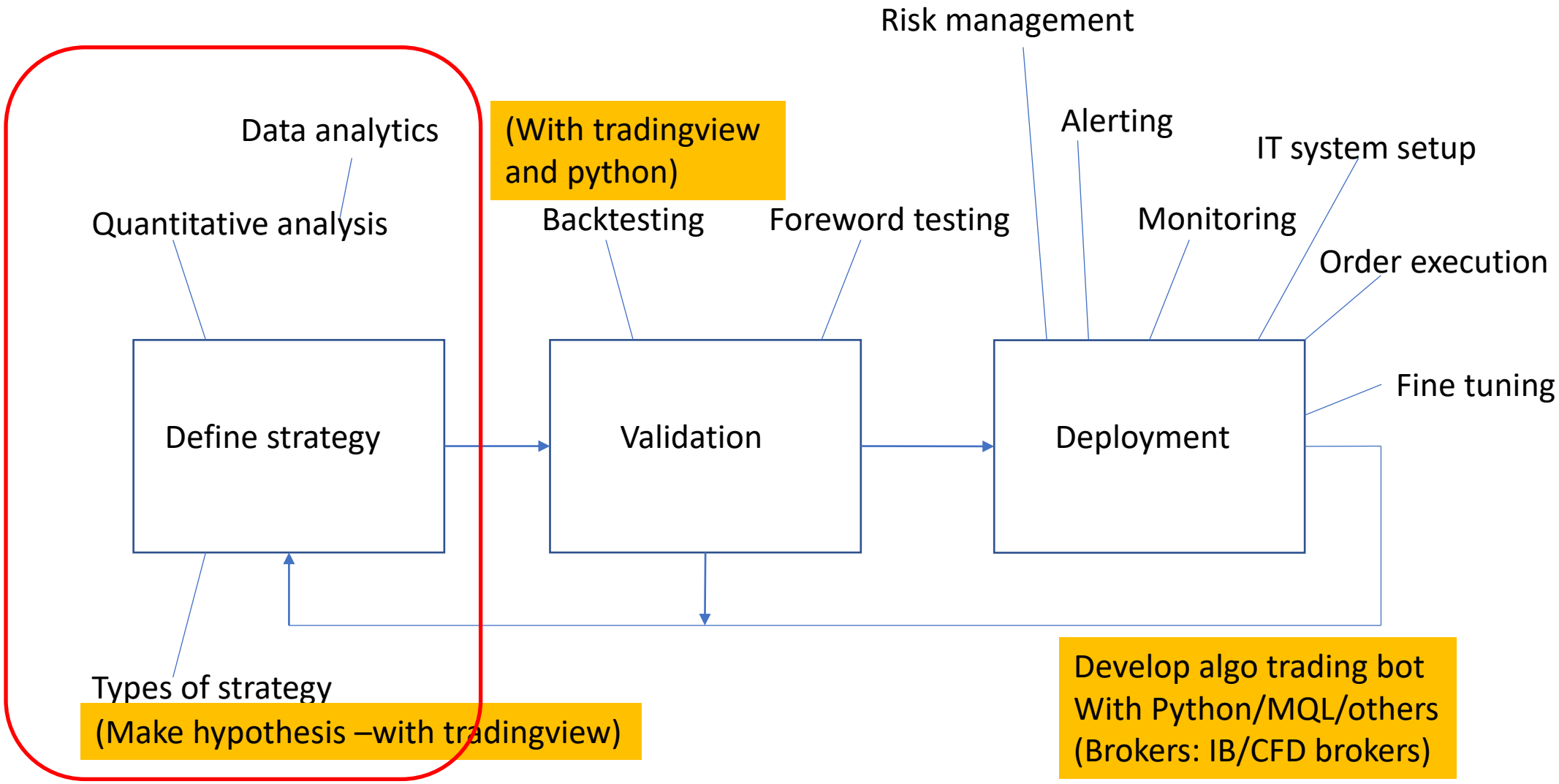
Overview of trading strategies

Version 4.1

Algo trading development is a workflow



Types of instrument

Select your favourite and the corresponding timeframe

- Stocks
  - Markets (HK/US)
  - Options
  - CFD (e.g. US stocks)
- Index
  - futures(expiration)
  - E.g. HSI/NQ/ES/MHI
  - CFD (HK50/NAS100)
  - Options
  - ETF
- Forex
  - E.g. USDJPY/AUDNZD/DXY (spot)
  - CFD
  - Futures/Options
- Crypto
  - Futures
  - CFD
- Commodity
  - XAUUSD
  - GC futures/options

Common data sources

- **Historical bar data/tick data**
  - Open/High/Low/Close/Volume
  - Pattern (Candle stick pattern,HH-LL, double bottom…)
  - Trend line
  - Support and resistance (=>breakout strategy)
  - Technical indicators (BB/EMA…)
  - Volume->Volume profile
  - Statistical analysis (e.g. Monthly range of HSI index)
- **Options related data**
  - OI
  - IV (e.g. IV percentile)
- **News** =>sentiment analysis

Types of trading strategies

- Trend following
  - E.g. Scalping
- Mean reversion
- Delta Neutral (e.g. Short Strangle)
- Pair trading

Challenges

- Trend following
  - No trend/range=>How to identify/predict range
- Mean reversion
  - Strong trendy market=>Quantitative analysis+ suitable position managment
- Delta Neutral (e.g. Short Strangle)
- Pair trading
- Arbitrage

Common types of algo trading bot

- Trend following
  - SMA/EMA/MACD/…
- Scalping (High volatility e.g. Crypto)
- Mean reversion
  - RSI/KD/MACD/BB/channel type indicators (e.g. BB)
- Breakout strategy
- Pair trading/arbritrage
- Money management (e.g. daily profit target/loss amount)
- Position management (e.g. martingale/grid trading)

Evaluation of the performance of trading strategies

- Risk and money management
- Position management


RISK VS REWARD
TRADING 101
RISK | REWARD & WIN RATE
20% 30% 40% 50% 60%
1:1 Not Profitable Not Profitable Not Profitable Break Even Profitable
2:1 Not Profitable Not Profitable Profitable Profitable Profitable
3:1 Not Profitable Profitable Profitable Profitable Profitable
4:1 Break Even Profitable Profitable Profitable Profitable
5:1 Profitable Profitable Profitable Profitable Profitable
EVERY TRADER SHOULD KNOW THIS!

Money management

- Capital (e.g 100K)
- 2% (2K)
- Define the corresponding stoploss level
- =>Define the amount of position
- =>Define the target profit with the appropriate RR (Risk reward)

什麼是交易策略

- **買入條件**(enter condition)
- **平倉條件**(exit condition)
- 止賺條件
- **止損條件**
- 注碼(position)
  - 例子：馬丁(Martingale)或者反馬丁策略

Trading strategy

- Enter condition
  - Enter signal (EMA/indicator/breakout…)
- Exit condition
  - Exit signal (EMA/indicator/breakout…)
  - Target profit
  - Stop loss
  - Trailing stop (e.g. with multiple of ATR e.g. 2xATR)
- Position

Multiple timeframe strategy

- Main timeframe (e.g. H1/M15)
  - Execute the order
- Larger timeframes (e.g. D1/W1)
  - Confirm the execution of order
- Example:
- If D1 has uptrend
  - Only execute long positions on the main timeframe

Example of trading strategy using KD

Time frame: H4

Long

Enter

- k<20 and k crossover d

Exit

- (k>=80 and k crossunder d) OR (num of bars after enter>=5)

Stop loss

- price <Low[1]

Target profit with trailing stop

Vice versa for short position

EMA cross strategy (EMA20 and EMA60)

Long

Enter:

- EMA20 crossover EMA60

Exit:

- EMA20 crossunder EMA60

Stop loss

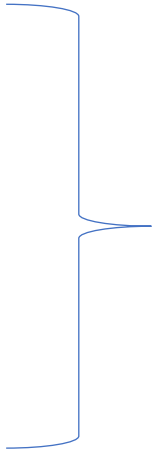
- price <Low[1]

