Francis Analytics

Actuarial Data Mining Services

Technical Predictors of Stock Price
A Datamining Example

Datamining

- Datamining is used to find patterns in complex data
- It is usually applied to large data bases containing many observations on many variables
- In insurance, it has been used by some personal lines companies for ratemaking and is used in fraud detection
- One of the areas in which the methods were pioneered is financial market analysis where vary large data bases with complicated relationships among the variables are available

Stock Prediction: Which Indicator is Best?

- Moving Averages
- Measures of Volatility
- Seasonal Indicators
  - The January effect
- Oscillators

The Data

- S&P Index close since 1930
- Open, High, Low, Close on S&P 500 since 1962

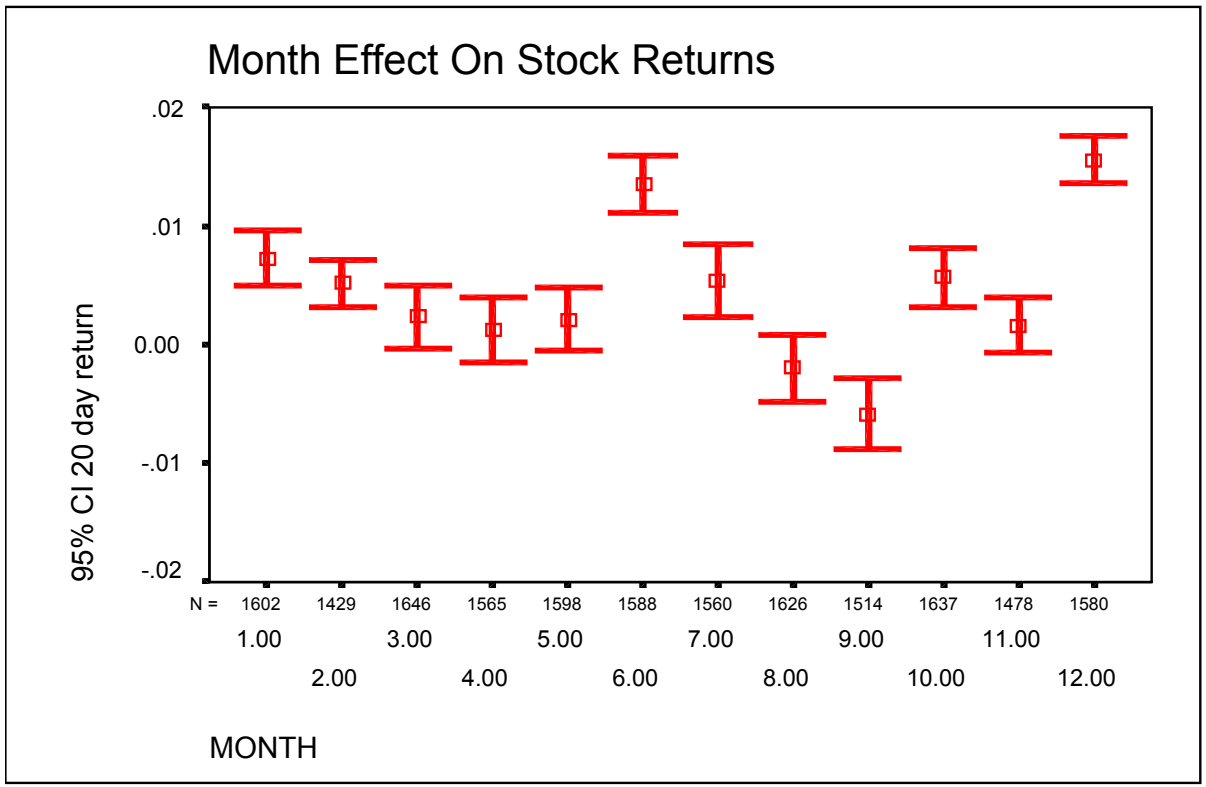
Moving Averages

- A very commonly used technical indicator
  - 1 week MA of returns
  - 2 week MA of returns
  - 1 month MA of returns
- These are trend following indicators
- In addition to moving averages there is a more complicated time series smoothers based on running medians called T4253H

