



Stock Market Trend Prediction with Neural Net and Natural Language Processing



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Introduction

- Goal: Predict stock market trends (daily price movements)
- Efficient Market Hypothesis (EMH): asset prices reflect all available information
- The EMH assumes that all market participants are equally informed and that markets are efficient.
 - But that may be an unrealistic assumption
- Therefore, there is merit to developing a machine learning algorithm with the aim of beating the market.

Approach & Methods

- An Automated Framework for Incorporating News Into Stock Trading Strategies (J.Nithiya Devi and G.Vjaybharathi 2014)
 - Demonstrated combining Boolean outputs of technical analysis and sentiment analysis to generate trading decisions [buy, sell, hold].
- Technical Analysis – Neural Network Approach
- Sentiment Analysis – Natural Language Processing

Neural Network

- Data inputs
 - S&P 500 – 68 Years of Historical Data
 - Financial Indicators: Momentum, Bollinger, SMA, EMA
- Model
 - Multilayer Perceptron Model
 - Supervised Learning
 - Training (80%), Test (20%)
 - Grid Search Was Used to Tune the Model
- Output
 - Model Predicts if the Next Day's Closing Price Will Rise or Fall

Natural Language Processing

- Data inputs
 - Training Data – Positive/Negative Movie Reviews
 - Test Data – 5 years of Wall Street Journal Articles
 - Used Web Scraping to Gather This Data
- Model
 - Naïve Bayes Classifier
 - Supervised Learning
- Output
 - Classifies Each Day as Having Positive or Negative Sentiment Based on News Articles

Strategies

- Buy & Sell
 - Condition 1 (c1): Neural Net predicts next days price will increase
 - Condition 2 (c2): NLP model predicts the market sentiment is positive
 - **If** (c1 V c2) **then** buy else sell
- Buy & Hold
 - Condition 1 (c1): Neural Net predicts next days price will increase
 - Condition 2 (c2): NLP model predicts the market sentiment is positive
 - **If** (c1 V c2) **then** buy else hold

Results



Results (cont..)



Conclusion

- Beat the market leveraging machine learning
 - Sentiment analysis component improved the trading performance confirming the importance of behavioral economics
- Markets may not be as efficient as the EMH assumes
 - The model could be improved from day trading to higher frequency trading allowing strategies to act upon news quicker