Project Financial Time series TMS088/MSA410

1 Introduction

In the attached csv-file, there is data from seven time series with prices from important financial markets on the planet Spiff, in a galaxy far far away. In each series, there is one gap of missing data points. Additionally, the last 200 data points are missing for all series. On Spiff there is no transactional friction and the market liquidity is infinite (i.e. it is always possible to buy and sell without any latency).

2 Task 1. Data analysis (2 points)

Make a thorough analysis of the data. Some possible questions to answer include (but is not limited to):

- What patterns exist within the individual series?
- What relationships exist between the different series?
- Can the series be grouped? If so, indicate which groups you believe exist.

What other questions can you ask and answer? Extract as much information as you can and keep a critical mindset. It may be relevant to consider the returns of the price series, i.e., the change in price from one day to the next relative to the price itself (or alternatively the log-returns). While it is possible that the absolute price levels also contain useful information, in this case, it is probably a good approach to primarily work with returns.

3 Task 2. Interpolation (2 points)

Fill in the gaps of the missing data points embedded in each series. Indicate the **uncertainty** of your estimate for each point!

- Evaluate how well your proposed solutions are expected to work.
- Make sure to avoid overfitting and data leakage in your models.
- Can you use insights from Task 1 to improve interpolation?

4 Task 3. Extrapolation (2 points)

Forecast the 200 missing data points at the end of each series. Indicate the **uncertainty** of your estimate for each point!

- Evaluate how well your proposed solutions are expected to work.

- Make sure to avoid overfitting and data leakage in your models.
- Can you use insights from Task 1 to improve extrapolation?

You are free to choose which methods to use for task 2 and 3. There are no rules other than the obvious one that the methods must be statistically sound. It is probably best to use one method for the interpolation problem (when data are missing within a series) and another method for the extrapolation problem (when data is missing at the end of the series).

5 Task 4. Investment strategies (2 points)

Propose some different trading strategies for the given markets. How much confidence do you have in your strategies? For this task, you can create your own strategies and/or test some from the literature like for instance:

- Buy N' Hold (passive)
- Moving average crossover (active)
- Channel breakout (active)
- Buy dips (active)

Evaluate and compare the performances of the strategies by using a standardized performance measure, e.g. *Sharp ratio* (using a simple fixed rate bond at 3% interest rate as an alternative risk-free investment). Make sure to evaluate how well they are expected to work in a production setting at launch.