

## Errata for Principles of Econometrics, 3e

### *First Printing*

Page	Date	Correction
Inside cover	26-Nov-07	Table 2 critical value for alpha = .10, DF = 40 is 1.303. See Table 2 on page 572
Inside cover, formula page on right	7-Oct-08	The formula for the least squares estimator should have $(y_i - \bar{y})$ in the numerator, <u>not</u> $(y_i - \bar{x})$ . That is $b_2 = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sum(x_i - \bar{x})^2}$ .  Thanks to Andrew Keenan, LSU.
xii	4 Feb 08	The author website for the book has moved, from <a href="http://www.bus.lsu.edu/hill/poe">http://www.bus.lsu.edu/hill/poe</a> to <a href="http://www.principlesofeconometrics.com">http://www.principlesofeconometrics.com</a>
18	9 Sept 09	In Table 2.1, the Std. Dev. Of Food Expenditure, in summary statistics, should be 112.6752 [Thanks to Gawon Yoon]
20	16 Feb 08	Figure 2.7(b) Horizontal axis is on the same scale as Figure 2.7 (a). “Tick” marks on $x$ -axis in panel (b) are directly below tick marks in panel (a)
26	27 Feb 09	In line 6: “...refer to Table A.2 and Figure <b>A.3</b> often...” James Hurley, Louisiana State University
51	16 Feb 08	Only tails of Figure 3.1 should be shaded. Central portion between $t_c$ and $-t_c$ should be unshaded.
55	16 Feb 08	In 3 <sup>rd</sup> line below Section 3.2.2, $c$ should be italic.
57	16 Feb 08	In Figure 3.2 only right tail ( $t > t_c$ ) should be shaded.
58	16 Feb 08	In Figure 3.3 only left tail ( $t < t_c$ ) should be shaded.
58	16 Feb 08	Only tails of Figure 3.4 should be shaded. Central portion between $t_c$ and $-t_c$ should be unshaded.
60	22 Apr 08	8 <sup>th</sup> line from bottom of page, change “at least” to “more than”. This reduces ambiguity. Chris Skeels (University of Melbourne)
72	13 Jan 08	Exercise 3.13 There are 4733 observations in the file <i>cps.dat</i> , not 4992.

72	27 Dec 07	Exercise 3.13 This exercise <b>may</b> not work with “student” versions of software.
78	26-Nov-07	Figure 4.2 horizontal line strikes axis at $\bar{y}$
79	1 Feb 09	1 <sup>st</sup> line: “...sample mean $\bar{x}$ ...” Filip Van den Bossche (Hogeschool-Universiteit (HU)Brussel, Belgium)
98	1 Feb 09	Exercise 4.8: To be consistent with the remainder of the book, the parameters in the first equations could be $\beta_1$ (intercept) and $\beta_2$ (slope). Similarly in the parameters of the second equation could be $\alpha_1$ and $\alpha_2$ , and in the third equation $\gamma_1$ and $\gamma_2$ . Filip Van den Bossche (HUBrussel, Belgium)
98	27 Dec 07	Exercise 4.8 (b): label last part (iv)
99	22 Sept 09	Exercise 4.11 (b): last sentence should read “Is it larger or smaller than the error computed in part (a)
99	28 Mar 10	Exercise 4.11 (d) should read “... that the <b>incumbent</b> party (Democrats) ...” This is actually the year the Democrats won the popular vote but lost the election due to the U.S. Electoral College system. Jonathan Powell (Manchester)
100	17 Jan 08	Exercise 4.15 There are 4733 observations in the file <i>cps.dat</i> , not 4992.
104	3 June 09	2 <sup>nd</sup> line from bottom: In the formula for the rate of return estimator there should be a minus (-) rather than a plus (+) in the exponential term. That is, the rate of return estimator should be $\hat{r} = e^{b_2 - \text{var}(b_2)/2} - 1$ . The explanation is that the “natural” estimator of the return $r = \exp(\beta_2) - 1$ is $\hat{r}_n = \exp(b_2) - 1$ . This estimator has expected value $E(\hat{r}_n) = \exp(\beta_2) \times \exp[\text{var}(b_2)/2] - 1$ . We can correct the natural estimator as $\hat{r}_c = \exp(b_2) \times \exp[-\text{var}(b_2)/2] - 1 = \exp[b_2 - \text{var}(b_2)/2] - 1$ so that $E(\hat{r}_c) = r$ . Mike Rabbitt (John Deere)
122	22 Sept 09	3 <sup>rd</sup> line from bottom should read “ $\beta_2 \geq 0$ a decrease in price leads to a decrease in sales revenue (demand is <b>unit elastic or</b> price inelastic), or Filip Van den Bossche (HUBrussel, Belgium)
128	20 Dec-07	Re-label parts of Exercise 5.3 to (a), (b), (c) and (d)
150	27 Mar 08	5 <sup>th</sup> line below Eqn (6.23) “... first note that $\beta_3 > 0$ because <b>wife’s</b> education ...” Genevieve Briand (Eastern Washington)

