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# Seasonality Analysis and Pattern Matching in R

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# Outline

## Seasonality Analysis – recurring TIME patterns

- Month of the Year Seasonality
- Option Expiration Week Seasonality

## Pattern Matching - recurring PRICE patterns

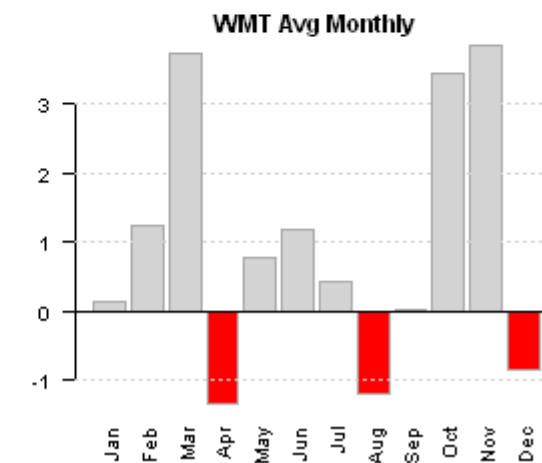
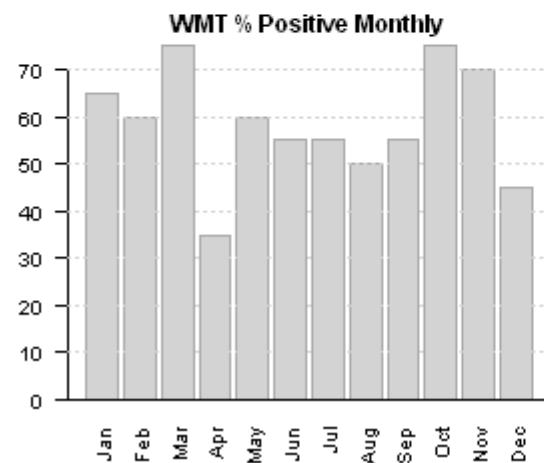
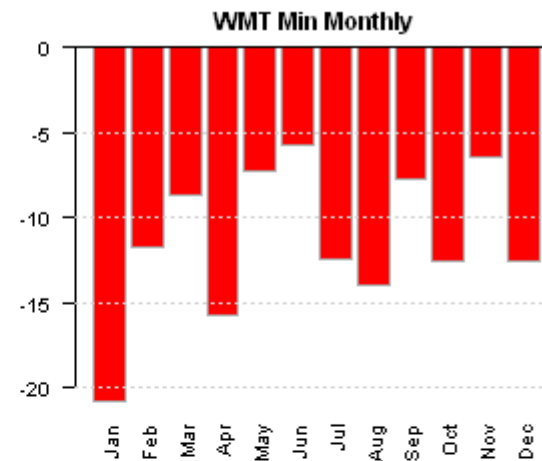
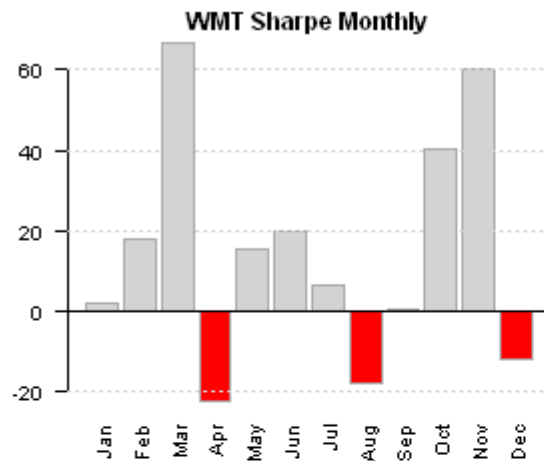
- Find historically similar matches to the last 90 days
- Find classical Technical Patterns: Head and Shoulders
- Define you own patterns

For complete source code, please see Appendix or my blog

[www.systematicinvestor.wordpress.com](http://www.systematicinvestor.wordpress.com)

