MACD trading system design

Equities

Stock – S and P 500 daily closing price 2016 to 2021

MACD Model

What is a moving average?

This is the average of a time series over a specific window size which slides along as we move along the time series.

$$SMA(t) = \frac{t_{-\propto} + \cdots t_{-1} + t + t_1 + \cdots + t_{\propto}}{2 \propto +1}$$

where $2 \propto +1$ *is the window size*

Standard Simple Moving Average

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However, we are unable to have access to future value in a time series hence we look at simple moving average using past data.

A window {t-T, t) is now used as basis of the computation of SMA. This gives a lag to the actual movement average value. The computation with the (t-T, t) sliding window is effectively the MA at t-T/2. Essentially this is the arithmetic moving average computed by summing the values of the series over the window period and averaging this using the size of the window.

SSMA = (p(t-T) + p(t-T+1) + p(t-T+2) ... + p(t-2) + p(t-1) + p(t))/(T+1)

MACD Model

To address the lag due to lack of foresight data, an exponential moving average that weighs the more on recent data is used.

The formula for the Exponential moving average is:
EMA = (today's closing price *K) + (Previous EMA * (1 – K))
N = number of days in EMA
K (Smoothing Factor) = 2/(N+1)

For a long EMA of 26 Days, N = 26 and for a short EMA of 12 Days, N=12.

