Final Project Report

Jiaxin Zhang, Xiaoya Wang
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Introduction

In this project, two sets of data are provided: One of 2 years of hourly prices for Gold (2014 -2015) and one of 1+ years of hourly prices for UsdJpy (2016).
We developed four strategies for trading these two assets. We calculate the return of each strategy and some statistical indicators to compare the strategies. Our goal is to reach an information ratio close to 1.5 or higher.

Assumptions

- We assume to have one-hour layback on trading actions after receiving alpha signals.
- The Bid-Offer Spread is 1bp.
- We flat our position at the end of each day and calculate daily profit and loss
- We assume fixed trading capital of 10000, i.e. my gains and losses do not change the amount.

Strategies

1. Simple Moving average (SMA)
2. Moving Average Convergence Divergence (MACD)
3. Breakout + Volume Indicator (BVI)
4. Breakout + Volume Weighted Moving Average (VWMA)

Simple Moving average (SMA)

This Alpha is the most common and popular of moving averages. We generate signals (long / short / hold) based on the crossovers of short-term and long-term moving averages. Because Short-term averages respond quickly to changes in the price of the underlying, while long-term averages are slow, we decide the signals based on following strategies:

- Moving Average Acting as Support (short cross long from below) - Buy
- Moving Average Acting as Resistance (short cross long from above) - Sell
- Does not cross - Hold

Moving Average Convergence Divergence (MACD)

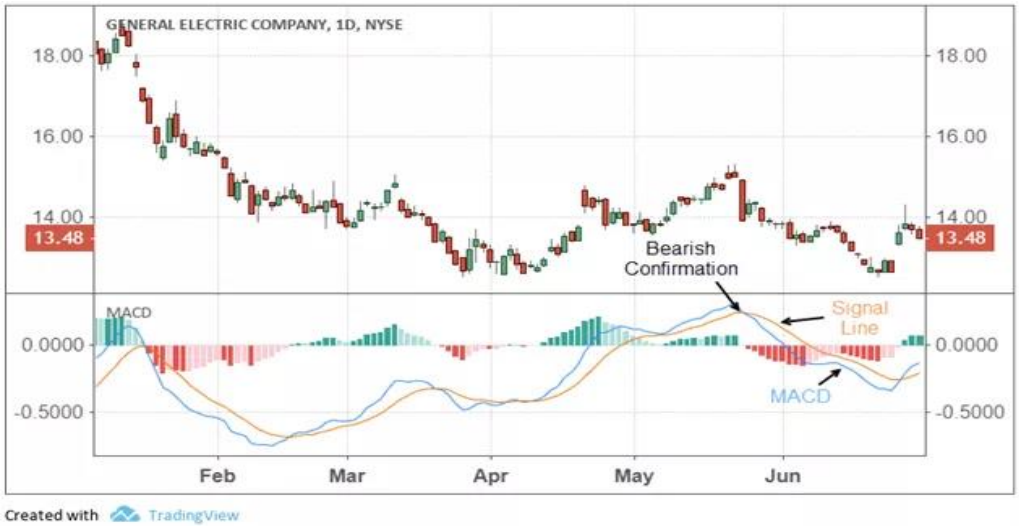
We need two lines here - MACD line and signal line. MACD line is calculated using the following formula:

> "MACD = short-period EMA − long-period EMA"
> A 9-day EMA is the signal line.

Note that lines used here are exponential moving averages, so they will have a greater reaction to the most recent price movement, unlike the SMA above. When MACD crosses above its signal line, we buy; while when it crosses below, we sell.

Examples:

When the MACD line rises above the signal line, it suggests the traders to buy because it indicates an upward momentum.



When the MACD line crosses below the signal line, it suggests the traders to sell because it indicates a downward momentum.

Breakout + Volume Indicator (BVI)

This trading strategy leverages the volume indicator as our tool for assisting in trading breakouts.
The graph below is a 10-minute chart of AT&T from Dec 8 – 9, 2015. The red line signifies the resistance level of a bearish trend. We have highlighted in the green circle the exact moment AT&T breaks out above the downtrend line.
We enter a position at the green point, but where should we exit a position? We utilized the price change combined with the change of volume to identify the exit point. When we see a volume increase relative to

the last few candlesticks and the price to also go counter to the primary trend, which is an early indication that the impulsive move is in the process of at least slowing down, we should close the position.

