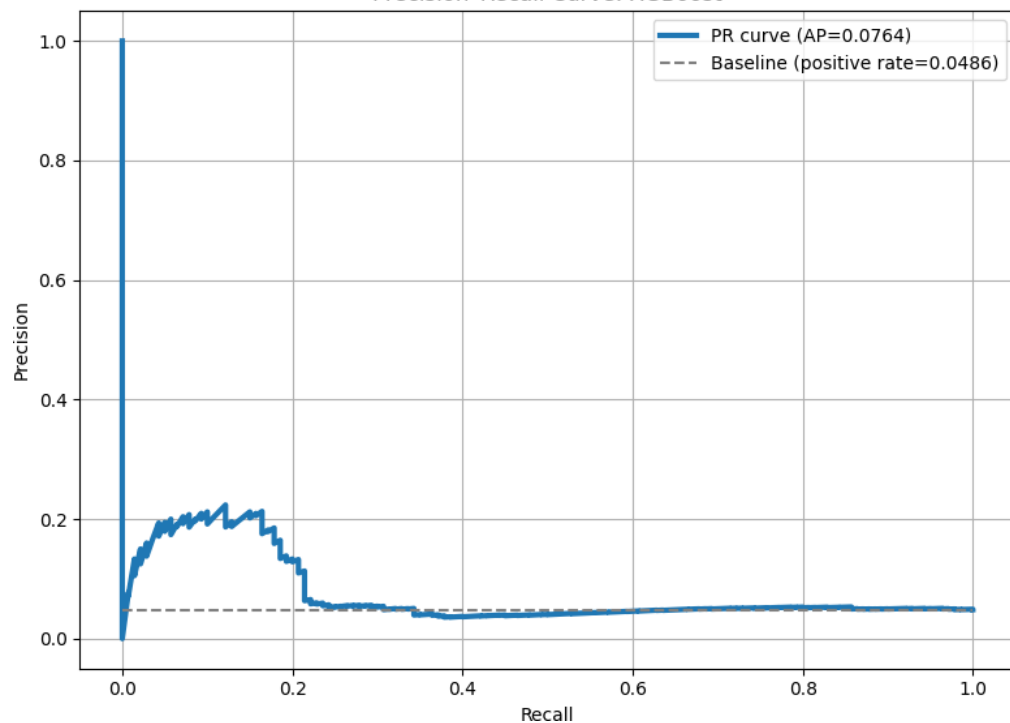


Precision-Recall is suited to rare depeg events.