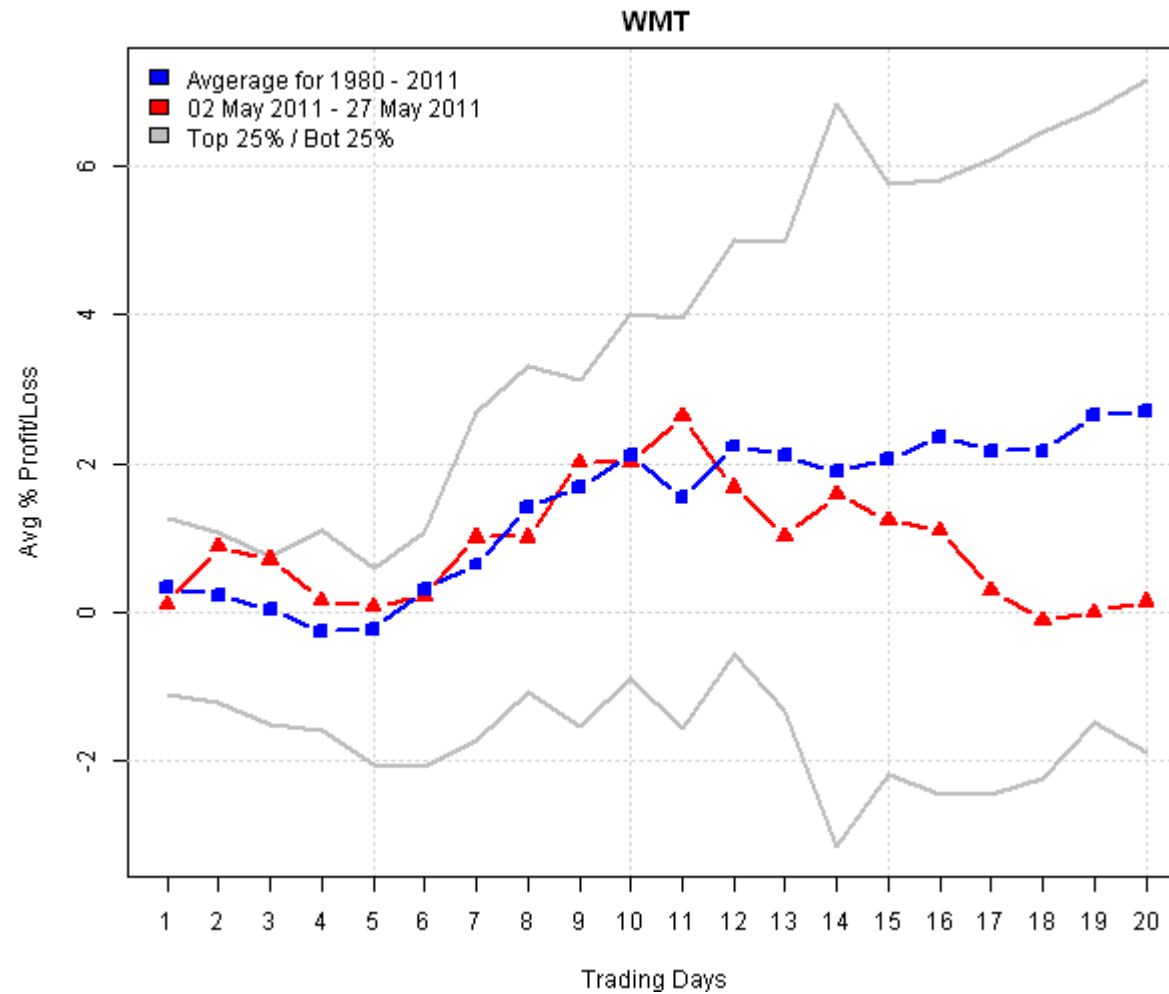
# Month of the Year Seasonality: Wal-Mart

Function: month.year.seasonality ( data, 'WMT' )



