

Assignment 2

Problem 1.

For this problem, we will be using the dataset `Shiller_ie_Data.xls` available on CANVAS, downloaded from [Robert Shiller's website](#). It has a pre-calculated **PE** ratio and provides both **dividend** and **price level** data for the S&P index. The variable construction can be seen from the Excel formulas generating the scaled data from the raw observations.¹ As indicated, **T-bill** data are available from many sources including FRED.

For this exercise, we take an initial look at predictive return regressions, where macro-finance variables are used to forecast the future equity premium. The task is to gauge whether there is (statistically significant) evidence of predictability in the S&P equity-index returns minus the risk-free rate (use 3-month T-bill rates – available from FRED at the St. Louis Fed).

In formal notation, $\mathbf{r}^e(\mathbf{t} + \mathbf{1}) = \mathbf{r}(\mathbf{t} + \mathbf{1}) - \mathbf{i}(\mathbf{t})$, where $r(t + 1)$ is the monthly continuously compounded nominal return on the S&P index from the end of month t to end of month $t + 1$, and $i(t)$ is the 3-month T-bill rate at the end of month t .

As predictors, we will choose the PE-ratio (price/earnings ratio), the DP-ratio (dividend/price ratio), and the relative interest rate (current 3-month T-bill rate minus the average 3-month T-bill rate over the prior last 12 month). This is labeled **RREL**.

The relevant predictive OLS regression take the form:

$$r^e(t + 1) = a + b'X(t) + u(t), \quad t = 0, 1, \dots, T$$

where t refers to the (end of) month for the observation.

- a) Run the regression above with only the PE-ratio as the explanatory (X) variable. Use the sample period from January 1963 - December 2022. Obtain OLS standard errors, assuming no heteroskedasticity or autocorrelation in the innovations, and assess the significance of the relevant regression coefficient and compute the R^2 statistic.
- b) Repeat the exercise from a), but with only the DP-ratio as the explanatory variable.
- c) Repeat the exercise from a), but with only the RREL as the explanatory variable.
- d) Repeat the exercise from a), but use both the PE-ratio and the RREL as regressors.
- e) Now, assess the significance of the regression coefficient(s) in the above regressions using heteroscedasticity robust standard errors (White standard errors).

¹ For more information on the dataset, check the 'Data Description.html' also available on CANVAS.

- f) Repeat [e\)](#) with heteroscedasticity and autocorrelation consistent (Newey-West) st. errors.
- g) Does the change of method for computing standard errors make any difference to the size of the estimated standard errors? Does it change your conclusions?