Volatility Measures

- Finance literature suggests volatility of market changes over time
- More turbulent market -> higher volatility
- Measures
  - Standard deviation of returns
  - Range of returns
  - Moving averages of above

Seasonal Effects



Oscillators

- May indicate that market is overbought or oversold
- May indicate that a trend is nearing completion
- Some oscillators
  - Moving average differences
  - Stochastic

Stochastic

- Based on observation that as prices increase closing prices tend to be closer to upper end of range
- In downtrends, closing prices are near lower end of range
  - %K = (C – L5)/(H5 – L5)
    - C is closing prince, L5 is 5 day low, H5 is 5 day high
  - %D = 3 day moving average of %K

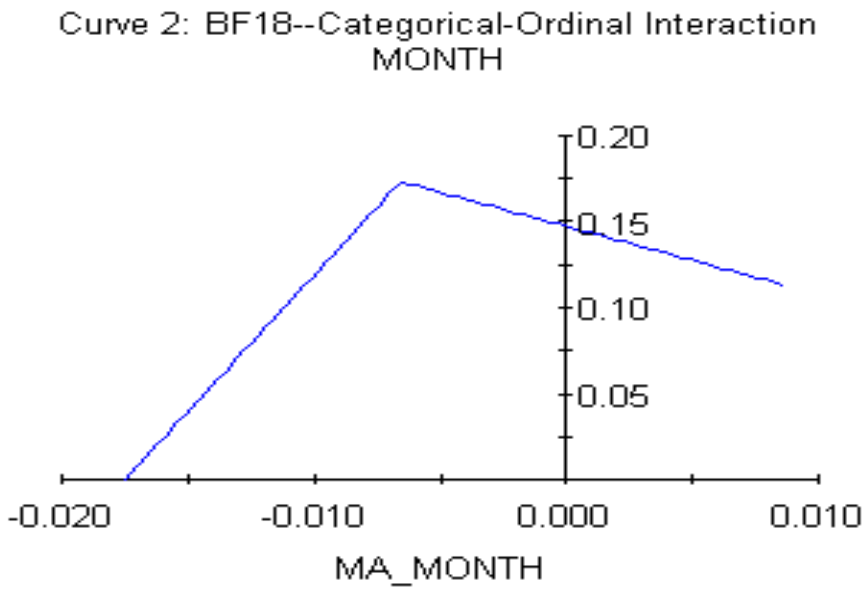
Methods

- MARS
  - Based on linear regression but fits non linear relationships and interactions
- Neural networks
  - Developed in artificial intelligence
  - A complex statistical model based on how neurons function in brain
  - Good with non-linear relationships and other complex situations

MARS Result

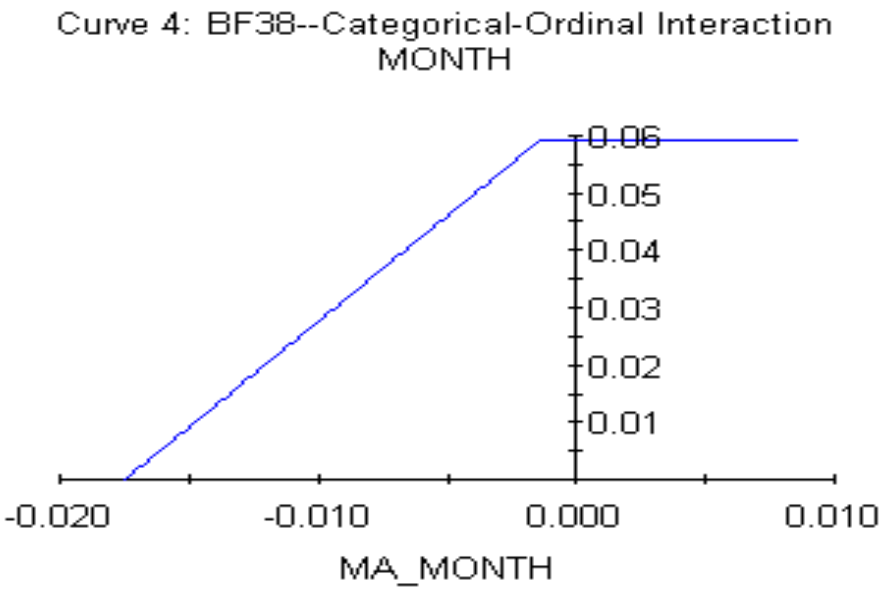
- Variable importance
  - Smoothed return
  - Month
  - Smoothed weekly standard deviation
  - Smoothed K (from stochastic)
  - 1 Month moving average of return
  - 2 week MA of 10 day K
  - Smoothed standard deviation
  - 1 month – 2 week MA of return
- R^2 was .13, or 13% of variance explained

