# CAPE Datathon 2023

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## 1 INTRODUCTION

Happy Halloween! Thank you for this awesome contest and running this Datathon, specially Evan Elms and Daniel Garrett. I know this is more than what is being asked for but I will do it anyway because I love this stuff!

## 2 PREDICTION

My prediction is that MDLZ will have the best performanc among the three chosen stocks. HSY also has very similar trend and possibility as MDLZ but since I need to chose one, I will go with MDLZ.

Best: MDLZ

Medium: HSY

Poor: NSRGY

## 3 ANALYSIS

### 3.1 Simple Moving Average

When the security price crosses above the SMA, a buy signal is generated. This suggests that the security's trend is beginning to rise. When the SMA is moving downward, the security is most likely experiencing a downturn. As seen in Figure 1, all 3 securities are experiencing downturn. However, MDLZ is experiencing the least downturn among all 3 securities.

### 3.2 Bollinger Band

The Bollinger Bands indicator is based on the idea that prices typically oscillate between the upper and lower bands. Buy and sell signals are provided by the Bollinger band. When the price dips below the lower band (signaling oversold conditions) and then climbs back above it, a common strategy is to take this as a buy signal. On the other hand, if the price rises above the upper band (signifying overbought conditions) and then drops back below it, that might be a sell signal. Bollinger Band is also not a great indicator in this case as all 3 stocks have very

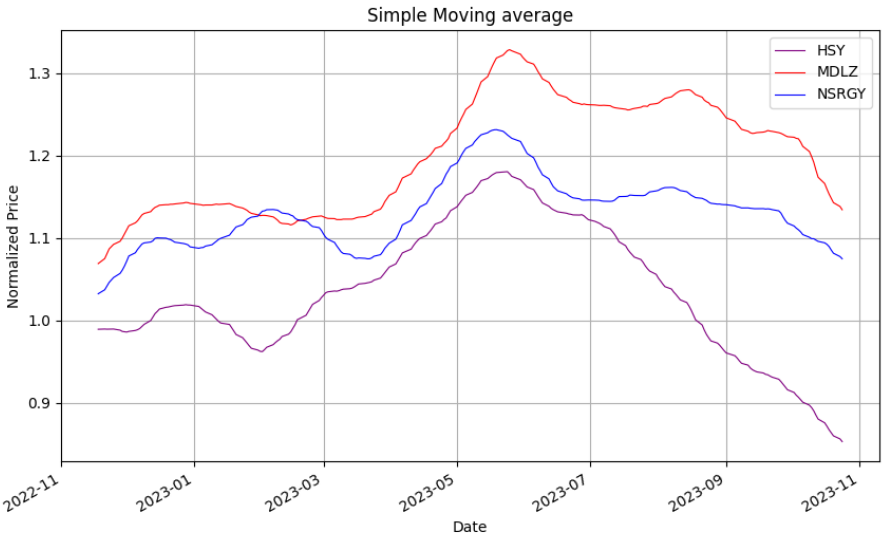


***Figure 1***—Simple Moving Average

similar trends. However, when comparing MDLZ (Figure 3) with HSY (Figure 2) and NSRGY (Figure 1), we can say that MDLZ will perform better as the price tocuhed the lower band and then starts to climb back again.

### 3.3 Momentum

The premise of the momentum indicator is that a security's price will carry on moving in the same direction as it has been. This is because of the tendency for trends to persist. A security's tendency to rise increases the likelihood that it will do so in the near future. Momentum is almost not helpful at all in this case as they all have similar trend and very close values. MDLZ and HSY has very similar momentum and values. Because of above two indicators, MDLZ is still the best stock prediction.

### 3.4 Commodity Channel Index

The commodity channel index (CCI) is a versatile technical indicator that assesses the discrepancy between the current price and the historical average price. CCI is comparably high when prices are much above their average. CCI is low when prices are far below their average. Buy and sell signals can be generated using the CCI. It is possible to interpret a CCI crossing above +100 as a buy signal.