Target profit with trailing stop

Vice versa for short position

Common indicators

- Pattern (e.g. support and resistance)
- Trend lines
- Candlestick pattern
- Moving averages(e.g. SMA/EMA)
- Bollinger band
- MACD
- RSI



Technical indicators
(Trend/mean reversion)

Chart pattern-Support and resistance

Higher High & Lower Low

Candlestick pattern

- Hammer
- Doji
- The morning star
- The evening star
- …

Morning Star

To identify the candle stick pattern-1/2

First bar:

- Lower shadow >=2/3 of whole body regardless it is green or red bar

Current bar:

- Green bar (Close>open)

To identify the candle stick pattern-2/2

- (Min(Open[1],Close[1])-Low[1]) > (**2/3**)* (High[1]-Low[1]) &
- (High[1]-max(Open[1],Close[1]))<(**1/4**)* (High[1]-Low[1]) &
- Close[0]>Open[0]

Evening Star

Types of indicators

- Price related indicators (e.g. EMA/MACD/BB/Market profile(TPO))
- Volume related indicators (e.g. Volume profile or VWAP etc)

Major types of technical indicators

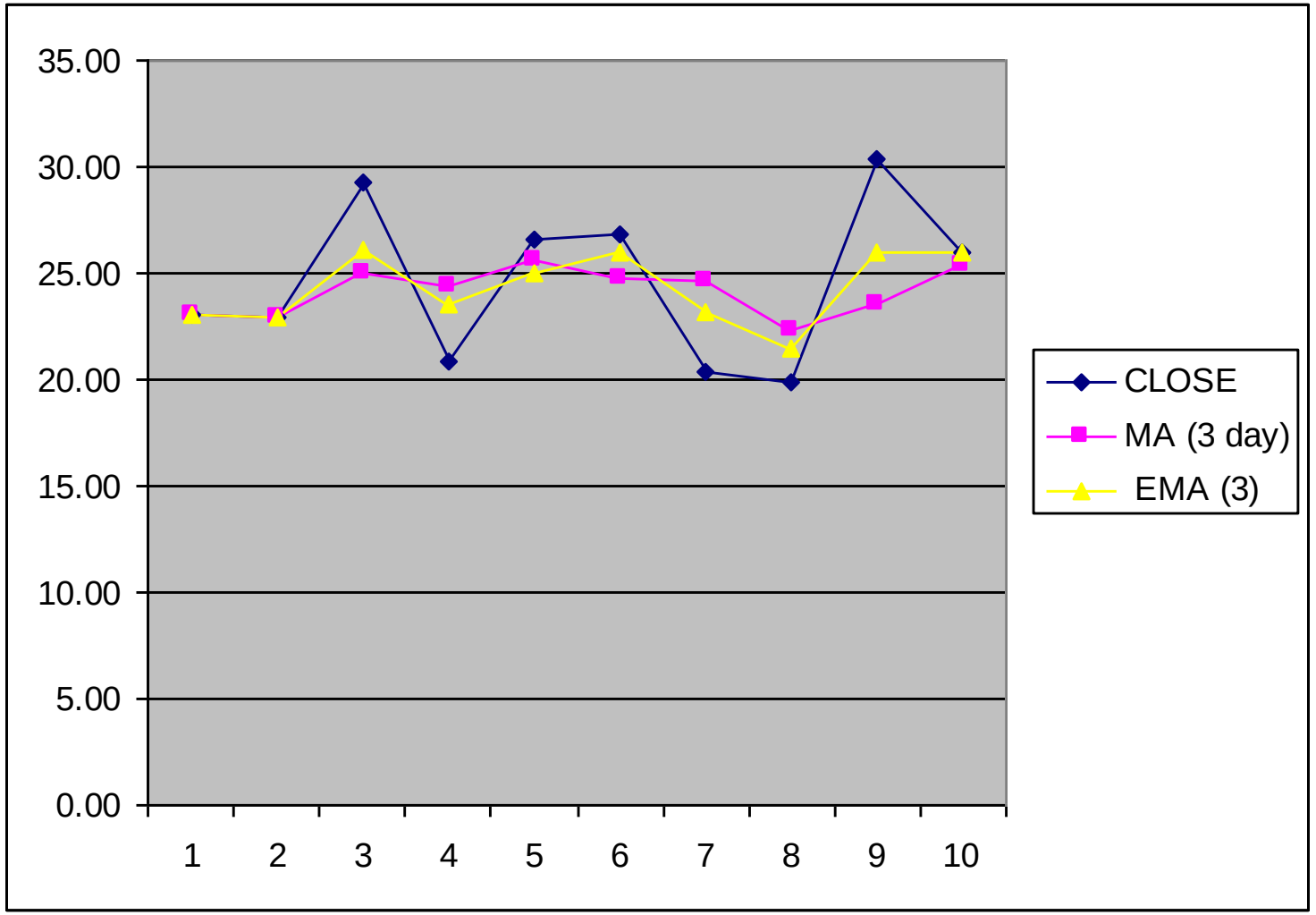
- **Trend-following indicators** include moving averages, MACD Lines (moving average convergence-divergence), the Directional System, On-Balance Volume, Accumulation/Distribution, and others. Trend-following indicators are coincident or lagging indicators—they turn after trends reverse.
- **Momentum(Oscillators)** help identify turning points. They include MACD-Histogram, Force Index, Stochastic, Rate of Change, Momentum, the Relative Strength Index, Elder-ray, Williams %R, and others. Oscillators are leading or coincident indicators that often turn ahead of prices.

Moving average and Exponential moving average

1. **MA(current)** = { Price(past1) + Price(past2) + … Price(pastN) } / N
2. **EMA(current)** = ((Price(current) - EMA(prev)) x Multiplier) + EMA(prev) where the Multiplier = 2 / (N + 1) and N in the time period is the fixed period one

CLOSE	MA (3 day)	EMA (3)
23.00	23.00	23.00
22.87	22.87	22.94
29.22	25.03	26.08
20.90	24.33	23.49
26.55	25.56	25.02
26.85	24.77	25.93
20.33	24.58	23.13
19.88	22.35	21.51
30.33	23.51	25.92
26.00	25.40	25.96

SMOOTHING BY **MOVING AVERAGE** & EXPONENTIAL MOVING AVERAGE



EMA is subject to quicker turns than a simple MA is.

Other moving average techniques

- Hull moving average

https://alanhull.com/hull-moving-average

- Adaptive moving average

https://www.metatrader5.com/en/terminal/help/indicators/trend_indicators/ama

EMA crossover (EMA20 and EMA60)

- EMA20[1] < EMA60 [1] and EMA20[0] > EMA60[0]

Dual EMA (shorter term EMA and longer term EMA

Sample strategy with EMAs

Long position

Time frame (M5/M15/H1/H4/D1/W1)

- Enter condition
  - EMA**20** crossover EMA**60**
- Exit condition
  - EMA20 crossunder EMA60
- Stop loss
  - Previous low (Low[1])-**stoploss_threshold**
- Target profit (?)
  - **300 pts** (?)
- **Trailing stop (with N xATR (e.g. 2 ATR) as parameter)**

- Vice versa for short position

Performance evaluation of trading strategy

- Win loss ratio
- RR (risk reward)
- Frequency
- Drawdown
- Number of consecutive loss
- Average/max profit per trade
- Average/max loss per trade

