

# Stock Technical Analysis with Python

## Section 3: Stock Trading Signals

# Course Disclaimer

- **Course Objective.** This course has an educational and informational purpose and doesn't constitute any type of trading or investment advice. All content, including code and data, is presented with no guarantee of exactness or completeness.
- **Investment Risk and Uncertainty.** All course content and conclusions are based on hypothetical historical back-testing and not real trading with the possibility of future outliers not previously observed within these time series. Past performance doesn't guarantee future returns. Investment risk and uncertainty can possibly lead to its total loss for unleveraged products and even larger for leveraged ones.
- **Responsibility Disclaimer.** The instructor is not responsible for any damages caused by using course content for trading or investment decisions; exclusively transferring all this responsibility to the student. Recommending that the student does own due-diligence based on several scenarios, assumptions and consult a certified financial advisor before taking any trading or investment decision.
- **Non-endorsement.** The instructor doesn't endorse any particular trading strategy and associated stock or investment vehicle. Some are from recent inception and haven't been exposed to a major market correction. Investment vehicles have risk considerations such as liquidity, tracking error, replicating index unpredictability, note issuer credit risk, among others. Therefore, recommending again student does own due-diligence and consult a certified financial advisor before taking any trading or investment decision.

# Stock Trading Signals

- **Stock trading signals** occur when there is a crossover among prices and technical indicators or between technical indicators and certain bands, centerlines or signals.
- These crossovers signal stock buying or selling opportunities and when it is overbought or oversold.
- They can either be applied **individually** or in **combination** with other stock trading signals.
- **Loop:** For i in n:
  - If Buying Signal = True: Trading Signal = 1
  - Else-if Selling Signal = True: Trading Signal = -1
  - Else: Trading Signal = 0

# Single Indicator Trading Signals

- **Single indicator trading signals** are used to follow uptrends and downtrends or to lead price movement by identifying their momentum tendency of rising or falling prices to keep doing so.

# MA Trading Signals

- **Moving averages trading signals** occur when there is a crossover among stock close prices and their moving average or between short term and long term moving averages.
- **Price Crossover** Trading Signals:
  - Buy signal: Previous ( $\text{Close} < \text{SMA}_5$ )  $\rightarrow$  Current ( $\text{Close} > \text{SMA}_5$ )
  - Sell signal: Previous ( $\text{Close} > \text{SMA}_5$ )  $\rightarrow$  Current ( $\text{Close} < \text{SMA}_5$ )
- **Double Crossover** Trading Signals:
  - Buy signal: Previous ( $\text{EMA}_5 < \text{EMA}_{21}$ )  $\rightarrow$  Current ( $\text{EMA}_5 > \text{EMA}_{21}$ )
  - Sell signal: Previous ( $\text{EMA}_5 > \text{EMA}_{21}$ )  $\rightarrow$  Current ( $\text{EMA}_5 < \text{EMA}_{21}$ )

## BB Trading Signals

- **Bollinger bands trading signals** occur when there is a crossover among stock close prices and technical indicators' lower and upper bands.
- **Bands Crossover** Trading Signals:
  - Buy signal: Previous (Close < Lower Band) → Current (Close > Lower Band)
  - Sell signal: Previous (Close < Upper Band) → Current (Close > Upper Band)

# SAR Trading Signals

- **Parabolic stop and reverse trading signals** occur when there is a crossover among stock close prices and corresponding technical indicator.
- **Stop and Reverse** Trading Signals:
  - Buy signal: Previous (Close < SAR) → Current (Close > SAR)
  - Sell signal: Previous (Close > SAR) → Current (Close < SAR)

## ADX Trading Signals

- **Average directional movement index trading signals** occur when average directional movement index indicator is above an upper band and there is a crossover among positive and negative directional index indicators.
- **Band and Double Crossover** Trading Signals:
  - Stock trending:  $ADX(14) > +20$
  - Buy signal: Previous  $(DI(14)_p < DI(14)_n) \rightarrow$  Current  $(DI(14)_p > DI(14)_n) \& ADX(14) > +20$
  - Sell signal: Previous  $(DI(14)_p > DI(14)_n) \rightarrow$  Current  $(DI(14)_p < DI(14)_n) \& ADX(14) > +20$



# CCI Trading Signals

- **Commodity channel index trading signals** occur when there is a crossover among technical indicator and its upper and lower bands.
- **Bands Crossover** Trading Signals:
  - Buy signal: Previous  $(CCI(20,0.015) < -100) \rightarrow$  Current  $(CCI(20,0.015) > -100)$
  - Sell signal: Previous  $(CCI(20,0.015) < +100) \rightarrow$  Current  $(CCI(20,0.015) > +100)$

# MACD Trading Signals

- **Moving averages convergence/divergence trading signals** occur when there is a crossover among technical indicator and its signal or centerline.
- **Signal Crossover** Trading Signals:
  - Buy signal: Previous ( $\text{MACD}(12,26) < \text{Signal}(9)$ )  $\rightarrow$  Current ( $\text{MACD}(12,26) > \text{Signal}(9)$ )
  - Sell signal: Previous ( $\text{MACD}(12,26) > \text{Signal}(9)$ )  $\rightarrow$  Current ( $\text{MACD}(12,26) < \text{Signal}(9)$ )
- **Centerline Crossover** Trading Signals:
  - Buy signal: Previous ( $\text{MACD}(12,26) < 0$ )  $\rightarrow$  Current ( $\text{MACD}(12,26) > 0$ )
  - Sell signal: Previous ( $\text{MACD}(12,26) > 0$ )  $\rightarrow$  Current ( $\text{MACD}(12,26) < 0$ )