MARS result : Impact of 1 Month Moving Average and Month



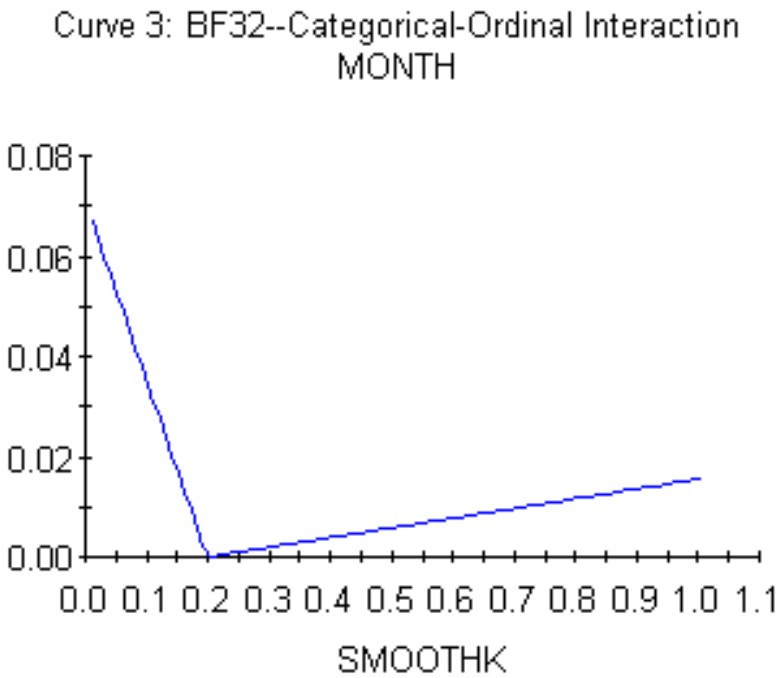
For months Jan, Feb, Mar, Oct, Nov, Dec

MARS result : Impact of 1 Month Moving Average and Month



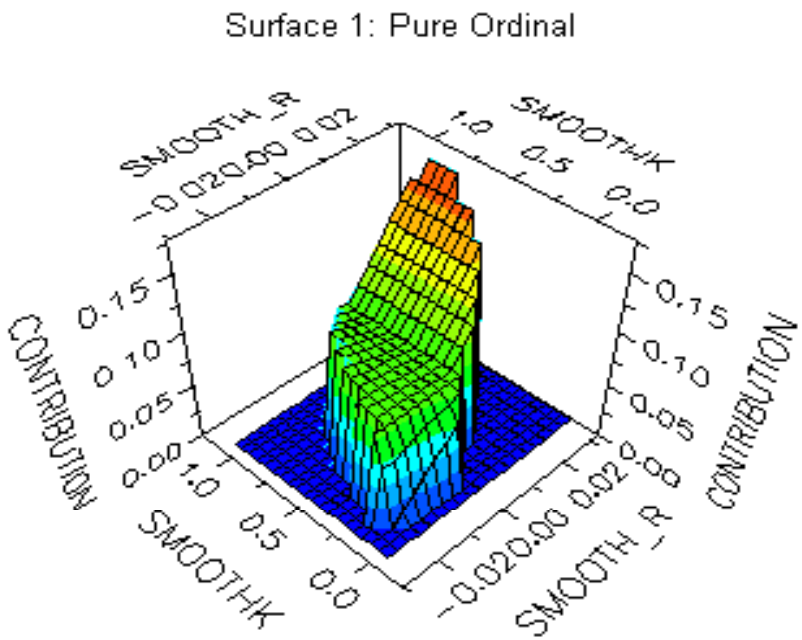
