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Group Work – Submission 3, Econometrics

Strategy Description

Implemented in Strategy.R is a momentum trading strategy applied to Gold daily data.

Gold was chosen as an instrument that historically demonstrated clear trends on various time scales, which is appropriate for momentum trading strategy.

This implementation of MACD & Bollinger bands is similar to the one considered within the course, with the difference being in the use of dplyr, provisions for search of optimum parameter set, some more charting, and some experimenting.

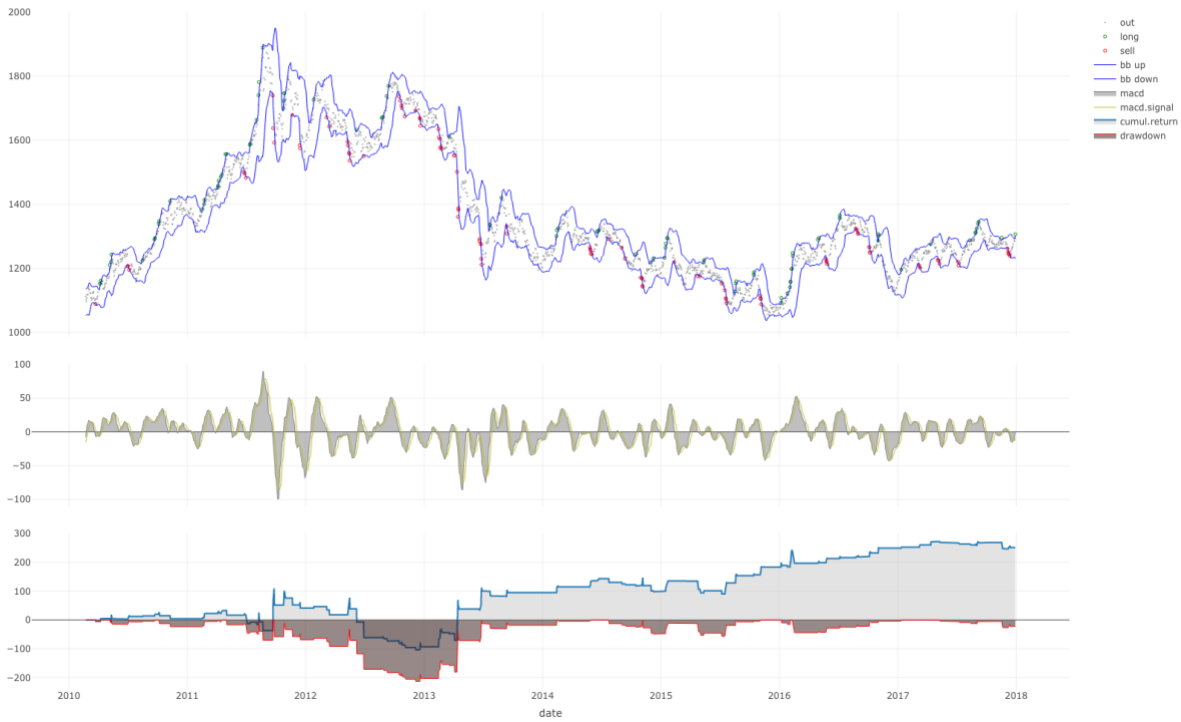
The optimization of the strategy in the parameters space (finding the optimum parameters on the training set).

Results and observations

Running the strategy with default set of parameters on sample of data from 2010-2018

while the positive results can be seen in years 2014-2018, there is substantial drawdown in preceding timeframe; the sharpe ratio and other performance characteristics of this strategy are quite low

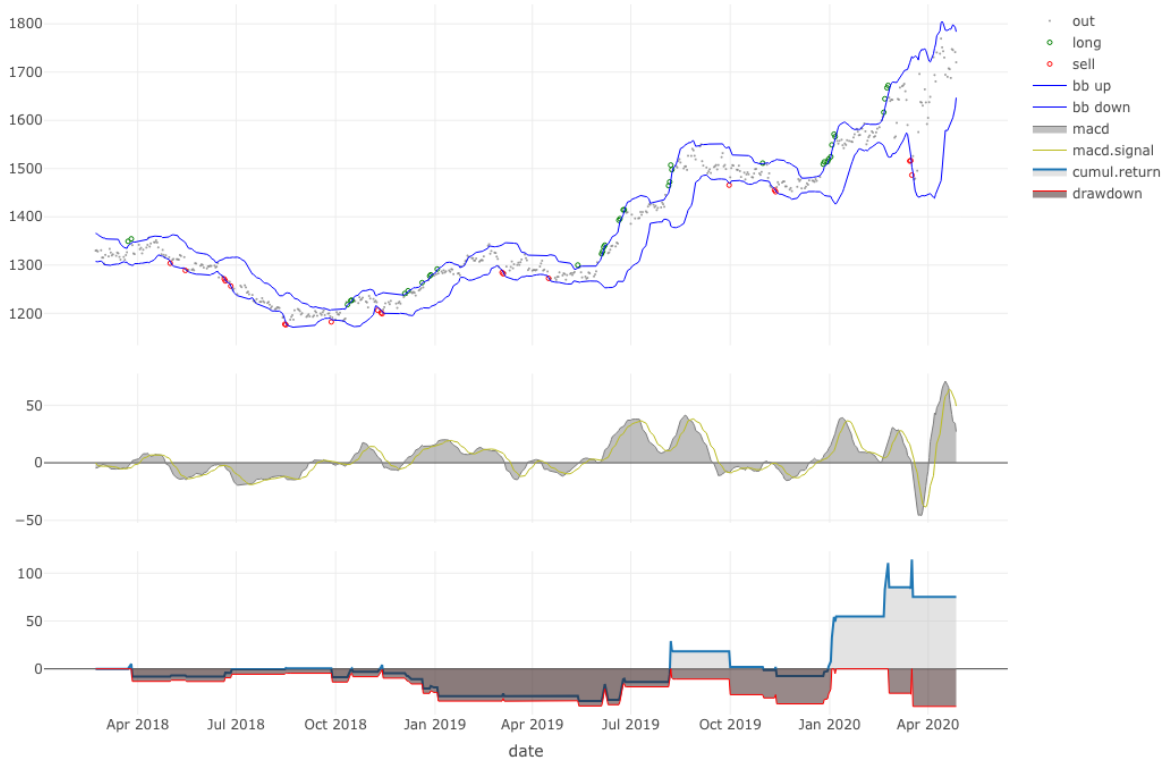
Fig. 1 Training Set – Default Parameters Fit



