Data-Driven Insights in Digital Asset Markets

A Study of Correlation, Anomaly Detection, and Trend Classification Using High-Frequency Price Data

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Questions I Wanted to Answer

Key Questions:

- Can we detect relationships between different cryptocurrencies?
- Can we quickly identify sudden price spikes?
- Can we predict short-term market trends using recent price data?

Data Preparation

Data Source:

- Blocklink Lake API
- Coinbase exchange
- 10-second price intervals

Assets:

- Bitcoin (BTC), Ethereum (ETH), Ripple (XRP), Solana (SOL), Chainlink (LINK), Dogecoin (DOGE), Avalanche (AVAX), Shiba Inu (SHIB)

Preprocessing:

- Data quality was very good
- Linear interpolation to fill rare gaps

Tools and Methods

Tools Used:

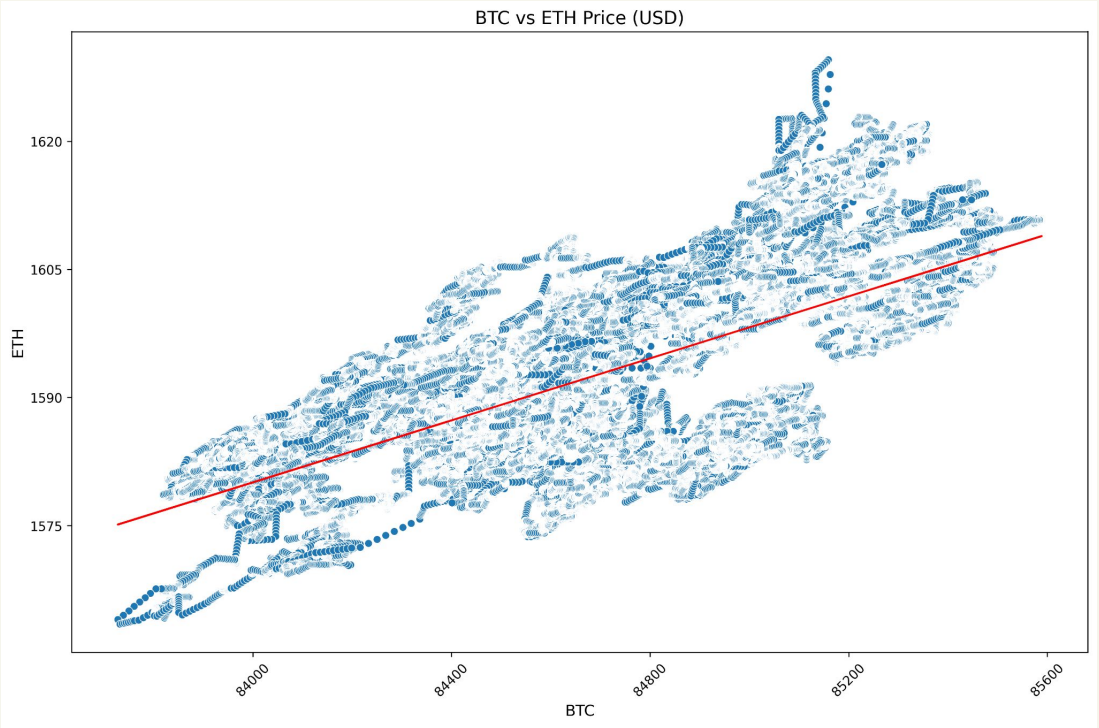
- Pandas, Matplotlib, Seaborn
- TensorFlow / Keras (LSTM model)

Techniques Applied:

- Pearson and Spearman Correlation
- Z-Score Anomaly Detection
- LSTM for Trend Classification

