

Empirical Finance: Course Work 1

Your team has been recently hired by **Imperial Global Asset Management**, and your task is to run a few exercises. Below, you find the guidelines about your assignments, but you can amend the specifications if you have plausible economic arguments. Finally, write a brief investment report no longer than about 3,000 words (this is just an indicative) as a financial economist. Describe what you have done and present the key results. There is no need to write any formulas. You can also be creative and report whatever may convince an investor to bet on your strategy. Whether a strategy works or not, try to come up with an economic story that explains why this is the case. Last but not least, make any assumptions you need, but please mention them. You do not need to submit codes and/or excel files.

Data

You have collected the following long-span data from [Global Financial Data](#):

- Stock market index for both the US and UK,
- Short-term Treasury yield for both the US and UK,
- Long-term Treasury yield for both the US and UK,
- GBPUSD exchange rate.

Exercise 1 [30%]

Take data for the US (i.e., stock market index, short-term yield, and long-term yield) and answer the following questions.

Questions

1. Present and comment their summary statistics.

2. Present and comment the ACF and PACF.
3. Identify the appropriate time-series specification, and estimate the key parameters. Present and discuss your results.

Exercise 2 [30%]

Consider the following models:

1. Benchmark model

$$y_t = \alpha + \varepsilon_t$$

2. Competing model

$$y_t = \alpha + \beta x_{t-1} + \varepsilon_t$$

where

- y_t is the monthly stock return between $t - 1$ and t ,
 - x_{t-1} is the term spread (long-term yield minus short-term yield) observed at time $t - 1$.
3. Use an expanding window (start with 10 years of data) as well as a 10-year rolling window to generate out-of-sample (OOS) forecasts for both models using US data

Questions

1. Compute the **OOS R-squared** or R_{oos}^2 ,
2. Test the **null hypothesis of equal predictive ability** using the Clark and West test,
3. Evaluate the **market timing ability** as in Henriksson and Merton (1981).
4. Present and discuss your results.

Exercise 3 [40%]

Consider the following models:

1. Benchmark model for stock returns

$$y_t = \alpha + \varepsilon_t$$

2. Competing model for stock returns

$$y_t = \alpha + \beta x_{t-1} + \varepsilon_t$$

3. Benchmark model for exchange rate returns

$$e_t = \alpha + \varepsilon_t$$

4. Competing model for exchange rate returns

$$e_t = \alpha + \beta z_{t-1} + \varepsilon_t$$

where

- y_t is the monthly stock return between $t - 1$ and t ,
 - e_t is the monthly exchange rate return between $t - 1$ and t ,
 - x_{t-1} is the term spread (long-term yield minus short-term yield) observed at time $t - 1$.
 - z_{t-1} is the interest rate differential (US short-term yield minus UK short-term yield) observed at time $t - 1$.
5. Use an expanding window (start with 10 years of data) as well as a 10-year rolling window to generate out-of-sample (OOS) forecasts using all data.

Questions

Consider a portfolio consisting of the US stock market, UK stock market, and the US short-term bond (a proxy for the riskless rate).

- Set $\sigma^* = 10\%$ per annum as target volatility, and rebalance your portfolio every month using your OOS forecasts.

- Report the **portfolio average return** and **volatility** in % per annum,
- Report both **SR** and **SO** in annualized terms,
- Report the **performance fee** \mathcal{P} in basis points per annum,
- Plot the cumulative returns, portfolio weights, and the one-year rolling SR.

Good Luck!