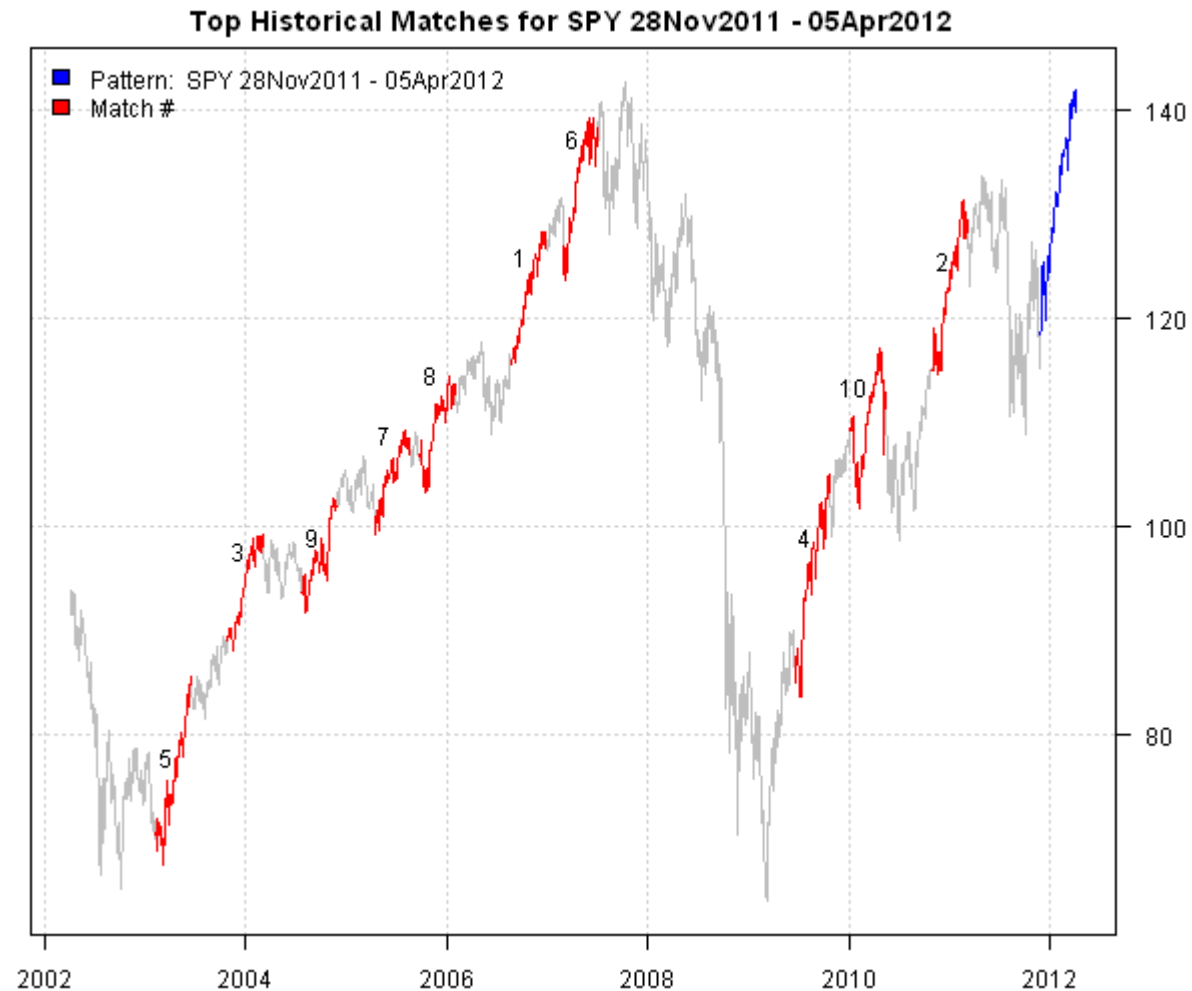
# Wal-Mart's Seasonality in May

Function: `time.seasonality(data, period.starts, 