**Errata for Eric Rasmusen's Games and Information, Third Edition, arranged by page number. Updated July 18, 2003.**

I apologize for the errors in this book, but I have tried to keep this errata current as partial compensation. I extend my gratitude to those readers who have pointed errors out to me. Specifically, I thank Kyung Baik, David Collie (Cardiff Business School), Ralf Elsas (Goethe U.), Diego Garcia (Dartmouth), Bettina Kromen (U. Koeln), Eva Labro (London School of Economics), Frank P. Maier-Rigaud, Ron Mallon (U. of Utah), Alexandra Minicozzi (U. Texas), Luis Pacheco (U. Portucalense), Pedro Sousa (U. Portucalense), and Charles Tharp. Martin Caley of the Isle of Man Treasury was particularly helpful, and I thank him for his very careful reading.

If you find any new errors, please let me know, so future readers can be warned. Do not be shy– if you think it might be an error, do not feel you have to check it out thoroughly before letting me know. It's my duty to make sure and to be clear, not yours.

I can be reached at Eric Rasmusen, Indiana University, Kelley School of Business, Rm. 456, 1309 E 10th Street, Bloomington, Indiana, 47405-1701. Office: (812) 855-9219. Fax: 812-855-3354. Erasmuse@Indiana.edu. Php.indiana.edu/∼erasmuse. The webpage for *Games and Information* is at http: //Php.indiana.edu/∼erasmuse/GI/index.html

To view Acrobat (.pdf) files, you will need to download the Adobe Acrobat Reader from http://www.adobe.com/acrobat/readstep.html. If you don't use the web, just let me know and I'll send you hardcopy.

There was a reprint in October 2001, so you may find some of these errors corrected in your printing of the book.

**Chapter 1 The Rules of the Game**

p. 16. second paragraph, line 3 (fixed in October 2001 reprint). Old-Cleaner's expected profit is 32, not 38, with a Low price. This does not affect the suboptimality of that strategy, though.

p. 24. Near Table 1.4. Drop Table 1.4 and the discussion of the Swiss Cheese Game,since this does not fit the definition of "weakly dominated" that I defined earlier. So drop:

"The easiest example is table 1.4's Swiss Cheese Game. Every strategy is weakly dominated for every player. Thus, one iterated dominance equilibrium is *(Up, Left)*, found by first eliminating Smith's *Down* and then Jones's *Right*, but *(Down, Right)* is also an iterated dominance equilibrium. And, in fact, every strategy combination is also a weak dominant strategy equilibrium as well as an iterated dominance equilibrium.

**Table 1.4 The Swiss Cheese Game**

| | | **Jones** | | |
|---|---|---|---|---|
| | | *Left* | | *Right* |
| | *Up* | **0,0** | ↔ | **0,0** |
| **Smith:** | | ↕ | | ↕ |
| | *Down* | **0,0** | ↔ | **0,0** |

*Payoffs to: (Smith, Jones)*

The Swiss Cheese Game is pathological, but it is not hard to come up with less obvious examples, such as..."

Then start the next paragraph:

"Consider the Iteration Path Game..."

p. 32. In the book:

Suppose the pareto-superior equilibrium (*Small*, *Small*) were chosen as a focal point in Ranked Coordination, but the game was repeated over a long interval of time. The numbers in the payoff matrix might slowly change

until (*Small, Small*) and (*Large, Large*) both had payoffs of 1.6, and (*Large, Large*) started to dominate.

Should be:

Suppose the pareto-superior equilibrium (*Large*, *Large*) were chosen as a focal point in Ranked Coordination, but the game was repeated over a long interval of time. The numbers in the payoff matrix might slowly change until (*Small, Small*) and (*Large, Large*) both had payoffs of 1.6, and shortly thereafter (*Small, Small*) might start to dominate.

p. 52, Figure 2.6 (fixed in October 2001 reprint) Should be payoffs to "(Smith, Jones)", not "(Smith, Brown)" .

p. 52, Figure 2.6 (fixed in October 2001 reprint) Jones's nodes should be labelled $J_1$ and $J_2$, not $B_1$ and $B_2$.

p. 55. (fixed in October 2001 reprint). "Jones uses the likelihood and his priors." INSTEAD OF "Jones uses the the likelihood and his priors."

p. 57, Figure 2.8. Line (4) is missing its heading, which should be $(B)|Large$.

p. 76. Paragraph starting "First, it is possible..." Replace $Up$ with *Down* and (3.14) with (3.12). Also change "$\theta^* > 1$" to "$\theta^* > 1$, or $\theta^* \leq 0$".

p. 77. (fixed in October 2001 reprint) The second paragraph, third line, should have $z < y$, not $z > y$, to fit the picture in Table 3.5.

