B.Tech Project (BTP)

"Real Time Trading and Finance Strategy Advisor"

Naik Dhyan Dharmesh (B21CS097)
Shreshth Vatsal Sharma (B21CS094)
Shashank Shekhar Asthana (B21CS093)

Introduction

Project Overview:

- Development of trading strategies for BTC/USDT and ETH/USDT pairs.
- Focused on creating a robust, data-driven algorithm to capture market trends and volatility.

Objectives:

- Leverage technical indicators and unique pattern recognition to optimize trading accuracy.
- Implement risk management techniques to enhance profitability and reduce drawdowns.

Motivation:

- Aim to capitalize on market fluctuations across different timeframes, from minute-level to monthly scales.
- Address the limitations of traditional trading indicators by incorporating innovative methods for trend analysis.

Progress Update

Current Analysis on BTC and ETH:

- **Kalman Filters:** Smoothing of price fluctuations, identification of volatility periods.
- **Z-Score Analysis:** Detection of outliers and mean-reversion patterns for entry/exit points.
- **Seasonal Decomposition:** Verification of minimal seasonality, emphasizing trend presence.
- **MACD Gaussian Smoothing:** Trend reversal identification, highlighting overall trends.
- **Dickey-Fuller Test:** Checked stationarity; no strong evidence of stationary behavior in datasets.

Key Insights:

- BTC and ETH data reveal high volatility with intermittent trend reversals.
- Presence of mean-reversion and short trends with minimal seasonal influence.

Challenges Encountered:

- Managing high volatility and false signals in trend identification.
- Stationarity and seasonality limitations in traditional indicators.

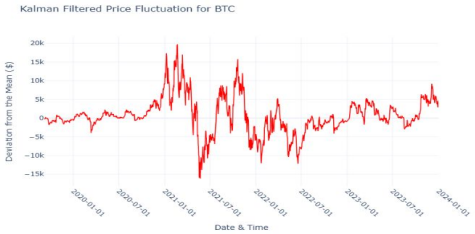

Fig. 1: KALMAN FILTER FOR BTC

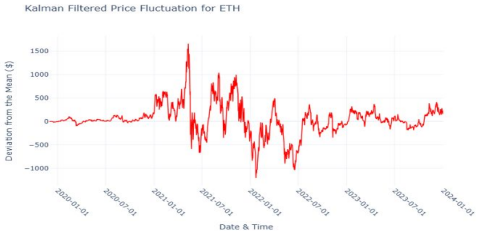

Fig. 4: Kalman for ETH

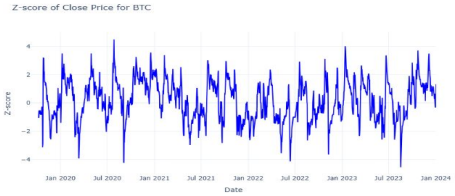

Fig. 2: Z-SCORE FOR BTC

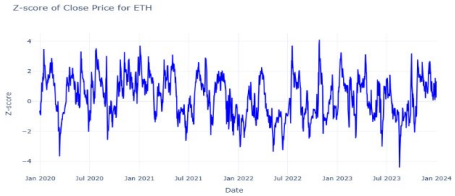

Fig. 5: Z-Score for ETH

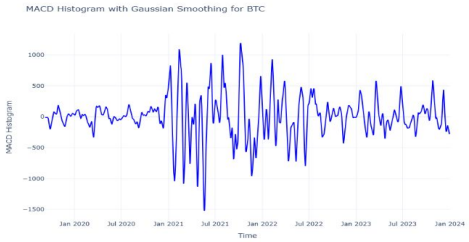

Fig. 3: MACD FOR BTC

Fig. 6: MACD FOR ETH

Future Plans

Co-Integration Strategy for BTC and ETH:

- Utilize co-integration between BTC and ETH for generating combined signals.
- Implement Augmented Dickey-Fuller Test on residuals to ensure stationarity in the co-integration approach.

Master Strategy - Strategy Curator:

- Development of a dynamic, adaptive strategy that selects high-performing "alphas" based on recent market conditions.
- Continuous evaluation across multiple timeframes, with re-weighting of alphas to respond to trend shifts and volatility.