Month = Apr, May, June, Jul, Aug, Sep

MARS result : Impact of Smoothed %K and Month



Month = Jan, Feb, Apr

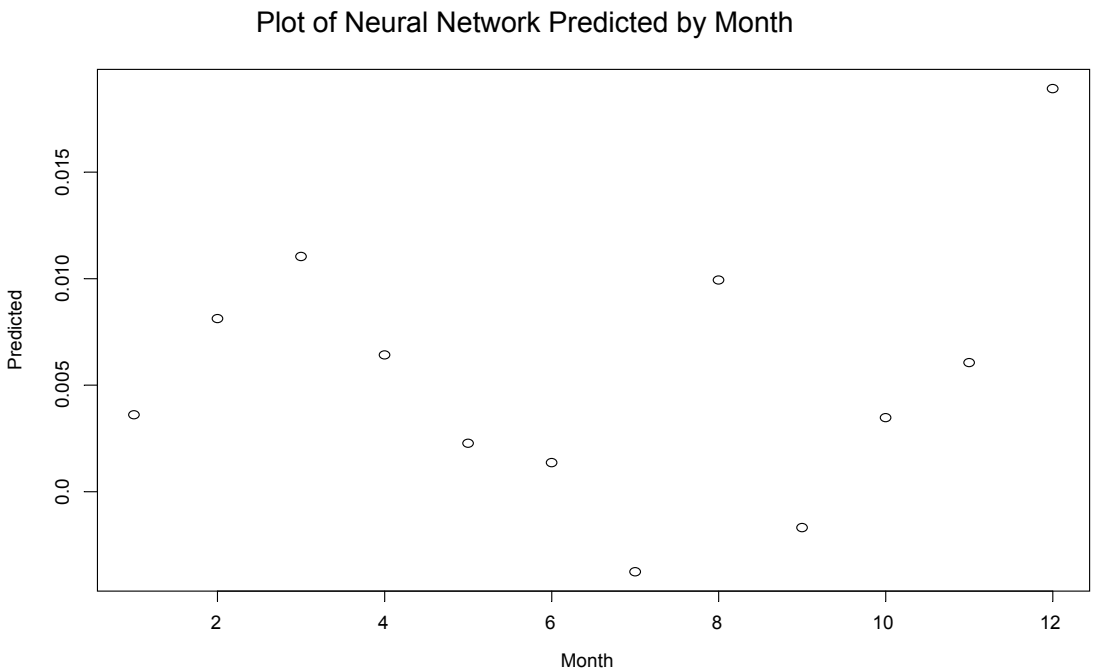
MARS result : Impact of Smoothed Return and Smoothed %K



