# Optimal Entry and Exit Strategies in the Stock Market

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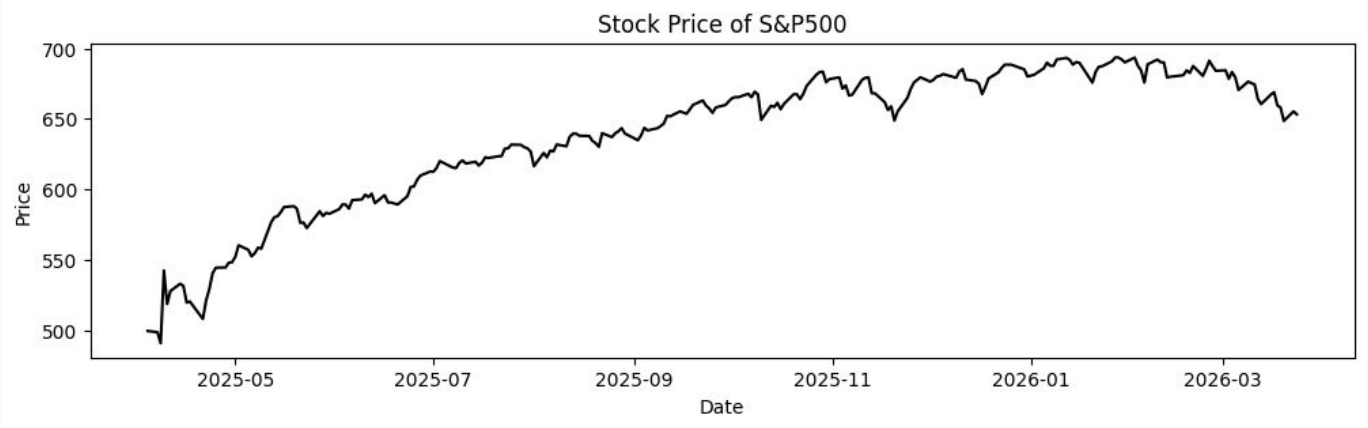
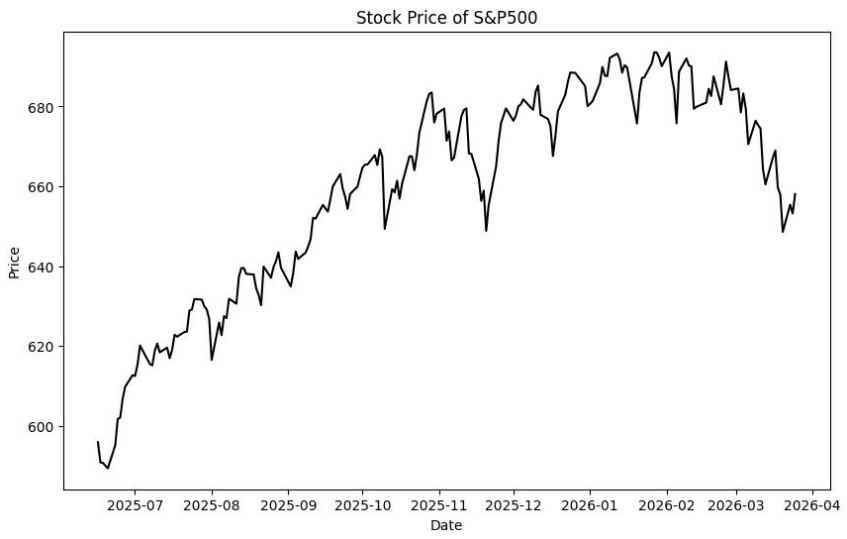
**Imagine you're an investor, hoping to profit off of the stock market...**

# Objectives




Examine quantitative methods of evaluating the equity market and determine if strategies using these quantitative metrics can meaningfully contribute to profit-making investments

# Strategy




At any point in time, one of three choices can be made: :

- buy
- sell
- hold

**Goal:** leverage financial indicators to aid this decision-making process

# Introduction to Financial Indicators

## Trend

- Used to identify the movement of the stock market during a given period
- Types: upward, downward, sideways
- Tools: moving average (MA)

## Momentum

- Measures the strength of the stock market movement
- Tools: relative strength index (RSI), stochastic oscillator, average directional index (ADX)

## Volatility

- Measures the intensity of the price fluctuations
- Tools: bollinger bands, relative volatility index, average true range

