

Errata for “MPhil Econometrics – Limited Dependent Variables and Selection”

Francis J. DiTraglia

University of Oxford, HT 2020

This document contains errata for my lecture slides. The times and dates given below refer to the *most recent version* of the document that contained the error. Subsequent versions have been corrected.

Version: 2020-02-09 at 13:40:53

- Lecture 4
 - Slide 17: The direction of the inequality in the expression for P_{ni} was incorrect: “>” has been corrected to “>”

Version: 2020-02-08 at 19:31:25

- Lecture 5
 - Slides 12-13: In my expression for the conditional density of z given that $z > c$, I initially used z both as the *argument* of the density function $f(\cdot|z > c)$ and to indicate the conditioning event $z > c$. This notation is confusing, because it treats z as a *realization* in the first case and a *random variable* in the second. To make things clearer, I’ve changed the argument of the conditional density to t . This change also affects slide 13: to keep the notation consistent, I’ve changed the variable of integration to t throughout. All of the steps themselves are unchanged: it’s just a change of notation.
 - Slide 14: In the first equality from the expression for $h(\mathbf{x})$ under the heading “Using Steps 4–5,” two instances of $\mathbf{x}\delta_2$ have been corrected to $\mathbf{x}'\delta_2$.

Version: 2020-02-06 at 15:44:49 There are two **major changes** and there is one **major typo**.

- Lecture 5
 - Slide 5: In the displayed equation v_1 has been corrected to v_2 .
 - Slide 7: This slide has been *cut*. I realized that what I wrote there originally was a bit misleading and is not actually needed to derive or understand the Heckman Selection Model. To ensure that the slide numbering is unchanged from lecture, I've added a "filler" slide in its place.
 - Slide 9: This slide has been substantially re-written. The original slide was confusing and did a poor job of making the point I was aiming for. I've streamlined and simplified it.
 - Slide 12: at the bottom right hand side of the slide $[1 - \Phi(z)]$ has been corrected to $[1 - \Phi(c)]$.

Version: 2020-02-05 at 12:22:33

- Lecture 3
 - Slide 14: In the second line of the sequence of equations for \mathbf{s}_i , the first term of the factor in curly braces has been corrected from $[1 - G(\mathbf{x}'_i\boldsymbol{\beta})]$ to $[1 - G(\mathbf{x}'_i\boldsymbol{\beta})] y_i$.
 - Slide 17: At the top right of the slide, the RHS of the equation for \mathbf{J}^{-1} has been corrected from $\mathbb{E} \{\text{stuff}\}$ to $\mathbb{E} \{\text{stuff}\}^{-1}$

Version: 2020-02-04 at 21:02:39

- Lecture 3
 - Slide 11: In the left column of the slide two instances of $G(\mathbf{x}'\boldsymbol{\beta})$ have been corrected to $G(\mathbf{x}'_i\boldsymbol{\beta})$.
 - Slide 15: $\frac{\partial \mathbf{s}_i}{\partial \boldsymbol{\beta}'} = \frac{\partial}{\partial \boldsymbol{\beta}} (\text{stuff})$ has been corrected to $\frac{\partial \mathbf{s}_i}{\partial \boldsymbol{\beta}'} = \frac{\partial}{\partial \boldsymbol{\beta}'} (\text{stuff})$, i.e. a missing transpose has been added.
- Lecture 4
 - Slide 6: The first equality for the choice probabilities at the bottom of the slide has been corrected from $P_{ni} = \mathbb{P}(U_{nj} > U_{ni} \quad \forall j \neq i)$ to $P_{ni} = \mathbb{P}(U_{ni} > U_{nj} \quad \forall j \neq i)$.

- Slide 9: In the expression for P_{car} , the difference of representative utilities $V_{\text{bus}} - V_{\text{car}}$ has been corrected to $V_{\text{car}} - V_{\text{bus}}$.
- Slide 9: In the expression for P_{bus} , the difference of representative utilities $V_{\text{car}} - V_{\text{bus}}$ has been corrected to $V_{\text{bus}} - V_{\text{car}}$.
- Slide 15: In the rightmost boxed equation near the bottom of the slide, $(\mathbf{x}_{nj}^*)'(\boldsymbol{\beta}/\sigma)$ has been corrected to $\mathbf{x}_{nj}'(\boldsymbol{\beta}/\sigma)$
- Slide 19: At the bottom of the slide, $\mathbf{s}_n'\boldsymbol{\gamma}$ has been corrected to $\mathbf{s}_n\boldsymbol{\gamma}_j$
- Slide 20: Under the heading “Likelihood” $f(y_i|\mathbf{z}_i, \boldsymbol{\theta})$ has been corrected to $f(y_n|\mathbf{z}_n, \boldsymbol{\theta})$

Version: 2020-02-02 at 17:11:59

- Lecture 3
 - Slides 6–7: I originally forgot to include the limits at infinity and minus infinity as assumptions of the index model. These have been added to slide 6, and slide 7 now refers back to them.
 - Slide 9: At the bottom-left of the slide, the partial effect for Probit was incorrect: $\exp\{-\mathbf{x}'\boldsymbol{\beta}/2\}$ has been corrected to $\exp\{-(\mathbf{x}'\boldsymbol{\beta})^2/2\}$
 - Slide 16: In Step 4, the original expression forgot to condition on \mathbf{x}_i . I’ve added “ $|\mathbf{x}_i$ ” to the inner expectation to correct this.
 - Slide 19: Added a sentence about why I don’t like pseudo R-squared. You’ll learn more on the problem set!