Because instead of volume data, our data sets provide flow data, which indicates the ratio of the amount of buy and sell actions. We slightly modified the strategy.
Long condition: the price crosses the 30-day moving average price from below
Flat or Short condition: the price start to fall and the flow is smaller than the previous 6-day average flow. (which means the there are fewer people buying and more people selling)

Breakout + Volume Weighted Moving Average (VWMA)

The volume weighted average price (VWAP) is a trading benchmark used by traders that gives the average price a security has traded at throughout the day, based on both volume and price. It is important because it provides traders with insight into both the trend and value of a security.

Formula for VWMA:

$$\text{VWAP} = \frac{\sum \text{Price} * \text{Volume}}{\sum \text{Volume}}$$

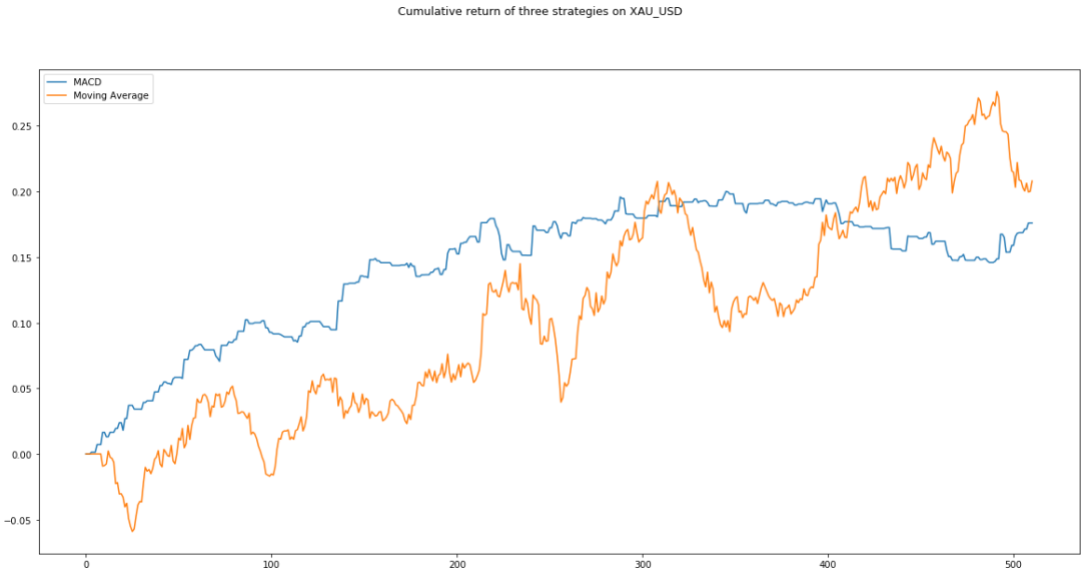
The graph below is the 10-minute chart of Bank of America for the period Dec 3 – 7, 2015. We use a 20-period VWMA.

Long condition: the price crosses the VWMA line from below
Flat or Short condition: the price crosses the VWMA line from above

Results and statistics

We implemented three alphas - Simple Moving average, Breakout + Volume Indicator, and Breakout + Volume Weighted Moving Average (VWMA) - on UsdJpy, and two alphas - Simple Moving average and MACD - on gold.

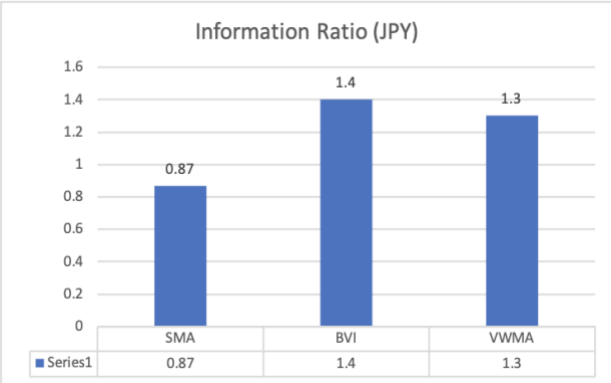
The cumulative percentage return graphs are shown below:

