# Using Neural Networks to Forecast Stock Market Prices

Date 5/9/17 No.

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Possible approaches:

- Technical analysis - detects trends based on previous trends and market psychology. Low predictive accuracy and time lag
- Fundamental analysis - tends to give superior long-term returns
- Time series forecasting - either univariate (e.g Box-Jenkins), which involves analysing patterns in autocorrelation, or multivariate, to discover causal relationships
- Efficient Market Hypothesis - i.e, buy and hold
- Chaos theory - the stock market is not purely random; it is massively complex and nonlinear.

Neural networks can capture nonlinearity, and can extract rules from data.

- Input data can take many forms. Most commonly:
  - technical indicators e.g moving averages, RSI
  - fundamentals e.g DCF value
  - sentiment by parsing reports/media
- Performance increases with the amount of data (generally).
- However, in the case of time series, very old data may just add noise.

## Network organisation

- Backpropagation is the most common architecture
  - node weights change in proportion to their error contribution
  - different activations can be used. The sigmoid function is best at learning average behaviour; tanh is better for deviations.
  - overfitting can be dealt with by pruning, or cross validation

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- Supplementary learning involves updating individual weights based on the total error. Each output node has an error threshold such that backprop only occurs if this tolerance is exceeded.
- Moving simulation involves constantly changing the target, learning, and prediction periods. In each iteration, the train-test-pred window moves forward in time.
- Genetic algorithms may be useful for large input dimensionalities, or for hyperparameter optimisation (e.g deciding on NN architecture).
- Modular NNs are often made of smaller backprop nets which act as interchangeable subunits.
- RNNs tend to be good at dealing with temporal data.
- Self-organising systems require a lot of data but are often difficult to train and prone to overfitting.
- Hybrid systems pass NN output through an expert system ← rule based, designed with domain knowledge

Comments

- Poorly organised: a lot of repetition within a few lines, and the ideas are presented in an illogical order
- Presents many individual results without linking ideas or adding value
- Some of the networks discussed appear to have disappeared from the literature.