**Chapter 4: Dynamic Games with Symmetric Information**

p. 93, Figure 4.2. *Exit* should read *Out* and *Remain* should read *In*. Also 'Payoffs to (Smith,Jones)' needs to be added.

p. 107. Problem 4.2d, first line. Should be "Union after Lenin died" (missing word).

**Chapter 5: Reputation and Repeated Games**

p. 109 (fixed in October 2001 reprint). Line 12: "known", not "knowns".

p. 113 (fixed in October 2001 reprint). Line 2: "always ", not "alwyas ".

p. 116, paragraph starting "It is important to remember that..." (Nov.2001). Replace "Fuderberg" with "Fudenberg".

p. 118, Table 5.2b. The arrow on the line *High Quality* should be pointed left towards 5,5 and not to the right.

**Chapter 6: Dynamic Games with Incomplete Information**

p. 148, Figure 6.3. "Strong" entrant, not "Stong", fixed in October 2001 reprint.

p. 149, line 4. Delete "+0.05[40]".

My explanation here is bad, so I will elaborate on it. Figure 6.3 is abbreviated, and contains within it the game in Figure 6.1. The (-10,300) and (- 10, 0) payoffs indicate what happens if the incumbent chooses FIGHT depending on whether the entrant is weak (300) or strong (0). In either case, the entrant gets -10 when the incumbent chooses FIGHT.

If, however, the incumbent chooses COLLUDE, then the entrant gets a payoff of 40, from Figure 6.1.

Suppose the entrant is strong and Nature told the incumbent that. But suppose the entrant does not know whether Nature told the incumbent. Nature did tell the incumbent with probability 0.1, and if the entrant then enters, the incumbent will collude and the entrant's payoff will be 40. Nature was silent with probability 0.9, and if the entrant then enters, the incumbent will fight and the entrant's payoff will be -10. The expected payoff is thus $-5(= 0.1[40] + 0.9[-10])$.

p. 157. The error is that in the form it takes in the book, there is no equilibrium with limit pricing, and the answer I had posted on the web made a mistake in its Low-price pooling equilibrium. For the question to make sense, the low-cost incumbent (C=20) must suffer some loss if entry occurs. In the original question, the low-cost incumbent is indifferent about whether entry occurs, so a High price is a weakly dominant strategy for it. To fix the problem, I have below added a competition cost of 50. I've also clarified the

wording a bit.

**Problem 6.2: Limit Pricing.**[1] An incumbent firm operates in the local computer market, which is a natural monopoly in which only one firm can survive. In the first period, the incumbent can price *Low*, losing 40 in profits, or *High*, losing nothing. It knows its own operating cost $C$, which is 20 with probability 0.75 and 30 with probability 0.25. A potential entrant knows those probabilities, but not the incumbent's exact cost. In the second period, the entrant can enter at a cost of 100, and its operating cost of 25 is common knowledge. If there are two firms in the market, each incurs a loss of 50, but one then drops out and the survivor earns the monopoly revenue of 200. There is no discounting; $r = 0$.

**Chapter 7: Moral Hazard: Hidden Actions**

p. 163. Screening should be Figure 7.1e, not 7.1d.

p. 167. In the paragraph starting "Let's now fit out..." replace "then" with "let" in two places. This is more a clarification than a correction; this paragraph is laying out specific functional forms for the problem, which includes a payoff linear in output and wages for the principal.

p. 168. I made some mistake in Mathematica, and the computation of $e^*$ is slightly off (and so all the resulting numbers are off too). Thus, replace the paragraph,

"but this cannot be solved analytically. Using the computer program Mathematica, I found that $e^* \approx 0.84934$, from which, using the formulas above, we get $q^* \approx 100 * log(1 + .84934) \approx 61.48$ and $w^* \approx 41.32$."

with

"but this cannot be solved analytically. Using the computer program Mathematica, I found that $e^* \approx 0.77$, from which, using the formulas above, we get $q^* \approx 100 * log(1 + 0.77) \approx 57.26$ and $w^* \approx 36.50$."

The $e^*$ miscalculation continues in the discussion of the three contracts at the bottom of the page. Change that section to read:

[1] See Milgrom and Roberts (1982a).