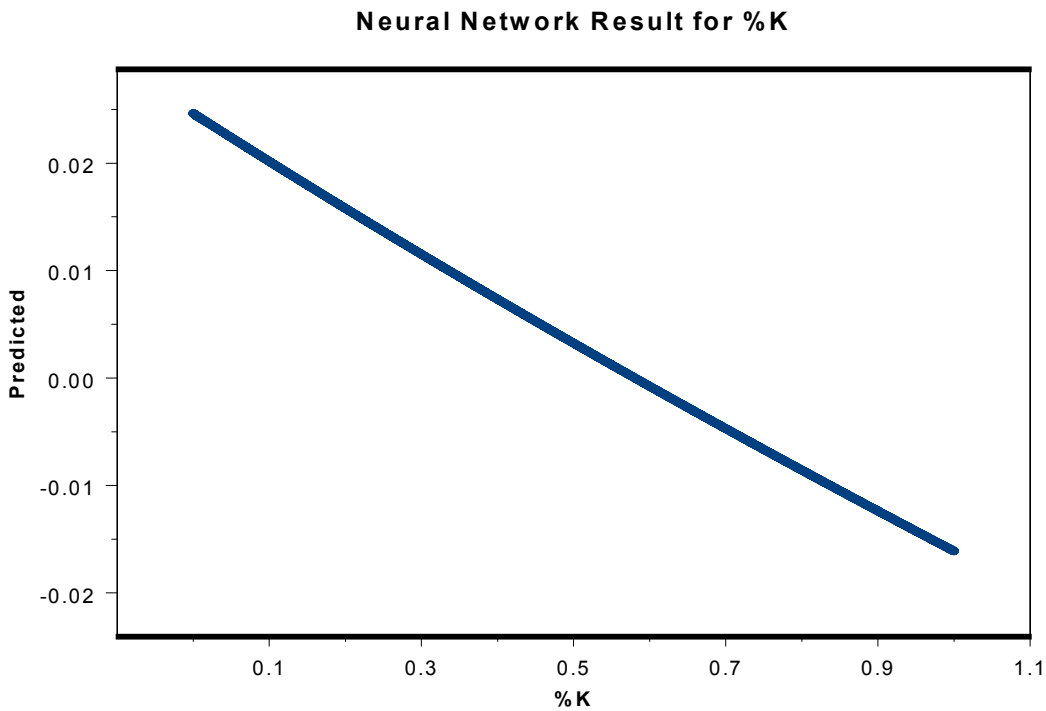
Neural Network Result

- Variable Importance
  - Month
  - %K (from stochastic)
  - Smoothed standard deviation
  - Smoothed return
  - 2 Week %D (from stochastic)
  - 1 week range of returns
  - Smoothed %K
  - R^2 was .15 or 15% of variance explained