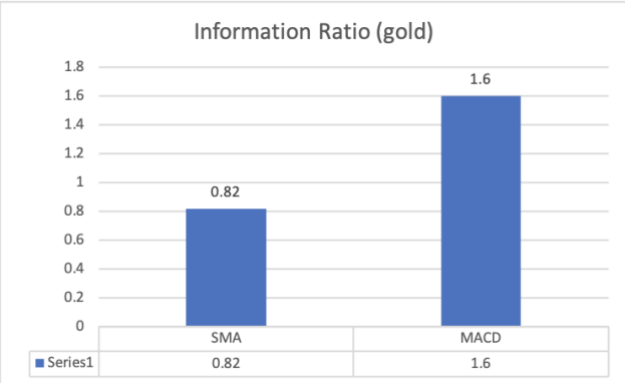


Information Ratio (annualized)

The information ratio I used here is calculated by the following formula:

$$Information\ Ratio = \frac{\text{Annualized portfolio return}}{\text{Annualized volatility}}$$

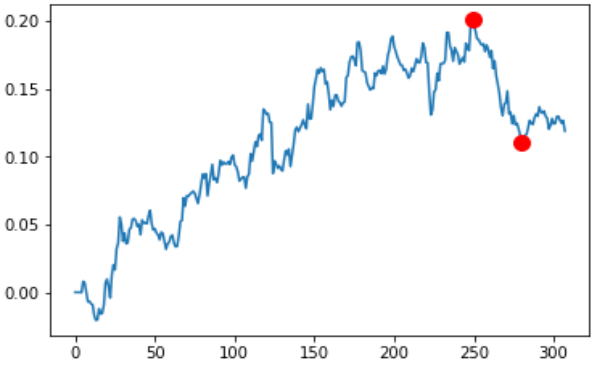




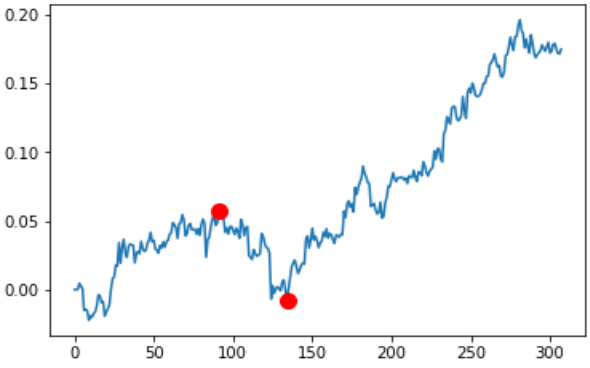
Max Drawdown

- Test on JPY

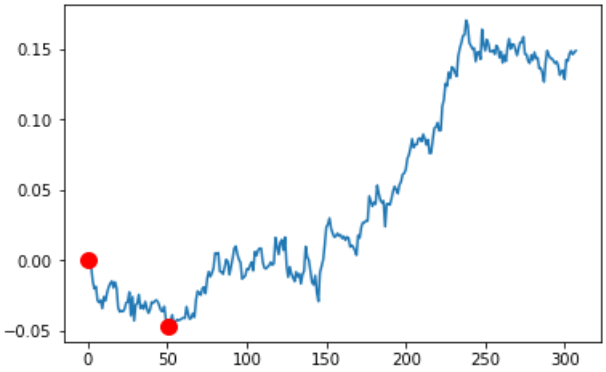
Simple Moving Average



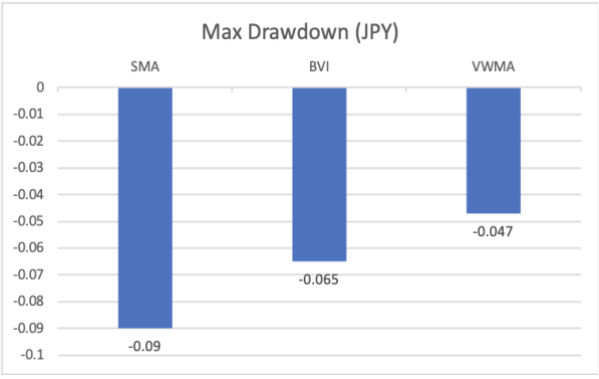
Breakout + Volume Indicator



