**Econometrics Test**
2014 - 04 - 16

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1. Say if the following statements are unambiguously true (TRUE), unambiguously false (FALSE) or impossible to classify the way they are stated (CAN'T SAY). Write the motivations to your answers **only** in the space provided. A "CAN'T SAY" answer with no motivations will be considered wrong.

   (a) If $A \cdot B'$ is a symmetric matrix, then the number of rows of $A$ and $B$ must be the same.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (b) Suppose that $\sqrt{n}(X_n - 3) \xrightarrow{\text{d}} N(0,1)$; then $X_n \xrightarrow{\text{p}} 3$.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (c) Suppose that
   $$E[y_t|x_t] = \beta_0 + \beta_1 \frac{1}{x_t + 1};$$
   then, the parameters $\beta_0$ and $\beta_1$ can be estimated via OLS.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (d) Suppose the relationship between two positive variables is correctly described by the model
   $$y_t = 10 - \frac{0.5}{x_t + 1} + \varepsilon_t;$$
   then, the elasticity of $y$ with respect to $x$ is negative.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

   (e) Godfrey's test statistic is larger than the Durbin-Watson statistic.

   TRUE ◯ FALSE ◯ CAN'T SAY ◯

2. A linear model was estimated on 200 observations with 8 explanatory variables and its $R^2$ was 0.75; after omitting four of them, the $R^2$ index went down to 0.7. Calculate the corresponding $W$ test and indicate whether the model reduction is supported by the data.

$W$: _____ Distribution: _____

degrees of freedom: _____ $p$-value: _____

Decision: ◯ Accept reduction ◯ Reject reduction

3. In the following model the dependent variable is the number of total medals (gold + silver + bronze) won at the Atlanta Olympics in 1996 for the 196 participant countries. Explanatory variables are

   - $y$: 1996 GDP per capita (in logarithm)
   - $p$: total population in 1996 (in logarithm)
   - USA: host country dummy variable

| | Coefficient | Std. Error | $t$-ratio | p-value |
|---|---|---|---|---|
| const | −49.3584 | 6.0114 | −8.2108 | 0.0000 |
| $y$ | 2.3617 | 0.3912 | 6.0368 | 0.0000 |
| $p$ | 2.2955 | 0.2907 | 7.8968 | 0.0000 |
| USA | 81.6975 | 8.4824 | 9.6314 | 0.0000 |

| | | | |
|---|---|---|---|
| Mean dependent var | 4.385417 | S.D. dependent var | 12.04387 |
| Sum squared resid | 12888.31 | S.E. of regression | 8.279785 |
| $R^2$ | 0.534810 | Adjusted $R^2$ | 0.527387 |
| $F(3, 188)$ | 72.04533 | P-value($F$) | 4.61e–31 |

White's test: $nR^2 = 45.746$, $p$-value $= \mathrm{P}(\chi^2_6 > 45.746) = 0.000000$

   (a) Comment on the signs and magnitudes of $\hat{\beta}$

   (b) Commenton any other displayed statistics you deem appropriate

   (c) Italy had, in 1996, about 57 million inhabitants and its per capita GDP was about 22000 $; compute the model's prediction of medals won by Italy. (Nota Bene: the actual figure is 35)

   (d) Belgium had, in 1996, about 10 million inhabitants and its per capita GDP was about 27000 $; compute the model's prediction of medals won by Belgium. (Nota Bene: the actual figure is 6)

Medals predicted for Italy: _____

Medals predicted for Belgium: _____