

# ECON4570 : Problem Set 3

Due by 11:59pm on Nov 03, 2024<sup>1</sup>

1. Low birth weight infants tend to have increased risks of serious health problems. It has been suggested that factors related to birth weight include baby sex, gestational age at which the child is born, race, mother height and mother weight. To investigate this relationship, 500 infants born in a large metropolitan hospital in the U.S. were studied and the following model was estimated:

$$Bw_i = \beta_1 + \beta_2 Sex_i + \beta_3 GA_i + \beta_4 Black_i + \beta_5 MH_i + \beta_6 MW_i + \epsilon_i$$

where

$Bw$  = Infant birth weight  
 $Sex$  = 1 if male, 0 otherwise  
 $Black$  = 1 if mother is black, 0 otherwise  
 $GA$  = Gestational age (calculated as number of weeks/40)  
 $MH$  = Mother height (calculated as actual height (in feet)/5.8)  
 $MW$  = Mother weight (calculated as actual weight (in pound) /130)

For a range of models the coefficient estimates and residual sum of squares (SSR) are reported below. For the first model (model A), estimated standard errors are also reported in parentheses below the coefficient estimates.

Estimated Models for the infant Birth Weight Data					
Variable	Model A	Model B	Model C	Model D	Model E
Constant	5.00 (1.0)	6.30	5.40	5.2	5.2
Sex	0.50 (0.20)			0.60	0.50
GA	0.45 (0.05)		0.75	0.35	0.40
Black	-0.15 (0.03)				-0.20
MH	0.25 (0.13)				
MW	0.30 (0.16)				0.45
SSR	850	900	892	885	860

<sup>1</sup>Please upload your answers to PS3 to LMS.

- (a) What is the predicted birth weight of children born to mothers with the following characteristics? (use Model A):  $Sex = 1$ ,  $GA = 0.95$ ;  $Black = 0$ ;  $MH = 0.9$ ;  $MW = 1.2$ .
- (b) Compute  $R^2$  for Model A? Compute (adjusted)  $\bar{R}^2$  for Model A? Explain the meaning of  $R^2$  for Model A.
- (c) Test the joint hypothesis that the coefficients on all of the variables (other than the constant) in Model A are equal zero at 5% significance level ( $F_{0.05}(5, 494) = 2.21$ ).
- (d) Construct a 95% confidence interval for the coefficient on Black in Model A. What does it tell you? ( $t_{0.025}(494) = 1.96$ )
- (e) How would you explain the change in the estimated impact of MW when Model E is used rather than Model A. Do you expect the coefficient of MW in model E will be significant at 5% level? why? Which of the two models is better? Why?