Types of Envelopes

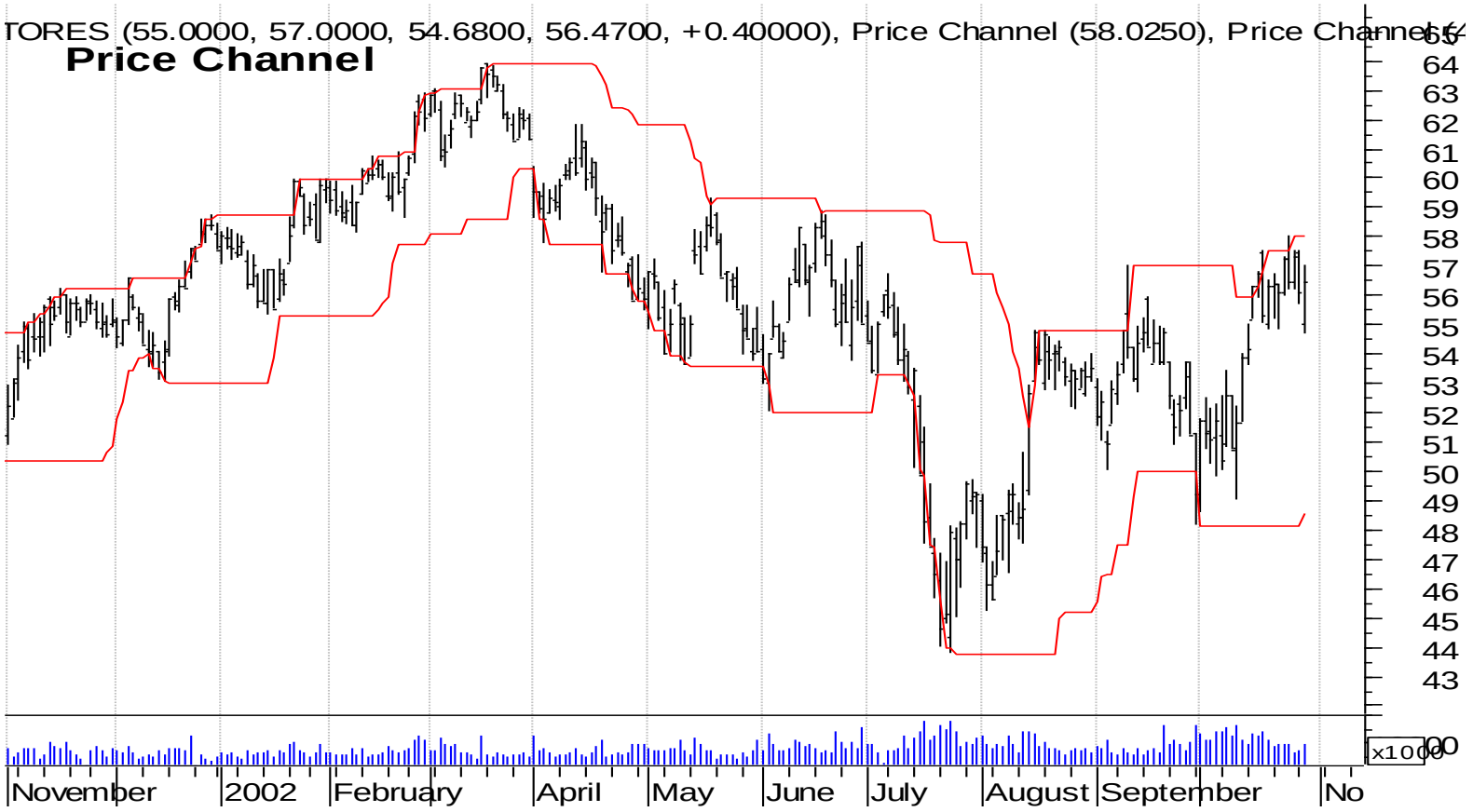
- Trading Bands
  - Lines above and below a central tendency
- Envelopes
  - Lines above and below by a %
- Channels
  - Parallel lines above and below prices

Envelope Examples – “Envelope”

- 2 Moving Averages, one shifted up, the other down
- Sell when reach upper envelope, buy when reach lower

Envelope Examples – “Price Channel”

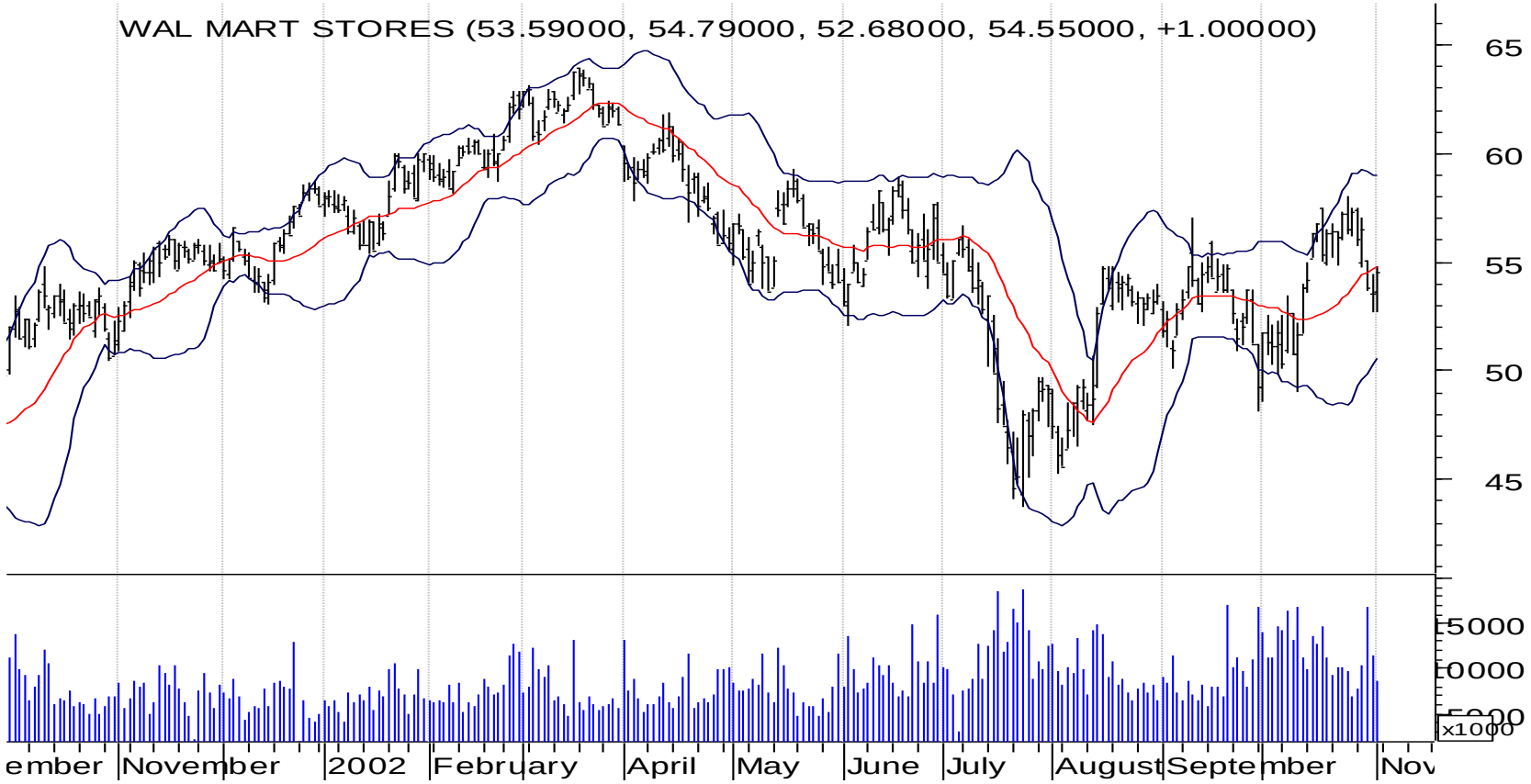
- Upper line is Highest High for *n* bars, Lowest Low for *n* bars
- Indicate *Support* and *Resistance* lines



Bollinger Bands

- John Bollinger – Financial News Network, “Market Technician” in 1980’s
- Pioneered use of *Standard Deviation* for construction of price envelope in 1983
- Bollinger Bands are:
  - 20 bar moving average,
  - Upper Band is 2 Standard Deviations above Mov Ave,
  - Lower Band is 2 Standard Deviations below Mov Ave
- Contains 89% of all prices
- Shows Volatilitiy