Objective:

- Enhance the model's adaptability to changing market dynamics, ensuring optimal signal generation and improved risk-adjusted returns.

Strategy Overview

Primary Strategies Implemented:

1. **New Candlestick Pattern (for BTC):**
   - Inspired by candlestick reversal patterns, e.g., Three White Soldiers and Three Black Crows.
   - Developed a custom 4-candlestick pattern for trend reversal and continuation signals.
2. **Technical Indicators Integration (for BTC):**
   - Combines EMA crossovers, RSI, and Parabolic SAR to identify trend direction and exit points.
   - Focuses on effectively capturing long-term trends in high-volatility markets.
3. **Temporal Fusion Transformer (TFT) Model (for BTC):**
   - Predicts short-term price trends using volume, month, and time index as key variables.
   - Uses predicted price changes to generate long or short positions based on a defined threshold.

Fig. 7: Three White Soldiers

Fig. 8: Three Black Crows

Fig. 9: Defined Pattern in BTC for given time frame

Fig. 10: Defined Pattern signaling uptrend

New Candlestick Pattern (for BTC)

Core Concept:

- Custom 4-candlestick pattern inspired by the Three White Soldiers and Three Black Crows.
- Developed through chart analysis to detect frequent patterns on BTC in the 4-hour timeframe.

Pattern Details:

- Combines constraints based on highs and lows of candlesticks to signal trend reversals or continuation.
- Works independently of other indicators, focusing on entry and exit points in volatile market conditions.

Key Advantages:

- Enables early entry in trends, enhancing position management.
- Reduces reliance on traditional lagging indicators, allowing more responsive trades.

Challenges and Solutions (BTC Pattern)

Challenges:

- **Lagging Indicators:** Traditional indicators struggled to capture BTC's high volatility and fast trend shifts.
- **High Drawdowns:** Initial tests revealed significant drawdowns, impacting strategy profitability.
- **False Signals:** Frequent but inconsistent patterns led to unreliable entry and exit signals.

Solutions Implemented:

- **Signal Generation Rules:** Defined specific rules for the 4-candlestick pattern to filter false signals and improve entry points.
- **Enhanced Risk Management:** Incorporated support/resistance levels as dynamic stop-loss points, reducing drawdowns by squaring off positions at reversal signals.
- **Independent Long/Short Signals:** Established separate criteria for long and short signals, increasing adaptability in varying market conditions.

Technical Indicators Integration (for BTC)

Overview:

- Strategy combines multiple technical indicators to identify market trends and optimize entry/exit points.
- Effective on BTC data, particularly in capturing long-term trends within a volatile market.

Core Indicators:

1. **Exponential Moving Average (EMA):**
   - EMA9 and EMA20 crossovers to confirm uptrends and signal buy points.
2. **Relative Strength Index (RSI):**
   - Detects overbought and oversold conditions, indicating potential trend reversals.
3. **Parabolic SAR (PSAR):**
   - Provides exit signals, particularly effective in bearish markets by trailing price movements.

Objective:

- Combine trend, momentum, and reversal indicators to maximize profit opportunities while maintaining a manageable risk profile.

Risk Management and Key Features

Risk Management Techniques:

- **Dynamic Stop Loss with PSAR:** Trailing stop-loss adjusted by Parabolic SAR to manage downtrends and prevent extended losses.
- **Support/Resistance Criteria:** Incorporated support/resistance levels to exit trades when price reverts to critical levels, reducing impact of false signals.
- **Thresholds for Entry/Exit:** Optimized entry and exit points based on indicator crossovers to balance profit capture and risk minimization.

Key Features of the Strategy:

1. **Trend and Volatility Adaptability:** EMA crossovers identify uptrends, while PSAR enables timely exits in downtrends.
2. **Momentum Detection:** RSI captures shifts in buying/selling momentum, enhancing timing in both trending and sideways markets.
3. **Volume Consideration:** Although not yet fully integrated, volume increases after reversal patterns indicate trend strength.