# ROC Trading Signals

- **Rate of change trading signals** occur when there is a crossover among technical indicator and its upper and lower bands.
- **Bands Crossover** Trading Signals:
  - Buy signal: Previous (ROC(21) < -5) → Current (ROC(21) > -5)
  - Sell signal: Previous (ROC(21) < +5) → Current (ROC(21) > +5)

# RSI Trading Signals

- **Relative strength index trading signals** occur when there is a crossover among technical indicator and its upper and lower bands.
- **Bands Crossover** Trading Signals:
  - Buy signal: Previous (RSI(14) < +30) → Current (RSI(14) > +30)
  - Sell signal: Previous (RSI(14) < +70) → Current (RSI(14) > +70)

## STO Trading Signals

- **Stochastic oscillator trading signals** occur when there is a crossover among technical indicator and its upper and lower bands.
- **Bands Crossover** Trading Signals:
  - Buy signal: Previous (Slow %D(14,3,3) < +20) → Current (Slow %D(14,3,3) > +20)
  - Sell signal: Previous (Slow %D(14,3,3) > +80) → Current (Slow %D(14,3,3) < +80)

## WPR Trading Signals

- **Williams %R trading signals** occur when there is a crossover among technical indicator and its upper and lower bands.
- **Bands Crossover** Trading Signals:
  - Buy signal : Previous (Williams %R(14) < -80) → Current (Williams %R(14) > -80)
  - Sell signal: Previous (Williams %R(14) < -20) → Current (Williams %R(14) > -20)

## Multiple Indicator Trading Signals

- **Multiple indicator trading signals** are used to follow uptrends or downtrends and confirm price movements by identifying their momentum tendency to keep on rising or falling.

## CCI and SMA Trading Signals

- **Commodity channel index and simple moving average trading signals** occur when there is a crossover among stock close prices and their simple moving average which is confirmed by commodity channel index being at an overbought or oversold area.
- **Price Crossover and Band Crossover Confirmation Trading Signals:**
  - Stock overbought:  $CCI(20,0.015) > +100$
  - Stock oversold:  $CCI(20,0.015) < -100$
  - Buy signal: Previous (Close  $< SMA_5$ )  $\rightarrow$  Current (Close  $> SMA_5$ ) &  $CCI(20,0.015) < -100$
  - Sell signal: Previous (Close  $> SMA_5$ )  $\rightarrow$  Current (Close  $< SMA_5$ ) &  $CCI(20,0.015) > +100$



## ROC and SMA Trading Signals

- **Rate of change and simple moving average trading signals** occur when there is a crossover among stock close prices and their simple moving average which is confirmed by rate of change indicator being at an overbought or oversold area.
- **Price Crossover and Band Crossover Confirmation** Trading Signals:
  - Stock overbought:  $ROC(21) > +5$
  - Stock oversold:  $ROC(21) < -5$
  - Buy signal: Previous ( $Close < SMA_5$ )  $\rightarrow$  Current ( $Close > SMA_5$ ) &  $ROC(21) < -5$
  - Sell signal: Previous ( $Close > SMA_5$ )  $\rightarrow$  Current ( $Close < SMA_5$ ) &  $ROC(21) > +5$

## RSI and SMA Trading Signals

- **Relative strength index and simple moving average trading signals** occur when there is a crossover among stock close prices and their simple moving average which is confirmed by relative strength index being at an overbought or oversold area.
- **Price Crossover and Band Crossover Confirmation Trading Signals:**
  - Stock overbought:  $RSI(14) > +70$
  - Stock oversold:  $RSI(14) < +30$
  - Buy signal: Previous (Close  $< SMA_5$ )  $\rightarrow$  Current (Close  $> SMA_5$ ) &  $RSI(14) < +30$
  - Sell signal: Previous (Close  $> SMA_5$ )  $\rightarrow$  Current (Close  $< SMA_5$ ) &  $RSI(14) > +70$

## STO and SMA Trading Signals

- **Stochastic oscillator and simple moving average trading signals** occur when there is a crossover among stock close prices and their simple moving average which is confirmed by slow stochastic oscillator indicator being at an overbought or oversold area.
- **Price Crossover and Band Crossover Confirmation Trading Signals:**
  - Stock overbought:  $\text{Slow \%D}(14,3,3) > +80$
  - Stock oversold:  $\text{Slow \%D}(14,3,3) < +20$
  - Buy signal: Previous ( $\text{Close} < \text{SMA}_5$ )  $\rightarrow$  Current ( $\text{Close} > \text{SMA}_5$ ) &  $\text{Slow \%D}(14,3,3) < +20$
  - Sell signal: Previous ( $\text{Close} > \text{SMA}_5$ )  $\rightarrow$  Current ( $\text{Close} < \text{SMA}_5$ ) &  $\text{Slow \%D}(14,3,3) > +80$

## WPR and SMA Trading Signals

- **Williams %R and simple moving average trading signals** occur when there is a crossover among stock close prices and their simple moving average which is confirmed by Williams %R indicator being at an overbought or oversold area.
- **Price Crossover and Band Crossover Confirmation Trading Signals:**
  - Stock overbought: Williams %R(14) > -20
  - Stock oversold: Williams %R(14) < -80
  - Buy signal: Previous (Close < SMA<sub>5</sub>) → Current (Close > SMA<sub>5</sub>) & Williams %R(14) < -80
  - Sell signal: Previous (Close > SMA<sub>5</sub>) → Current (Close < SMA<sub>5</sub>) & Williams %R(14) > -20