

Quantitative Analyst / Research Scientist

Mini Project

Overview

The ultimate goal of a systematic hedge fund is the development of predictive systems. New systems are only discovered rarely, require robust testing, are never “finished” and always the product of a strong team effort. Hence much of the day to day work in the research group revolves around brainstorming, experimental testing of new ideas and validating existing systems. Like most sciences, new ideas often aren’t fruitful but we feel it is more important to deeply understand why these ideas don’t work so to find the rare ones that do.

Timeline

You have **two weeks** to get as far as you can with the project.

Assessment

The purpose of the project is to assess your scientific process, IT skills, attention to detail, creativity and communication skills. We are not necessarily expecting a trading system, although it certainly should be your goal.

Scientific Method

We want to see you followed a well-defined arc of thought from start to end, regardless of the outcome. This means clearly defining why you followed a certain path, what your hypothesis was, your method, results and conclusions.

We would like to highlight that while most modern coding packages now come with a huge array of toolboxes for signal processing, machine learning, data manipulation (etc), the understanding of these tools is often far more complex than the ease in which you can now apply them.

What's important to us is that you deeply understand the tools you are using, that you know which tools will work on Gaussian-like data and which won't, for example, and that you are able to assess if the results are "real" or not. Hence, we would strongly advise you only use the tools and techniques you are most familiar with.

Code

At AE, we use a proprietary library of code shared among all research and development staff. You will be expected to use and contribute to our shared libraries so it's important your code is self-documenting and easy to maintain.

We understand that much of research is "rapid prototyping" with heavy use of scripts (etc) which often leads to rough code. However, once you've finished your research, try to spend some time to neaten your code (aka refactoring) and demonstrate good use of abstraction (ie functions and/or classes), clearly defined parameters/variables, the following of naming conventions, etc.

Upon completion, please submit via email

- Your code in one or more ASCII text files.
- A power point style presentation.
This should be like a presentation you would do for any scientific conference and demonstrate your professionalism and effectiveness in communicating your work.

We will then review your submission and provide feedback. If the submission is successful, we will then invite you to present your findings to the research group.

Data

Attached you will find a .csv file with two financial time series spanning 1-Jan-2008 to 1-Jan-2013. The columns of the .csv file are of the form;

`time, ts1, ts2`

Some notes on this dataset;

- It's not important what these time series represent although they are financial markets
- time is expressed using Matlab's date format
- ts1 refers to time series 1
- ts2 refers to time series 2
- NaN indicates missing data

Remember, you can make money in markets that go up or down by going long or short respectively.

To get you started

Clean Data

The most important aspect of studying any data is making sure it is "clean". We would like evidence of how you have done this.

Log Return Space

Some statistical properties of financial markets are better analysed in log return space (r). This is done by applying the following transform to the price (p) time series;

$$r_t = \log \left(\frac{p_t}{p_{t-1}} \right)$$

Some suggested lines of thinking

- Can ts1 predict ts1?
- Can ts2 predict ts2?
- Can ts1 predict ts2?
- Can ts2 predict ts1?