UNIVERSITY OF COLOMBO, SRI LANKA

FACULTY OF MANAGEMENT & FINANCE

Postgraduate & Mid-career Development Unit

MBA/MBA in Finance (Semester III – First Half) Examination – April, 2017

MBAFI 616 – Financial Econometrics

Three (03) Hours
Answer Only Five (05) Questions

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1. Consider the following market model of asset pricing:

$$r_{i,t} = \beta_0 + \beta_1 r_{m,t} + u_t$$

where $r_{i,t}$ is return on i^{th} stock in period t; $r_{m,t}$ is return on market portfolio in period t. The model is estimated using daily data for five-day weeks during the sample period from 1st January 2010 to 31st December 2015.

i. How do you modify the above model in order to find whether there is any day of the week effect in the market? Explain how you interpret the estimation results.

(06 Marks)

ii. Suppose that there were a few terrorist attacks in the country during the first half of 2012 and, for this reason, most of the analysts say that returns during that period was abnormal. How would you modify the initial model in order to evaluate the validity of such a view? Explain how you interpret the estimation results.

(07 Marks)

iii. Suppose that there is a view in the market that return on a certain stock responds to changes in market returns asymmetrically (i.e. the impact of an increase and a decrease in market returns on a certain asset is not the same). How would you modify the initial model in order to test the validity of such a view? Explain how you interpret the estimation results.

(07 Marks)

(Total 20 marks)

2. i. Define the two concepts Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF).

(04 Marks)

ii. Explain how the graphs of ACF and PACF can be used to differentiate between Autoregressive (AR), Moving Average (MA) and Autoregressive-Moving Average (ARMA) processes. Are those graphs considered a proper measure to perform that task? Give reasons.

(06 Marks)

iii. What is the common rationale behind most of the information criteria in selecting the optimal lag length in ARMA model building?

(05 Marks)

iv. Obtain 1-step, 2-step, 3-step and 4-step ahead forecasts for the following AR(2) process:

$$y_t = 10 + 0.4y_{t-1} + 0.1y_{t-2} + u_t$$

Comment on the results.

(05 Marks)

(Total 20 marks)

3. i. "Most of the financial time series tend to be spuriously correlated".
What is meant by 'spurious correlation'?

(03 Marks)

ii. Identify the factors that can give rise to spurious correlation between two time series.

(03 Marks)

iii. Explain what is meant by the concept of cointegration.

(03 Marks)

iv. Suppose that a researcher is interested in testing whether 3-month and 6-month Treasury bill rates are cointegrated. Briefly describe how Engle-Granger two-step procedure can be used to perform the task.

(05 Marks)

v. Suppose that the test results confirm that 3-month and 6-month Treasury bill rates are cointegrated. Outline a model with which you can capture short-run and long-run relationships between the two interest rates and the rate of adjustment. How do you interpret the key parameters of the model outlined?

(06 Marks)

(Total 20 marks)

4. i. Consider the following VECM estimation results obtained for three time series: GDP, Market capitalization (M_C) and Quasi money (Q_M).

Cointegrating Eq:	CointEq1	CointEq2	
GDP(-1)	1.000000	0.000000	
M_C(-1)	0.000000	1.000000	
Q_M(-1)	-5.189737	-114.7807	
	(0.81294)	(26.1758)	
	[-6.38395]	[-4.38499]	
C	-22.96768	-985.1592	
Error Correction:	**D(GDP)**	**D(M_C)**	**D(Q_M)**
CointEq1	-0.016432	0.028437	0.026305
	(0.00603)	(0.35119)	(0.01275)
	[-2.72455]	[0.08097]	[2.06394]
CointEq2	0.000621	0.024618	-0.000406
	(0.00017)	(0.00969)	(0.00035)
	[3.73405]	[2.54056]	[-1.15555]
D(GDP(-1))	0.275718	-2.640009	0.203511
	(0.09331)	(5.43322)	(0.19717)
	[2.95492]	[-0.48590]	[1.03213]
D(GDP(-2))	0.057408	-0.156429	-0.007918
	(0.09387)	(5.46605)	(0.19837)
	[0.61156]	[-0.02862]	[-0.03992]
D(M_C(-1))	-0.003828	-0.540686	0.005880
	(0.00135)	(0.07872)	(0.00286)
	[-2.83152]	[-6.86834]	[2.05806]
D(M_C(-2))	-0.002395	-0.555892	0.003195
	(0.00133)	(0.07758)	(0.00282)
	[-1.79790]	[-7.16574]	[1.13470]
D(Q_M(-1))	-0.023312	3.914256	0.318579
	(0.03879)	(2.25884)	(0.08197)
	[-0.60095]	[1.73286]	[3.88632]
D(Q_M(-2))	0.000862	4.839792	-0.225023
	(0.03967)	(2.30997)	(0.08383)
	[0.02174]	[2.09518]	[-2.68428]
C	0.362747	31.09995	-0.185714
	(0.05796)	(3.37505)	(0.12248)
	[6.25840]	[9.21467]	[-1.51625]
R-squared	0.263951	0.409557	0.229656
Adj. R-squared	0.220970	0.375079	0.184673

a. Given the relationship $\pi = \alpha\beta$, identify the matrices α, β and π.

(04 Marks)

b. Comment on the following:

1. Long-run relationships among three variables.

(03 arks)

2. Short-run relationships among three variables.

(03 arks)

3. Rates of adjustment

(03 Marks)

ii. Consider the Granger causality test.

a. Explain the rationale underlying the test.

