Corrections and updates for second printing of Osborne and Rubinstein’s “A Course in Game Theory”
(MIT Press, 1994)
2012/9/25

We thank the following people for pointing out errors and improvements: Lorand Ambrus-Lakatos, Pierpaolo Battigalli, Jean-Pierre Benoît, Jim Bergin, Richard Boylan, Boudewijn P. de Bruin, Joel Cohen, Juan Dubra, Peter Forsyth, Haruo Imai, Christopher Kah, Karthik Kalyanaraman, Nicolas Klein, Fuhito Kojima, Vijay Krishna, Hui Li, Tsen Lim, Kin Chung Lo, Salvatore Modica, Robert Murphy, Yasuyuki Noguchi, Marc Pauly, Bezalel Peleg, Daniel Probst, Phil Reny, Al Roth, Dov Samet, Giora Slutzki, Lutz Veldman, Shmuel Zamir.

Corrections

Page, Line Correction

<table>
<thead>
<tr>
<th>Page</th>
<th>Line</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>xiii, 4</td>
<td>Instructors using the book in a course may now request the solutions to the exercises at <a href="http://www.economics.utoronto.ca/osborne/cgt/">http://www.economics.utoronto.ca/osborne/cgt/</a>.</td>
<td></td>
</tr>
<tr>
<td>xv</td>
<td>Martin J. Osborne’s email address is now <a href="mailto:martin.osborne@utoronto.ca">martin.osborne@utoronto.ca</a> and his mailing address is Department of Economics, University of Toronto, 150 St. George Street, Toronto, Canada, M5S 3G7.</td>
<td></td>
</tr>
<tr>
<td>xv</td>
<td>Ariel Rubinstein’s email address is now <a href="mailto:rariel@post.tau.ac.il">rariel@post.tau.ac.il</a>, his website is <a href="http://arielrubinstein.tau.ac.il">http://arielrubinstein.tau.ac.il</a>, and his second address is Department of Economics, New York University, New York, NY 10003, USA.</td>
<td></td>
</tr>
<tr>
<td>xv</td>
<td>The authors now maintain a web site for the book: <a href="http://www.economics.utoronto.ca/osborne/cgt/">http://www.economics.utoronto.ca/osborne/cgt/</a>.</td>
<td></td>
</tr>
<tr>
<td>xiii, −4</td>
<td>Replace “that” with “than”.</td>
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</tr>
<tr>
<td>6</td>
<td>Zermelo did not define the algorithm discussed in the second paragraph; the references to him should be deleted.</td>
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</tr>
<tr>
<td>13</td>
<td>In the caption of Figure 13.1, replace “strategies” by “actions”.</td>
<td></td>
</tr>
<tr>
<td>23, 11</td>
<td>Replace “A2” with “A1”.</td>
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<tr>
<td>23, 14</td>
<td>Replace the sentence “Note that ...” with “Note that by part (c), the players’ Nash equilibrium strategies may be found by solving the problems max_x min_y u_1(x, y) and max_y min_x u_2(x, y).”</td>
<td></td>
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<tr>
<td>30</td>
<td>Add, at the start of line 5, “The result in Exercise 20.4 is due to Nash (1951).”</td>
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</tbody>
</table>
32 Replace the first two sentences of the paragraph above (32.2) with: “Note that each function $U_i$ is multilinear. That is, for any mixed strategy profile $\alpha$, any mixed strategies $\beta_i$ and $\gamma_i$ of player $i$, and any number $\lambda \in [0,1]$, we have $U_i(\alpha_{-i}, \lambda \beta_i + (1 - \lambda) \gamma_i) = \lambda U_i(\alpha_{-i}, \beta_i) + (1 - \lambda) U_i(\alpha_{-i}, \gamma_i)$.”

35 In the fourth line of the caption of Figure 35.1 replace “indicated” with “indicate”.

40, 6 Replace $((\frac{1}{3}, \frac{2}{3}), (\frac{2}{3}, \frac{1}{3}))$ with $((\frac{2}{3}, \frac{1}{3}), (\frac{1}{3}, \frac{2}{3}))$.

42 In line 3 of Exercise 42.1 replace “distribution” with “distributed”.

45, –7 Replace “he” with “she”.

50, –2 Replace “0 \leq \gamma \leq 1” with “0 < \gamma \leq 1”.

55, –9 Replace “the following exercises” with “Exercises 56.4 and 56.5”.

60, 22 Replace “player $1$” with “player $i$”.

60, 23 Replace “$U_i(a_{-i}, a_i^*)$” with “$u_i(a_{-i}, a_i^*)$”.

62, 2 Delete second “that”.

68, –2 Add “infinite” before “decimal”. (A number has a unique infinite decimal expansion.)

90, –20 Replace “If the length of every history is finite” with “If the longest history is finite”.

96 The Nash equilibrium $((2, 0), nny)$ (resulting in the division $(0, 0)$) is missing in Example 96.1.

97 In the display in Definition 97.2 replace $\preceq_i$ with $\preceq_i|_h$.

98 In the display in Lemma 98.2 replace $\succeq_i$ with $\succeq_i|_h$.

99, 4 Replace $\Gamma(h^*)$ with $\Gamma(h', h^*)$ on this line and on lines 6, 8, and 10.

