

Imperial College

Applied Trading Strategies (BUSI97075-1920) – Ganesh Ramchandran

BACKTESTING PROJECT – 15%

(DUE on Friday 29 May at 17:00)

For this project, each group will have to develop a trend-following strategy in commodities (based on returns provided in the dataset called 'Commodity Data.xlsx' to be provided). The file contains daily excess return index data for a set of commodities (sheet titled "Return Indices"), as well as an overview of the sectors to which these commodities belong (sheet titled "Assets").

Questions

- Load the dataset and provide summary statistics for the asset returns for each series (date of first observation, number of observations, mean, standard deviation, etc.).
- Calculate a "commodity market factor" as the equally-weighted average of all commodities in the set.
- Based on an "ideas first" approach, form a time-series momentum / trend strategy based on past returns for each asset based on its own time series or any other signals, technical etc (NOT on a cross-section basis). It can be defined over whatever interval you want and using whatever portfolio construction / weighting method you want – you can build your strategy implementing one of the signals discussed in class:
 1. Historical 12-month returns as in Moskowitz, Oui, Pedersen, JFS 2012
 2. Moving average crossovers (with slow and fast)
 3. Breakout signal
 4. Gaussian mixture

Or your group can try your own trend-following strategy -- You will be **REWARDED** !!

- Calculate the summary statistics for the strategy as well as for the commodity market factor calculated in the previous step. Also show a plot of the cumulative strategy performance.

- Explain which parameters you are using in your backtest and why. Did you try other parameters/strategies before you picked your final set?
- Run a regression of your strategy returns on the commodity market factor to calculate the sensitivity with respect to the commodity market.
- Show the contribution of each sector (“Agri & Livestock”, “Energy”, and “Metals”) to the total strategy performance.
- **RECOMMENDED** -- Based on a “data first” approach, test out different Machine Learning algorithms to predict the performance of the same commodities (A comprehensive cross-asset historical dataset will be provided as inputs/features in your ML study).
- List potential improvements of the basic strategy (e.g. in refining the dataset, signal generation, drawdown control, portfolio construction).

You will not only be marked on your results and performance statistics, but also for:

- Whether or not you are able to explain and understand the results
- The quality of the code (structure, readability, annotation, clarity, etc.)

The strategy and accompanying analyses should be done in Python (not Excel or VBA). You should present a report in a Word/PDF document (**max 7 pages**) stating the methodology used, along with assumptions, challenges, results (tables/graphs), and possible enhancements. All Python code should be clearly documented, with a one-page summary of all functions used and a clear explanation of how the code has been organised. Please make sure your code will run in a Windows or a MAC environment. If there are any problems in your code, explain where it breaks etc. in the one-page summary. (Without any disclaimers, I will assume that everything works from start to finish.)

MOST IMPORTANT: This is a group project – work only with the members of your own group. **DO NOT work with OTHER groups.** All reports and results/ Python code submitted will be carefully checked to ensure that groups have not collaborated. Groups that have been found to have shared work will be severely penalised.