Introduction to Financial Econometrics December 2018

Please answer to all questions

Allowed time 90 minutes

Family Name (Surname)	First Name	Student Number (Matr)

All exam questions are based on the R code **exam2018_12_mock.R** that does not need any detached dataset. You will have to run the code or a modified version of it to answer some of the questions. The pass level for the exam is 18 points. All marks above 18 will be rescaled to fit the Bocconi benchmark distribution.

Question 1 (**3 points**)

Describe the content of the berndt.df dataframe, after you have run the programme up to row 18. Please explicitly indicate the cross-sectional and time-series dimensions of the dataframe.

Question 2 (2 points)

Please specify the purpose of line 38 of the code

Question 3 (10 points)

Plot, over the sample 1978:1-1987:12 the monthly exact returns of CITICORP, called **CITCRP**, and the log of the value over time of 1 dollar invested in CITICORP, called **LCITCRP_P**. Indicate the relationship that links the two series and, on the basis of the graphical evidence, judge their respective level of integration. Compute the mean of **LCITCRP_P.** Would you use this mean to predict LCITCRP_P in 1997:12? (Briefly motivate you answer)

Question 4 (10 points)

Consider estimating the following relationships between the returns on the MARKET the returns on CITCRP and the returns on MOBIL :

$$
\begin{aligned}
MOBIL_t &= \beta_1 + \beta_2 MARKET_t + u_{1t} \\
CITCRP_t &= \beta_3 + \beta_4 MARKET_t + u_{2t}
\end{aligned}
$$

Given the estimation of the two relationships by OLS could you indicate, first theoretically and then in the data

(i) the correlation matrix of the OLS residuals from the first equation $\hat{u}_{1t} and\ MARKET_t$

(ii) the correlation matrix of the OLS residuals from the first equation, $\hat{u}_{1t}$, and the OLS residuals from the second eqaution, $\hat{u}_{2t}$

(iii) Define the matrix $\hat{\boldsymbol{\beta}}$ containing the OLS estimates of the parameters $\beta_1 - \beta_4$ as follows:

$$
\hat{\boldsymbol{\beta}} = \begin{bmatrix} \hat{\beta}_1 & \hat{\beta}_3 \\ \hat{\beta}_2 & \hat{\beta}_4 \end{bmatrix}
$$

Specify the elements of the matrices $\mathbf{X}$ *and* $\mathbf{Y}$ for which you have:

$$
\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1}\mathbf{X}'\mathbf{Y}
$$

Question 5 (8 points)

(i) What are the elements of the G.hat matrix defined on line 102 of the code ?

(ii) What are the elements of the e.hat matrix defined on line 104 of the code? What is the column mean of e.hat ?

(iii) What are the elements of the matrix diagD.hat defined on line 106 of the code ?

(iv) Rank the fifteen stocks in the dataframe berndt in terms of the correlation of their monthly returns with the monthly returns from holding the MARKET

Question 6 (7 points)

(i) Compute (without reporting it) as SIGMA the sample variance-covariance matrix of the fifteen returns, whose observations are included in returns.mat. Carefully explain the difference between cov.si derived in line 119 of the market and SIGMA.

(ii) Explain the purpose of line 138-139 of the code

(iii) Explain the outcome of running lines 153-154 of the code.

Università Commerciale
Luigi Bocconi

Via Sarfatti 25
20136 Milano

DISTRIBUZIONE DI BENCHMARK

E' stato stabilito, nel Consiglio di Facoltà del 20 settembre 2005, di avere come riferimento nell'assegnazione dei voti la distribuzione di benchmark, come peraltro previsto dagli standard internazionali. L'obiettivo è quello di tenere sotto controllo la possibile inflazione dei voti alti.
La distribuzione di benchmark non è una regola da rispettare meccanicamente nell'assegnazione di voti, ma rappresenta un utile riferimento per i docenti e sarà utilizzata, ex-post, per verificare l'esistenza di eventuali divergenze di rilievo.
I casi meritevoli di attenzione vengono identificati sulla base di deviazioni piuttosto pronunciate delle frequenze cumulate rispetto alle soglie di riferimento.

Distribuzione dei voti di Benchmark

Fascia voti	Frequenza cumulata	Fascia voti	Corrispondente frequenza marginale
≤ 20	almeno 10%	18 - 20	10%
≤ 23	almeno 35%	21 - 23	25%
≤ 27	almeno 65%	24 - 27	30%
≤ 29	almeno 90%	28 - 29	25%
≤ 30L	100%	30 - 30L	10%