UNIVERSITY OF FORT HARE

EAST LONDON CAMPUS

ECO 617E

DEGREE EXAMINATIONS

NOVEMBER EXAMINATIONS

Time: 3 Hours

Subject: Applied Econometrics Marks: 100

This paper consists of 7 pages including the cover page

Internal Examiner

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Instructions

Answer ALL questions

Question 1 [21 marks]

3. (a) Describe the intuition behind the maximum likelihood estimation technique used for limited dependent variable models. [3 Marks]

(b) Why do we need to exercise caution when interpreting the coefficients of a probit or logit model? [5 Marks]

(c) How can we measure whether a logit model that we have estimated fits the data well or not? [6 marks]

(d) What is the difference, in terms of the model setup, in binary choice versus multiple choice problems? [3 marks]

4. (a) Explain the difference between a censored variable and a truncated variable as the terms are used in econometrics. [4 marks]

Question 2 [41 marks]

5. You are given variables listed in Table 1. There are 11 developed countries in the data set: Canada CAN, Denmark DNK, Finland FIN, France FRA, Germany GER, Japan JPN, Netherlands NLD, Norway NOR, Sweden SWE, United Kingdom UNK, United States USA. In this question, you will explain FDI as a function of country credit risk, market size, openness, infrastructure, and an index of political freedom.

Table 1 Variable list

Variable name	Description
FDI	FDI as percentage of GDP, both measured in US dollar.
CC	Country credit risk index, compiled by *Institutional Investor*, ranging between 0 and 100, with higher values indicating lower credit risk.
MS	Market size, expressed as GDP per capita in dollar terms
FH	*Freedom House* index measuring civil liberty, political rights and risk. Takes on values between 1 and 7, with 7 the least favourable.
T	Infrastructure as proxied by number of telephone mainlines per 1000 of population.
OPEN	Degree of openness to international trade, measured as (X+Z)/GDP.

The following specification was tested:

FDI = f(log(CC), log(MS), FH, log(T), log(OPEN))

1.) For the model specification above, hypothesize *a priori* on the expected relationship of each explanatory variable with the dependent variable. Provide some economic intuition. Why would some variables in the theoretical specification not be logged? [7 Marks]

2.) Six variables contained in the specification were pooled into EVIEWS using the "Pool Object". The pooled model and the results are presented below:

Dependent Variable: FDI?
Method: Pooled Least Squares
Sample: 1980 1998

Included observations: 19

Cross-sections included: 11

Total pool (balanced) observations: 209

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CC?)	2.477975	1.151221	2.152475	0.0325
LOG(MS?)	-0.002115	0.372766	-0.005673	0.9955
FH?	-0.662847	0.304469	-2.177060	0.0306
LOG(T?)	-0.177483	0.114398	-1.551445	0.1224
LOG(OPEN?)	0.910883	0.198312	4.593177	0.0000
C	-8.145620	6.747396	-1.207224	0.2288

R-squared	0.149282	Mean dependent var	1.013199
Adjusted R-squared	0.128328	S.D. dependent var	1.282830
S.E. of regression	1.197693	Akaike info criterion	3.226960
Sum squared resid	291.1973	Schwarz criterion	3.322912
Log likelihood	-331.2173	Hannan-Quinn criter.	3.265754
F-statistic	7.124369	Durbin-Watson stat	0.696106
Prob(F-statistic)	0.000004		

(a) Briefly discuss the sign and significance of the pooled coefficients. Do they agree with your expectations? [10 marks]

4.) A test for poolability (pooled model vs. individual regressions) was performed. Results are presented below: Given that the critical values at 5% level is: $F(n-1)k',(n(t-k');0.05 = F_{50,154;\ 0.05} = 1.433$. Is the pooled model relevant? [3 marks]

Note: Since the FH variable is equal to 1 for most of the countries for the entire sample, estimation of individual regressions will result in

matrix singularity. For this reason, FH should be excluded from both the restricted and unrestricted model estimations.