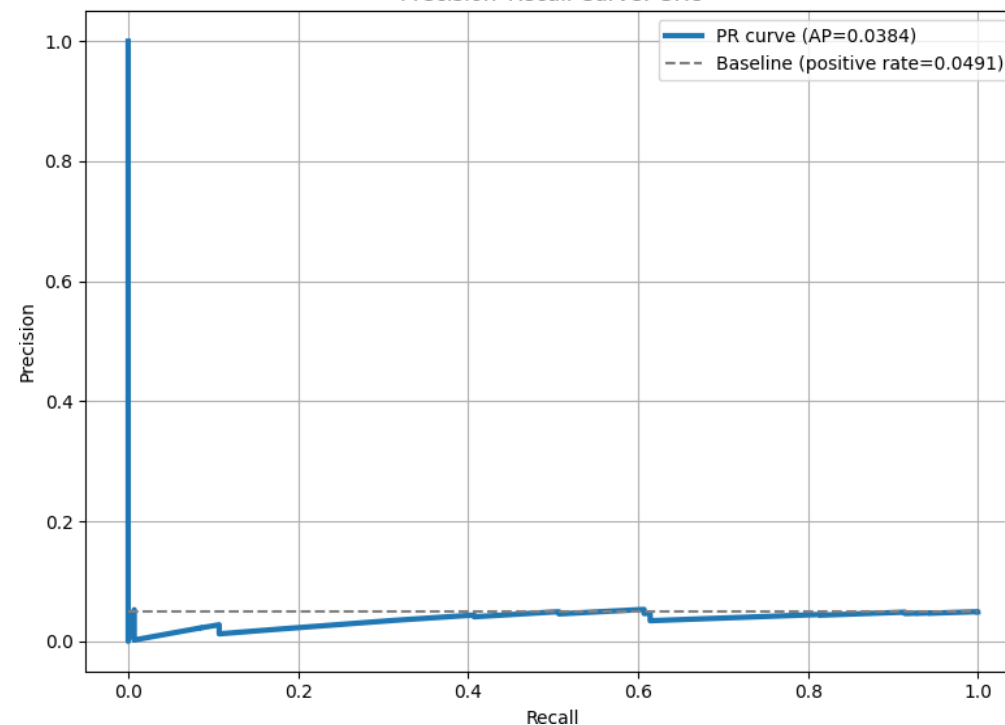


No peeking: features use information known at prediction date.