# Moving Average

- Trend indicator
- 2 main types: simple moving average and exponential moving average
- Low-pass filter: filters out high frequency movements
- Shows the general trend of the movement over a period of time (usually 200 days)

$$\mathrm{MA}_t^{(n)} = \frac{1}{n} \sum_{i=0}^{n-1} P_{t-i}$$

# Bollinger Bands

- Volatility indicator
- Moving average: local mean
- Bands: similar to confidence interval in statistics
- Price near upper bands: overbought

Strategy:

- Pt < lower → buy
- Pt > upper → sell

Define:

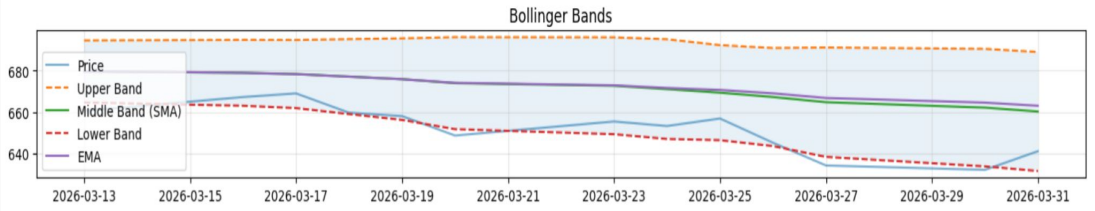
$$\mathrm{MA}_t^{(n)} = \frac{1}{n}\sum_{i=0}^{n-1} P_{t-i}$$

$$\sigma_t^{(n)} = \sqrt{\frac{1}{n}\sum_{i=0}^{n-1}(P_{t-i} - \mathrm{MA}_t^{(n)})^2}$$

Then the bands:

$$\mathrm{Upper}_t = \mathrm{MA}_t^{(n)} + k \cdot \sigma_t^{(n)}$$

$$\mathrm{Lower}_t = \mathrm{MA}_t^{(n)} - k \cdot \sigma_t^{(n)}$$

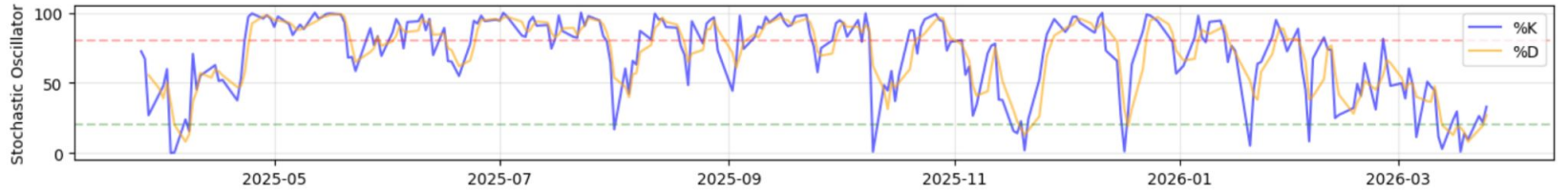


# Stochastic Oscillator

- Detects momentum reversals
  - > 80: overbought
  - < 20: oversold
- %K line: fast line, where the price sits relative to recent data
- %D line: slow line
- Buy: %K crosses above %D
- Sell: %K crosses under %D

$$\%K = \frac{\text{close - lowest low}}{\text{highest high - lowest low}}$$

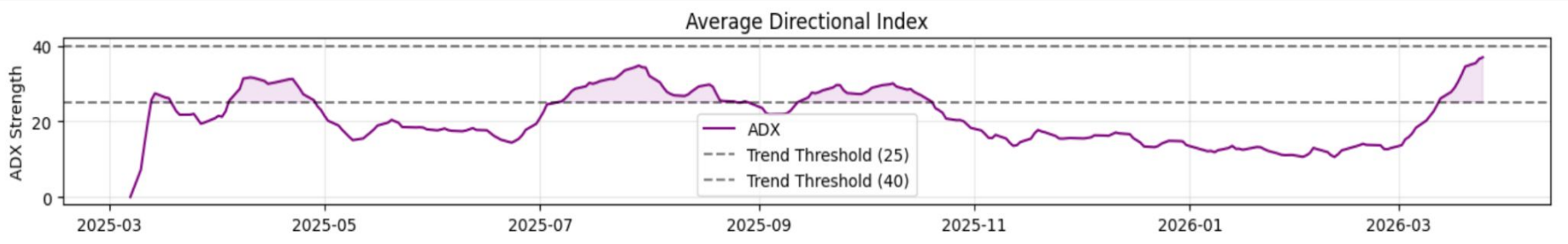
$$\%D = \frac{\%K_t + \%K_{t-1} + \%K_{t-2}}{3}$$