Version: 2020-01-30 at 12:34:30 One of these typos is arguably **major**.

- Lecture 2
 - Slide 4: In the first order condition at the bottom of the slide, two instances of $\mathbf{x}'y$ have been changed to $\mathbf{x}y$.
 - Slide 9: Under the heading “Sample” in the left column, $\boldsymbol{\theta}_o$ has been changed to $\hat{\boldsymbol{\theta}}$.
 - Slide 19: In the expression for \mathbf{K} , $\mathbf{x}_i\mathbf{x}_i'$ was missing from the third equality. It has been added.
 - Slide 20: The inequality for Underdispersion ran the wrong way: $\sigma^2 > 1$ has been corrected to $\sigma^2 < 1$.

Version: 2020-01-29 at 12:10:36

- Lecture 1
 - The definition of s_y^2 on slide 20 was incorrect: $(y_i - \bar{y})$ has been corrected to $(y_i - \bar{y})^2$.

Version: 2020-01-28 at 12:10:09 Major errors are **indicated in red** and a “meta-erratum,” i.e. something that I *said* was an error in lecture but is in fact correct, is **indicated in blue**.

- Lecture 1
 - Slide 15: “ θ_o is consistent for θ_o ” has been corrected to “ $\hat{\theta}$ is consistent for θ_o ”
- Lecture 2
 - Slide 2: In the bottom-most displayed equation there is a β . In class I said that this should be a θ but I was wrong. Here θ is being used to indicate a vector of *arbitrary* parameter values while β is being used to indicate a *particular* vector of parameter values: the solution to the population least-squares problem.
 - Slide 4: in the middle displayed equation, $(\mathbf{A} + \mathbf{A}')\mathbf{x}$ has been corrected to $(\mathbf{A} + \mathbf{A}')\mathbf{z}$
 - Slide 4: in the bottom-most displayed equation θ has been corrected to β . See my “meta-erratum” above.
 - Slide 5: At the bottom of the slide I wrote that $\log(0)$ equals ∞ . This has been corrected to $-\infty$.
 - Slide 7: Just under the heading “Assumption:” I wrote β_o and β . These have been changed to **boldface**: β_o and β .
 - Slide 10: In the final displayed equation of the slide $\exp(\mathbf{x}_i\beta)$ has been corrected to $\exp(\mathbf{x}_i'\beta)$
 - Slide 15: in the FOC at the bottom of the slide $\{\mathbb{E}[y_i|\mathbf{x}_i] - \exp(\mathbf{x}_i'\beta)\}\beta$ has been corrected to $\{\mathbb{E}[y_i|\mathbf{x}_i] - \exp(\mathbf{x}_i'\beta)\}\mathbf{x}_i$.
 - Slide 16: in the FOC at the top of the slide $\{\mathbb{E}[y_i|\mathbf{x}_i] - \exp(\mathbf{x}_i'\beta)\}\beta$ has been corrected to $\{\mathbb{E}[y_i|\mathbf{x}_i] - \exp(\mathbf{x}_i'\beta)\}\mathbf{x}_i$.

Version: 2020-01-26 at 22:50:29 All of these are “minor errors”

- Lecture 1
 - Slide 8: “What parameter value θ_0 ” should be “What parameter value θ_o ”
 - Slide 11: the denominator of the definition of \mathbf{J} at the bottom of the slides contains a ∂^2 that should be simply ∂
 - Slide 13: \mathbf{y} in the definitions of \mathbf{J} and \mathbf{K} should be \mathbf{y}_i to be consistent with the rest of the slide
 - Slide 14: at the bottom of the slide $\hat{\mathbf{J}}^{-1}\mathbf{K}\hat{\mathbf{J}}^{-1}$ should be $\hat{\mathbf{J}}^{-1}\hat{\mathbf{K}}\hat{\mathbf{J}}^{-1}$, i.e. the \mathbf{K} should have a “hat” over it
 - Slide 16: the left hand side of the second to last displayed equation on the slide reads $\mathbb{E} \left[\frac{\partial \log f(\mathbf{y}|\boldsymbol{\theta}_o)}{\partial \theta} \right]'$ but the $'$ should be deleted
 - Slide 21: At the bottom left of the slide y_n should be y_N
 - Slide 21: Two instances of y_n should be y_N