(04 Marks)

b. Can Granger causality be considered true causality? Explain the reasons for your answer.

(03 Marks)

(Total 20 marks)

5. i. Demonstrate the Koyck transformation.

(04 Marks)

ii. The following model is based on the Fisher hypothesis:

$$i_t = \beta_0 + \beta_1 \pi^e_{t+1} + u_t$$

where i is nominal interest rate and π^e is expected inflation rate. It is clear that this specification of the model cannot be estimated as a non-realized value, namely π^e, is involved.

Using adoptive expectations and Koyck transformation, obtain a version of the model that can be estimated.

(05 Marks)

iii. Consider the following model which involves both partial adjustment and adaptive expectations:

$$K_t^d = \beta_0 + \beta_1 S_t^e + u_t$$

$$K_t - K_{t-1} = \delta\left(K_t^d - K_{t-1}\right) \quad \text{(Partial adjustment)}$$

$$S_t^e - S_{t-1}^e = \lambda(S_{t-1} - S_{t-1}^e) \quad \text{(Adaptive expectations)}$$

where K^d is desired capital stock; K is actual capital stock; S^e is expected sales; and S is actual sales.

Obtain a version of the model to find the actual capital stock in period t (i.e. K_t).

(06 Marks)

iv. Explain the steps involved in ARDL bounds testing approach to cointegration.

(05 Marks)

(Total 20 Marks)

6. i. What is meant by simultaneity bias? Explain the repercussions of it.

(04 Marks)

ii. Consider the following simultaneous-equation model:

$$y_{1t} = \delta_0 + \delta_1 y_{2t} + \delta_2 y_{3t} + \varepsilon_t$$

$$y_{1t} = \varphi_0 + \varphi_1 y_{2t} + \xi_t$$

Using an appropriate method, find whether each equation can be identified.

(05 Marks)

iii. Why is it argued that a recursive/triangular system of equations is different from a system of simultaneous-equations? Explain using an example.

(05 Marks)

iv. Consider the following simultaneous-equation model:

$$y_{1t} = \phi_0 + \phi_1 y_{2t} + \phi_2 y_{3t} + \varepsilon_{1t}$$

$$y_{2t} = \lambda_0 + \lambda_1 y_{1t} + \lambda_2 y_{4t} + \varepsilon_{2t}$$

Explain how this model can be estimated as two single equations using the method of two stage least squares (2SLS).

(06 Marks)

(Total 20 Marks)

7. i. A researcher is planning to estimate the impact of macroeconomic fundamentals on stock returns. The sample consists of 45 firms and quarterly data is available for a period of 6 years.

   a. Is it a sensible idea to pool cross sectional and time series data in such a task? Give reasons for your answer.

   (04 Marks)

   b. Explain how the researcher can check whether panel data approach is actually needed for estimation of parameters (you are expected to identify the relevant test, describe how the test is performed and explain how the results are interpreted).

   (06 Marks)

   c. Suppose that the results of the above test suggest that panel data approach is needed for the estimation of parameters. Explain how the researcher should decide whether to use a fixed effect model or a random effect model for the task to be performed.

   (05 Marks)

   ii. Explain the difference between time-demeaned and cross section-demeaned fixed effect models.

   (05 Marks)

   (Total 20 marks)

8. i. Explain how a time series can be tested for the presence of ARCH effect.

   (05 Marks)

   ii. Show that a GARCH(1,1) model is an ARMA(1,1) model in structure.

   (04 Marks)

iii. The following estimation results were obtained for a certain stock market:

GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*RESID(-1)^2*(RESID(-1)<0) +
C(7)*GARCH(-1)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.071822	0.028607	2.510655	0.0121
AR(1)	0.179754	0.013508	13.30719	0.0000
AR(2)	-0.063603	0.013779	-4.615787	0.0000
		Variance Equation		
C	0.011964	0.003337	3.584926	0.0003
RESID(-1)^2	0.054843	0.005309	10.33107	0.0000
RESID(-1)^2*(RESID(-1)<0)	0.036841	0.026726	1.378483	0.0000
GARCH(-1)	0.933732	0.002782	335.6184	0.0000

a. Identify the GARCH-family model employed.

b. Comment on the results. Clearly explain how you arrived at your conclusion.

(04 Marks)

iv. Consider the following estimation results obtained for a certain stock market.

LOG(GARCH) = C(4) + C(5)*ABS(RESID(-1)/@SQRT(GARCH(-1))) + C(6)
*RESID(-1)/@SQRT(GARCH(-1)) + C(7)*LOG(GARCH(-1))

Variable	Coefficient	Std. Error	z-Statistic	Prob.
@SQRT(GARCH)	0.058818	0.020609	2.853950	0.0043
C	-0.007582	0.031516	-0.240587	0.8099
AR(1)	0.162283	0.012790	12.68822	0.0000
		Variance Equation		
C(4)	-0.105386	0.004832	-21.80833	0.0000
C(5)	0.154303	0.006410	24.07391	0.0000
C(6)	-0.036523	0.004546	-8.034097	0.0000
C(7)	0.996894	0.000528	1887.783	0.0000

a. Identify the GARCH-family model employed.

b. What do the estimation results imply? Clearly explain how you arrived at your conclusions.

(07 Marks)

(Total 20 marks)
