**Linear Factor Models**

**Performance Measurement**

Risk\_Factors.xlsx contains monthly observations of the risk-free rate and the three Fama–French risk factors (expressed as percentages), over the ten-year period from Jan 2004 through Dec 2013.

Using excess returns for the ten industry portfolios, calculate the following performance metrics:

* Sharpe ratio
* Sortino ratio (using risk-free rate as target)
* Treynor ratio (using CAPM β)
* Jensen's α
* Three-factor α

The sample semi-variance can be estimated as:

 where *R*i is return on industry portfolio and *R*f is risk-free rate.

* Create a table showing the performance metrics for the ten industry portfolios.
* Plot your results as a bar chart for each performance metric.
* Briefly explain (in words, without mathematical equations or formulas) the economic significance and pricing implications of each of the three performance ratios (but not α's).