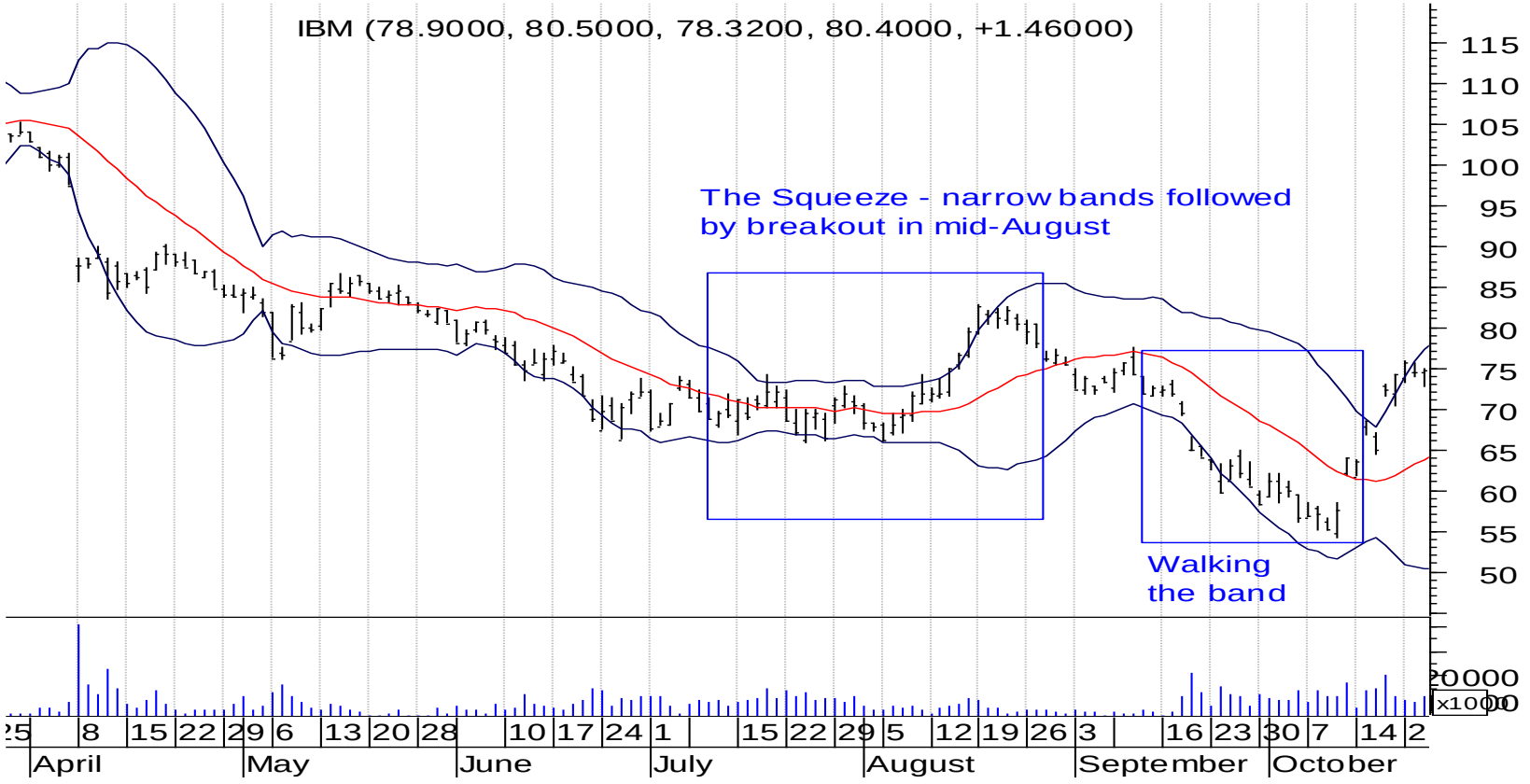
Envelope Examples – “Bollinger Bands”



Using Bollinger Bands

- “The Squeeze”
  - Low volatility followed by break-out, higher volatility
  - Lower volatility marks end of trend, Opposite Band turns in at end of trend
- “Walk the Bands”
  - Indicates strong trend
  - pullbacks to Moving Average
- Sideways trend
  - tag of upper, followed by tag of lower band, and visa versa
  - If cross Mov Ave, then will continue to Band

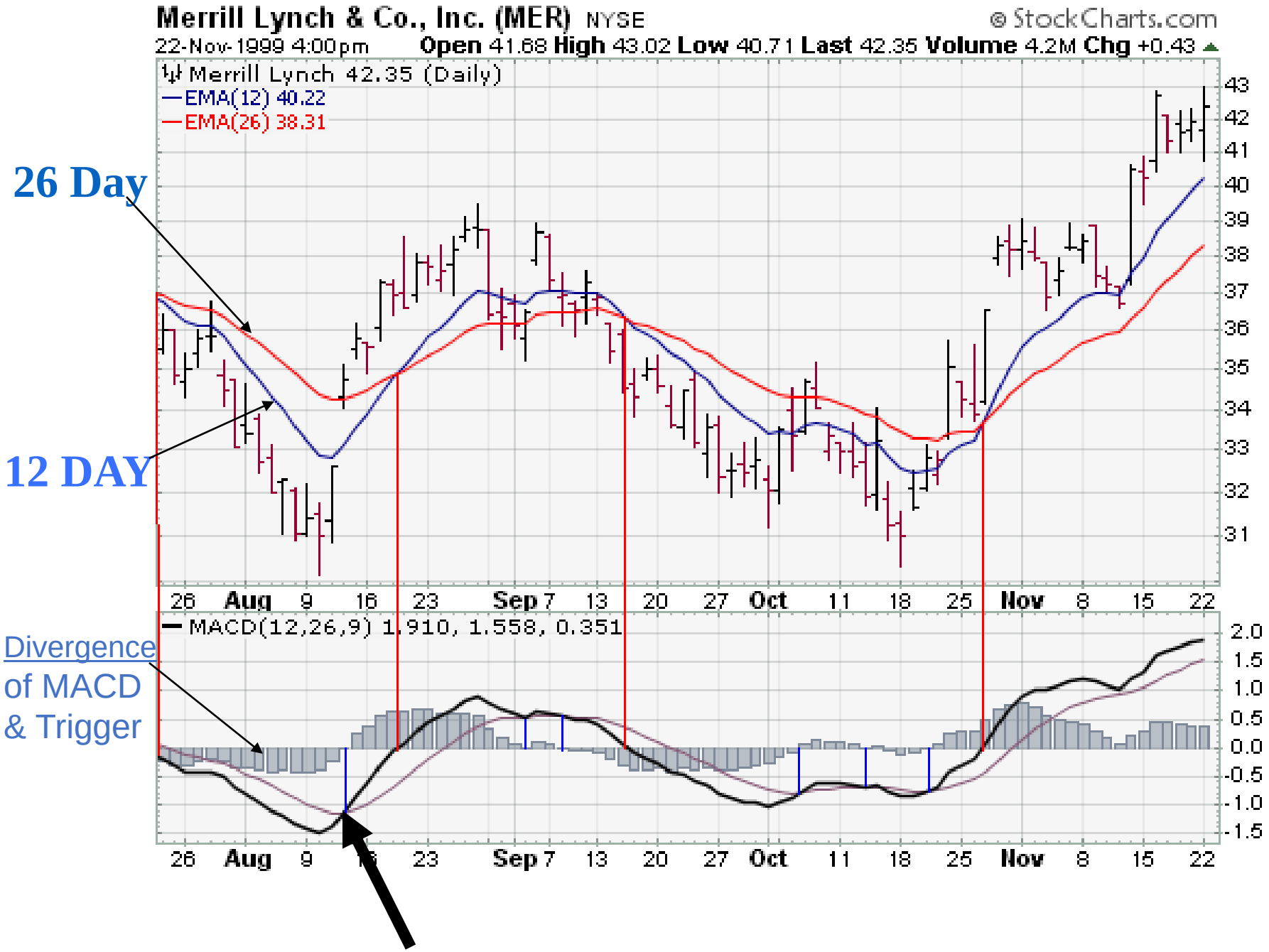
Using Bollinger Bands – The Squeeze, Walking the Bands



Moving Average Convergent Divergent (MACD)

- **MACD** is an updated price momentum indicator (Gerald Appel) which sometimes includes a signal or trigger line.
- It is a smoothed oscillator based on the point spread **difference** between two exponential moving averages, constructed as a (Short – Long) oscillators.
  - A EMA 26 (long) & a EMA 12(short)
  - The **difference** *(short - long)* is **MACD** line
  - EMA 9 to form the SIGNAL or TRIGGER line
    - Buy when MACD crosses Trigger Line
- Moving Average Convergent Divergent (MACD) is a trend deviation oscillator that measures the difference between two exponential moving averages of different lengths.