# Average Directional Index (ADX)

- Momentum indicator
- Measure of trend strength
- DI: directional movement
- Does not show trend direction

$$\mathrm{ADX}_t \approx \mathrm{MA}(|+DI - -DI|)$$

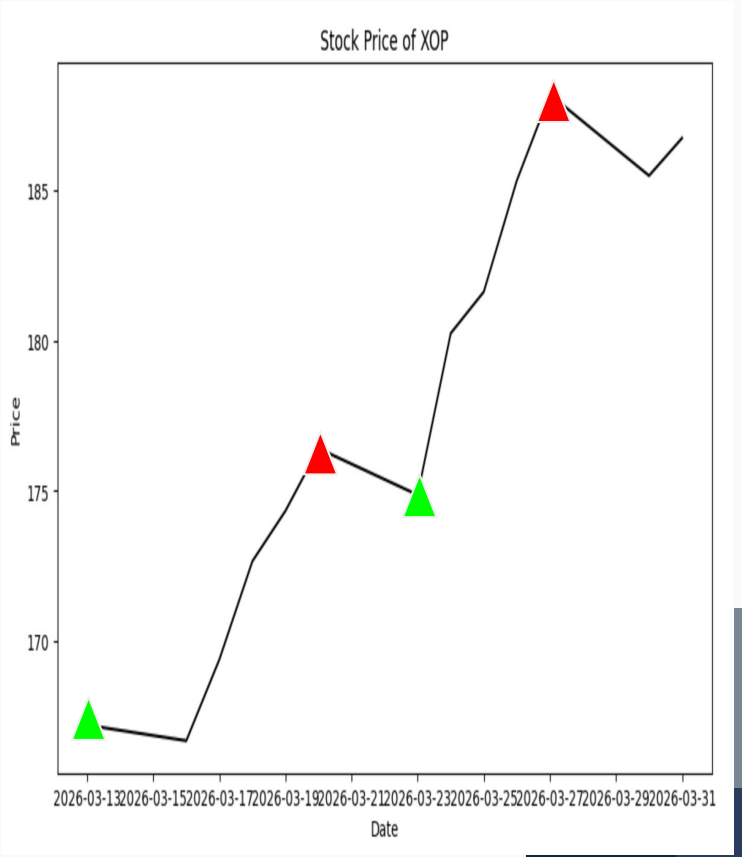


# Goal

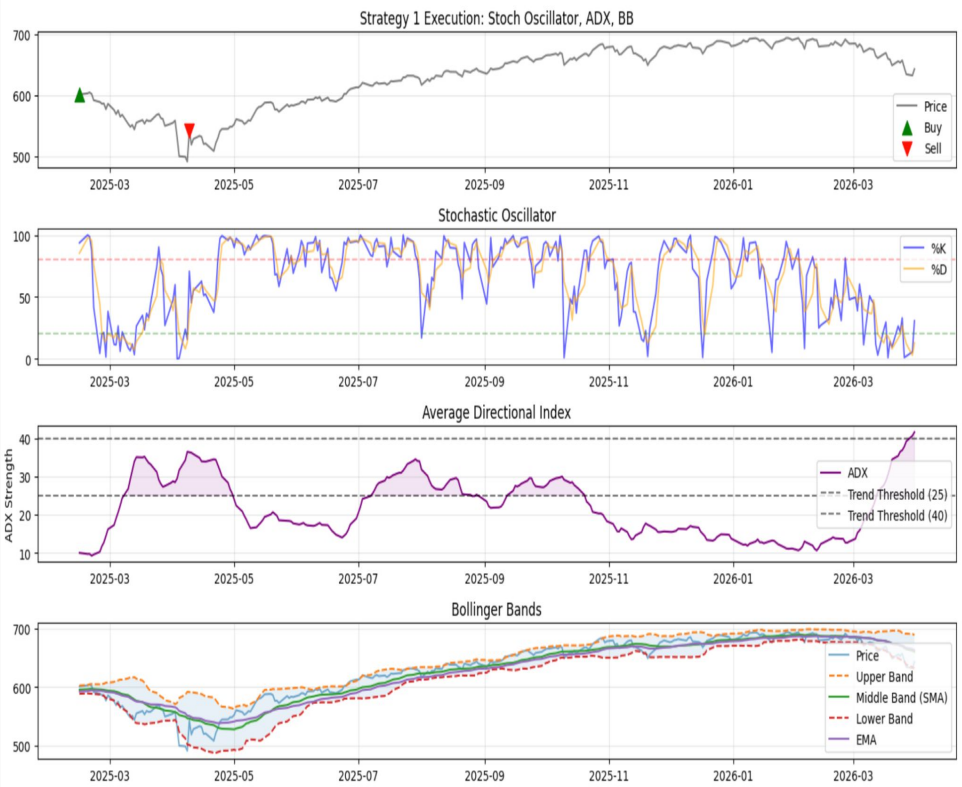
Over a given period of time, buy low, sell high using the buy and hold as a benchmark.