20, 'WMT')`



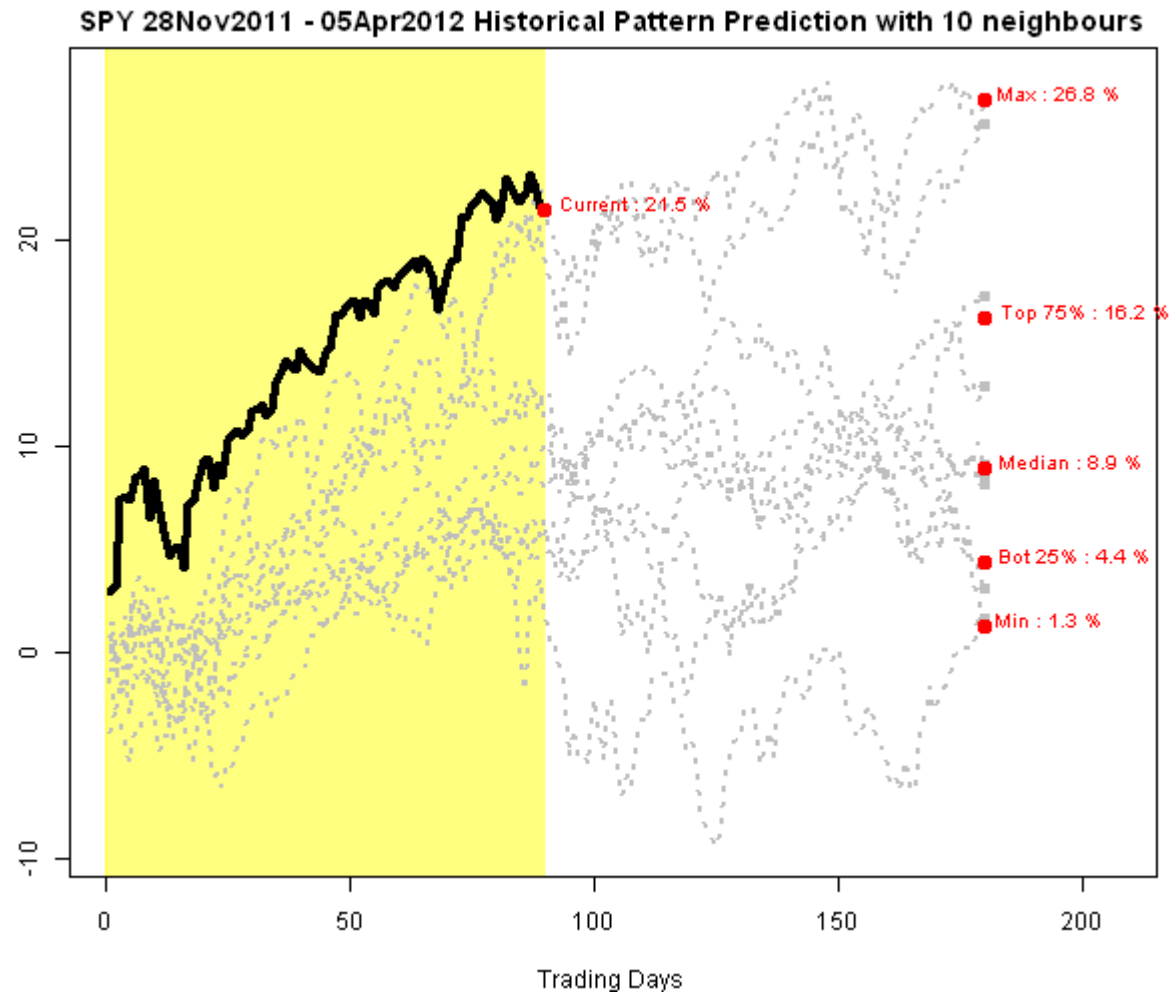
# Pattern Matching – last 90 days of SPY