1. **MACD line =** subtract a 26 period exponential moving average from a 12 period (a price oscillator)
2. **The SIGNAL line** - **dotted line** is a 9 period exponential moving average of the MACD line as an early trigger.
   - Buy when MACD crosses above Trigger line.
   - Sell when MACD crosses below he Trigger line


Merrill Lynch & Co., Inc. (MER) NYSE
© StockCharts.com
22-Nov-1999 4:00pm Open 41.68 High 43.02 Low 40.71 Last 42.35 Volume 4.2M Chg +0.43
Merrill Lynch 42.35 (Daily)
EMA(12) 40.22
EMA(26) 38.31
26 Day
12 DAY
Divergence of MACD & Trigger
MACD(12,26,9) 1.910, 1.558, 0.351
26 Aug 9 16 23 Sep 7 13 20 27 Oct 11 18 25 Nov 8 15 22
43 42 41 40 39 38 37 36 35 34 33 32 31
2.0 1.5 1.0 0.5 0.0 -0.5 -1.0 -1.5
MACD crosses Trigger Line is an early buy indicator

MACD is the solid line. Trigger is the dotted line

Sample strategy with MACD

Long position

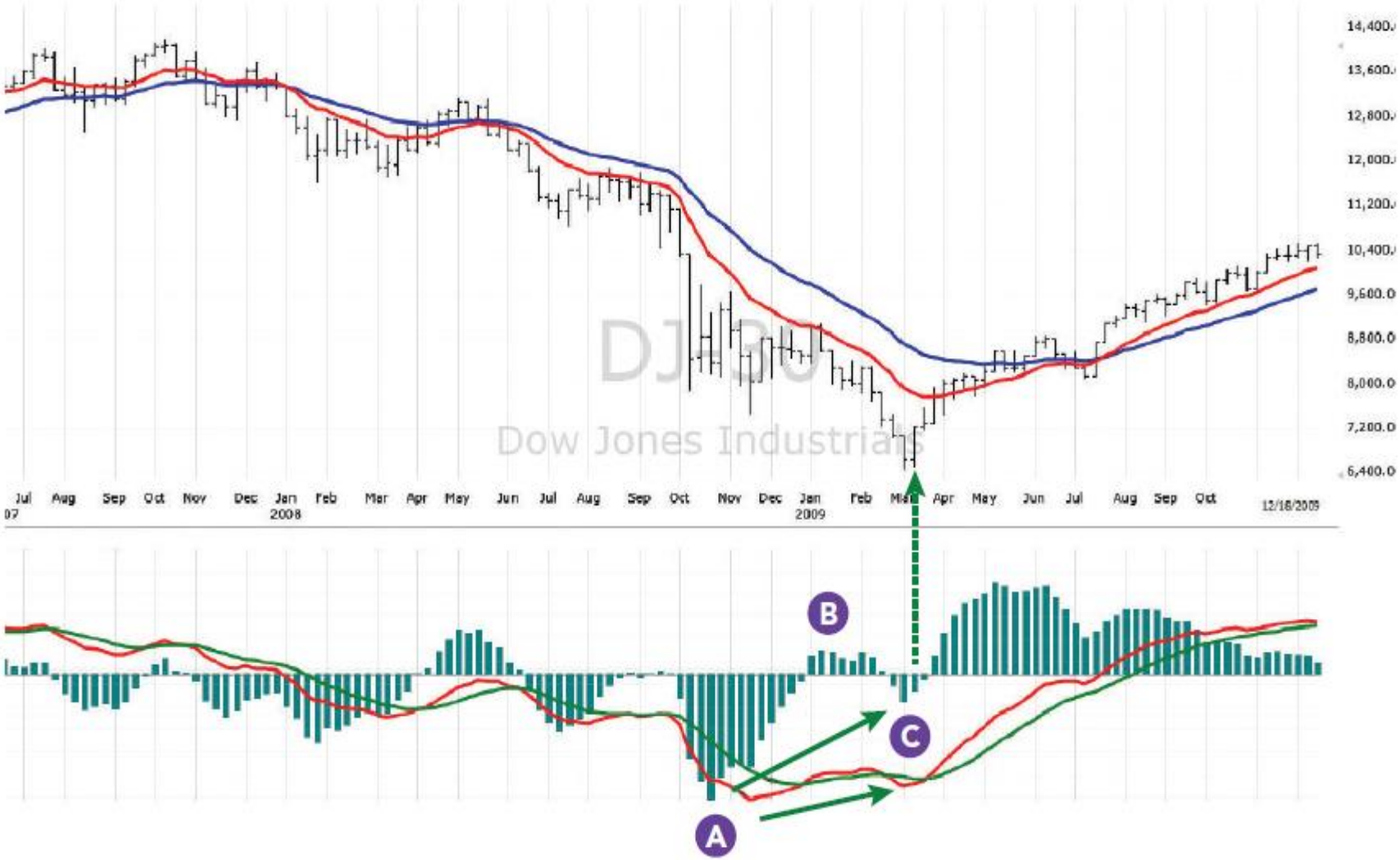
Time frame (M5/M15/H1/H4/D1/W1)

MACD parameter (e.g. 20/60/10)

- Enter condition
  - MACD crossover MACD signal
- Exit condition
  - MACD crossunder MACD signal OR MACD_historgram at peak
- Stop loss
  - Previous low (Low[1])-**stoploss_threshold**
- Target profit (?)
  - **300 pts** (?)
- **Trailing stop (with N xATR (e.g. 2 ATR) as parameter)**

