

Linear Regression in Technical Analysis

Jarod Wright

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1 Introduction

“Technical analysis (TA) is a methodological framework of analyzing, primarily graphically, the historical evolution of financial assets’ prices and inferring from this assessment future predictions.” Stocks, bonds, and currency pairs are the most typical assets traded within this framework. Technicians use a variety of technical tools within their trading activities, like filters, technical indicators, patterns and candlestick charts. Although most academics are dismissive of TA, a significant proportion of practitioners subscribe to techniques of TA within their trading activities. Practitioners of TA range from retail traders, with orders less than a million dollars in value, and institutional hedge funds who make orders in excess of hundreds of millions of dollars.

A trading strategy is typically back-tested on historical market data. Fundamentally, this back testing consists of pairing buy and sell signals with price data in hopes of generating a return on price movement. Investment analyst works along side economist to identify market conditions and trends.

2 Data, Approach

A TA strategy utilizes time-series data for the price of an asset and typically the volume of orders for a particular interval. The open, close, low, high of an asset's price are recorded at regular intervals(candles) for the duration of a trading window; commonly traded windows are 5-minute, 1-hour, 1-day. This data is used to construct indicator functions. A near universally utilized indicator is linear regression. A linear regression model will take dates as predictive variables and price of n candles as a response in order to establish a "fair value price". This model can subsequently be used to establish a linear regression channel where you have a resistance and support defined from the linear-regression and standard deviation of price as follows:

$$f_{w,b} = wx + b \tag{1}$$

$$f_{w,b} = wx + b + \sigma \equiv \textit{resistance} \tag{2}$$

$$f_{w,b} = wx + b - \sigma \equiv \textit{support} \tag{3}$$

Data can be accessed in real-time from exchanges via brokers in order to make continuously updated models. Additionally, you can access historical data from a plethora of places to test the efficacy of a TA strategy.

3 Method

I constructed a crude trading strategy using closing price data from the New York Stock Exchange to illustrate the effectiveness of a linear regression channel. The strategy consists of defining a linear regression channel for n day candles on a year window, where n increases continuously as new candles are reported. The linear regression model is updated as each new entry of price is reported.

A buy signal for x_0 shares is initiated when the closing price crosses the support channel and another $x_i = x_{i-1} + 10$ shares are ordered for each subsequent crossing of the support channel. Finally, one sell order is initiated to sell all shares $\sum x_i$. The returns for two symbols is computed and compared for a 1-year time frame.



Figure 1: aapl: Continuously updated LR with support and resistance channels



Figure 2: amzn: Continuously updated LR with support and resistance channels

4 Conclusion

Figure 1 and 2 present an opportunity for successful application of the described strategy. When applying the strategy to Apple stock in 2010, we saw a return of \$47,580.70. For Amazon in 2010, the return was \$89,768.23. Apple’s average closing price for 2010 was \$254.76 while Amazons was \$135.87. Further, the strategy for Amazon triggered 36 buy/sell orders while that number was only 17 for Apple. These figures can vary wildly with volatility.

4.1 Remarks

There is a lot of ‘woo’ in TA. No strategy is effective in every area and what once proved to be an effective strategy may not be later. TA is by no means a concrete science and must be applied appropriately and with context. Price movement is easily influenced by large scale trades. Additionally, psychological and social perspective massively influence price movement. It can be modeled as neither purely deterministic nor as a purely random system.

5 References

- Gawlik, Dominik. “New York Stock Exchange.” Kaggle, 22 Feb. 2017, <https://www.kaggle.com/dgawlik/nyse>.
- Tsinaslanidis, Prodromos E., and Achilleas D. Zapranis. Technical Analysis for Algorithmic Pattern Recognition. Springer International Publishing, 2016.

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^{1*}The described strategy is very crude and does not take any consideration of capital available to a hypothetical trader.