155	1 Feb 09	5 <sup>th</sup> line of text "... additional cylinder reduces miles per gallon of gasoline by 3.6 miles per gallon, ..." Filip Van den Bossche (HUBrussel, Belgium)
162	26 Dec 07	Exercise 6.15(b) (iii) Change the size of the 40 year old house from 2300 square feet to 2400 square feet.
171	1 Feb 09	Line 14 is better presented as "...parameter $\delta$ is that it is a <b>location premium</b> , the difference ..." Filip Van den Bossche (HUBrussel, Belgium)
175	1 Feb 09	Line 2 Based on one-tail $t$ -tests of significance at the $\alpha = 0.05$ ...." After the word "significance" insert the footnote <a href="#">[Recall that the <math>p</math>-value for a one-tail test is half of the reported two-tail <math>p</math>-value]</a> Filip Van den Bossche (HUBrussel, Belgium)
185	1 Feb 09	In section 7.5.1a, in the 6 <sup>th</sup> line of text, the reference should be to Table A.3 and not Table A.2. Filip Van den Bossche (HUBrussel, Belgium)
190	16 Feb 08	Exercise 7.5(d) <a href="#">Blue diamond</a> ♦
194	20 Jan 07	Delete * from Exercise 7.16
195	21 Jan 07	Exercise 7.16(e) Also assume the house has 3 bedrooms and 2 bathrooms. Use the traditional style houses only equation that may have been estimated in part (d).
202	20 Aug 08	<p>The White standard error of 1.81 for the slope coefficient is computed using the White variance estimator</p> $\widehat{\text{var}}(b_2) = \frac{N}{N-2} \sum_{i=1}^N w_i^2 \hat{e}_i^2 = \frac{N}{N-2} \frac{\sum_{i=1}^N [(x_i - \bar{x})^2 \hat{e}_i^2]}{\left[ \sum_{i=1}^N (x_i - \bar{x})^2 \right]^2}.$ <p>This modification of equation (8.9) includes a multiplicative factor <math>N/(N-2)</math>. The source of this adjustment follows from the discussion on pages 33 and 34 of POE/3e. Namely, the expected value of the sum of squared regression errors is <math>E\left[\sum e_i^2\right] = N\sigma^2</math>. However the expected value of the sum of the squared least squares residuals is <math>E\left[\sum \hat{e}_i^2\right] = (N-2)\sigma^2</math>. The squared least squares residuals are smaller, on average, than the true regression errors. The adjustment is to offset this fact. The White standard error using equation (8.9) is 1.76327. Thanks to Genevieve Briand (Eastern Washington University)</p>
211	2 Feb 09	Lines 15-16: "... we plotted the estimated least squares function and the residuals and reported them in Figure 8.2." Actually Figure 8.2 does not show the residuals explicitly, but it does show them

implicitly, because the residuals are the (vertical) distance between the observed values and the fitted least squares line. Filip Van den Bossche (HUBrussel, Belgium)

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1 Feb 09

Lines 8-9 may be better worded as “The level of income observed in the Smith’s household, for example, **does not affect, nor is it affected by**, the level of income in the Jones’ household.” Filip Van den Bossche (HUBrussel, Belgium)

234

24 Mar 09

The value for  $r_1$  given by equation (9.18) should be

$$r_1 = \frac{\sum_{t=2}^T \hat{e}_t \hat{e}_{t-1}}{\sum_{t=2}^T \hat{e}_{t-1}^2} = \frac{1.196874}{2.997871} = 0.399$$

instead of the reported value of  $r_1 = 0.404$ . The discrepancy arises because of the way in which the means of the series  $\hat{e}_t$  and  $\hat{e}_{t-1}$  are treated. If these means are taken as zero, we get  $r_1 = 0.399$ . If we recognize that the least squares residuals will no longer have zero means when the first or the last observation is omitted, we obtain

$$r_1 = \frac{\sum_{t=2}^T (\hat{e}_t - \bar{\hat{e}}_{[-1]}) (\hat{e}_{t-1} - \bar{\hat{e}}_{[-T]})}{\sum_{t=2}^T (\hat{e}_{t-1} - \bar{\hat{e}}_{[-T]})^2} = 0.404$$

where  $\bar{\hat{e}}_{[-1]}$  is the sample mean of the  $\hat{e}_t$ , with the first observation excluded and  $\bar{\hat{e}}_{[-T]}$  is the sample mean of the  $\hat{e}_t$ , with the last observation excluded. In general the difference between the two alternative formulas will be slight and it disappears as the sample size gets larger.