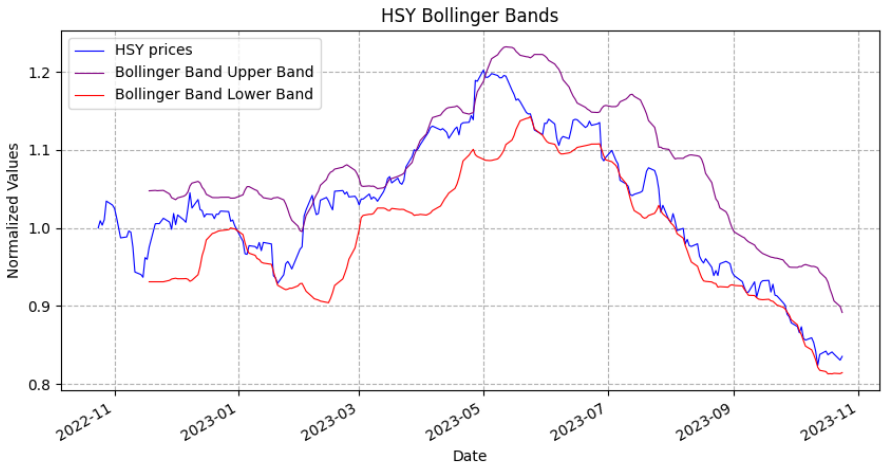


***Figure 2***—HSY Bollinger Band

On the other hand, a crossing of the CCI below -100 can be interpreted as a sell signal. As seen in figure 6, MDLZ has higher CCI index and therefore, it is predicted that it will perform better.

### 3.5 Moving Average Convergence Divergence

The connection between two moving averages of the price of a securities is displayed by the trend-following momentum indicator known as the Moving Average Convergence Divergence (MACD). The MACD produces buy and sell signals when its line crosses the signal line. When the MACD line crosses above the signal line, it is considered a bullish indicator, meaning that the price is likely to continue to increase. As seen in figure 9, NSRGY MACD is not crossing the signal line so it is not a buy signal. As seen in figure 7 and 8, MACD is crossing the signal line. Looking at above indicators and that MDLZ MACD is slightly higher than HSY MACD from signal line, I believe MDLZ will perform better.

## 4 TECHNICAL IMPLEMENTATION DETAILS

This code defines several functions for calculating technical indicators commonly used in financial analysis.

The calculate_rolling_mean function calculates the rolling mean of a given set of values over a specified window size. It uses the rolling method of a Pandas DataFrame to calculate the rolling mean.

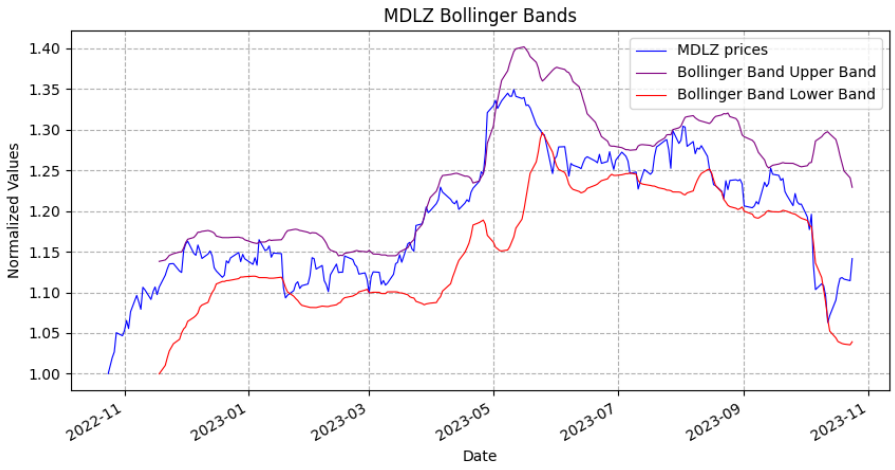


***Figure 3***—MDLZ Bollinger Band

The calculate_rolling_std function calculates the rolling standard deviation of a given set of values over a specified window size. It also uses the rolling method of a Pandas DataFrame to calculate the rolling standard deviation.