Key considerations

- Long-term vs Short-term
- Volatile vs Stable



# Strategy 1: ADX, stop loss, BB




## Buy Signal

- Current price < lower BB
- Strong trend: ADX > 25
- Momentum reversal (%K line crosses above %D line)

## Sell Signal

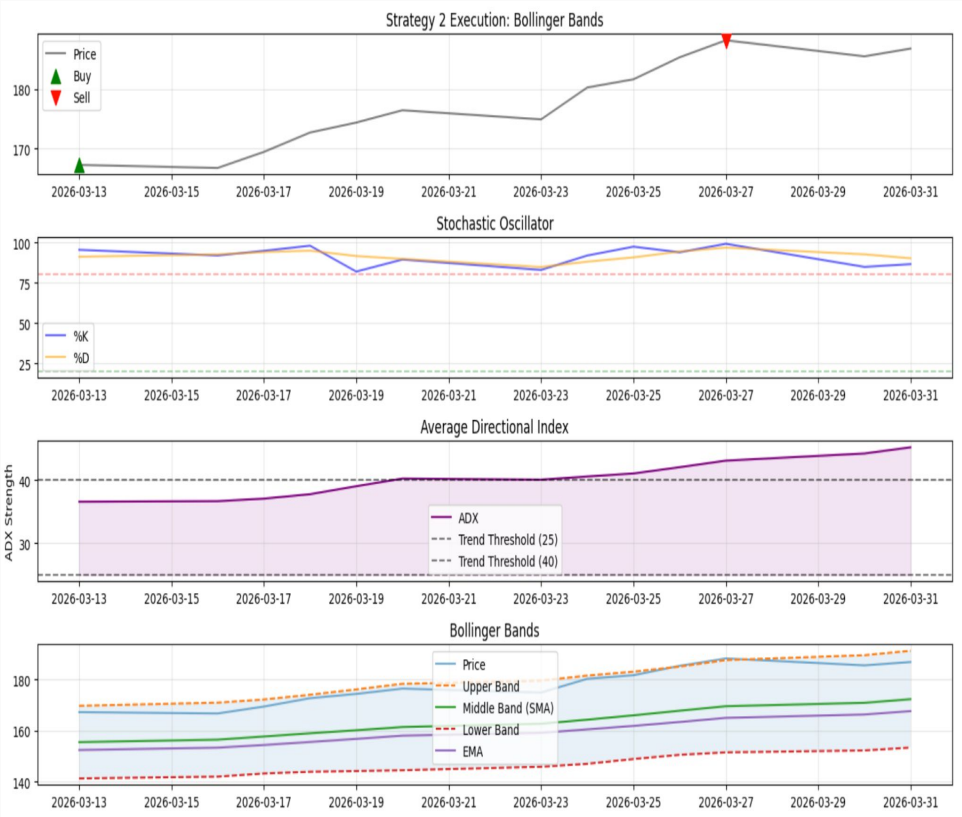
Case 1:

- Current price > lower BB
- Strong trend: ADX > 25
- Momentum reversal

Case 2:

- Stop loss at 20% price drop

# Strategy 2: BB




## Buy Signal

- Current price < lower BB

## Sell Signal

Case 1:

- Current price > upper BB

Case 2:

- Stop loss at 20% price drop

# Strategy Outputs

ADX, stop loss, BB vs. BB

# Strategy 1: 5-year Term


ASTC Performance: -22.79% Buy and Hold: -86.97%


TSLA Performance: -31.41% Buy and Hold: 39.82%


SPY Performance: 11.10% Buy and Hold: 63.89%

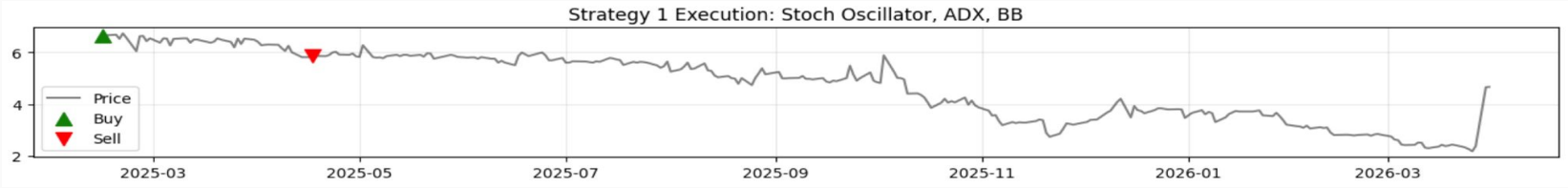
# Strategy 2: 5-year Term


ASTC Performance: -60.40% Buy and Hold: -86.97%


TSLA Performance: 44.41% Buy and Hold: 39.82%

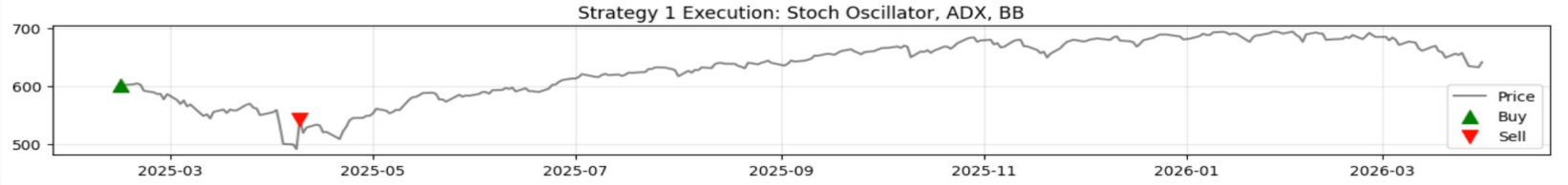

SPY Performance: 38.59% Buy and Hold: 63.89%

# Strategy 1: 1-year Term



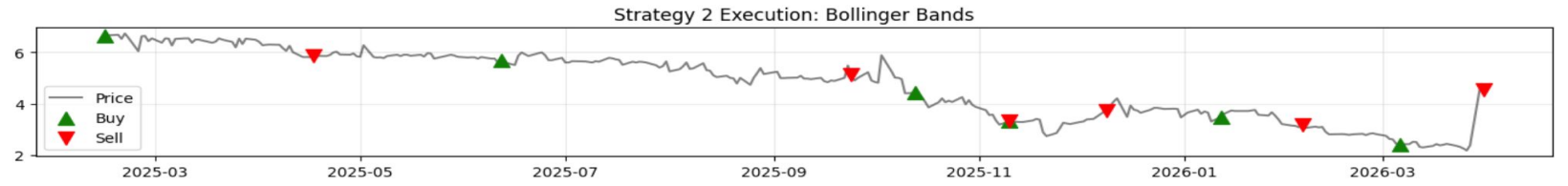

ASTC Performance: -11.98% Buy and Hold: -29.92%


TSLA Performance: 12.66% Buy and Hold: 2.13%



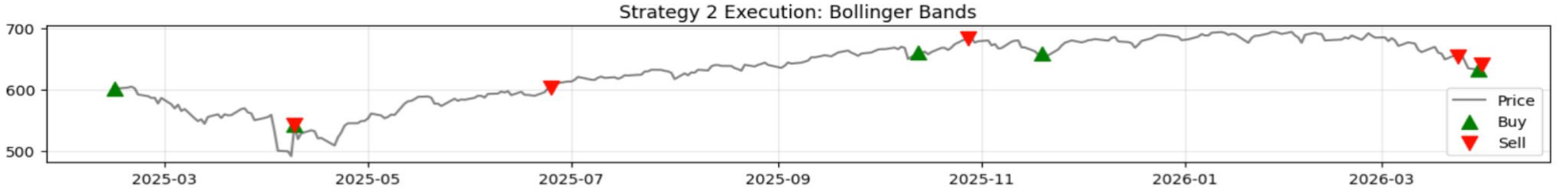

SPY Performance: -9.85% Buy and Hold: 6.62%