Breakout + Volume Weighted Moving Average

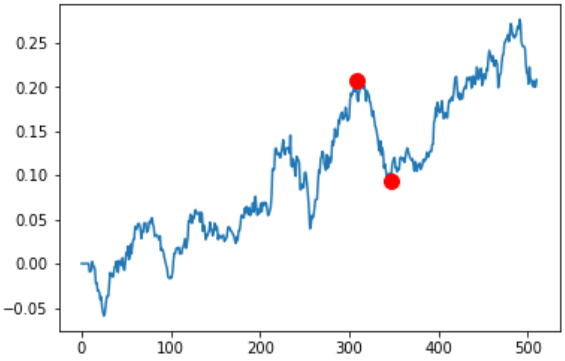


Max Drawdown Table

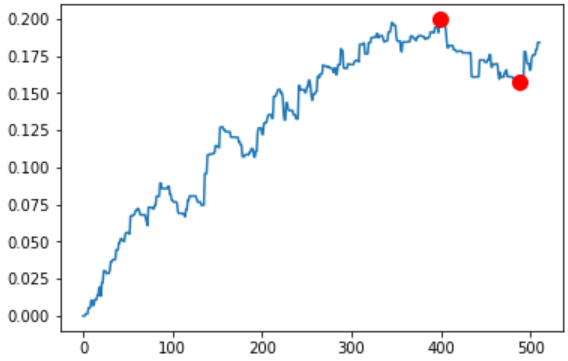


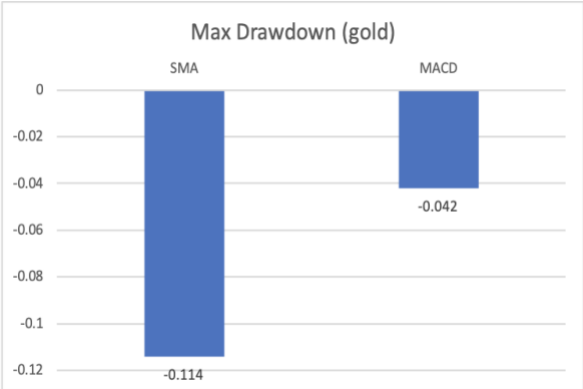
- Test on Gold

Simple Moving Average



Moving Average Convergence Divergence

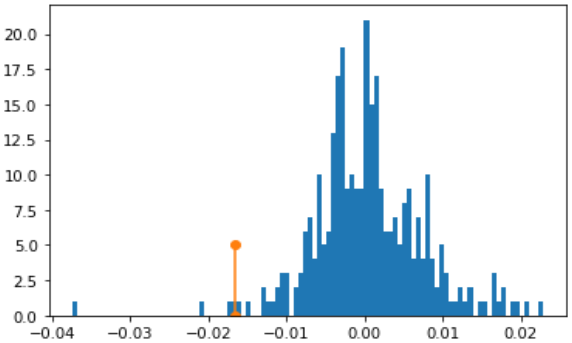




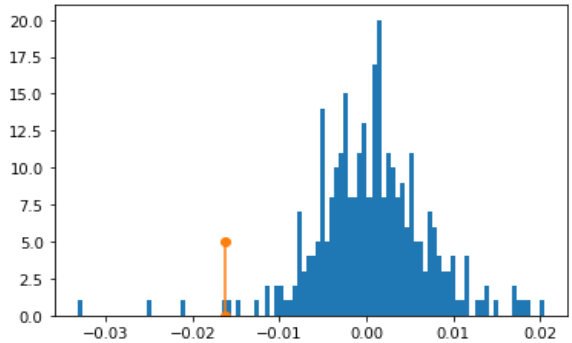
VAR (99% Confidence Interval)

- Test on JPY

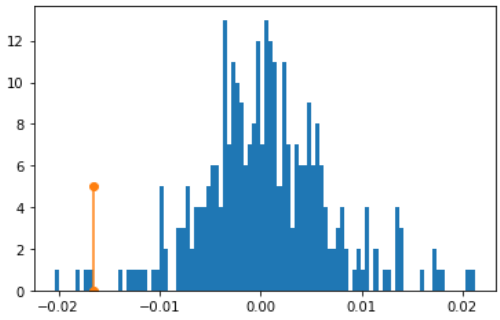
Simple Moving Average (-1.66%)