Some software calculates a third estimator

$$r_1 = \frac{\sum_{t=2}^T \hat{e}_t \hat{e}_{t-1}}{\sum_{t=1}^T \hat{e}_t^2} = \frac{1.196874}{3.031571} = 0.395$$

In this case the summation in the denominator includes the extra term  $\hat{e}_1^2$ . In large samples the difference between the 3 alternatives will be negligible.

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24 Mar 09

The above issue arises again when the correlations  $r_1, r_2, \dots, r_6$  are presented. The alternative values are:

Correlation	Not mean corrected	Mean corrected	$T$ observations in denominator
$r_1$	0.399	0.404	0.395
$r_2$	0.120	0.122	0.117
$r_3$	0.083	0.084	0.081
$r_4$	–	–	–
	0.327	0.353	0.320
$r_5$	–	–	–
	0.381	0.420	0.371
$r_6$	–	–	–
	0.143	0.161	0.138

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22 Dec 07

Eqn (9.43)  $\hat{\sigma}_j$  not  $\sigma_j$  in first term

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1 Feb 09

Below eqn (9.44), after “ $\text{cov}(v_t, v_s) = 0$ ”, add “ $(t \neq s)$ ” Filip Van den Bossche (HUBrussel, Belgium)

255

1 Jan 08

Line –2:  $\ln(JV)$  should be  $\ln(JV)$

291

4 Nov 08

In Table 10.2 the coefficient and t-statistic for  $VHAT$  should have a positive sign. Thanks to Genevieve Briand (Eastern Washington University).

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27 Feb 09

In the data files, the variables  $y = INFLATION$ ,  $x = MONEY$   
 $GROWTH$  and  $z = OUTPUT$   $GROWTH$

321

1 Feb 09

For Exercise 11.9, parts (e) and (f), the value for  $PF$  is missing for 2000. Use the 1999 value for  $PF$  (0.61765) in its place. In part (g), subpart (i) should end with a period (.) rather than a question mark (?). Filip Van den Bossche (HUBrussel, Belgium)

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30 Jan 08

Change Exercise 12.6(b) to read: At what significance level do you conclude that the changes  $DTX = TXNAG - TXNAG(-1)$  and  $DUS = USNAG - USNAG(-1)$  are stationary variables?

345	1 Feb 09	Exercise 12.10. "... from the first quarter of 1980 to the <a href="#">third</a> quarter of 2006. Filip Van den Bossche (HUBrussel, Belgium)
350	28 Nov 08	In equation (13.7) the value of $R^2$ is computed by the EViews software as $1 - SSE/SST$ . This is sometimes called the "centered" $R^2$ because $SST = \sum (y_i - \bar{y})^2$ . When no intercept is included in a regression an alternative definition of $R^2 = 1 - SSE / \sum y_i^2$ . This "uncentered" $R^2$ is computed by SAS, Stata and Excel in the no-intercept model. For equation (13.7) this value is 0.99965. A better policy when a model does not include an intercept is to not report an $R^2$ at all
369	22 Dec 08	The $LM$ statistic value (reported 9 lines from bottom) is $LM = (T - 1)R^2 = 499 \times 0.124 = 61.876$ . This calculation is correct. Computer software reports $R^2 = 0.124568$ , and using this value for the calculation results in $LM = (T - 1)R^2 = 499 \times 0.124568 = 62.1595$
380	1 Feb 09	There is an error in <i>gold.def</i> . Obs: 200, daily (12.13.2003-9.19.2006) should be Obs: 200, daily (12.13.2005-9.19.2006). Filip Van den Bossche (HUBrussel, Belgium)
384	1 Feb 09	Christian Kleiber (Universität Basel) and Achim Zeileis (Wirtschaftsuniversität Wien) have discovered that the Grunfeld data used in our book <i>POE3</i> (and others as well!) differ from Grunfeld's original data. These authors have documented the differences (some might call them errors!) at <a href="http://statmath.wu-wien.ac.at/~zeileis/grunfeld/">http://statmath.wu-wien.ac.at/~zeileis/grunfeld/</a> We will correct our errors, which cause only minor changes in estimates, in the next edition of <i>POE</i> .
392	1 Feb 09	In equation (15.12): remove indices 2 and 3 from $V_{2it}$ and $K_{3it}$ . Filip Van den Bossche (HUBrussel, Belgium)
398	24 Dec 08	In line 7 the $F_{(0.99, 715, 2858)}$ critical value is given as 1.0. That is the limit of accuracy using Table 5 F-critical values (page 576). Using statistical software we can compute the "exact" critical value, 1.14463.
401	3 June 08	In equation (15.28), the term in curly braces should be squared. Thanks to Marcel Pribsch, Stanford University
401	1 Feb 09	Below equation (15.28) the text should read: "The test works because the numerator will contain terms like $2\hat{e}_{i1}\hat{e}_{i2} + 2\hat{e}_{i2}\hat{e}_{i3} + \dots$ whose sum ..." Filip Van den Bossche (HUBrussel, Belgium)

