Executive Summary

In this paper, we attempt to create a platform where traders can customize their trading strategies with a combination of technical indicators such as trend indicators, momentum indicators and volume indicators. The platform provides historical financial data which traders can rely on to carry out back testing to guide them in formulating their optimal trading strategies.

Introduction

Technical analysis is an investment methodology that involves estimating future price trends by studying historical trading activity using technical indicators. Commonly used technical indicators that are covered in this paper include: Moving average convergence divergence (MACD), Relative Strength Index (RSI) and Bollinger Bands

1. Moving Average Convergence Divergence (MACD)

   The MACD is a trend indicator that can be calculated by subtracting the exponential moving average (EMA) of a longer period from the EMA of the shorter period. Typically, the 26-day and 14-day EMA are used to calculate the MACD, after which the 9-day EMA of the MACD is used as the signal line. The MACD when used together with the signal line usually gives two types of trading signals:

   I. MACD crossing over with the signal series

      MACD falling below the signal line indicates that future prices are likely to fall. Likewise, MACD rising above the signal line indicates that future prices are likely to rise.

   II. Divergence of price from MACD

      Price tending to diverge from the MACD signals an upcoming trend reversal.

2. Relative Strength Index (RSI)

   Stochastic Oscillators are momentum indicators that are bound between the values of 0 and 100. Any value above 80 is a signal that the stock is overbought and any value under 20 is a signal that the stock is oversold. In using stochastic oscillators, we generally look out for crossovers that occur at the overbought at oversold ranges which would signal the end of a current trend and that prices will soon return to normal values.

3. Bollinger Bands

   The application of Bollinger Bands involves the use of 3 lines, the middle line is the moving average of a specific period, which the top and bottom lines are standard deviations of the moving average. Bollinger bands, just like stochastic oscillators, are useful for determining whether a stock is overbought or oversold. When price crosses above the middle line, the stock is overbought and when it moves below the middle line, the stock is oversold. Bollinger bands can also determine the volatility of a stock; when the bands lie close together, the volatility is expected to be low. Conversely, when the bands lie far apart, the volatility is expected to be high.

Data & Methodology

To backtest our algorithm, we collected daily historical opening and closing prices of Exxon (XOM), which is an oil and gas stock from the New York Stock Exchange over a period of 3 years from the Quantopian database.

The three technical indicators mentioned in the introduction were included in our algorithm. We also factored in sentiment analysis by incorporating the SentDex sentiment analysis algorithm to score our security based on how traders across the world feel about it.

Our algorithm will long a security when either:

- Bollinger Percentage is higher than 0.5
- MACD is above the signal line
- RSI is lower than 30
- SentDex score higher than 3

It will short a security when either:

- Bollinger Percentage is lower than 0.5
- MACD is below the signal line
- RSI is higher than 70
- SentDex score lower than -1

To measure the success of each trading strategy, our algorithm will calculate the win rate of our strategy over the past 3 years for different securities.

Results
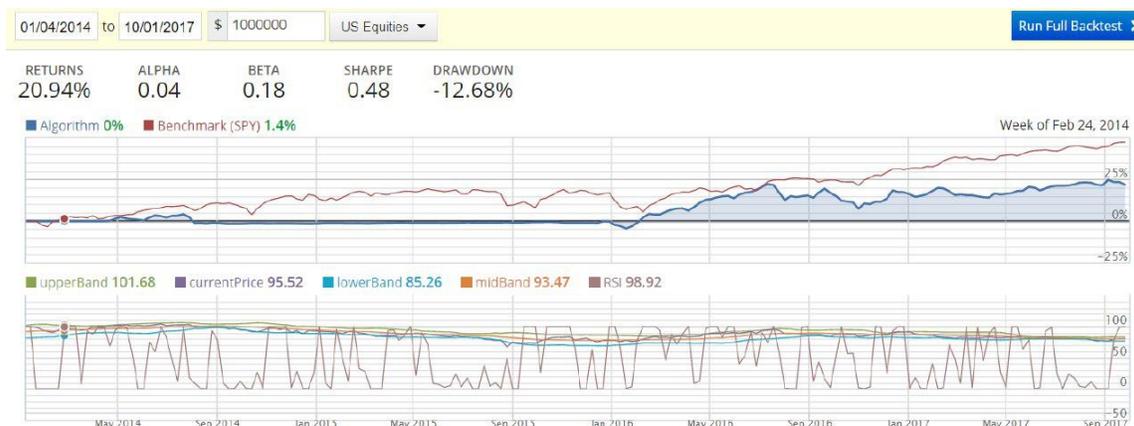
Using our algorithm, we ran a backtest on historical stock data on the counter Exxon (XOM) from the New York Stock Exchange. Our algorithm achieved over 20% returns, which is decent. However, the value of the Sharpe ratio, which is a measure of the risk-adjusted returns is a mere 0.48, can be further improved.

Conclusion

While our algorithm is profitable is many instances, there are areas where our trading strategy can be improved. For example, we will have to work on our strategy such that the Sharpe ratio achieves a value that is greater than 1. We also suspect that the incidence of Type-II errors might also be rather high for our algorithm since the number of opportunities over the past 3 years is rather low. Some of our improvement plans to make our algorithm more extensive and reliable involves incorporating a wider range of trading strategies into our algorithm and more rigorous testing of our algorithm with other types of financial instruments to check if our results can be replicated for different types of financial instruments.