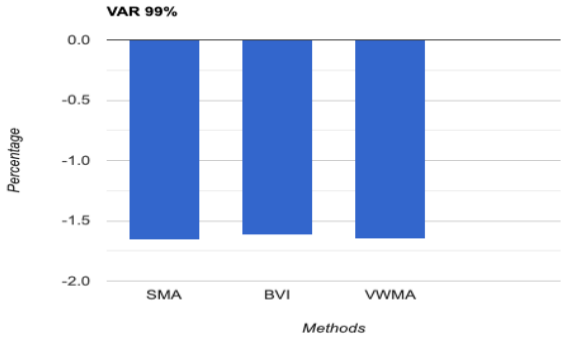
Breakout + Volume Indicator (-1.62%)



Breakout + Volume Weighted Moving Average (-1.65%)



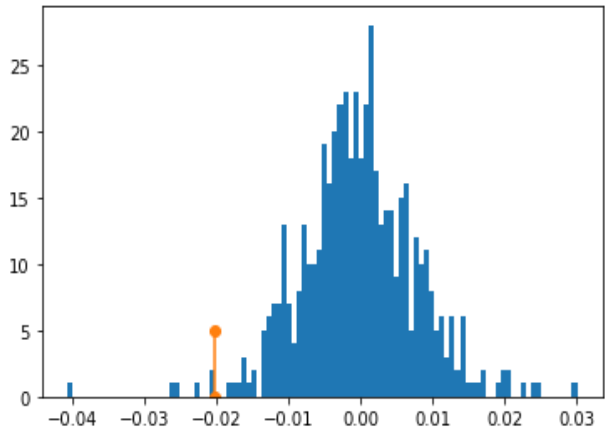
Comparison



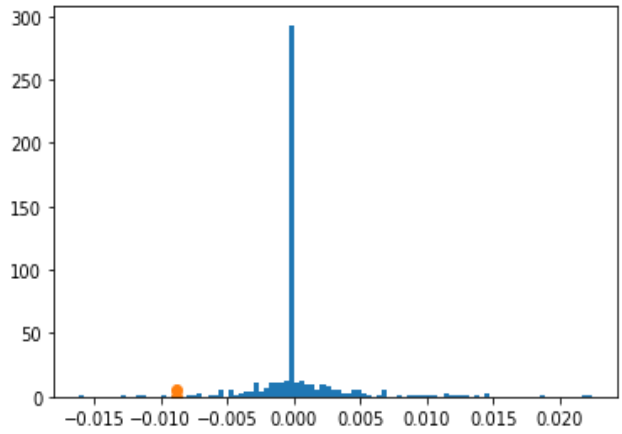
They have approximately the same VAR99.

- Test on Gold

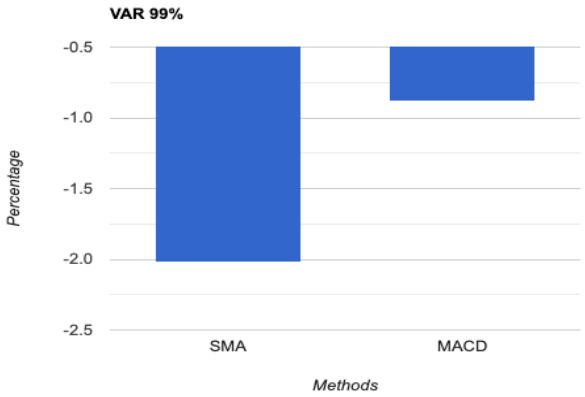
Simple Moving Average (-2.02%)



Moving Average Convergence Divergence (-0.88%)



Comparison



Conclusion

For USD_JPY, the Breakout + Volume Indicator generates the best return with the lowest information ratio of 1.4.
For gold, the Moving Average Convergence Divergence generates the highest return with the lowest information ratio of 1.7.

Reference :

https://tradingsim.com/blog/day-trading-breakouts/#What_Times_Work

https://www.investopedia.com/terms/m/macd.asp