- Vice versa for short position

Bullish divergence



Bearish divergence

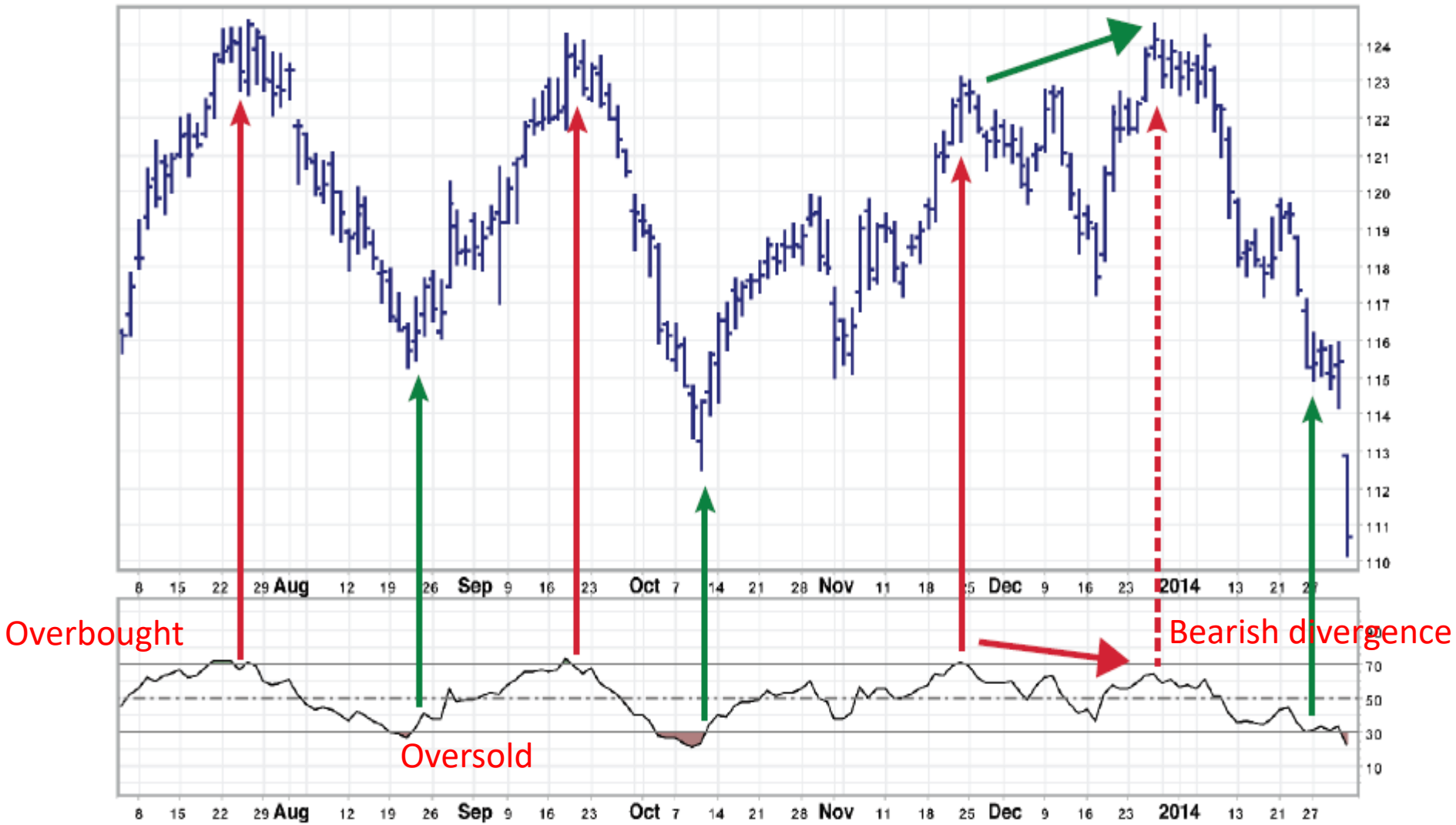
Relative Strength Index

$$\text{RSI} = 100 - \frac{100}{1 + \text{RS}}$$

$$\text{RS} = \frac{\text{Average of net UP closing changes for selected period of days}}{\text{Average of net DOWN closing changes for the same number of days}}$$

- RSI fluctuates between 0 and 100. When it reaches a peak and turns down, it identifies a top.
- When it falls and then turns up, it identifies a bottom. The pattern of RSI peaks and valleys doesn't change in response to the width of its time window

Example


Overbought
Oversold
Bearish divergence
124
123
122
121
120
119
118
117
116
115
114
113
112
111
110
8 15 22 29 Aug 12 19 26 Sep 9 16 23 Oct 7 14 21 28 Nov 11 18 25 Dec 9 16 23 2014 13 21 27
70
50
30
10

Sample strategy with RSI

Long position

Time frame (M5/M15/H1/H4/D1/W1)

RSI parameter (e.g. 14)

- Enter condition
  - RSI crossover 30
- Exit condition
  - RSI crossunder 70
- Stop loss
  - Previous low (Low[1])-**stoploss_threshold**
- Target profit (?)
  - **300 pts** (?)
- **Trailing stop (with N xATR (e.g. 2 ATR) as parameter)**

- Vice versa for short position

Slow stochastic indicator

- The Slow Stochastic Oscillator is a momentum indicator that **shows the location of the close relative to the high-low range over a set number of periods.** The indicator can range from **0 to 100**.
- The closing price tends to close near the high in an uptrend and near the low in a downtrend. If the closing price then slips away from the high or the low, then momentum is slowing. Stochastics are most effective in broad trading ranges or slow moving trends. Two lines are graphed, the slow oscillating %K and a moving average of %K, commonly referred to as %D.

Definition

- Slow %K= 100[Sum of the (C - L14) for the %K Slowing Period / Sum of the (H14 – L14) for the %K Slowing Period]
- Slow %D = SMA of Slow %K

Where:

- C = Latest Close
- L14 = Lowest low for the last 14 periods
- H14 = Highest high for the same 14 periods
- %K Slowing Period = 3

RSI vs slow stochastic

- While relative strength index was designed to measure the speed of price movements, the stochastic oscillator formula works best when the market is trading in consistent ranges. Generally speaking, RSI is more useful in trending markets, and stochastics are more useful in sideways or choppy markets.

Sample strategy with slow stochastics (KD)

Long position

Time frame (M5/M15/H1/H4/D1/W1)

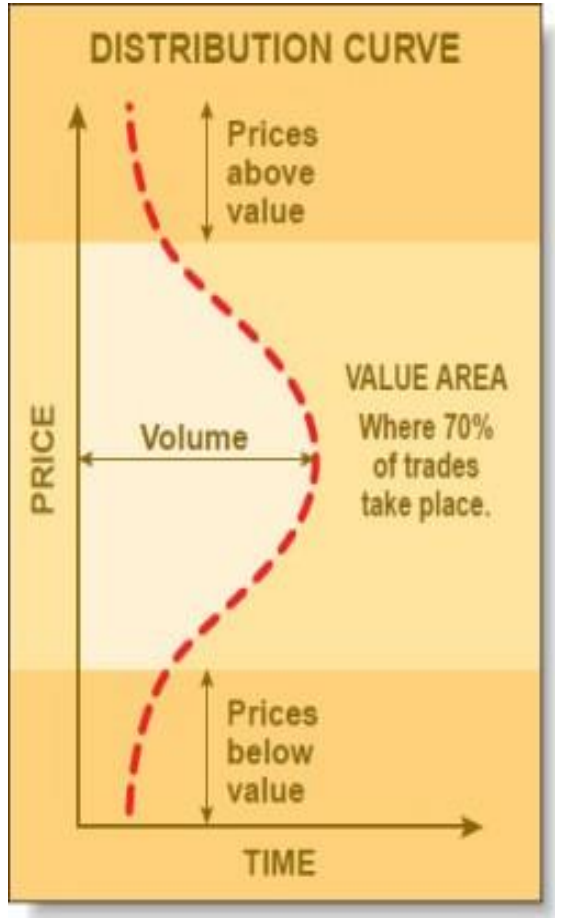
KD parameter (e.g. 14/3/3)

- Enter condition
  - K crossover D and K<=low_threshold(e.g. 20)
- Exit condition
  - K crossunder D
- Stop loss
  - Previous low (Low[1])-**stoploss_threshold**
- Target profit (?)
  - **300 pts** (?)
- **Trailing stop (with N xATR (e.g. 2 ATR) as parameter)**