Precision-Recall Curve: XGBoost



Precision-Recall Curve: GRU

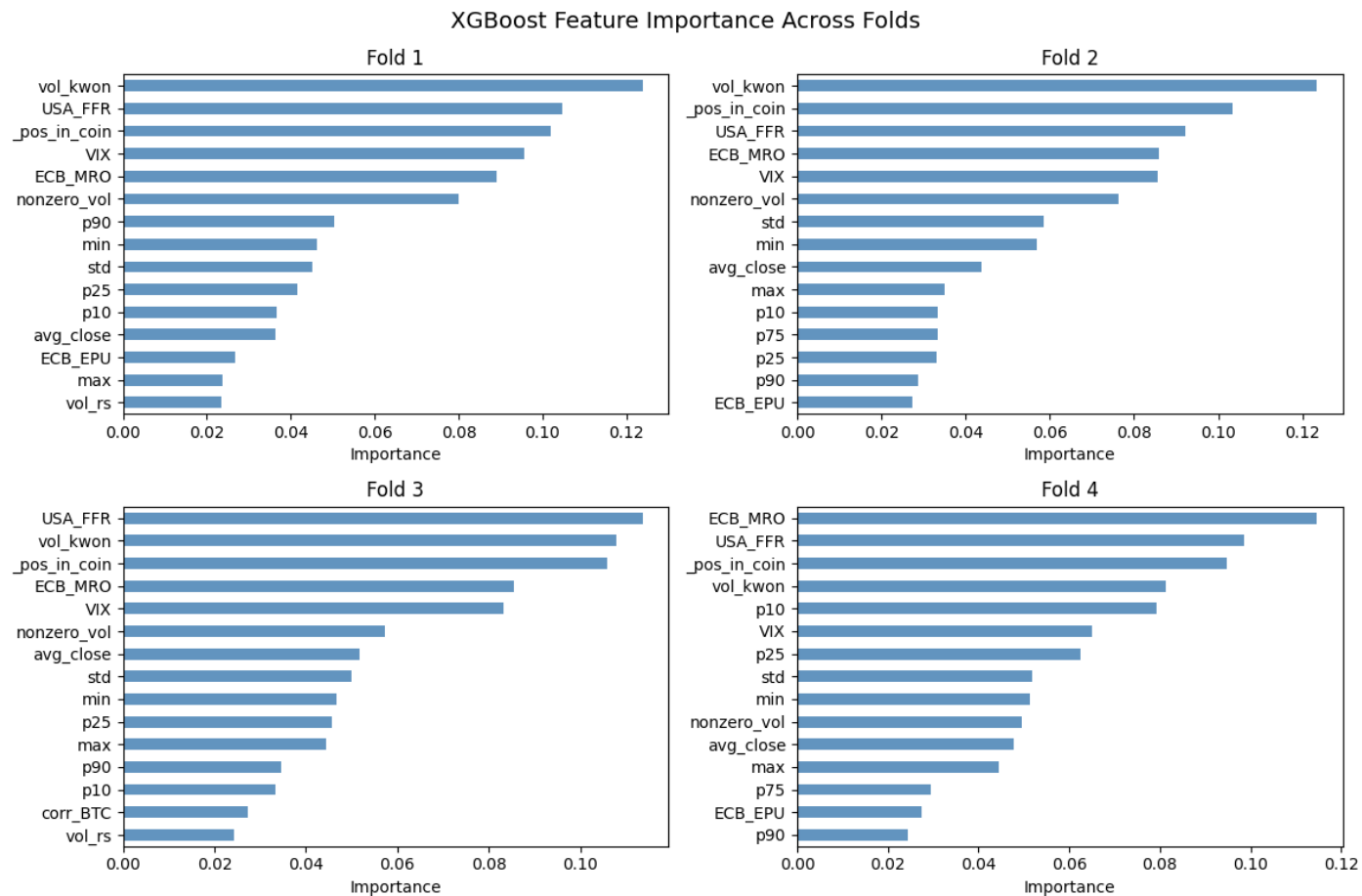


PR curves

- Precision: correctly identified positive predictions ($= TP/(TP+FP)$)
- Recall: correctly identified positive instances ($= TP/(TP+FN)$)

Feature Importance

XGBOOST



Preliminary Results – Model Performance (using CCCAGG)

- Low stress: predictive power often near baseline.
- High stress: GRU improves when depegs cluster.
- No single model dominates across regimes

Why need to Adjust data input?

01

AGGREGATE FEED

CCCAGG may smooth short-lived depeg moves, weakening the signal.

02

SINGLE EXCHANGE

Exchange-level data reveals more price spikes than the aggregate feed.

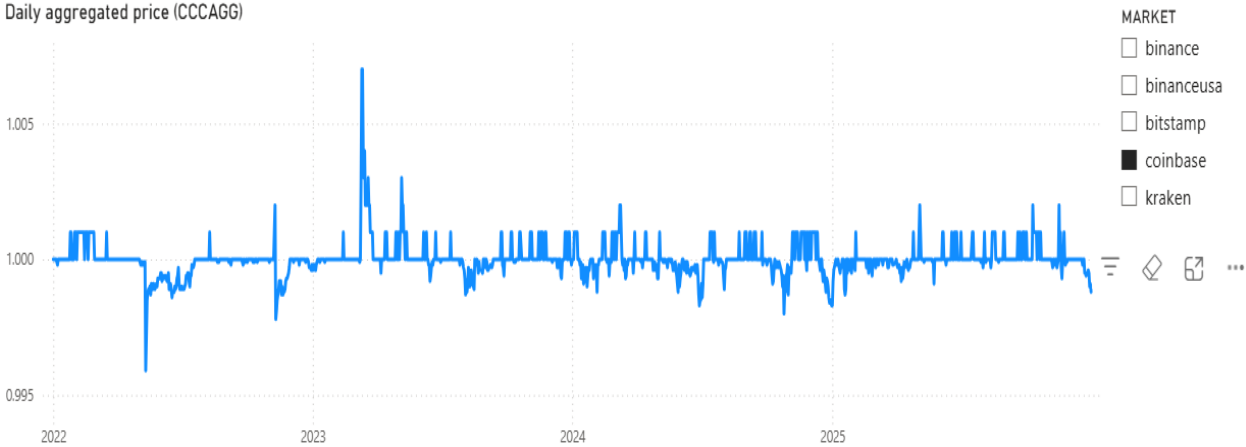
03

HOURLY FREQUENCY

Test whether abrupt depegs emerge without a long build-up.

