Economics 272
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MIDTERM EXAM

1. The following STATA log runs a regression of the birth weight in grams of children in Cebu the Philippines against sex of the child, whether the family lives in an urban location, the mother's age and years of education, and the mother's height.

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. regress  bw sexchild urban mothage motgrd  moheight

      Source |       SS       df       MS              Number of obs =    3022
-------------+------------------------------           F(  5,  3016) =   35.92
       Model |  32540996.5     5   6508199.3           Prob > F      =  0.0000
    Residual |   546471499  3016  181190.815           R-squared     =  0.0562
-------------+------------------------------           Adj R-squared =  0.0546
       Total |   579012496  3021  191662.528           Root MSE      =  425.67

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          bw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    sexchild |   40.85196   15.52463     2.63   0.009     10.41202     71.2919
       urban |   44.26499   18.98823     2.33   0.020     7.033813    81.49617
     mothage |   8.716754   1.301816     6.70   0.000     6.164218    11.26929
      motgrd |    .679521   2.474886     0.27   0.784    -4.173113    5.532155
    moheight |   16.23067   1.577784    10.29   0.000     13.13703    19.32431
       _cons |   258.8253   235.8906     1.10   0.273    -203.6974     721.348
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. imtest

Cameron & Trivedi's decomposition of IM-test

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              Source |       chi2     df      p
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  Heteroskedasticity |      30.92     18    0.0294
            Skewness |      14.57      5    0.0124
            Kurtosis |      10.00      1    0.0016
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               Total |      55.49     24    0.0003
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. regress  bw sexchild urban mothage motgrd  moheight,robust

Regression with robust standard errors                 Number of obs =    3022
                                                       F(  5,  3016) =   34.51
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.0562
                                                       Root MSE      =  425.67

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             |               Robust
          bw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    sexchild |   40.85196    15.4868     2.64   0.008      10.4862    71.21772
       urban |   44.26499   18.65565     2.37   0.018     7.685904    80.84408
     mothage |   8.716754   1.369204     6.37   0.000     6.032087    11.40142
      motgrd |    .679521   2.443228     0.28   0.781     -4.11104    5.470082
    moheight |   16.23067   1.545999    10.50   0.000     13.19935    19.26199
       _cons |   258.8253    233.486     1.11   0.268    -198.9826    716.6332
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a. Interpret the coefficient for sex of the child.

B. Explain the results of the test and the subsequent regression.

2. Given the following model:

$$Y_i = X_i\beta + \epsilon_i$$

where all terms are scalars, X is non-stochastic, and the ϵ's are iid normal with mean zero and variance σ^2. You can assume that the full Gaus-Markov assumptions hold.

a. Derive the least squares estimator for β. Show that it is unbiased.

b. Derive the method of moments estimator for β.

c. Suppose that we can no longer assume that X is non-stochastic. Furthermore $E(X_i\varepsilon_i) \neq 0$. However, there exists Z's such that $E(Z_i\varepsilon_i) = 0$. Derive the method of moments estimator.

d. Suppose we add the following equation to the model:

$$X_i = Z_i\gamma + \mu_i$$

1). Test for identification using the order condition.
2). Discuss the two-stage least squares method of estimation.
3). Show that the two-stage least squares estimator and the method of moments estimator from part c are identical.

3. Given the following model:

$$Y = X\beta + \varepsilon$$

where all the standard assumptions are satisfied except:

$$\varepsilon_t = \mu_t + \lambda_1\mu_{t-1} + \lambda_2\mu_{t-2}$$

where the μ's are independent with mean zero and variances σ_t^2 and $\mu_0 = \mu_{-1} = 0$.

a. Derive the covariance matrix of ϵ.

b. Show that the OLS estimator of β is unbiased.

c. Discuss a method of obtaining a consistent estimator for the covariance matrix of the OLS estimator for β.