- Vice versa for short position

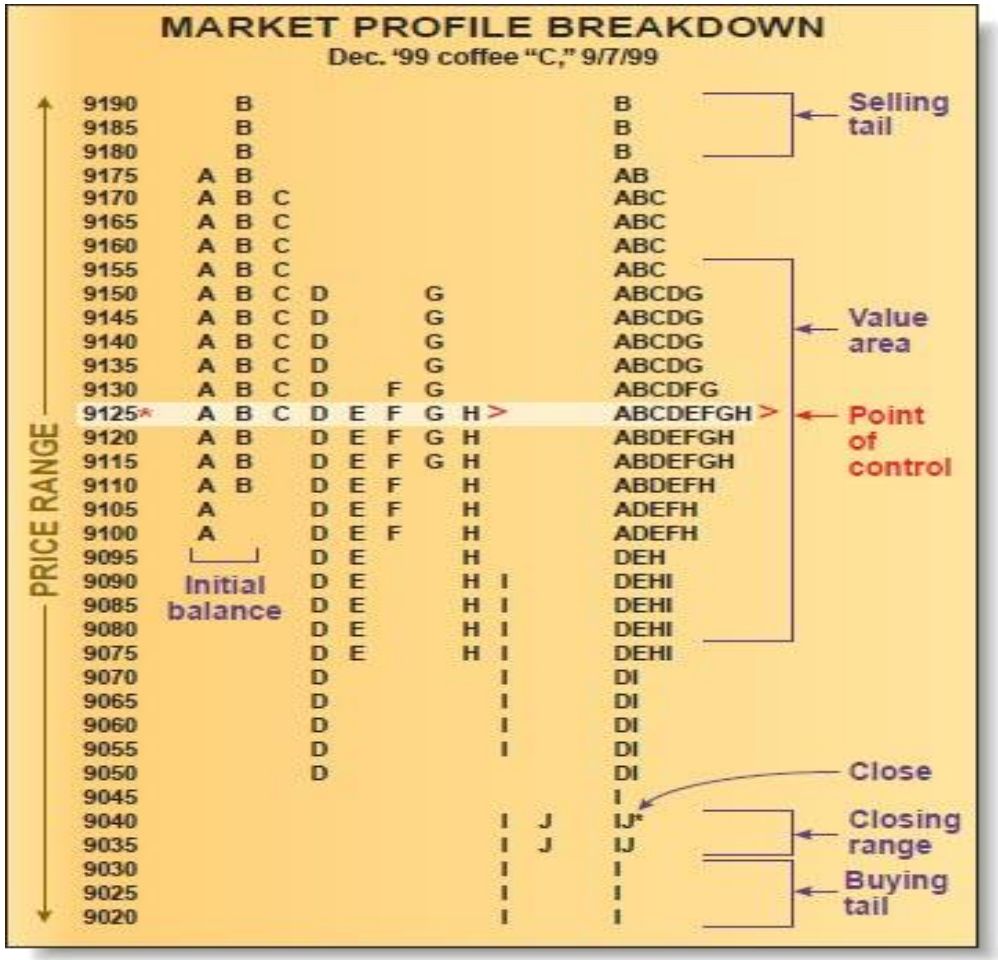
Market profile

- Market Profile is best understood as a way to see order in the markets.
- Developed by J. Peter Steidlmayer in the 1980s, Market Profile was a way for traders to get a better understanding of what was going on, without having to be on the trading floor.



Common terms used in Market profile

- Time Price Opportunity (TPO) – The letters assigned to each 30-min time period.
- Initial Balance – The first hours range.
- Value Area – Where 70% of the day's trading took place.
- Value Area High (VAH) – The upper level of value area.
- Value Area Low (VAL) – The lower level of value area.
- Point of Control (POC) – Price where the most trading occured (longest line of TPOs).
- Single Print Buying/Selling Tail – When price makes a one letter print in a row.
- Range – The high to low of a day's price action
- Range Extension – An extension of price beyond the initial balance.



Use of technical indicators with Python

- Please refer to the following link for details on the use of the TA-Lib please refer to the following link

https://mrjbq7.github.io/ta-lib/doc_index.html

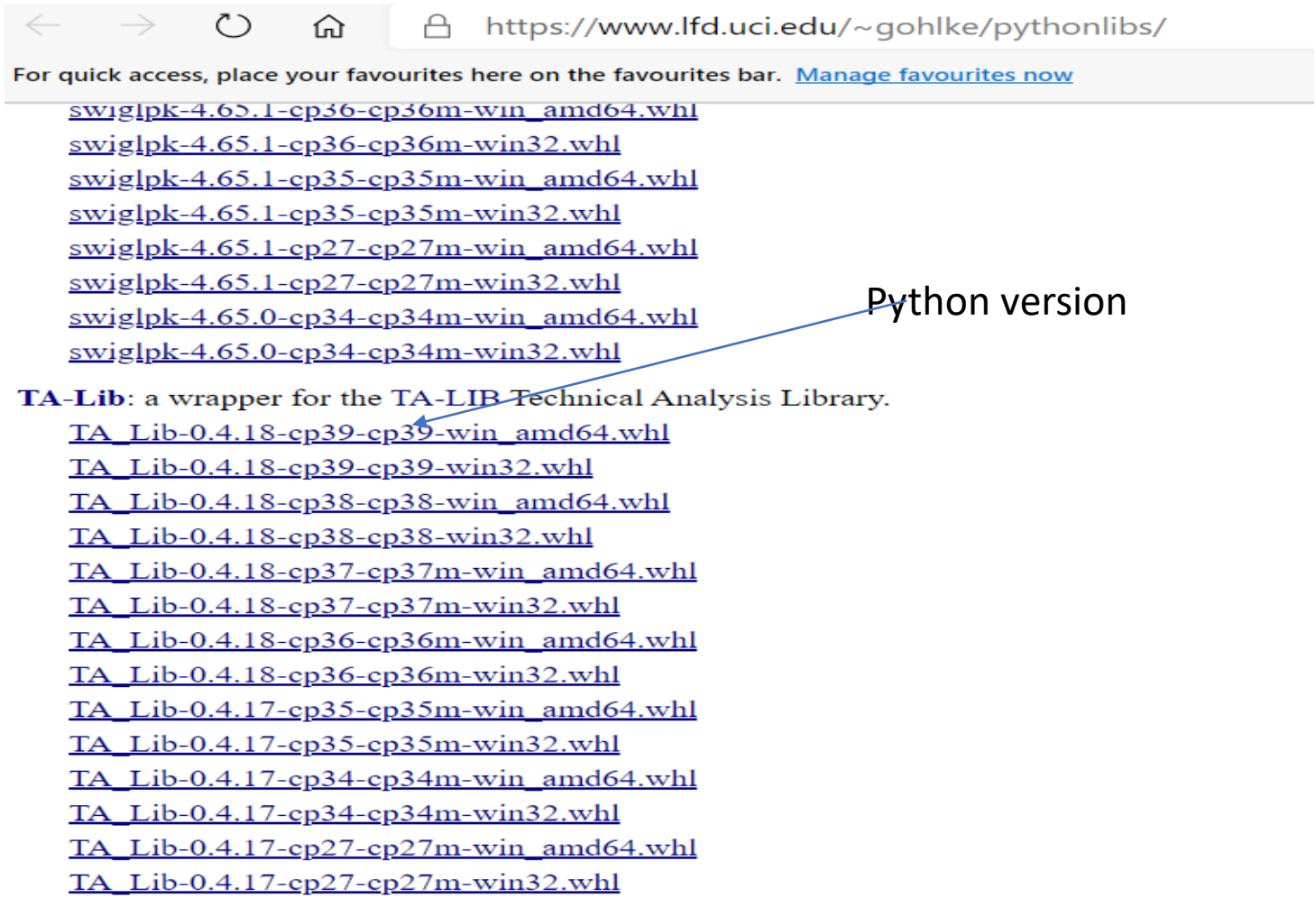
- You could click here and search for the latest version of TAlib package file

https://www.lfd.uci.edu/~gohlke/pythonlibs/

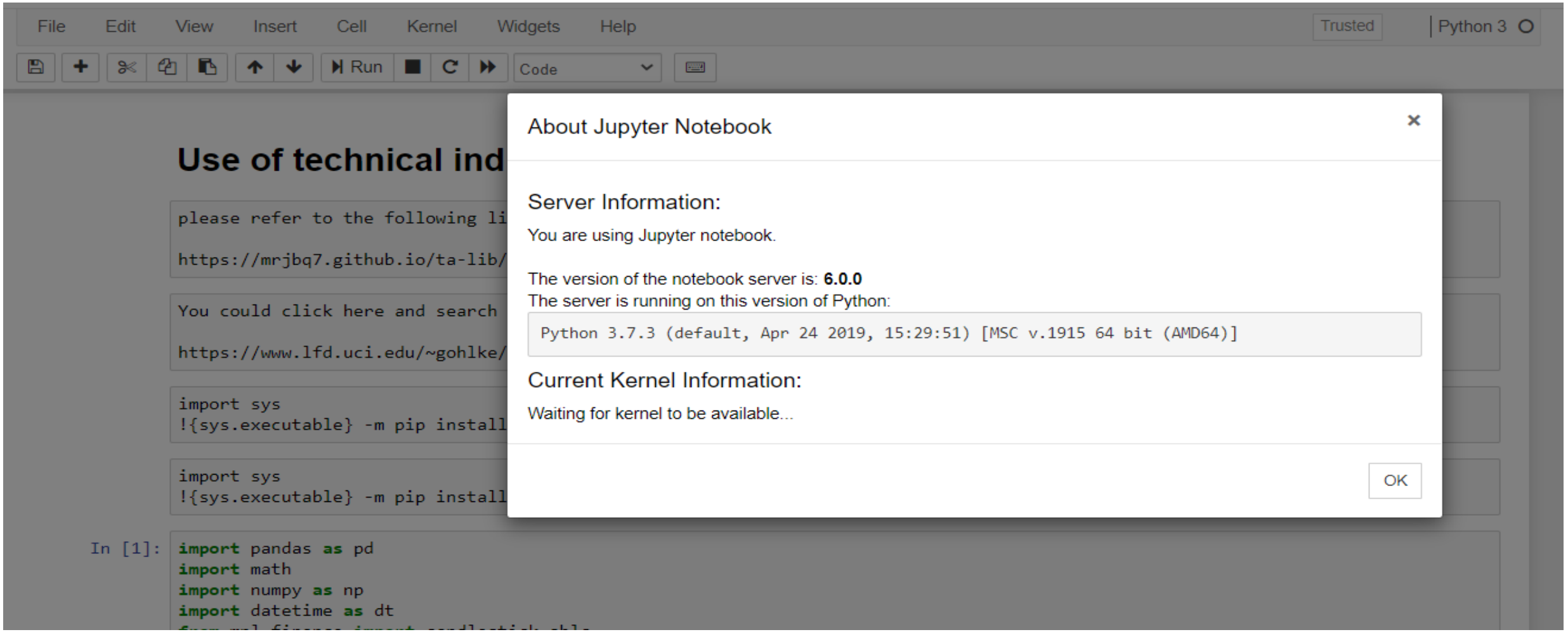
- To install TA-Lib

```
import sys
!{sys.executable} -m pip install "D:/TA_Lib-0.4.17-cp37-cp37m-win32.whl"
```