# Strategy 2: 1-year Term



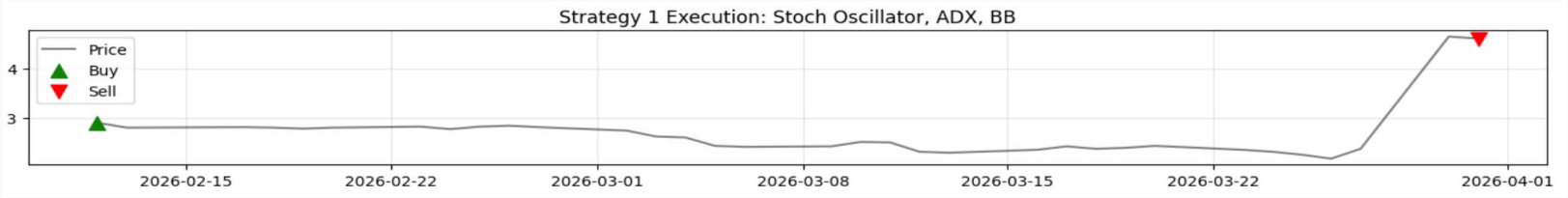

ASTC Performance: 13.66% Buy and Hold: -32.03%


TSLA Performance: 5.17% Buy and Hold: 2.21%

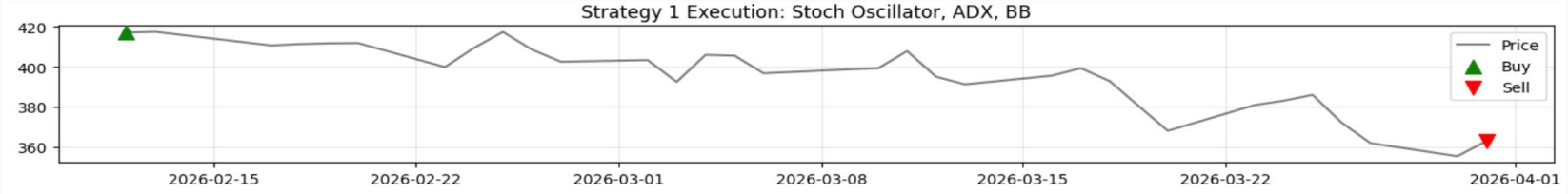



SPY Performance: 3.63% Buy and Hold: 6.64%

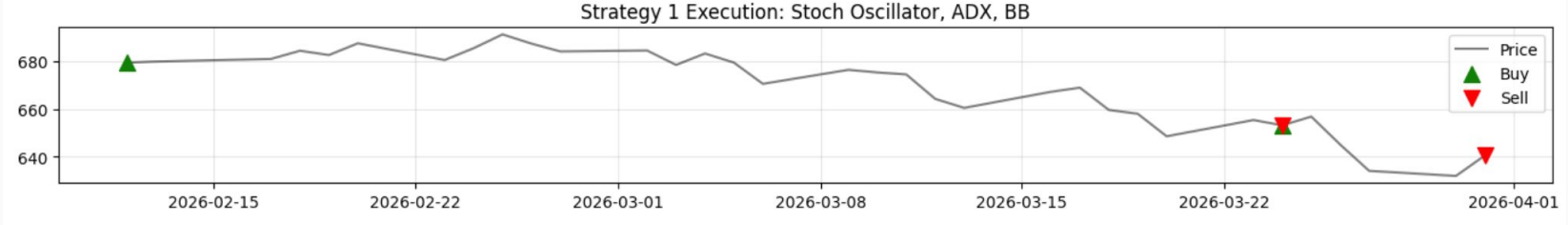
# Strategy 1: 2-month Term




ASTC Performance: 58.97% Buy and Hold: 58.97%



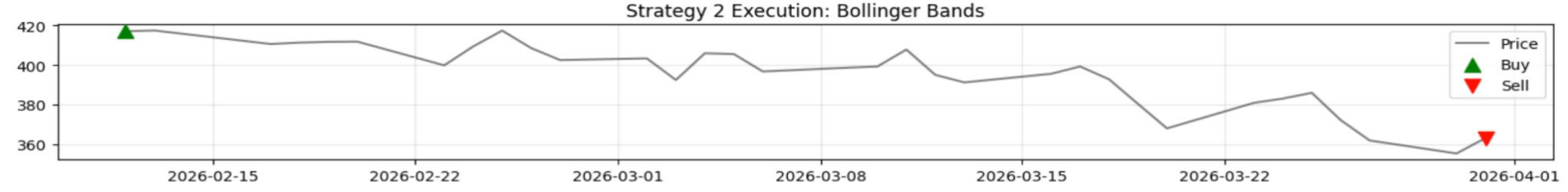

TSLA Performance: -13.00% Buy and Hold: -13.00%



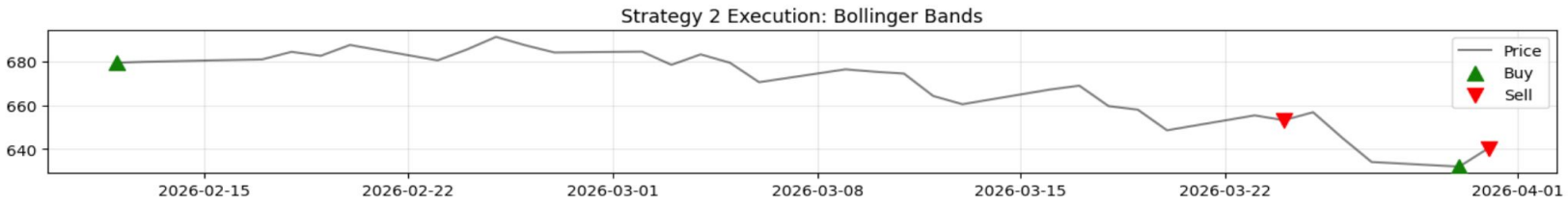

SPY Performance: -5.82% Buy and Hold: -5.72%

# Strategy 2: 2-month Term


ASTC Performance: 58.35% Buy and Hold: 58.35%




TSLA Performance: -12.94% Buy and Hold: -12.94%



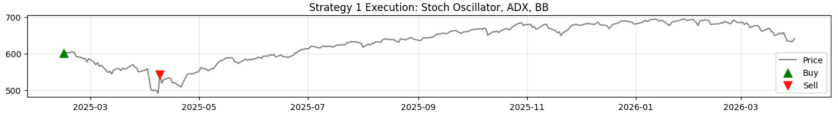

SPY Performance: -2.68% Buy and Hold: -5.74%

# Recommendation

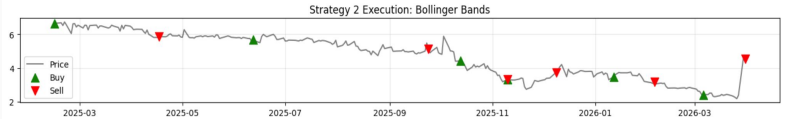
## Short-term (< 1 year): Strategy 2 (BB)


ASTC Performance: -11.98%

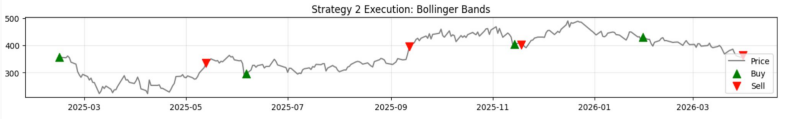

TSLA Performance: 12.66%




SPY Performance: -9.85%




ASTC Performance: 13.66%




TSLA Performance: 5.17%


SPY Performance: 3.63%

# Recommendation

Long-term: Volatile → Strategy 1 (ADX, Stochastic, BB)
Stable → Buy and Hold


ASTC Performance: -22.79%


TSLA Performance: -31.41%


SPY Performance: 11.10%


ASTC Performance: -60.40%


TSLA Performance: 44.41%


SPY Performance: 38.59%

# Conclusion

- Trade-off
  - Trade Frequency vs Signal Quality
  - Sensitivity vs Robustness
- Limitations
  - Time period selection
- Future Research Directions
  - Machine learning
  - Multi-asset portfolios

# Q&A

# Thank you for listening!