The calculate_simple_moving_average function calculates the simple moving average of a given set of prices over a specified window size. It calls the calculate_rolling_mean function to calculate the rolling mean.

The calculate_bollinger_bands function calculates the upper and lower Bollinger bands of a given set of values over a specified window size and number of standard deviations. It calls the calculate_rolling_mean and calculate_rolling_std functions to calculate the rolling mean and standard deviation.

The calculate_momentum function calculates the momentum of a given set of values over a specified window size. It uses the shift method of a Pandas DataFrame to calculate the percentage change in values over the specified window size.

The calculate_commodity_channel_index function calculates the commodity channel index (CCI) of a given set of values over a specified window size. It calls the calculate_rolling_mean and calculate_rolling_std functions to calculate the rolling mean and standard deviation, and then scales the difference between the values and the rolling mean by a scaling factor.

The calculate_moving_average_convergence_divergence function calculates the

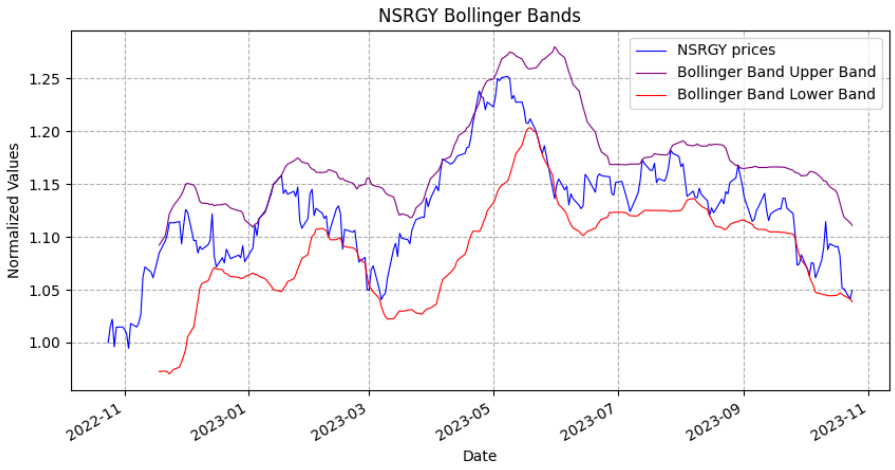


***Figure 4***—NSRGY Bollinger Band

moving average convergence divergence (MACD) of a given set of values over a specified short period, long period, and signal period. It uses the ewm method of a Pandas DataFrame to calculate the exponential moving averages (EMAs) of the short-term and long-term periods, and then calculates the MACD line and signal line based on the difference between the two EMAs.

Finally, the test_code function defines some test data and calls the get_data function to retrieve financial data for three different symbols. It then calculates the normalized prices for each symbol and stores them in separate Pandas DataFrames.