1 The **forcing contract** sets $w(e^*) = w^*$ and $w(e \neq 0.77) = 0$. Here, $w(0.77) = 37$ (rounding up) and $w(e \neq e^*) = 0$.

2 The **threshold contract** sets $w(e \geq e^*) = w^*$ and $w(e < e^*) = 0$. Here, $w(e \geq 0.77) = 37$ and $w(e < 0.77) = 0$.

3 The **linear contract** sets $w(e) = \alpha + \beta e$, where $\alpha$ and $\beta$ are chosen so that $w^* = \alpha + \beta e^*$ and the contract line is tangent to the indifference curve $U = \bar{U}$ at $e^*$. The slope of that indifference curve is the derivative of the $\tilde{w}(e)$ function, which is

$$\frac{\partial \tilde{w}(e)}{\partial e} = 2e * Exp(3 + e^2). \qquad (7.14)$$

At $e^* = 0.77$, this takes the value 56. That is the $\beta$ for the linear contract. The $\alpha$ must solve $w(e^*) = 37 = \alpha + 56(.77)$, so $\alpha \approx -7$.

p. 169. In the first paragraph replace $e = 0.84$ with $e = 0.77$.

p. 173. Just after equation (7.19), the cite should be to equations (7.18a) and (7.18b) on the opposite page, not to (7.11a) and (7.11b), which don't exist.

**Chapter 8: Further Topics in Moral Hazard**

p. 200. In Figure 8.2, the contract $C_3$ is point (6, 4), but it looks more like (6,3.1) the way the figure is drawn. For clarity, in the next edition I should mark 4 on the vertical axis and not 2, and note that $C_1 = (6, 6), C_2 = (3, 3), C_3 = (6, 4)$. I have a better drawn figure up on the Web at http://pacioli.bus.indiana.edu/erasmuse/GI/pages/fig08.2.jpg.

**Chapter 9: Adverse Selection**

p. 223, fourth line from the bottom. Replace "steeper" with "less steep".

p. 234. N9.2, second point (extra explanation). The service stream seems to depreciate by 33 percent, even though the car's price falls by 66 percent, because one of the two years of the car's life is over. Thus the service stream's apparent value only falls from \$3,000 to \$2,000.

p. 238. (fixed in October 2001 reprint) Although there is no actual error in this problem, I have clarified the wording in problem 9.3b and added a new part to the question.

(9.3b) In equilibrium, the employer tests workers with probability $\gamma$ and pays those who pass the test $w$, the talented workers all present themselves for testing, and the untalented workers present themselves with probability $\alpha$, where possibly $\gamma = 1$ or $\alpha = 1$. Find an expression for the equilibrium value of $\alpha$ in terms of $w$. Explain why $\alpha$ is not directly a function of $x$ in this expression, even though the employer's main concern is that some workers have a productivity advantage of $x$.

(9.3c) If $x = 9$, what are the equilibrium values of $\alpha$, $\gamma$, and $w$?

(9.3d) If $x = 8$, what are the equilibrium values of $\alpha$, $\gamma$, and $w$?

**Chapter 10: Mechanism Design**

p. 251, Figure 10.5. The shaded area should be $r^*(x_u) - cx_u^*$, not $r^*(x_u)$.

p. 254, paragraph starting "Under perfect price discrimination...". Line 2 should be Figure 10.6a, not 10.4a. Line 3 should have $r(x_p) = A + B + J + K + L$, not $r(x_p) = J + K + L$.

p. 255, top of page. The dash between $v(x_u)$ and $r(x_u)$ looks like a minus sign. It would be better replaced by ", because".

The next line should start $v(x_p) - r(x_v)$, not $v(x_p) - r(x_v u)$.

p. 261, line 5. Should be "commit", not "commits".

**Chapter 11: Signalling**

p. 267. Line 4 should have Figures 7.1d and 7.1e, not 7.1e and 7.1f.

p. 282. (fixed in October 2001 reprint) In the first paragraph of Section 11.5, delete "with models of warranty issue by Matthews & Moore (1987) and of" and replace with "for example, the multiple signal model used to

explain". (Matthews and Moore (1987) is about product warranties, not financial warrants.)

p. 297. In Figure 12.1, the captions are reversed. 12.1(a) is the Nash Bargaining Game, and 12.1(b) is Splitting a Pie. Also, in Figure 12.1(a), the horizontal axis should be $U_{Smith}$, not $\theta_{Smith}$.