Objective:

- Ensure robust performance in volatile conditions by combining trend, momentum, and volatility-based risk management.

New Candlestick Pattern (for ETH)

Core Concept:

- Adapted BTC 4-candlestick pattern to ETH’s volatility, focusing on trend and momentum signals in the 4-hour timeframe.

Challenges:

- High drawdowns and frequent false signals due to ETH’s increased volatility.

Risk Management:

- Dynamic Take Profit and Stop Loss levels on closing prices.
- Support/Resistance criteria to minimize losses.

Key Features:

- Strong trend and momentum alignment, optimized for ETH’s volatile market.

Temporal Fusion Transformer (TFT) Model (for BTC)

Overview:

- TFT model predicts BTC price trends based on key variables like volume, month, and time index.

Core Concept:

- Generates trading signals: long positions for predicted increases over +0.125%, short for decreases below -0.125%.

Risk Management:

- Threshold optimization for signal entry/exit, with plans for stop-loss integration.

Key Features:

- Uses seasonal patterns and short-term price changes, with volume as a liquidity indicator.

Performance Metrics

New Candlestick Pattern (BTC):

- Net Profit: $5,262.29
- Win Rate: 46.34%
- Max Drawdown: 5.27%
- Sharpe Ratio: 4.30

New Candlestick Pattern (ETH):

- Net Profit: $8,296.88
- Win Rate: 74.09%
- Max Drawdown: 9.97%
- Sharpe Ratio: 9.95

Technical Indicators (BTC):

- Net Profit: $3,177.53
- Win Rate: 61.9%
- Max Drawdown: 8.31%
- Sharpe Ratio: 7.20

TFT Model (BTC):

- Net Profit: $298.16
- Win Rate: 72.4%
- Max Drawdown: 1.13%
- Sharpe Ratio: 8.29

Strategy	Profit / Loss	Sharpe Ratio	Annualized Return (%)	Max Drawdown	Time to Recovery
New Candlestick Pattern (for BTC)	1516.77%	4.21	100.52%	-4.83%	126.33 days
Technical Indicators (for BTC)	698.28%	7.20	68.09%	-8.3%	136.66 days
New Candlestick Pattern (for ETH)	161895.63%	9.95	534.42%	-9.96%	46.16 days
TFT (for BTC)	33.22%	8.29	1195.65%	-1.38%	11.04 days

TABLE I: Comparison of Strategies

Unique Approach and Innovation

Trend Analysis and Pattern Recognition:

- Developed a custom candlestick pattern for BTC and ETH that detects trends early, improving entry points.
- Utilized a combination of technical indicators and machine learning for enhanced accuracy.

Master Strategy - Portfolio Manager:

- Dynamic re-weighting of strategies based on market trends, adapting the portfolio to evolving conditions.

Innovation Over Traditional Methods:

- Avoided conventional lagging indicators by using real-time patterns and advanced models like TFT, optimizing for both volatile and stable markets.

Challenges and Future Scope

Challenges:

- **Sideways Markets:** Strategies struggled in low-trend conditions, impacting profitability.
- **False Signals in Volatile Periods:** High volatility led to increased false entries/exits, affecting accuracy.

Future Enhancements:

- **Reinforcement Learning:** Integrate RL to optimize trading decisions through continuous learning from market feedback.
- **Adaptive Stop-Loss Mechanisms:** Implement ATR-based stop-loss to better respond to volatility.
- **Extensive Testing:** Perform rolling window cross-validation to assess model robustness across diverse market conditions.

Conclusion

Project Summary:

- Developed a multi-strategy trading model combining custom candlestick patterns, technical indicators, and the TFT model.
- Successfully enhanced trend detection, entry/exit timing, and risk management for BTC and ETH trading.

Key Achievements:

- Significant profit and improved risk-adjusted returns across multiple strategies.
- Demonstrated adaptability to various market conditions, leveraging both pattern recognition and machine learning.

Future Outlook:

- Plans for reinforcement learning integration and adaptive risk management to further optimize performance in dynamic markets.

Final Remarks:

- The project shows promise for practical application in trading strategies, with future enhancements expected to further improve robustness and profitability.

Thank You