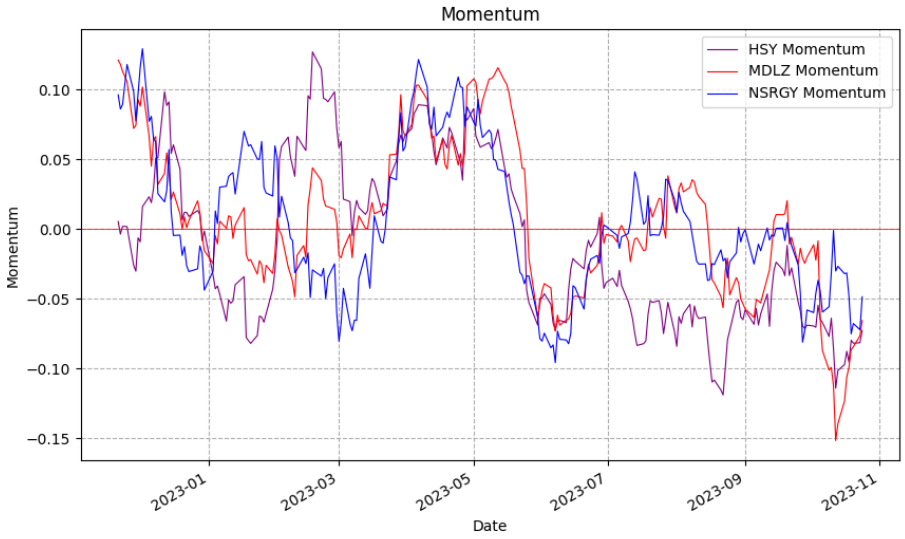


***Figure 5***—Momentum

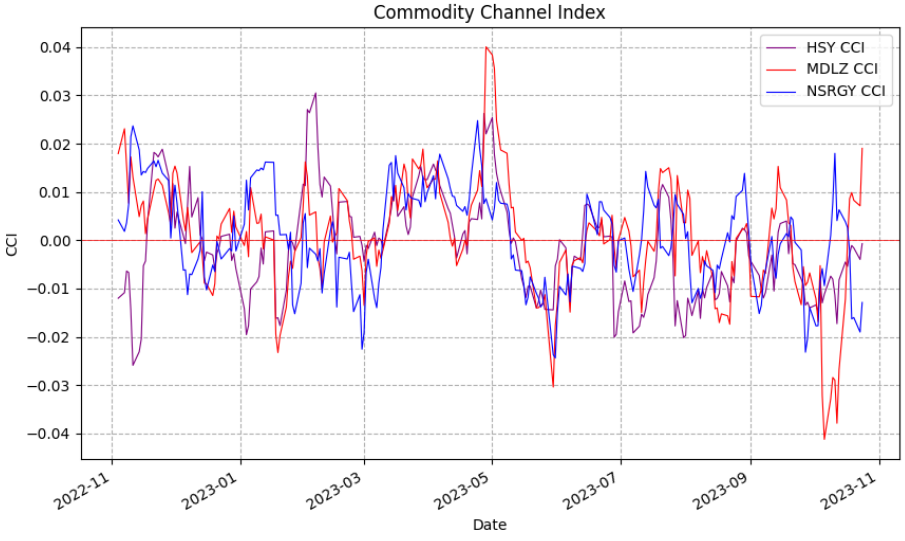


***Figure 6***—CCI

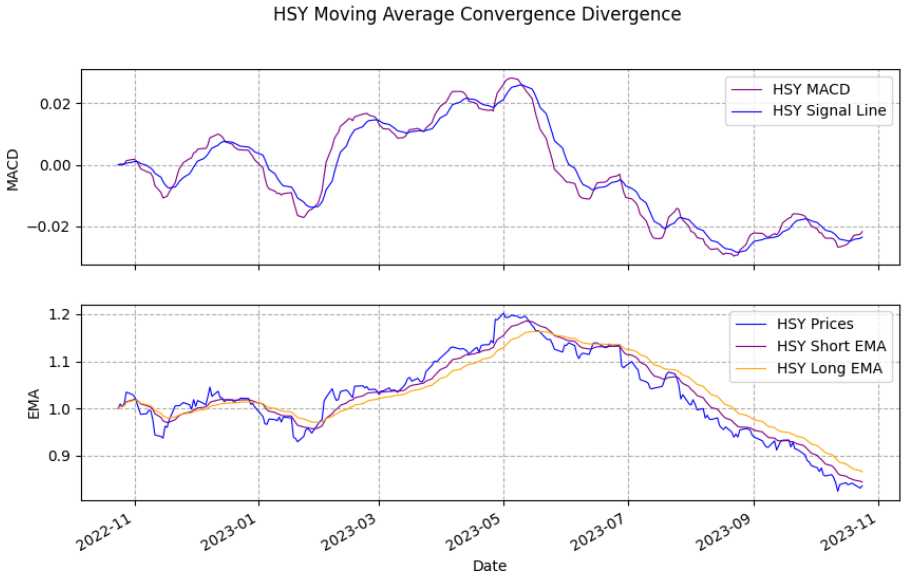