Applying default parameters to “testing” set (years 2018-2020)

Fig.2 Control data – default parameters

Clearly the performance on this set is unremarkable. Most of the time the strategy shows losses and only towards the end goes into positive.



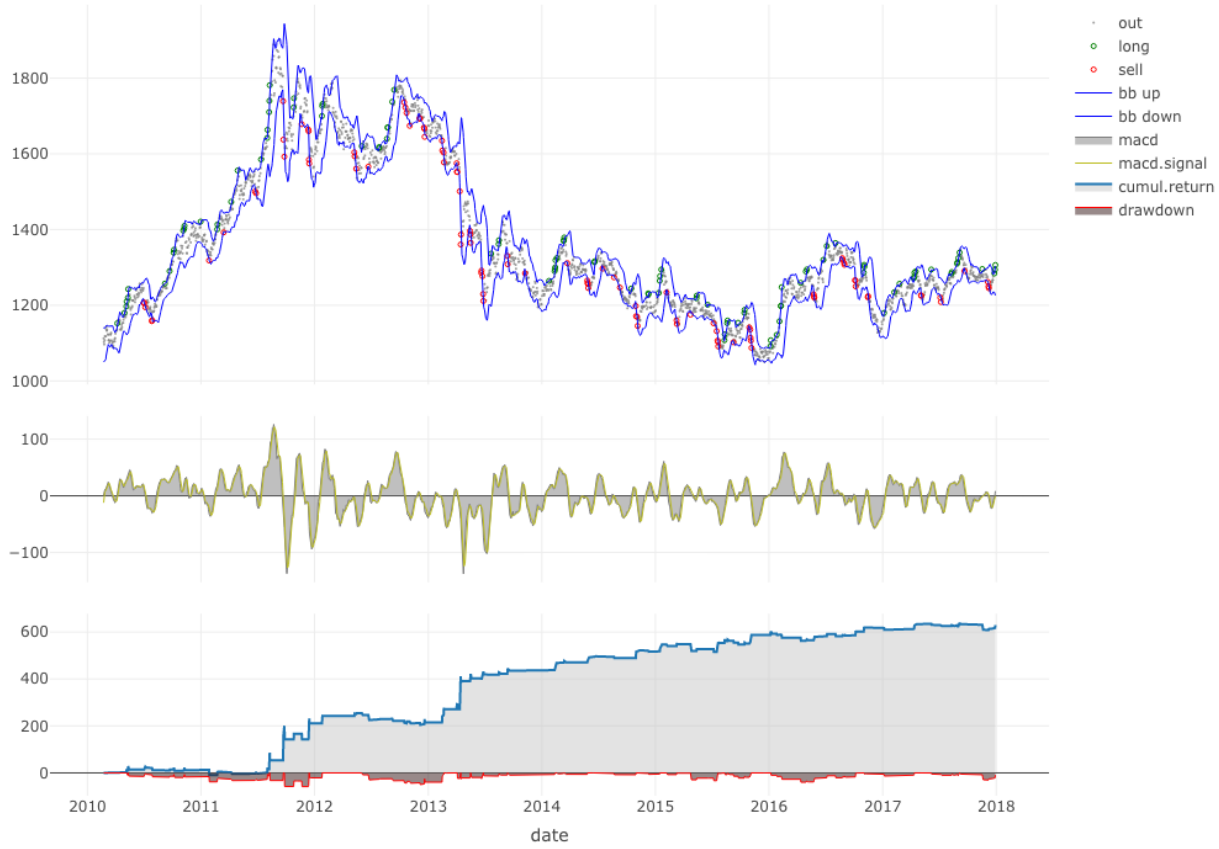
Applying search for better parameters

With the search for a better set of parameters it is possible to yield the following performance on the training set – see Fig 3. Overall return is improved three-fold. Substantial part of it comes from reduction in drawdowns preceding Apr 2013 and the capture of large price gap in April.