402	16 Feb 08	Delete equation number (15.31). The last sentence before Section 15.5.4 should read “Then, least squares is applied to (15.29) with $\sigma_e^2$ and $\sigma_u^2$ replaced by $\hat{\sigma}_e^2$ and $\hat{\sigma}_u^2$ in the parameter $\alpha$ ”. Thanks to Vera Tabakova (East Carolina).
403	26 Oct 09	The next to last sentence in Section 15.5.5 should read “These differences are <b>not</b> picked up by the fixed effects.” Thanks to Silvia Golem.
411	28 Mar 10	The solution to 4.11 (b) should be $-2.91$ . Jonathan Powell (Manchester)
413	22 Sept 09	In Exercise 15.12, parts (a) and (b) are mislabeled. The item labeled (b) (starting “Consider a model ...”) should be labeled (a) and should appear first. The item labeled (a) (starting “What signs ...”) should be labeled (b) and appear second.
413	1 Feb 09	In Exercise 15.12, part (d): “...test whether the country level effects are <b>all equal</b> , or not.” Filip Van den Bossche (HUBrussel, Belgium)
430	16 July 08	The 5 <sup>th</sup> percentile value of <i>GRADES</i> is given as 2.635 which is halfway between observations 50 and 51 in this 1000 observation data set. While this is a common way to calculate the 5 <sup>th</sup> percentile, it is not the only way. Since $.05 \times 1000 = 50$ , some software will report the 50 <sup>th</sup> value, after sorting according to increasing value, 2.63. Others may take a weighted average of the 50 <sup>th</sup> and 51 <sup>st</sup> values, such as $.95 \times 2.63 + .05 \times 2.64 = 2.6305$ . Thanks to Tom Doan (Estima) for noting this. Estima develops and sells <a href="#">RATS</a> (Regression Analysis of Time Series), a leading econometrics and time-series analysis software package
464	1 Feb 09	When using summation operations, parentheses should be used to indicate items to be summed together. For example, $\sum_{i=1}^n (x_i + 5) = \left( \sum_{i=1}^n x_i \right) + 5n$ whereas $\sum_{i=1}^n x_i + 5 = \left( \sum_{i=1}^n x_i \right) + 5$ . The summation operation extends only to the term immediately to its right. Raffaella Cuff (Louisiana State University)
476	27 Aug 08	In Exercise A.4, the last term $\overline{nx\bar{y}}$ on the line should be read as $n \times \bar{x} \times \bar{y}$ . Thanks to Greg Upton (Louisiana State University)
476	2 Feb 08	In Exercise A.5, delete 2 <sup>nd</sup> comma after equation.
547	3 Feb 08	In Exercise C.11(d), delete “using appropriate theorems about normal distributions”. [Not necessary to derive mean and variance.]
550	15 Jan 08	In Exercise 4.9, the answers should be: (a) 1.467, 1.251, 1.643 (b) 0.0161, 0.0038, 0.0348 (c) 0.538, 0.148, 1.037

552	16 Jan 08	In Exercise 4.13(h), delete sentence beginning “It has the lowest Jarque-Bera value... “ Replace with “The simple linear model is not a good choice because the residuals are heavily skewed to the right and hence far from being normally distributed.”
554	21 Dec 07	In the equation for Exercise 5.11(a), the estimated coefficient for <i>INFLATION</i> should be $-0.1862$ , not $+0.1862$
554	21 Dec-07	In the equation for Exercise 5.11(b), $+0.1862$ should be $-0.1862$ . The answer is correct, however.
554	21 Dec-07	In the first inequality in Exercise 5.11(c), $+0.1862$ should be $-0.1862$ . The remainder of the solution is correct, however.
557	27 Dec 07	Exercise 6.16(b): Delete the last sentence that reads “Alternatively, the calculated <i>F</i> -value is 7.17 with a <i>p</i> -value of 0.012.”
557	27 Dec 07	Exercise 6.18(c): Change “10% significance level” to “5% significance level”.
568	30 Jan 08	At the end of the answer to Exercise 12.5(b), add: “A different result is obtained for <i>CONSUMPTION</i> if augmentation terms are included in the test equation.”
Rear inside cover, left side	13 April 09	The definition of the forecast error, to be consistent with equation (4.3) should be $f = y_0 - \hat{y}_0$ . Juan Steer Nunes, LSU.