*Figure 7*—HSY MACD

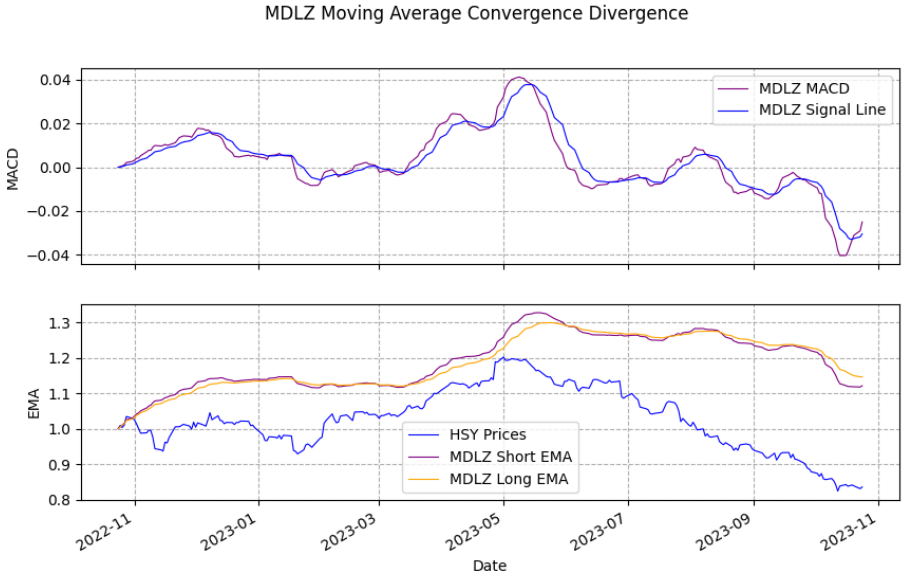


*Figure 8*—MDLZ MACD

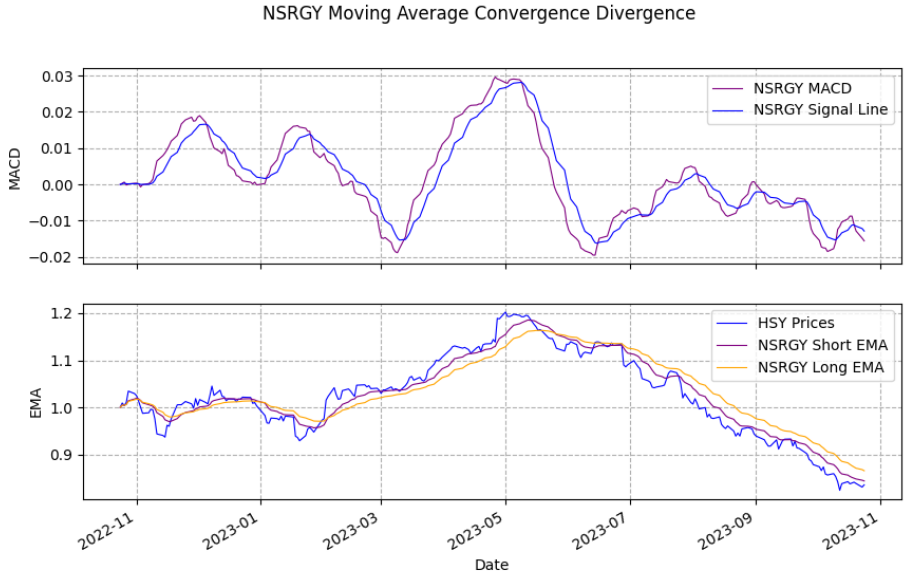


***Figure 9***—NSRGY MACD