From CCCAGG to single exchanges

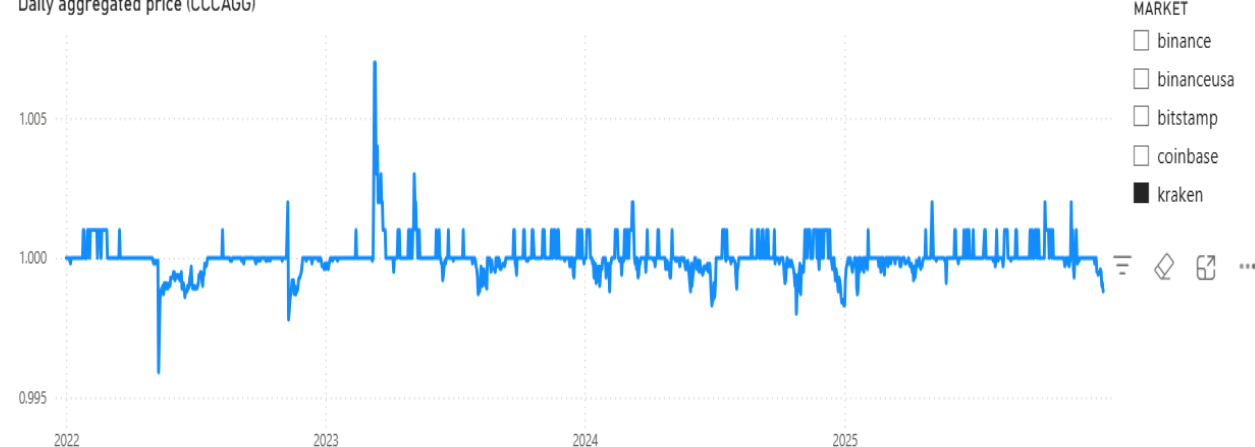
Daily aggregated price (CCCAGG)



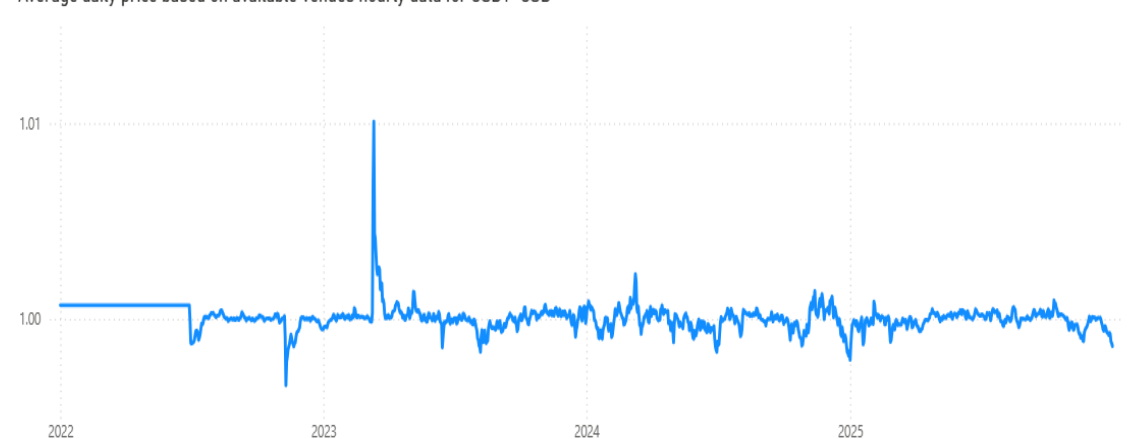
Average daily price based on available venues hourly data for USDT-USD



Daily aggregated price (CCCAGG)



Average daily price based on available venues hourly data for USDT-USD



Policy implications



Monitoring: timely warnings for central banks and regulators.



Bridge: combines on-chain liquidity and macro-financial stress.



Enhancing regulatory frameworks: supports MiCA-style supervision of stablecoin issuers.

Conclusion



The “Betelgeuse moment”:

Stablecoin pegs can **break abruptly** when confidence erodes. *Early identification of such moments is crucial for financial stability.*



Key takeaways:

Our initial results show **some predictive value** for forecasting depeg risk. **No silver bullet yet!**



More work to be done.

Next steps

- **Data**: continue with single exchange
- **Adjust time frequency**: intraday (**hour**) as depegs with little long term warning
- **Expand scope**: Incorporate euro-denominated stablecoins
- **Refine event detection**: Explore multi-criteria depeg triggers for greater robustness