**Chapter 12: Bargaining**

p. 309. Step (3) in the shaded box and (3') below should say "and to the seller otherwise" rather than "and to the buyer otherwise".

p. 310. The inequality in the equation in the paragraph starting "This is not efficient..." should be reversed, so it looks like $v_b < \frac{1+v_s}{2}$.

p. 312. The minus sign at the start of the payoff of the seller, (12.19), should be deleted.

p. 322. (fixed in October 2001 reprint) In the last line of question 12.7, replace "$p_s \geq p_b$" with "$p_s \leq p_b$".

**Chapter 14: Pricing**

p. 350. The shaded box for the Hotelling pricing game has the payoffs for Apex if he captures the entire market as $p_a(1) = 1$. It should be $p_a(1) = p_a$.

p. 350 (clarification) When I say, "Price aside, Apex is most attractive for the customer at $x = 0$..." I mean that Apex is the most attractive of the two sellers for the customer at $x = 0$. The customer who most prefers Apex, another way to read that sentence, is the one at $x = x_a$.

p. 353. Figure 14.5: In example 2, both firms should be located at $x = 0.9$, not $x = 0.7$.

p. 357. Line 2 should say "asymmetric", not "asymemtric".

p. 359. A good addition to the second paragraph is a sentence to make it read:

"If $c_n$ increases enough, then the nature of the equilibrium changes dras-

tically, because firm $n$ goes out of business. Even if $c_n$ increases a finite amount, the implicit function theorem is not applicable, because then the change in $p_n$ will cause changes in the prices of other firms, which will in turn change $p_n$ again."

p. 360. A5' should say "Increasing parameter $\tau$", not "Increasing parameter $c$".

p. 365. The caption of Figure 14.8 should have "Player" capitalized. The last sentence before equation (14.66) has a reference to equation (14.66) which should be (14.63) instead. The first sentence after equation (14.69) has a reference to equation (14.63) which should be (14.66) instead.

p. 369. the word "be" should be added to the second note on 14.4, so it reads, "...because his product can be recycled..."

**Chapter 15: Entry**

p. 391. In question 15.1, Replace "preying on Brydox" with "preying on Brydox (and he does not learn from experience) "

Equation (15.29) should have $-p_a + m < 2d$, not $-p_a + m \leq 2d$.

Problem 15.1b should say, "the equilibrium can be pooling", not "the equilibrium will be pooling".

Equation (15.30) should be

$$\theta \geq \frac{d_b}{p_b + d_b}.$$

p. 392. In question 15.1c: replace "after observing Apex chose Prey in the first period." with "after observing that Apex chose *Prey* in the first period. Show that the equilibrium values of $\alpha$ and $\beta$ are:"

In question 15.1c, equation (15.31) should be:

$$\alpha = \frac{\theta p_b}{(1-\theta)d_b}$$

Question 15.1d should say "following phenomenon?", replacing the period with a question mark.

In problem 15.3, clarify by replacing

"Set $f(x) = log(x)$, $g(y) = .5(1+y/(1+y)$ if $y \geq 0$, $g(y) = .5(1+y/(1-y)$ if $y \leq 0$, $y = 2$, and $z = 1$."

with

"Set $f(x) = log(x)$, and for $w = f(x_i) - f(x_e)$, $g(w) = .5[1 + w/(1 + w)]$ if $w \geq 0$, $g(w) = .5[1 + w/(1 - w)]$ if $w \leq 0$, $y = 2$, and $z = 1$."

**Mathematical Appendix**

p. 394. In the definition of Maximum, it should say $Maximum(x - x^2 = 1/4$, not $Minimum(x - x^2 = 1/4$.

p. 396. In Figure A.1, draw in a dotted line to illustrate the convexity definition similar to the one for the concavity definition.

p. 397. In the definition of Metric, the second line should say "$d(w, z) = 0$ if and only if $w = z$", not "$d(w, z) = 0$ if $w = z$".

The definition of Metric Space should begin "Set X is a metric space if ..." rather than "A non-empty set X is a metric space..."

The definition of "one-to-one" is wrong. It should be:

"The mapping $f : X \rightarrow Y$ is one-to-one if every point in set $X$ maps to a different point in $Y$, so $x_1 \neq x_2$ implies $f(x_1) \neq f(x_2)$."

Note also that a one-to-one *correspondence* is conventionally defined as a correspondence which is a mapping that is both one-to- one and onto.