Function: `matches = bt.matching.find ( data, plot = T )`



# Overlay best historically similar matches

Function: `bt.matching.overlay (matches, plot = T)`



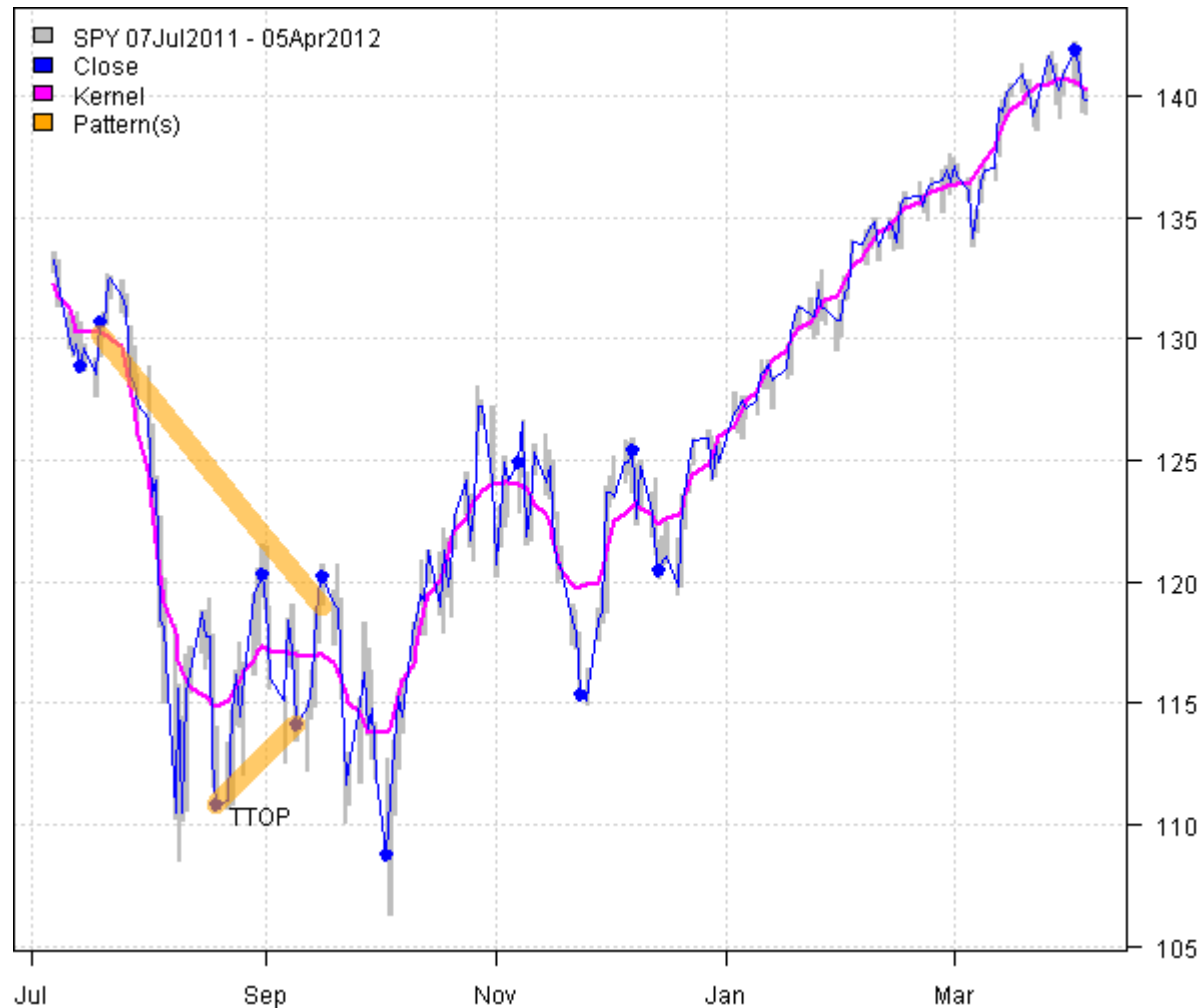
# Pattern Matching – Technical Patterns

- Foundations of Technical Analysis by A. Lo, H. Mamaysky, J. Wang
- Computational Algorithm to define and find Technical Patterns
- The Technical Patterns definitions are easy to translate into R  
For example, Triangle Tops definition:

Foundations of Technical Analysis	R Code
$\text{TTOP} \equiv \begin{cases} E_1 \text{ is a maximum} \\ E_1 > E_3 > E_5 \\ E_2 < E_4 \end{cases}$	<pre>pattern = list() pattern\$len = 5 pattern\$start = 'max' pattern\$formula = expression(     E1 &gt; E3 &amp; E3 &gt; E5 &amp;     E2 &lt; E4 ) patterns\$TTOP = pattern</pre>

# Classical Technical Pattern(s) for SPY

Function: `plot.patterns ( data, 190, 'SPY')`





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# The End

Please visit my blog at

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for more examples and ideas.

# Appendix: R Code

Download R Code at [www.systematicportfolio/RFinance2012](http://www.systematicportfolio/RFinance2012)

```
#####  
# Load Systematic Investor Toolbox (SIT)  
#####  
con = gzcon(url('http://www.systematicportfolio.com/sit.gz', 'rb'))  
  source(con)  
close(con)  
  
# Load supporting R code for R/Finance 2012  
con=url('http://www.systematicportfolio.com/rfinance2012.r')  
  source(con)  
close(con)
```

```

#*****
# Seasonality Analysis - TIME patterns
#*****

load.packages('quantmod')
ticker = 'WMT'

data = getSymbols(ticker, src = 'yahoo', from = '1970-01-01', auto.assign = F)
  data = adjustOHLC(data, use.Adjusted=T)
data = data['1980::2012:04:07']
#*****
# Look at the Month of the Year Seasonality
#*****

month.year.seasonality(data, ticker)

#*****
# Look at What seasonally happens in the first 20 days of May
#*****
# Find first day of May: it is one day after the last day of April
month.ends = endpoints(data, 'months')
  month.ends = month.ends[month.ends > 0 & month.ends < nrow(data)]
  index = which(format(index(data), '%b')[month.ends] == 'Apr')

layout(1)
time.seasonality(data, 1 + month.ends[index], 20, ticker)

```

```
#####  
# Pattern Matching - PRICE patterns  
#####  
# Load historical data  
#####  
load.packages('quantmod')  
ticker = 'SPY'  
  
data = getSymbols(ticker, src = 'yahoo', from = '1970-01-01', auto.assign = F)  
  data = adjustOHLC(data, use.Adjusted=T)  
data = data[':2012:04:07']  
#####  
# Find historical Matches similar to the last 90 days of price history  
#####  
matches = bt.matching.find(CI(data), main = ticker, n.query=90, plot=TRUE)  
  
out = bt.matching.overlay(matches, plot=TRUE)  
  
#####  
# Find Classical Technical Patterns, based on  
# Pattern Matching. Based on Foundations of Technical Analysis  
# by A.W. LO, H. MAMAYSKY, J. WANG  
#####  
plot.patterns(data, 190, ticker)
```