

Problem Set 3
Econ 40357 Financial Econometrics
University of Notre Dame
Professor Nelson Mark
Fall 2022

Due Thursday 6 October, electronic submission through Canvas. 100 points total on this problem set. Please read the problem set carefully, especially about **what you should report** as your answers. As before, submit **a single pdf** document. The first part of the document will have the group answers. The second part will be an appendix with individual Eviews output. The first page of the solutions needs to have your group number (or group name) with a list of your group members. In the appendix, list your name on the first page of your Eviews output.

1. This first question pertains to the log-likelihood function and information criteria
 - (a) (5 points) What is the log-likelihood function?
 - (b) (5 points) What is maximum likelihood estimation?
 - (c) (5 points) What are the information criteria AIC, BIC, and HQIC, what is the role of the log-likelihood function?
2. Use the Eviews workfile PS03.wf1, sheet entitled FF_3Factors. Mkt is the monthly market return–value-weight return of all CRSP firms incorporated in the US and listed on the NYSE, AMEX, or NASDAQ (stated in percent). RF is the one-month Treasury bill rate (from Ibbotson Associates, also stated in percent).
 - (a) (5 points) Report the first 4 autocorrelations for mkt and rf
 - (b) (5 points) Use Hannan-Quinn information criteria in automatic ARIMA forecasting to choose the best ARMA model for mkt. Report the specification (that is, the p and q in ARMA(p,q). Then estimate that model. Report the coefficients, identifying which ones are autoregressive coefficients and which are moving average.
 - (c) (5 points) Repeat part b for rf
3. In PS03.wf1, go to the second worksheet entitled ‘Shiller’. gr is the gross monthly return on the S&P index, and rf is the monthly risk-free rate (stated as a pure number—not in percent). Thus, the monthly excess return on the market is $er = gr - 1 - rf$. dy is the monthly dividend yield on the index.
 - (a) (7 points) Write a program to generate the future 12-month excess (rate of) return. Call it FER12 and regress it on the dividend yield. Report the coefficient estimates, t-ratios, and R^2 . See hint at the bottom of the problem set.
 - (b) (7 points) If we interpret the fitted part of the regression as an estimate of the risk premium, what is the implied annual risk premium if the dividend yield is 0.138?
 - (c) (7 points) Repeat part b for a dividend yield of 0.011.
 - (d) (7 points) Write a program to generate the future 96-month excess (rate of) return. Call it FER96. Repeat parts a,b, and c with FER96. **Note:** We want the implied **annual** risk premium here.

4. Consider the following matrices,

$$A = \begin{pmatrix} 1 & 6 \\ -2 & 4 \end{pmatrix}, B = \begin{pmatrix} -3 & -8 \\ 6 & 4 \end{pmatrix}, C = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}, D = \begin{pmatrix} 6 & -2 \\ 0 & -1 \\ 3 & 0 \end{pmatrix}$$

- (a) (5 points) Which pairs of matrices can be multiplied together?
- (b) (5 points) For those pairs that can be multiplied, perform the multiplications.
- (c) (5 points) What is $2A$
- (d) (5 points) What is C' (transpose of C)?
- (e) (5 points) Calculate $A + B$
- (f) (5 points) Calculate $B - A$
- (g) (5 points) If $A = \begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$, find $A^{-1} \cdot \begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}^{-1}$.

5. (7 points) For being a good person, which I know you are!

Hint: This will get you started on the program.

```
series g = 1+er
series FER12 = g
for !j = 1 to 12
    series FER12 = FER12*g(+!j)
next
series FER12 = FER12 - 1
```