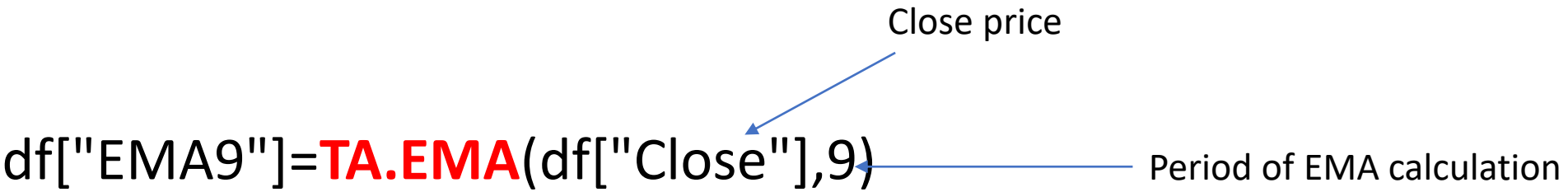
Download TA-Lib package



To check python version from Jupyter notebook



Examples of using TA Lib



df["macd"],df["macdsignal"],df["macdhist"]=**TA.MACD**(df["Close"],fast period=5, slowperiod=34, signalperiod=5)

Crossover calculation

Crossover Up

00111
0100
00100

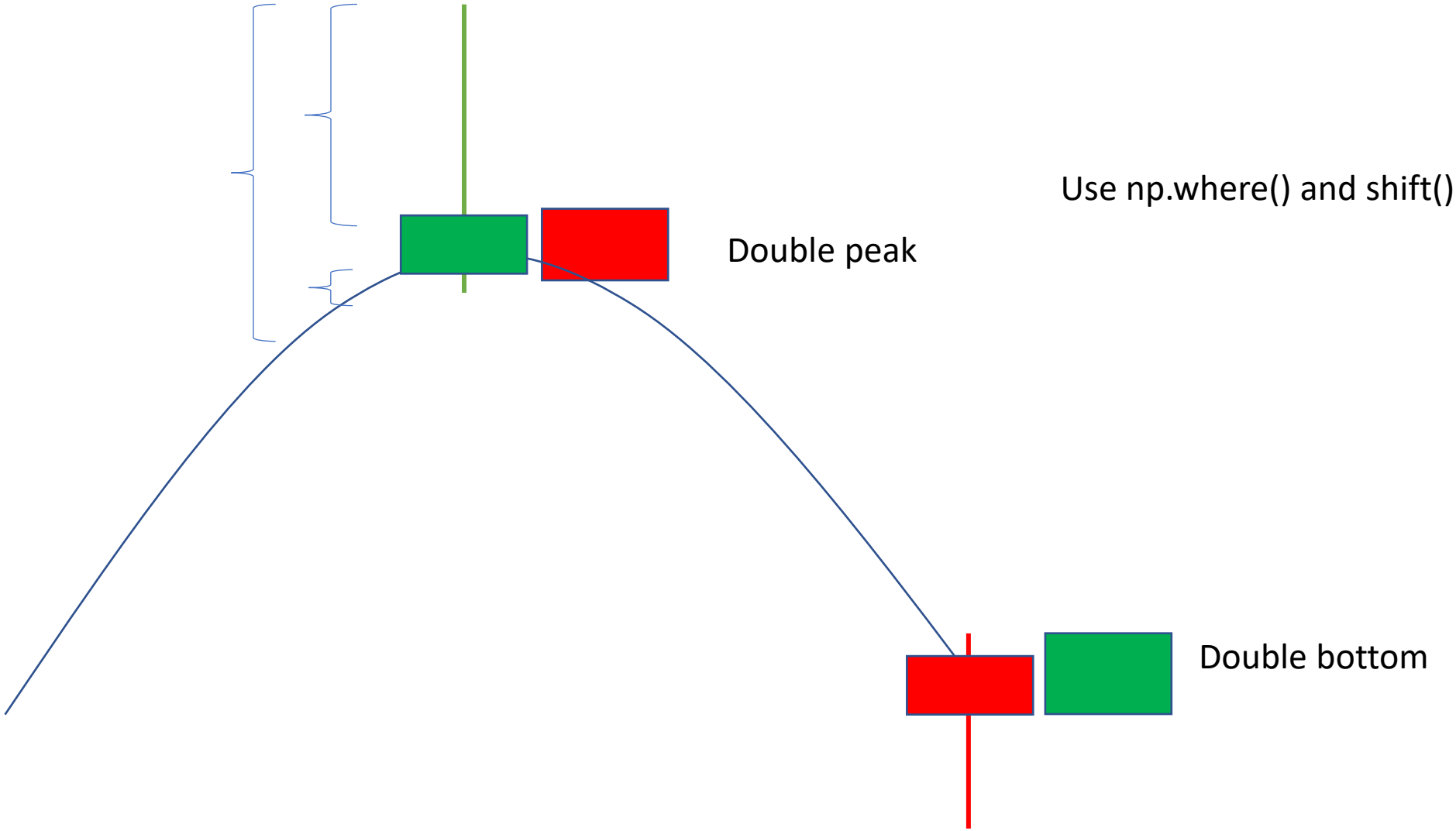
Result

```
TA1_TA2=np.where((df[TA1]-df[TA2])>0,1,0)
np.where(np.diff(TA1_TA2)==1,1,0)
np.pad(np.where(np.diff(TA1_TA2)==1,1,0),(1,0),"constant")
```

Another way of defining the cross over up function

- To define the function which indicate cross over up happen
- Input: dataframe with close/EMAX/EMAY
- Output: Series with value of 1 indicates cross-over up happen
- shift() and np.where() and rolling()
- Hint:
- Before crossover-up point: SMA20-SMA50<0
- After crossover-up point: SMA20-SMA50 >=0

Exercise: Customized indicators



Double bottom

- OHLC
- O[1]

Low shadow line=Min(Close,Open)-Low

Condition 1=

Min(Close[1],Open[1])-Low[1] >=0.6*(H[1]-L[1]) &

H[1]-max(Close[1],Open[1])<=0.1*(H[1]-L[1]) & (C[0]>O[0])

To define the pattern with Python

First bar:

- Lower shadow >=2/3 of whole body regardless it is green or red bar

Current bar:

- Green bar (Close>open)

Suggest way to move forward

- Get one product to get familiarize (BTC/ETH/HSI/ES/NQ/XAUUSD/EURUSD/…..)
  - Spot
  - Futures
  - Options
- Create a demo account for manual trade
- Define/revise trading strategies and perform backtesting (tradingview)
- Optimize the trading strategy (parameters) (Python/MT4/MT5)
- Deploy the trading strategy
  - Tradingview+webhooking+order execution (python)
    - MT5
    - IB
    - Bybit
    - …
  - Deploy the trading bot with Python or MQL (MT4/MT5)
  - Automatic alert sending with Telegram and Python
- Deploy risk management/money management