Econometric Modelling

Mock Exam Paper

Duration 2 hours

Answer Question 1 and 2 other questions

Question 1

Consider the following estimation results from Microfit:

```
                    Ordinary Least Squares Estimation
*******************************************************************************
 Dependent variable is LC
 49 observations used for estimation from 1950 to 1998
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 C                          .48291            .27276             1.7705[.084]
 LC(-1)                    1.3006             .15514             8.3835[.000]
 LC(-2)                   -.52965             .14277            -3.7098[.001]
 LY                         .53920            .077867             6.9246[.000]
 LY(-1)                   -.58446             .13664            -4.2775[.000]
 LY(-2)                     .23525            .11179             2.1045[.042]
 LP                       -.16115            .079246            -2.0335[.049]
 LP(-1)                     .23680             .15905             1.4888[.144]
 LP(-2)                  -.070647            .086534            -.81640[.419]
*******************************************************************************
 R-Squared                    .99933   R-Bar-Squared                    .99920
 S.E. of Regression         .0097335   F-stat.    F(  8,  40)    7476.0[.000]
 Mean of Dependent Variable  12.4349   S.D. of Dependent Variable      .34370
 Residual Sum of Squares    .0037896   Equation Log-likelihood       162.4210
 Akaike Info. Criterion     153.4210   Schwarz Bayesian Criterion    144.9078
 DW-statistic                 2.0276
*******************************************************************************


                              Diagnostic Tests
*******************************************************************************
*    Test Statistics  *        LM Version        *         F Version          *
*******************************************************************************
*                     *                          *                            *
* A:Serial Correlation*CHSQ(   1)=   .54504[.460]*F(   1,  39)=   .43868[.512]*
*                     *                          *                            *
* B:Functional Form   *CHSQ(   1)=  .062481[.803]*F(   1,  39)=  .049793[.825]*
*                     *                          *                            *
* C:Normality         *CHSQ(   2)=   .37664[.828]*       Not applicable       *
*                     *                          *                            *
* D:Heteroscedasticity*CHSQ(   1)=   5.3569[.021]*F(   1,  47)=   5.7690[.020]*
*******************************************************************************
   A:Lagrange multiplier test of residual serial correlation
   B:Ramsey's RESET test using the square of the fitted values
   C:Based on a test of skewness and kurtosis of residuals
   D:Based on the regression of squared residuals on squared fitted values
```

Where the variables are:

LC: Log of real consumers expenditure in 1995 prices
LY: log of real personal disposable income in 1995 prices
LP: log of the consumer price index

a.) Briefly explain what the results tell us about the determination of consumption. (40%)

Briefly explain what the t ratios, the F-statistic, R-Squared, the DW statistic, diagnostic test A, diagnostic test B, and diagnostic test D are and what they tell us. (30%)

b.) Explain the following variable deletion test and what it tells us (30%):

```
                    Variable Deletion Test (OLS case)
*******************************************************************************
 Dependent variable is LC
 List of the variables deleted from the regression:
 LP(-2)
 49 observations used for estimation from 1950 to 1998
*******************************************************************************
 Regressor              Coefficient       Standard Error         T-Ratio[Prob]
 C                          .55618            .25652             2.1681[.036]
 LC(-1)                    1.2401             .13571             9.1375[.000]
 LC(-2)                   -.48828             .13293            -3.6732[.001]
 LY                         .55998            .073288             7.6409[.000]
 LY(-1)                   -.61294             .13157            -4.6586[.000]
 LY(-2)                     .25645            .10828             2.3684[.023]
 LP                       -.10364            .036156            -2.8664[.007]
 LP(-1)                     .11027            .035575             3.0995[.003]
*******************************************************************************
 Joint test of zero restrictions on the coefficients of deleted variables:
 Lagrange Multiplier Statistic     CHSQ( 1)=   .80309[.370]
 Likelihood Ratio Statistic        CHSQ( 1)=   .80975[.368]
 F Statistic                   F(  1,  40)=   .66651[.419]
*******************************************************************************
```

Question 2

In the following linear model:

$$y_t = \alpha + \beta x_t + \gamma z_t + u_t$$

a.) Derive the least squares estimate of α, β and γ (60%)

b.) Show that the least squares estimate of β is unbiased. (40%)

Question 3

Consider:

$$Y_t = BX_t^{\beta 1} X_{t-1}^{\beta 2} Y_t^{\beta 3}$$

a.) Show how you would transform this model to estimate it by OLS and relate it to at least 6 alternative static and dynamic forms, giving the restrictions implied. (60%)

b) Derive the static long run equilibrium of the equations in part a. (40%)

Question 4

a.) Define a stationary process, and explain how you would test for a unit root in a time series. (50%)

b.) Explain what cointegration is and how you would test for it using the Engle-Granger method. How would your answer change if you were dealing with more than 2 variables? (50%)

Question 5

Consider the following model

$$y_t = \alpha + \beta x_t + u_t$$

where $E(u_t) = 0$
$E(u_t) = \sigma^2$
$E(u_s, u_t) \neq 0 \ \forall s \neq t$

a.) What problems would least squares estimators of this model have and what are the likely causes? (60%)

b.) How would you test for first order serial correlation and then for higher order serial correlation? (40%)

Question 6

a.) Explain what heteroscedasticity is and why it is a problem. Outline two general tests that could be used to detect it. (60%)

b.) Show how you could use the generalised least squares (GLS) approach to deal with heteroscedasticity. (40%)

Question 7

Consider the model

$$y_i = \alpha + \beta x_i + \delta z_i + \gamma w_i + \varepsilon_i \ \text{ where } i=1,\ldots N \text{ and } w_i = 2z_i$$

a.) Explain in detail the problems of estimating the coefficients of this relationship using OLS (40%).

b.) Discuss at least three ways in which you could detect multicollinearity and determine whether it was a problem (60%).

Question 8

Consider the following model of supply and demand:

Demand: $Q_t^D = \beta_0 + \beta_1 P_t + \beta_2 W_t + u_{1t}$

Supply: $Q_t^S = \alpha_0 + \alpha_1 P_t + \alpha_2 Z_t + u_{2t}$

a.) Derive the reduced form of the system stating your assumptions. (60%)

b.) Explain how you would estimate the structural parameters of the system and how your answer would be affected by α_1 being zero. (40%)