$$F = \frac{(e'e - e_1'e_1 - Ke_N'e_N)/(N-1)K'}{(e_1'e_1 + e_2'e_2 + Ke_N'e_N)/N(T-K')}$$

$$= 7.134$$

5.) Next, the fixed effects model was estimated and the results are presented below:

Dependent Variable: FDI?
Method: Pooled Least Squares
Sample: 1980 1998
Included observations: 19
Cross-sections included: 11
Total pool (balanced) observations: 209

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CC?)	5.792278	1.708332	3.390605	0.0008
LOG(MS?)	8.817368	1.459810	6.040079	0.0000
FH?	-0.612437	0.337332	-1.815535	0.0710
LOG(T?)	-5.748422	2.458058	-2.338603	0.0204
LOG(OPEN?)	3.326562	0.581530	5.720361	0.0000
_CAN--C	-92.91707	10.80987	-8.595575	0.0000
_DNK--C	-97.87365	11.17194	-8.760668	0.0000
_FIN--C	-95.09448	10.96672	-8.671184	0.0000
_FRA--C	-95.24604	11.12341	-8.562667	0.0000
_GER--C	-97.87497	11.32535	-8.642118	0.0000
_JPN--C	-97.74419	11.61423	-8.415897	0.0000
_NLD--C	-97.31904	11.19528	-8.692867	0.0000
_NOR--C	-98.52945	11.27804	-8.736396	0.0000
_SWE--C	-110.8058	15.18841	-7.295420	0.0000
_UNK--C	-91.95052	10.85548	-8.470425	0.0000
_USA--C	-93.05239	11.14147	-8.351893	0.0000

R-squared	0.551198	Mean dependent var	1.013199
Adjusted R-squared	0.516317	S.D. dependent var	1.282830
S.E. of regression	0.892174	Akaike info criterion	2.683155
Sum squared resid	153.6231	Schwarz criterion	2.939027
Log likelihood	-264.3897	Hannan-Quinn criter.	2.786606
F-statistic	15.80224	Durbin-Watson stat	1.241202
Prob(F-statistic)	0.000000		

(a). What are the two possible specifications under the fixed effects model? [3 marks]

(b). Discuss the sign and significance of the pooled coefficients on the above model. Do they agree with your expectations? [6 Marks]

2. (a) Explain how fixed effects models are equivalent to an ordinary least squares regression with dummy variables. [6 marks]

(b) How does the random effects model capture cross-sectional heterogeneity in the intercept term? [6 marks]

Question 4 [22 marks]

Asteriou and Price (2001) used GARCH models to capture the effects of socio-political instability in UK GDP. To approximate and quantify socio-political instability, they constructed indices that summarized various variables capturing phenomena of social unrest for the UK over the period 1960 - 97 using quarterly time series data. Specifically, their indices were constructed by applying the method of principal components to the following variables: Terri, the number of terrorist activities that caused mass violence; STRIKES, the number of strikes that were caused by political reasons; ELECT; the number of elections; REGIME, a dummy variable that takes the value of one for government change to different political parties, zero otherwise; FALKL; a dummy variable that takes the value of 1 for the period of Falklands War (1982; q1-q4), zero otherwise; and finally GULF, a dummy variable which takes the value of 1 for the period of the first Gulf War (1991; q1 - q4), zero otherwise. Asterio and Price estimated the following model:

$$\Delta \ln(Y_t) = a_0 + a_{1i}\sum_{i=0}^{4} \Delta ln(Y_{t-i}) + a_{2i}\sum_{1=0}^{4} \Delta \ln(I_{t-i}) + \sum_{j=1}^{6} d_j X_{jt} + u_t$$

$$u_t \sim N(0, h_t)$$

$$h_t = b_1 e_{t-1}^2 + b_2 h_{t-1}$$

Where the growth rate of GDP (denoted by $\Delta\ln(Y_t)$) is modelled as an AR(4) process, including the growth and four lags of investments (denoted by $\Delta\ln(I_t)$) plus the political instability proxies (X_{jt}), where the variance is conditioned on the lagged variance and lagged squared residuals.