Across the rest of the time horizon the performance is largerly on par with the previous result. The key question is whether this improvement translates into a better result on the testing set.

[see next page]

Fig. 3 Training Set – Best Fit



Control Set with Optimized Parameters

With optimized parameters used on control set the strategy was in the positive for most of 2019, however, there was no breakthrough in performance – see Fig. 4

Comparing Fig 4 (parameters optimized on training set) with Fig. 5 (parameters optimized specifically for the control set) it is easy to see that the strategy is inherently limited with its predictive powers and profit-generating qualities.

More experiments conducted with various parts of the data shown that:

1. it is difficult to find universally good parameters that would deliver good performance
   across all years of 2000-2020

2. it seems relevant to greater increase in volatility somewhere around 2007
   as parameters that deliver good performance prior 2007 are not working after that and vice versa

3. from observations of trade points it seems the algoritm holds the position for too short a time frame

4. there are different variations of MACD/BBands algorithms,
   in particular I think the one which uses more than one set of Bolinger bands is
   useful, since it offers criteria that should lead to more prolonged position

holding compared to this strategy.

Fig 4. Control Set with optimized parameters

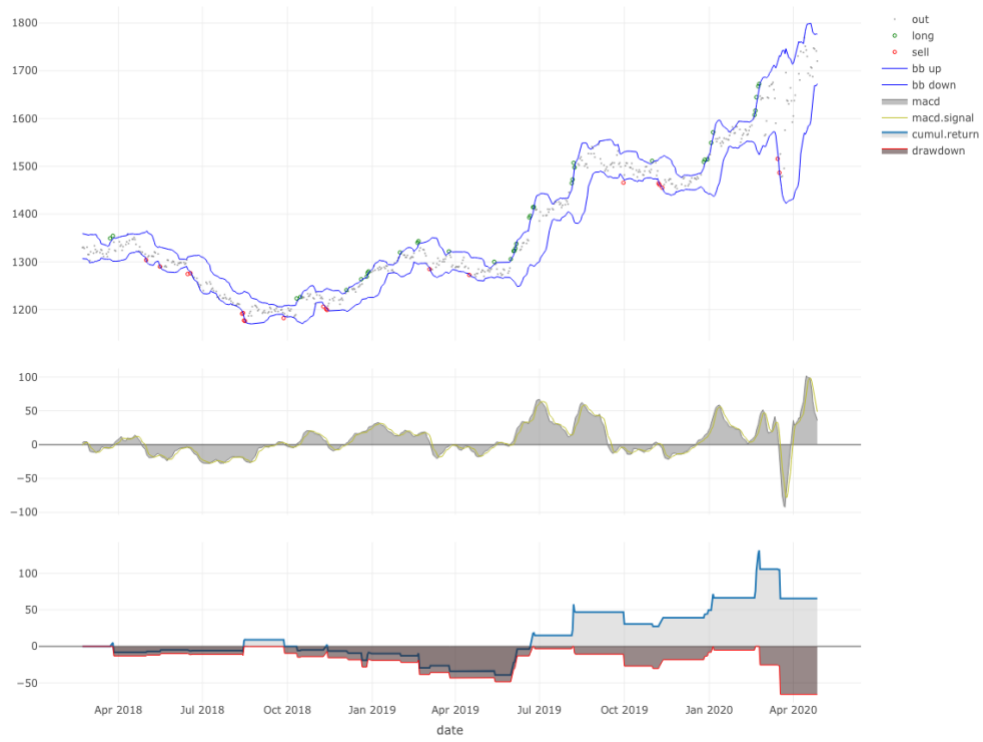


Fig 5 . Control set with parameters optimized specifically on control set

Description of main functions

Please refer to the Stategy.R for more details

```
#
# performs the backtesting of the strategy
# given the data and the parameters of MACD and BBands
#
# it returns data, fitted with indicators/signals, performance metrics and parameters
#
makeStrategy <- function(data_tibble, ma.nFast = 12, ma.nSlow = 26, ma.nSig = 9, bb.n = 20, bb.sd = 2)


#
# this function uses plotly to create a chart of all elements
# including the prices, trade points, bolinger bands, MACD, cumulative return
# and drawdown
#
makeChart <- function(result)


#
# this function searches through the parameters space
# to maximize returns while keeping the drawdown (both absolute and max percentage)
# within the limits specified in parameters
#
findBest <- function(df,
                     fast.range = c(seq(3,10),seq(12,25,by=3)),
                     slow.range = c(seq(5,10),seq(12,20,by=2), seq(25,50,by=5)),
                     sig.range = c(seq(2,10), seq(12,20,by=2)),
                     bb.range = c(seq(3,10), seq(12,20),seq(25,50,by=5)),
                     sd.range = c(2),
                     max.drawdown.pct = 45,
                     max.drawdown.abs = 100)
```