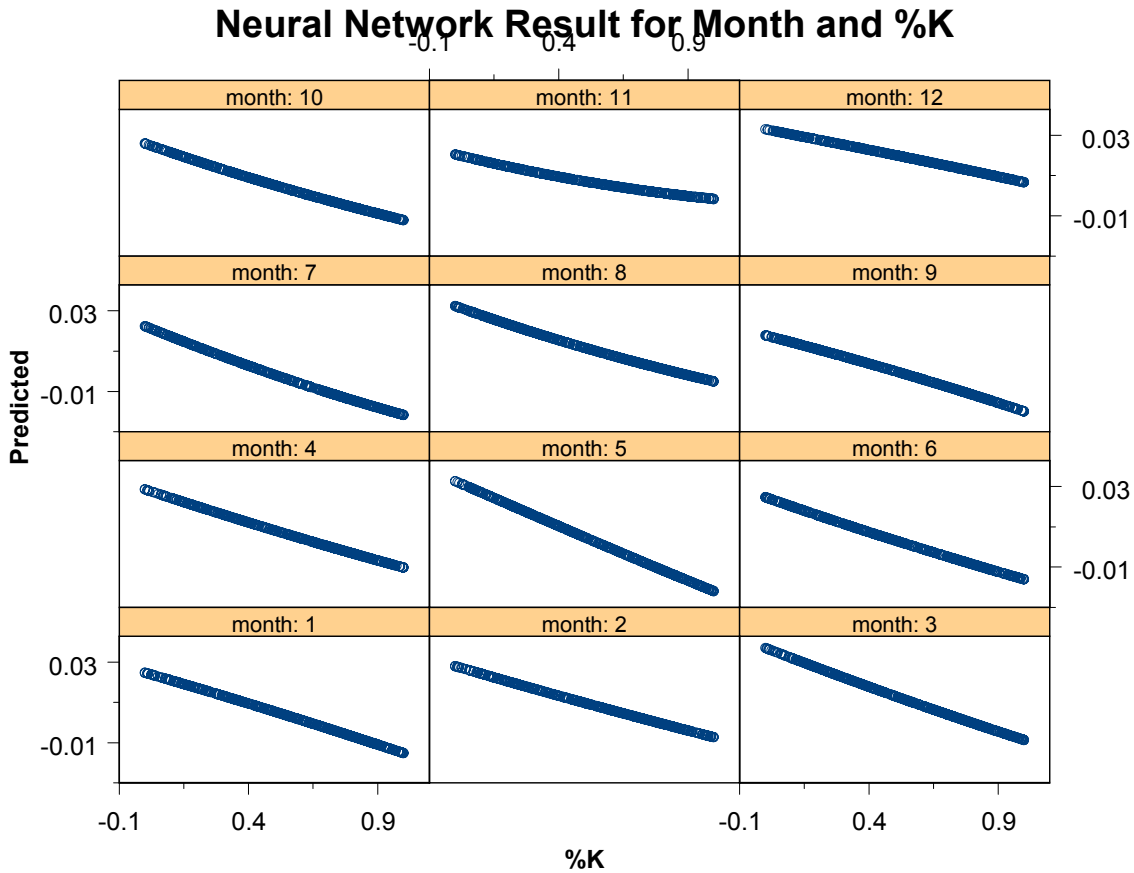
Neural Network Result for Seasonality



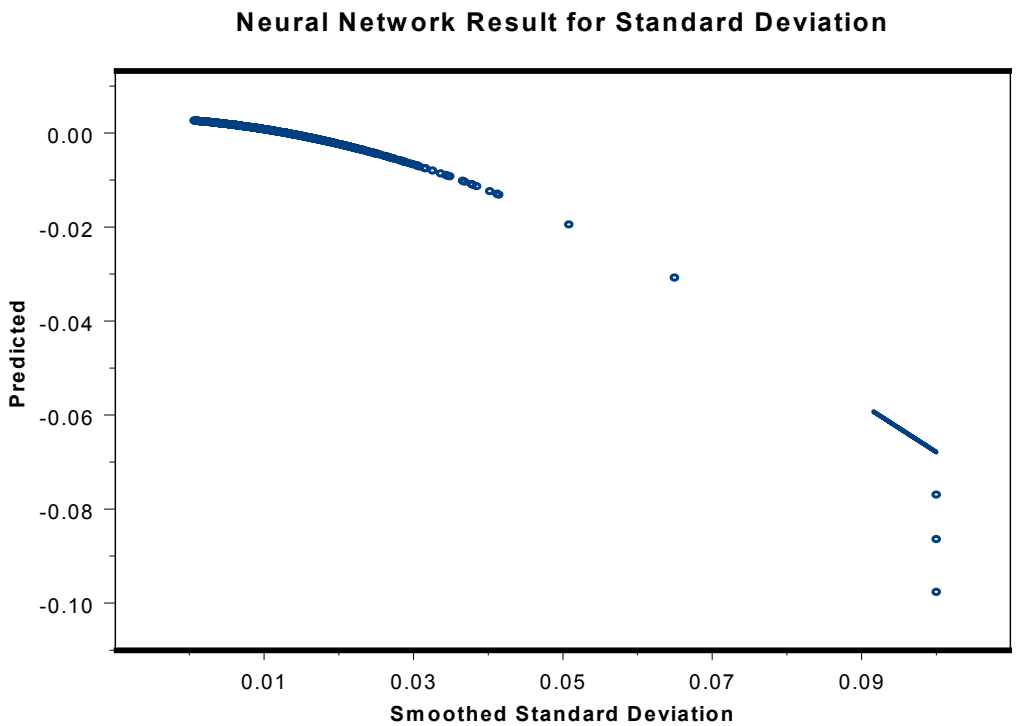
Neural Network Result for Oscillator



Neural Network Result for Seasonality and Oscillator



Neural Network Result for Seasonality and Standard Deviation



Neural Network Result for Seasonality and Standard Deviation