Table 2: GARCH Estimates of GDP growth with political uncertainty proxies				
Dependent variable: $\Delta\ln(Y_t)$: Sample 1961q2 – 1997q4				
Parameter	1	2	3	4
Constant	0.003(3.49)	0.005(3.75)	0.004(3.80)	0.006(5.66)
$\Delta\ln(Y_{t-3})$	0.135(1.36)	0.194(.199)	0.186(1.87)	0.270(3.42)
$\Delta\ln(Y_{t-4})$	0.131(1.23)	0.129(1.22)	0.122(1.48)	0.131(1.29)

$\Delta \ln(I_{t-2})$	0.180(2.25)	0.132(1.48)	0.162(1.92)	
REGIME		-0.012(-4.91)		-0.012(-5.63)
TERROR		-0.004(-2.72)		-0.005(-2.66)
STRIKES		-0.011(-2.58)		-0.015(-3.44)
PC1			-0.005(-4.33)	
PC2			-0.003(-2.02)	
Variance Equation				
Constant	0.00001(1.83)	0.00001(1.66)	0.00000(1.16)	0.00006(1.71)
ARCH(1)	0.387(3.27)	0.314(2.44)	0.491(4.18)	0.491(4.46)
GARCH(1)	0.485(2.95)	0.543(3.14)	0.566(6.210	0.566(3.36)
R^2	0.006	0.099	0.030	0.104
S.E of d.v.	0.010	0.010	0.010	0.010
S.E. of Reg.	0.010	0.010	0.010	0.010

Based on the results presented in Table 2, answer the following questions:

4.1 Why, in recent empirical research, have researchers preferred GARCH(1,1) models to pure ARCH(*p*)? [4 Marks]

4.2 Describe two extensions to the original GARCH model. What additional characteristics of financial data might they be able to capture? [4 Marks]

4.3 Interpret the investment coefficient in model 1. Does the result correspond to the apriori expectation? [2 Marks]

4.4 Evaluate the signs and magnitude of REGIME, TERROR and STRIKES on economic growth as per model 2. Again, explain if these results are consistent with the apriori expectations. [6 marks]

4.5 Asteriou and Price (2001) estimated model 4 without including the investment terms, though including the political uncertainty dummies. Can we conclude that the impact of political uncertainty on growth operate through investment? Explain your answer. [4 Marks]

4.6 Do All models presented in Table 2 adequately captured the conditional volatility? Substantiate your answer. [2 Marks]

Question 5 [16 Marks]

2. Consider the following system of two equations

$$y_{1t} = a_0 + a_1 y_{2t} + a_2 X_{1t} + a_3 X_{2t} + u_{1t} \quad 1$$

$$y_{2t} = \beta_0 + \beta_1 y_{1t} + \beta_2 X_{1t} + u_{2t} \quad 2$$

(a). Explain, with reference to these equations, the undesirable consequences that would arise if (1) and (2) were estimated separately using OLS. [2 marks]

(b). What would be the effect upon your answer to (a) if the variable y_{1t} had not appeared in (2)? [2 marks]

(c). State the order condition for determining whether an equation which is part of a system is identified. Use this condition to determine whether (1) or (2) or both or neither are identified. [5 marks]

(d). Explain whether indirect least squares (ILS) or two-stage least squares (2SLS) could be used to obtain the parameters of (1) and (2). Describe how each of these two procedures (ILS and 2SLS) are used to calculate the parameters of an equation. Compare and evaluate the usefulness of ILS, 2SLS and IV. [6 Marks]

(e). Explain briefly the Hausman procedure for testing for exogeneity.

[3 marks]