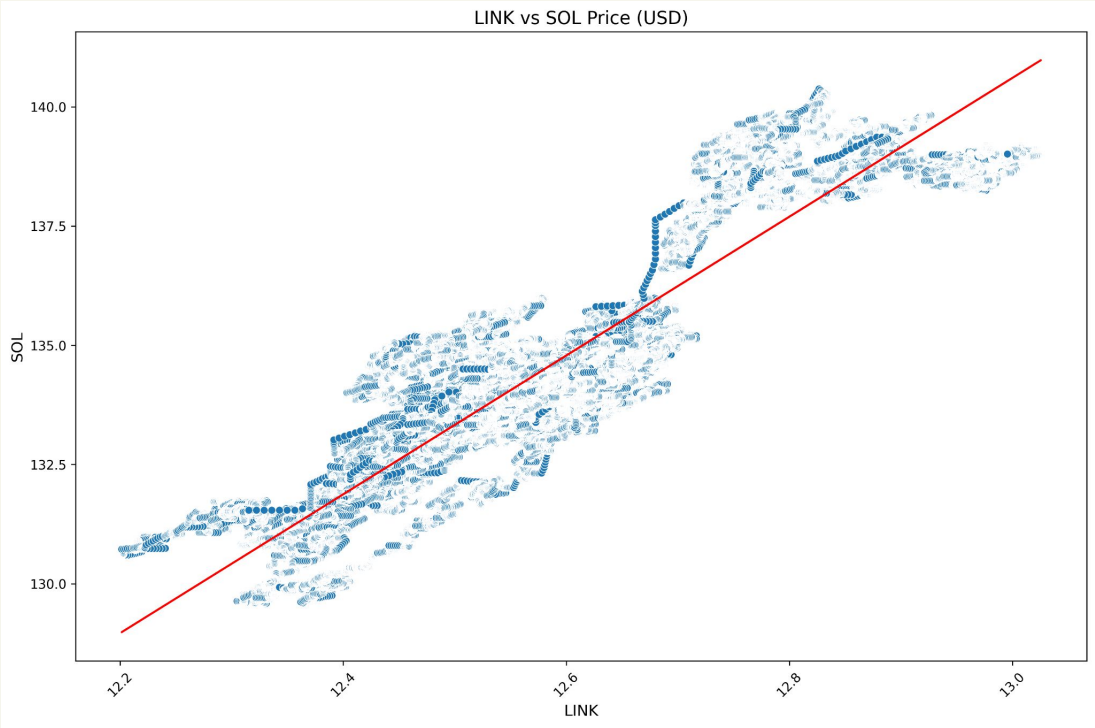
Key Results - Correlation Analysis

BTC and ETH: Strong positive correlation



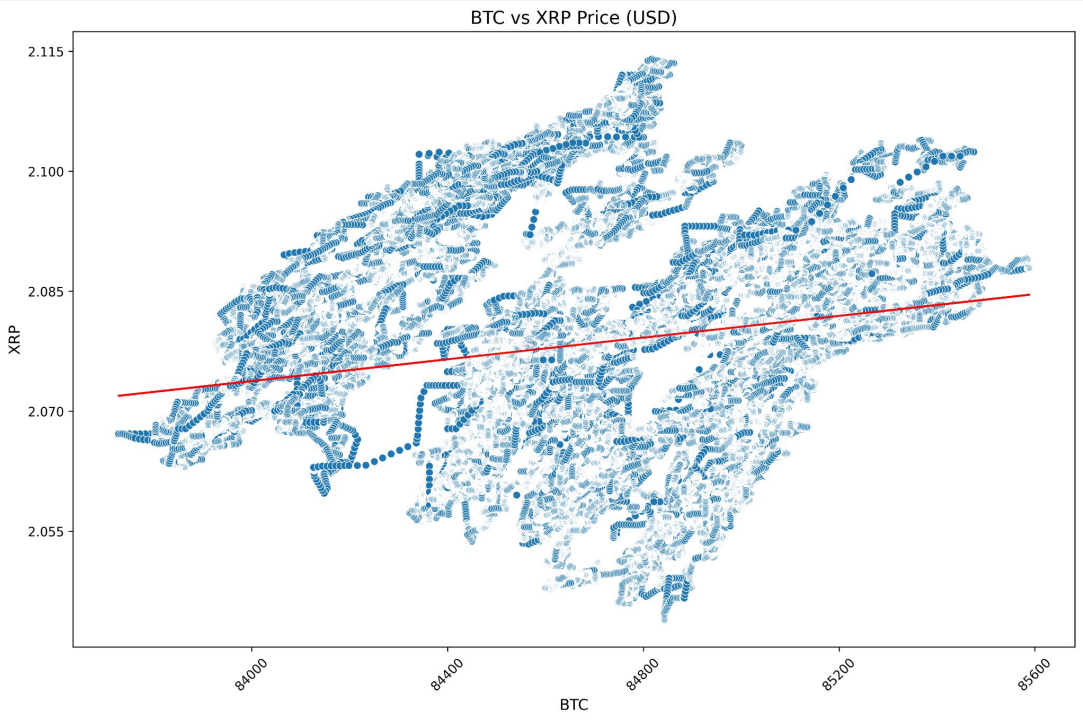
Key Results - Correlation Analysis

LINK and SOL: Highest correlation



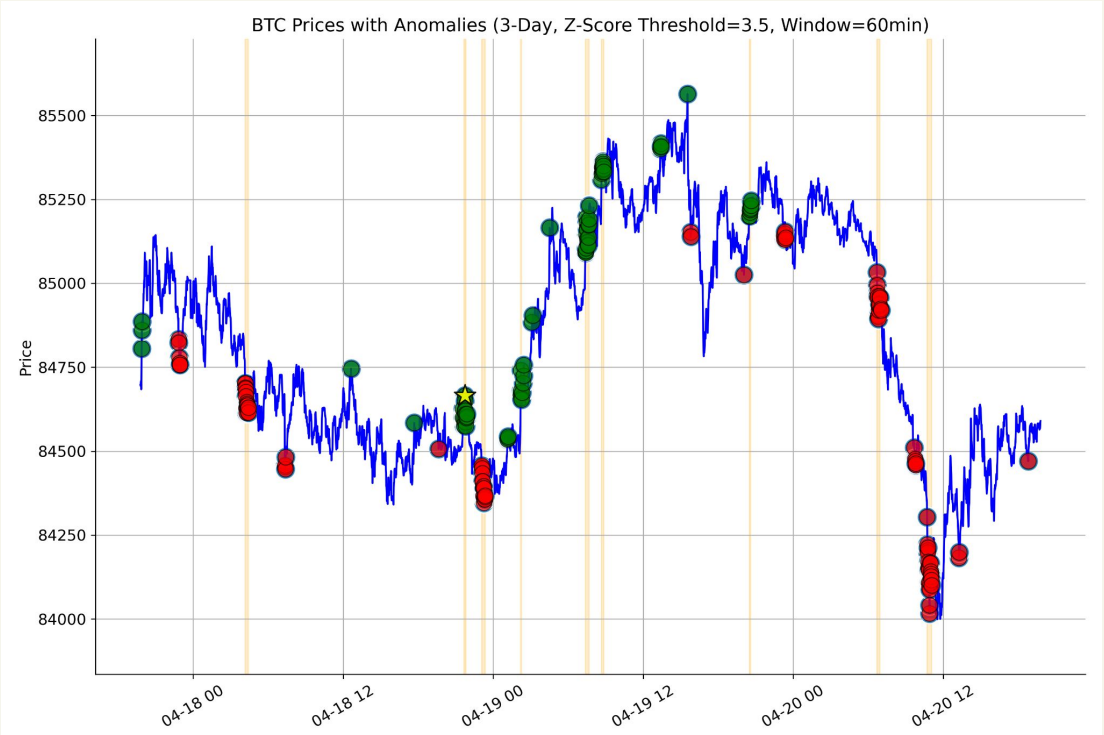
Key Results - Correlation Analysis

BTC vs XRP: Weakest correlation



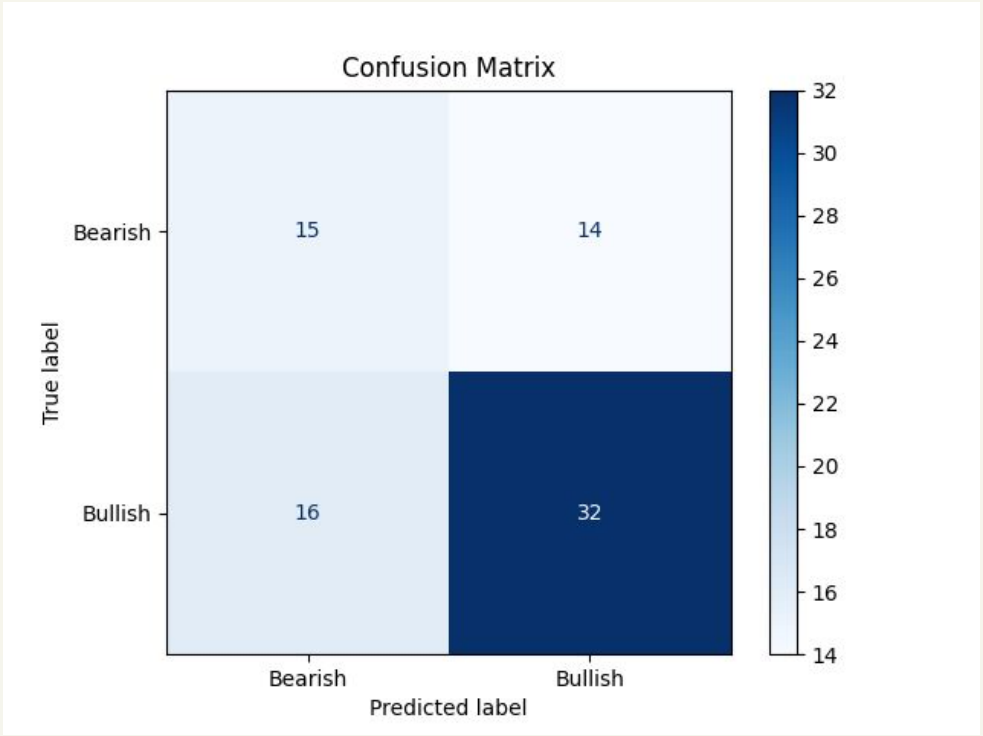
Key Results - Anomaly Detection

- 183 anomalies detected
- 9 clusters of volatility
- Largest anomaly aligned with a sharp reversal



Key Results - Trend Classification

- LSTM model achieved ~63% accuracy
- Strong at predicting bullish trends (70% precision, 67% recall)
- Not as strong at predicting bearish trends (60% precision, 52% recall)



Knowledge Gained

- Cryptocurrencies may or not be strongly correlated based on use case
- Simple statistical methods like Z-score are powerful for real-time monitoring
- LSTM models can uncover short-term signals from recent price patterns

Applications

- Build smarter portfolios diversity using correlations
- Create new or enhance existing real-time alerting systems
- Lay groundwork for deeper machine learning models on market behavior

Thank you!