Problem Set 3
MFE 402: Econometrics
Professor Rossi

This problem set is designed to review material on the multiple regression model and time series. Include both your R code and output in your answers.

Question 1

Using a sequence of simple regressions computed in `R`, show how to obtain the multiple regression coefficient on $P2$ in the `multi` dataset from the `DataAnalytics` package.

Question 2

Use matrix formulas and `R` code to reproduce the least squares coefficients and standard errors shown on slide 17 of Chapter II. The `countryret` dataset is in the `DataAnalytics` package.

Question 3

Rerun the regression of `VWNFX` on `vwretd`.

a. Compute a 90% prediction interval for `VWNFX` when `vwretd` $= 0.05$ using the formulas in the class notes.
b. Check your work in part (a) by computing a 90% prediction interval using R's `predict` command.

Question 4

This question will ask you to use matrix formulas to compute the variance of a portfolio. Specifically, let:

$$\mu = \begin{bmatrix} 0.010 \\ 0.015 \\ 0.025 \end{bmatrix} \quad \text{and} \quad \Sigma = \begin{bmatrix} 0.0016 & 0.0010 & 0.0015 \\ & 0.0020 & 0.0019 \\ & & 0.0042 \end{bmatrix}$$

a. Compute the correlation matrix of these three assets from the variance-covariance matrix Σ without using the `R` function `cov2cor`. (Hint: you must divide the (i, j) element of Σ by σ_i and σ_j.)
b. Compute the mean and standard deviation of a portfolio made from these assets with weights $(0.3, 0.4, 0.3)$

Question 5

Using the same data as in Question 3 above and following the lecture slides (Chapter 3, section g), test the general linear hypothesis that $\beta_{up} = \beta_{down}$ in the following regression. Note that if you account for the `NA` values properly, you should get a slightly different result than what is presented in the lecture slides.

$$VWNFX_t = \alpha + \beta_{up} * vwretd_t^+ + \beta_{down} * vwretd_t^- + \varepsilon_t$$

Question 6

Retrieve the Apple stock price series using the `quantmod` package (as done in the notes). Compute the autocorrelation of the difference in log prices.