Predicting Markets with Neural Networks

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Overview

- Goal
  - To predict the next day's market direction using a set of historical time series data
  - Compare the accuracy of different neural network / deep learning structures
- Markets to Predict
  - S&P 500
  - Gold
  - Oil
  - US Treasury Yields

Data

- ~ 2,500 financial and macroeconomic time series from the St. Louis Fed's FRED database

- Data Issues:
  - Inconsistent starting dates
  - Inconsistent frequency
  - Inconsistent release day of week for weekly data
  - Timestamps of weekly data was not date of release but last date of data coverage

- Solutions:
  - Used daily data only
  - Cut out data prior to a start date of the feature with the latest start date

  Only 500 features remained to be used

Neural Networks Used

- Feedforward Neural Networks
  - Data only goes forward starting from input nodes to output nodes

- Recurrent Neural Networks
  - Loops exist within the layers such that outputs can be inputs to nodes at the same layer or to prior layers
  - Can be thought of as a way to introduce a kind of memory into the system
  - Works well for sequential data such as time series and text data

Accuracy Visualizations

- Graph of Accuracy vs. various number of layers of a Feedforward Neural Net Structure
- Graph of Accuracy vs. various number of nodes for two hidden layers
- Graph of Accuracy for Feedforward vs. Recurrent Neural Networks

Conclusion

- Explain the feasibility of using neural networks to predict financial markets
- Explain general accuracy trends observed for various number of hidden layers and number of nodes per hidden layer
- Explain general observations for accuracy between feedforward vs. recurrent neural networks