CS 4646 | Project 6
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Technical Indicators

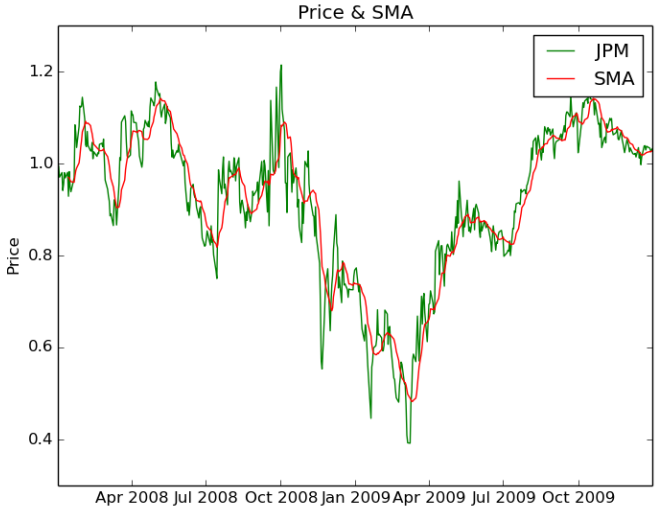
In this report I will highlight the technical indicators chosen in order to create a deterministic ensemble of indicators to ultimately output signals to buy, short, or hold a stock. Technical indicators are generally understood as heuristic methods to model the stock market. While their efficiency when used in stan-along scenarios are perhaps mediocre at best, when used as part of an ensemble logic they could provide some insight on the behavior of the market.

For this assignment, I have constructed a logic in which four common technical indicators vote for a signal at every given time-step of data. For this specific implementation, every 1-day the system will output either a 'buy', 'sell', or 'hold' signal. In the following section, I will discuss underline logic behind each indicator.

All the graphs shown on this section explaining the technical indicators we plotted using the in-sample data range. The out of sample data range was only used when testing the already developed model.

Simple Moving Average

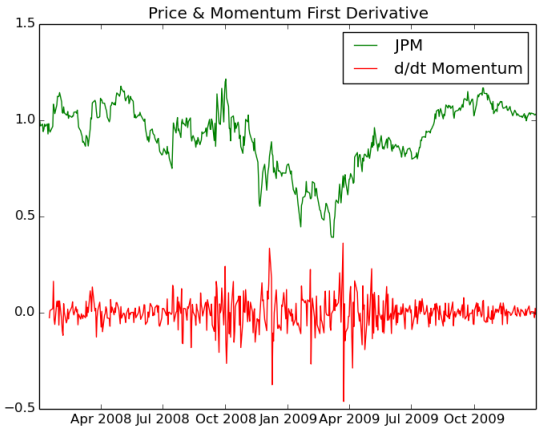
The Simple Moving Average (SMA) is in fact very simple. It defined as the mean of a rolling window; in this specific implementation, 10 days. The SMA is a lagging indicator. It is mainly used to smooth the behavior of stock price to get insight on possible trends. It is interesting to notice the relationship between the indicator and the price itself. If we assume that past prices carry some information of future prices, but shield from immediate noise, we can study the points in which the two lines crosses and infer assumptions of bullish trends when the current price goes under the average, and bearish when the opposite occurs.



In the graph observe the price of JPM plotted against its 10-day SMA. We can clearly see that virtually the two-line crosses, a change in the price direction happens.

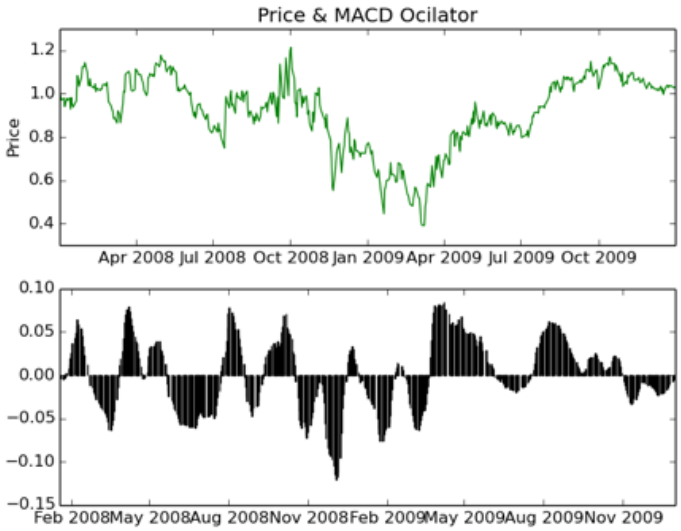
Momentum

The momentum gives us insight on the general trend of the stock. For this specific implementation, instead of using momentum, its rate of change was used in order to determinate if the stock was likely to keep increasing in price, or otherwise.



MACD Oscillator

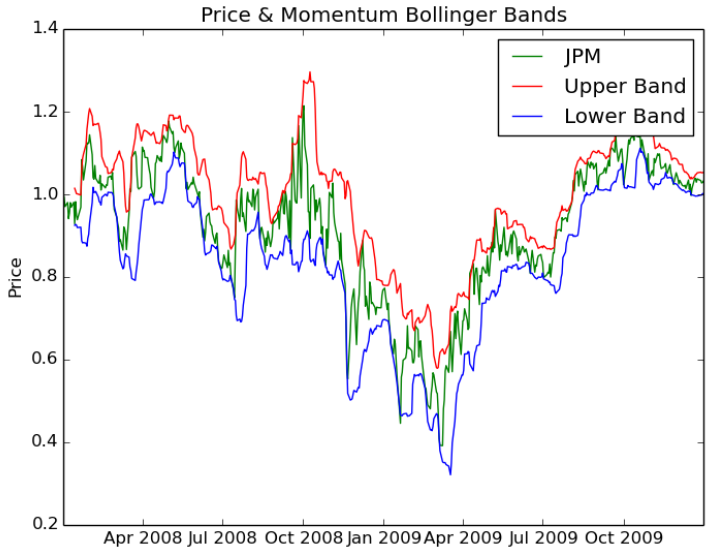
MACD Oscillator is goo to follow trends, but mainly to obverse changes in trends in the market. It consists of two simple moving averages, one to 12 days, and the second of 26 days. The



oscillator is defined as the difference between the two averages. When the oscillator is positive, we should long the stock; when negative, we should short it.