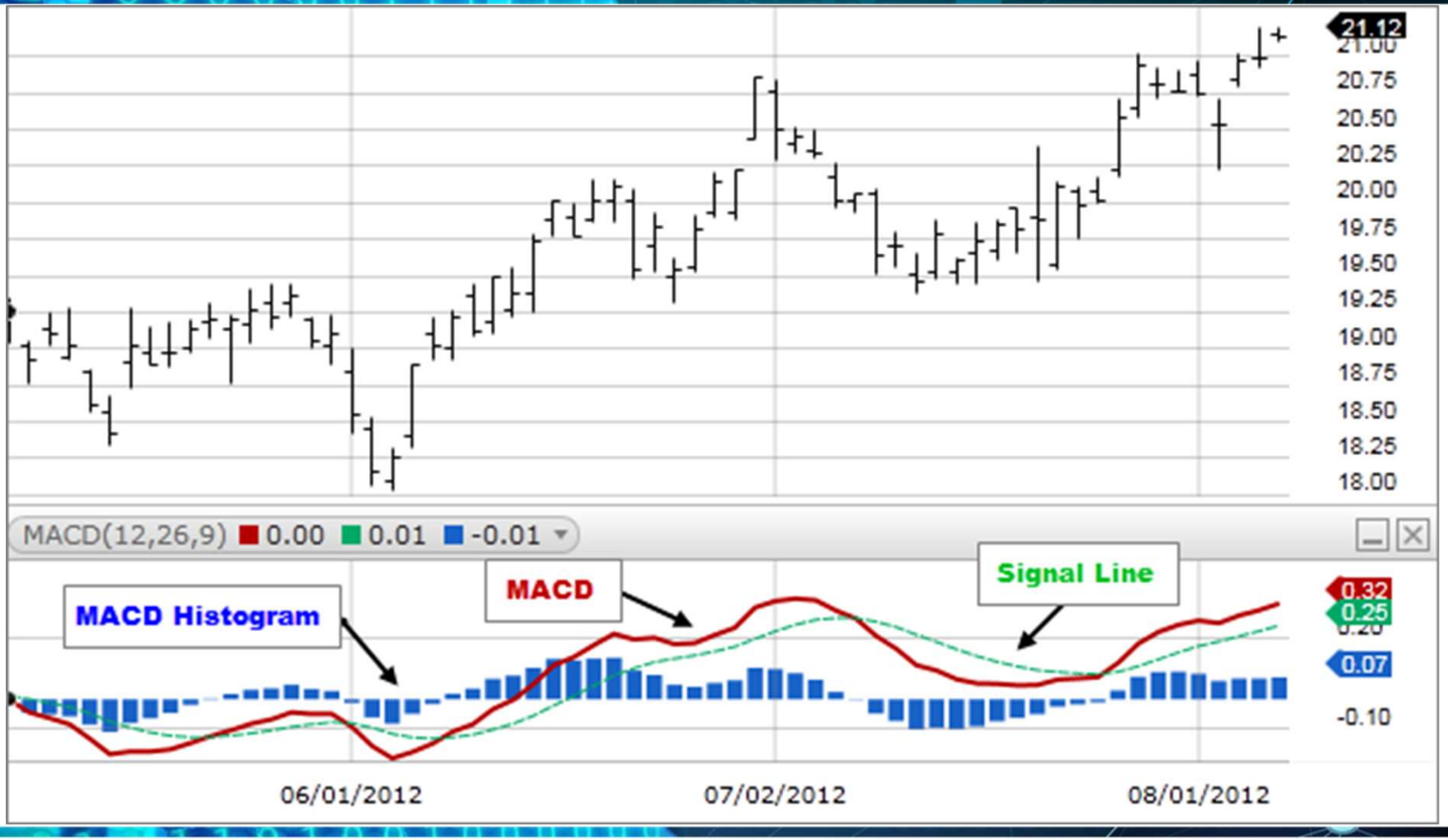
MACD Model

MACD line = S-MA – L-MA (MA can be SMA or EMA of the time series)
9-MACD-MA is the signal line (MA can be SMA or EMA of the MACD)
MACD Histogram = MACD – 9-MACD-MA (+ve = bullish and –ve = bearish)

1) When the signal line crosses over the MACD line (That is the histogram changes from +ve to –ve) it represents a trend reversal turning bearish

2) When the signal line crosses under the MACD line (that is the histogram changes from –ve to +ve) it represents a trend reversal turning bullish

MACD and MACDH



MACD Model

Each trend reversal can be accompanied by a Buy for Bullish market – condition 2 or a Sell for Bearish market – condition 1.

Each pair forms a BUY-HOLD-SELL action and incur commission loss at the BUY and SELL position determined by the cross over of the signal line.

In a BUY and HOLD investment, the Long position is held over the duration of investment and no opportunistic BUY and SELL are considered during this investment holding period. Hence only 2 commission loss are incurred in standard BUY and HOLD strategy.

MACD and MACDH

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How effective is MACD trading during a fully bullish market with minor market correction?

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What is the biggest leakage in trading?

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Which market is more dangerous for long term investment?

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S and P 500


Close
600
500
400
300
200
100
0
2016-01-01
2016-03-01
2016-05-01
2016-07-01
2016-09-01
2016-11-01
2017-01-01
2017-03-01
2017-05-01
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Can a trading system be computerised?

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Design Specification

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MACD trend reversal model using the exponential Moving average for Long and Short can be used within the MACD trend reversal model.

Design using flowchart and pseudo code for the computerisation of the MACD trend reversal system. The Long moving average (MA) is set at 26 days and the short MA is set at 12 days. The signal line is using the 9 day MA of the MACD line. As the standard simple moving average incurs a lag in the trend reversal timing due to lack of look forward data, the use of the exponential moving average is commonly used instead. This attempts to reduce this lag by exponentially weighing the information closer to time t. In your design allow the choice to the use of standard simple moving average as well as exponential moving average in the MACD trading system.

Design Specification – cont'd

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At each trend reversal:
1. The Signal line crossing under the MACD line - a buy signal is given to initiate a BUY and when
2. The Signal line cross over the MACD line a sell signal is given to initiate a SELL

Compute the BUY and SELL pair through the trading cycle with a commission of 1/8th percent of each trade done during each of the trend reversal BUY/SELL position. Assume all the holdings are bought or sold with all the accumulated fund. The stock series is stored in a text or excel file.

Also in your design compare your profit/loses against a simple BUY-HOLD-SELL position over the entire period of the trend reversal trading

Design Specification – cont'd

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Prepare a report 5-6 pages on the design of such a trading system with block diagram using flow chart and pseudo code.

Highlight the advantages and limitations of your design for maintainability

Your design must allow the user to select either standard simple moving average or exponential moving average in the computation of the MACD historgram.

If we intend to reduce unnecessary trade due to weak trend reversal when must be added to your design?

Submission:

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Send design report to:

computationalsc1003@gmail.com

Filename: name_assign1.docx or pdf

Deadline: 14th February 2022