**Project: back-testing of a simple fundamental strategy**

*In the two attached datasets, you will find:*

*-Monthly returns for the largest 1500 US stocks, from 1990 to 2015.*

*-Some accounting data for the same firms (the variable* ***ROA*** *is defined here as operating cash flows divided by total assets). The fiscal year end is variable “****datadate****” (not on the same month for all firms). The variable “****sic2****” is the industry of the firm (2-digit SIC code).*

*-“****firm\_id****” is a firm-level identifier common to both datasets.*

*Assume that the accounting data become available to the traders 5 months after fiscal year end. Feel free to make choices in the interpretation of the exercise when needed. (We leave it to you to find historical returns of the* ***S&P500*** *index).*

***Please return to us a written report. Provide useful graphics to illustrate your results. Also provide (separately) the program files that you used to generate the answer (can pick the language you want).***

1. Consider the following long-short strategy: At the end of ach month, we rank stocks by ROA (using the latest available information at that time); We get long the top 20% and short the bottom 20% of the ROA distribution, using equal weighting on the selected stocks. We keep the same portfolio until the end of the next month. Etc.
2. Compute the time-series of returns of the portfolio (per dollar long). Draw the graph of the cumulative returns.
3. What is the Information ratio?
4. Draw 12 months rolling volatility of the returns and compare to the volatility of the SP500.
5. Assume this is the unique strategy of a fund: what leverage do you suggest to use if the fund is targeting same volatility as the SP500 index.
6. Now, we consider some possible improvements to the basic strategy:
7. ***Industry Neutrality :*** we change the signal by sorting stocks within their industry. We select the top 20% and short the bottom 20% of the ROA distribution *within each industry*. Does that improve the Information ratio computed in question 1? Draw the two cumulative returns lines on a same graph.
8. ***Hedging*** *:* Assume we hedge dynamically using an ETF that tracks the SP500. Specifically, for each month t, we regress the past 24 months of the strategy’s returns on SPY. This gives us a *beta(t)*, which we use to eliminate the market exposure of the strategy portfolio during that month. Compute *beta(t).* Draw our portfolio position in the ETF (per dollar of the pre-hedging long-market value). Compute the Information ratio of the hedged strategy (per dollar long, including the positions coming from hedging) and compare to the non-hedged original strategy. (Explain what first date you use for the comparison).
9. Think about ways to improve hedging (test them if feasible), we will discuss about it !