Bollinger Bands

Bollinger Bands are at essence just three simple averages putted together, separated by 2 standard deviations each. These bands provide with the concept of support and barrier for the price of a stock.



Notice in the figure that the price is at almost all time between the two bands. In rare occasions, however, the price does go outside the bands, meaning that it either broke a barier of bell under a support. When this happened, it is very likely that the stock will compensate quickly.

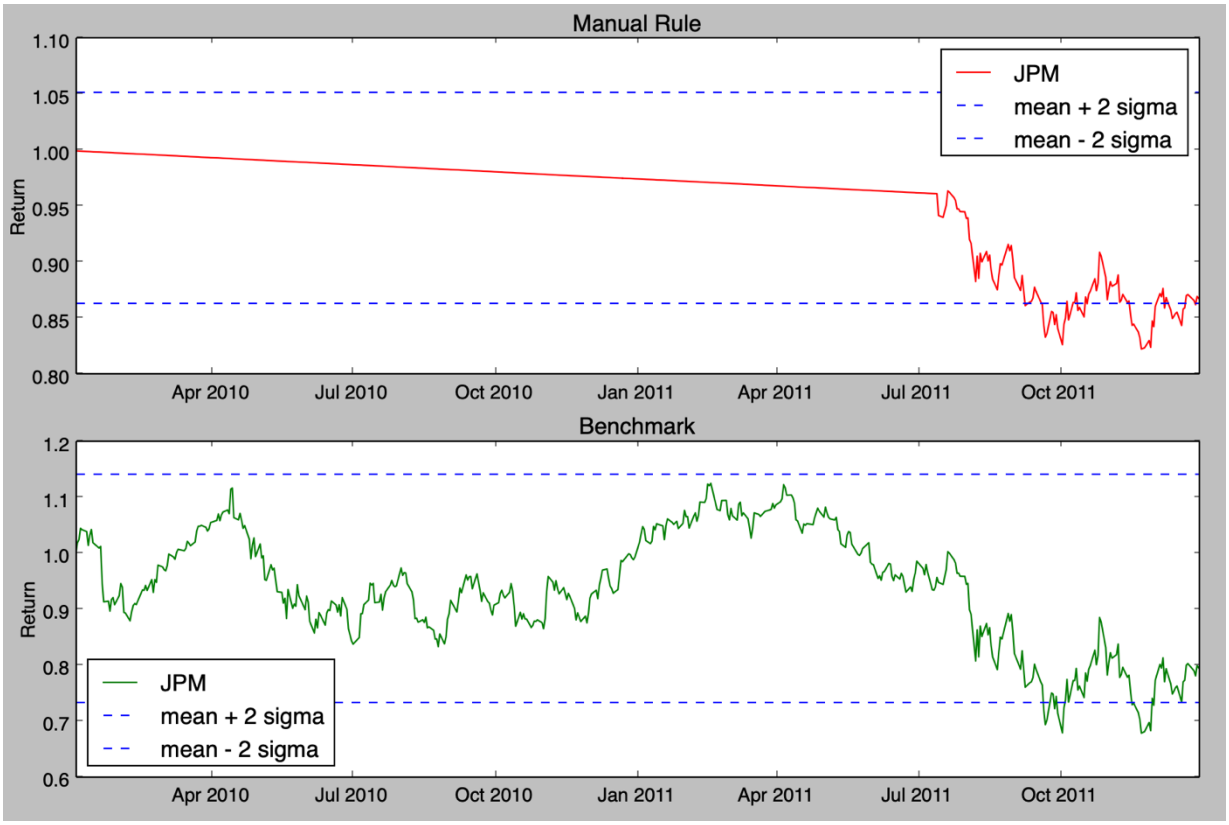
Signal Generation

The process of generating the signal is simple. Every indicator has a vote a that it casts according to it's underlining logic. Hyperparameters were, of course, tuned for each indicator in order to maximize the returns of the in-sample period of the stock. The model then was deployed in the out-of-sample period, and results compared. As a preliminary conclusion, it is likely that the hyper parameters were overfitted for the range of data in which it was tuned, since it did perform poorly in the out-of-sample data.

Manual Strategy

The manual strategy did not perform well in the out of sample data. It did not trigger a buying or sell signal for most of the data period, and when it finally did perform a single 'buy', the stock was trending down still, and it lost about 15% of it's original investment,

	Manual	BenchMark
Cum Return	0.86815338	0.79593834
Std	0.04705272	0.10201531
Mean	0.95705098	0.93726236



Theoretical

The theoretical optima were achieved by computing the daily returns of the stock, and creating trades file where we assure to be bought in the stock at day d when to stock were to have positive daily returns at day d+1, and short the stock when it were to have negative daily returns at day d+1. He hence achieved a cumulative return of more than 4 time the initial investment.

	Theoretical	BenchMark
Cum Return	4.1202	0.79593834
Std	0.85059917	0.10201531
Mean	2.4525869	0.93726236