Trend Reversal

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agenda

Trend Reversal Strategy Definition

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What is Trend Reversal?

Identifying price shifts before they occur

Strategy Intuition

Stocks tend to have **trending periods** of increasing/decreasing price.
This is the basis of momentum trading: buying high, selling higher.

Identifying when the trend/momentum is shifting can allow us to predict price shifts. Changes in price tend to be preceded by changes in momentum.

Our goal is to **identify when a stock price trend is changing before it does**

MACD

Moving Average Convergence Divergence

A formula that compares Exponential Moving Averages (EMAs) of different periods against each other.

$$MACD = EMA_{12} - EMA_{26}$$

$$EMA_{n,t=0} = P_t \times \alpha_n + EMA_{n,t=-1} \times (1 - \alpha_n)$$

$$EMA_{n,t=-n} = \frac{\sum_{t=-2n}^{-n} P_t}{n}$$

$$\alpha_n = \frac{2}{n+1}$$

Note: **Exponential Moving Average** is a type of moving average that places greater weight on more recent data points.

Understanding the Divergence Signal

We are going to use MACD as functionally a “**derivative**” of price

When prices hit all time highs or lows, we want to know how MACD is changing

If prices are reaching an extremum but MACD is not, then we’ve identified a divergence

This **decoupling of the variable and its derivative** suggests a trend reversal, which we capitalize on.

Trading Specifications

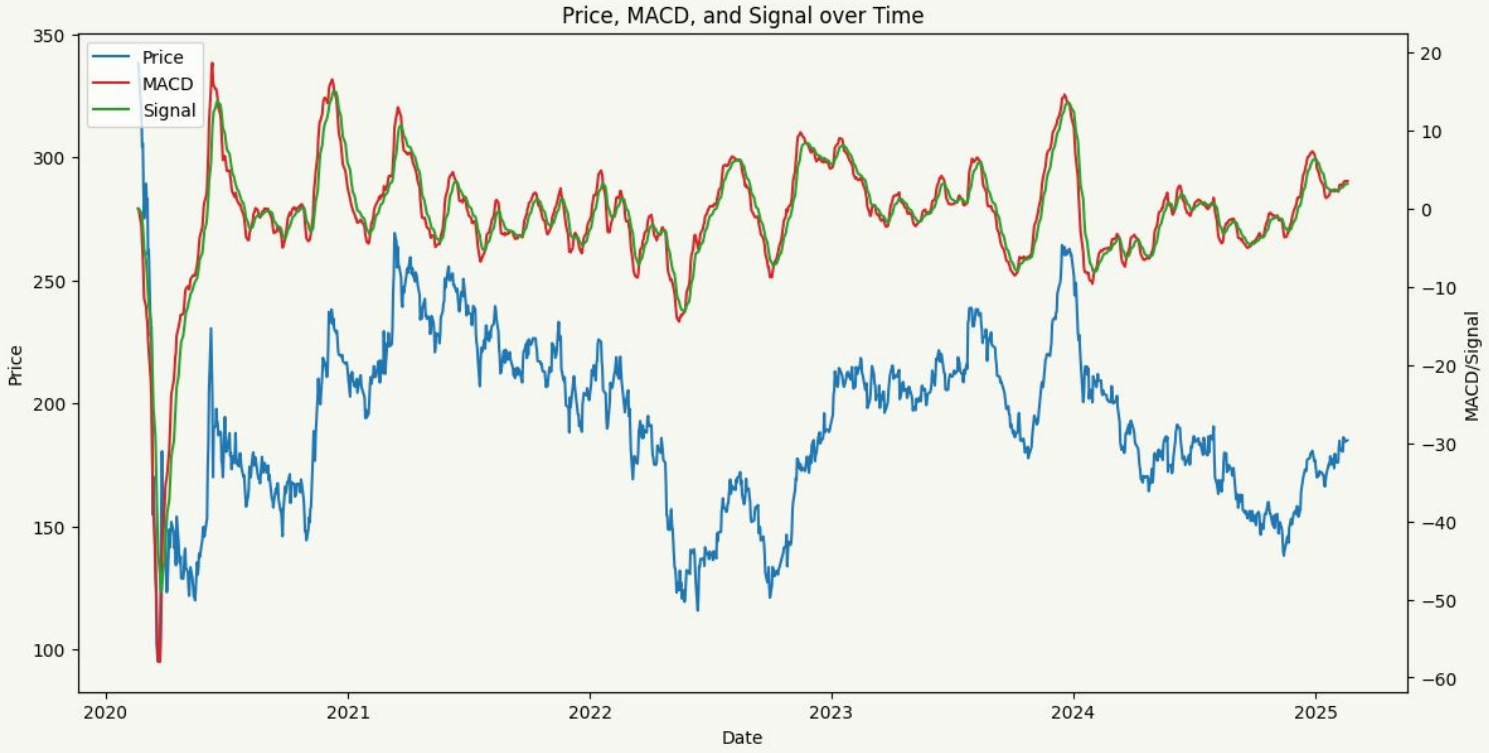
Hope to trade:

(1) **Moderate volatility** markets so price swings are sufficiently significant to generate clear indicators, but not so erratic that noise—such as false divergences—obscure the signal.

(2) **Range-bound** markets, i.e., those oscillating between a high and a low. In these markets, divergence between price and MACD is more likely to indicate a coming reversal rather than the continuation of a powerful trend.

(3) **Large-Cap** stocks, because higher liquidity means price data tends to be smoother and less prone to erratic moves caused by low trading volume. This makes our EMAs (and hence the MACD) more reliable.

Boeing


Price, MACD, and Signal over Time
Price
MACD
Signal
Price
MACD/Signal
Date
350
300
250
200
150
100
20
10
0
−10
−20
−30
−40
−50
−60
2020
2021
2022
2023
2024
2025

Code

```
# Check for buying opportunity
elif df['Close'].iloc[i] < min(prev_prices): # Are prices bottoming?
  divergence = macd_position - price_position - 5
  if divergence > 0: # Is the divergence significant?
    if curr_macd > curr_signal: # Have MACD and signal lines crossed?
      investment_size = (((0.3 / trade_cap) * snp_holdings) -
        ((0.01 / trade_cap) * snp_holdings) * divergence)
      snp_shares -= investment_size / snp_price
      portfolio.append((investment_size / curr_price,
                        curr_price, curr_macd, day))
      position = BULL
      print(f"On {day}, bought {investment_size / curr_price} shares,"
      f"for a total of ${investment_size}")
```

Logic for bullish divergence: Scans the rolling window and checks if MACD's relative position is significantly lower than price's

```
# Should we realize our investments?
if ((position == BULL and curr_macd < curr_signal) or
 (position == BEAR and curr_macd > curr_signal)):
  share_count = 0
  gains = 0
  for shares, purchase_price, purchase_macd, day in portfolio:
    share_count += shares
    gains += shares * curr_price
  snp_shares += gains / snp_price
  print(f"On {day}, cleared {wordmap[position][0]}ish portfolio: "
  f"{wordmap[position][1]} {share_count} shares, for a total of ${gains}")
  position = NEITHER
  portfolio = []
```

Logic for realizing investments: sell/cover when MACD and signal line have crossed, indicating that MACD momentum is ending

Link to view code with Colab: https://colab.research.google.com/drive/1vuRTip0BRVUVpcb6-YU6JDhzwX9m3ZGt?usp=sharing

Results


Portfolio Value over Time
Holding S&P 500
Divergence Trading
Portfolio Value
220000
200000
180000
160000
140000
120000
100000
80000
60000
2020
2021
2022
2023
2024
2025
Date

Questions?

Thank you