99, 5 Replace $s^*_i|h'$ with $s^*_i|h'$.

100, 7–8 Delete “(a result first proved by Zermelo (1913))”.

100, 9 The official version of chess is not finite, because a player has he option of declaring a draw once a position is repeated three times. Our argument applies to the version of chess in which a draw is automatic in this case.

107 Replace the first clause of the sentence starting on line 8 with “Player $P(C(t))$ prefers $S(t+3)$ to $S(t+1)$ to $S(t+2)$ for $t \leq T-3$”.

108 On the fifth line of Exercise 108.1 insert “strategic form of the” before “modification”.

108, –2 Delete “only”.

109, –5 Replace “equilibria” with “equilibrium”.

114, –2 Replace “Kuhn (1953)” with “Kuhn (1950, 1953)”.

115, 2 Replace “Kuhn (1953)” with “Kuhn (1950, 1953)”.

122 Add to A3 the requirement that the Pareto frontier of $X$ be connected.
Replace the second sentence of the proof of Step 1 with “By A3 and the continuity of the preference relations, the domain of $\phi$ is an interval and $\phi$ is continuous, one-to-one, and decreasing.”

After “histories” add “in which no agreement is reached”.

Change the parenthetical clause to read “(in which he makes the same proposal whenever he is the proposer, uses the same rule to accept proposals whenever he is the first responder, and uses the same rule to accept proposals whenever he is the second responder)”.

Replace the first point of the itemization in Definition 137.1 by

\[ H = \{\emptyset\} \cup \bigcup_{t=1}^{\infty} A_t \bigcup A^\infty \] (where $\emptyset$ is the initial history and $A^\infty$ is the set of infinite sequences $(a^t)_{t=1}^{\infty}$ of action profiles in $G$) and in the third point replace “the set $A^\infty$ of infinite sequences $(a^t)_{t=0}^{\infty}$ of action profiles in $G$” by “$A^\infty$”. Remove the period at the end of the display in the third point.

Change the summation to $\sum_{t=1}^{\infty} \delta^{t-1} v_i^t$.

Remove $\lim_{T \to \infty}$.

Replace “A payoff profile $w$ in $G$” with “A profile $w$”.

The statement of Proposition 145.2 is correct, but is improved by changing the second sentence to read: “For all $\epsilon > 0$ there exists $\delta < 1$ such that for all $\delta > \tilde{\delta}$ there exists a payoff profile $w'$ of $G$ for which $|w' - w| < \epsilon$ and $w'$ is a Nash equilibrium payoff profile of the $\delta$-discounted infinitely repeated game of $G$.”

Change “it” to “if”.

Replace the sentence starting “Consider” and the following sentence with “Consider a strategy $\hat{s}_i$ of player $i$ that differs from $s_i$ only in that after the history $(a^1, \ldots, a^{t-1})$ it chooses $a_i$, and after any longer history $h$ it chooses an action that, given the profile $s_{-i}(h)$ of actions planned by the other players after the history $h$, yields at least $i$’s minmax payoff. The outcome of $(s_{-i}, \hat{s}_i)$ is a terminal history $\hat{a}$ that is identical to $a$ through period $t - 1$; $u_i(\hat{a}^t) > u_i(a^t)$ and $u_i(\hat{a}^r) \geq u_i(a^r)$ for $r \geq t + 1$.”

The sketch of the proof of Proposition 160.1 is flawed. It has been replaced. (The text has been rewritten, moving the result to page 159, where it appears as Proposition 159.1.)

Change $\ell \leq t^*$ to $\ell < t^*$.

After the colon modify the text to read: “for example, if $\gamma = 2$, $|N| = 2$, and $\theta_i = 1$ for both players then the associated game has also, in addition to $(1,1)$, inefficient equilibria (e.g. $(0,0)$)”.

3
201 Replace the paragraph starting on line –2 with: “Note that Definition 200.1 extends our definition of an extensive game with perfect information and chance moves (see Section 6.3.1) in the sense that the extensive game with perfect information and chance moves \( \langle N, H, P, f_c, (I_i)_{i \in N}, (\equiv_i)_{i \in N} \rangle \) may naturally be identified with the extensive game \( \langle N, H, P, f_c, (I_i)_{i \in N}, (\equiv_i)_{i \in N} \rangle \) in which every member of the information partition of every player is a singleton.”

209, –7 Replace \( \ell \) with \( r \).

212 In Figure 212.1 replace –2, 2 with 2, –2 at the right-hand side of the top and middle games and replace –1, 1 with 1, –1 in the bottom game.

216, –6 Replace the mathematical expression with \( p^2 \cdot 0 + p \cdot (1 - p) \cdot 1 + (1 - p) \cdot 0 = p(1 - p) \).

217, –2 Replace “Kuhn (1953)” with “Kuhn (1950, 1953)”.

218, 3 Replace “Kuhn (1953)” with “Kuhn (1950, 1953)”.

221, –2 \( L \) at the end of the line should be \( R \).

226, 1 Replace from the start of the line to the end of the sentence with “equilibrium since the associated assessment violates sequential rationality at player 2’s (singleton) information set.”

226, 5 Replace \( \beta^2_2(C)(c) = 1 - 2\epsilon \) with \( \beta^2_2(C)(d) = 2\epsilon/(1 - \epsilon) \).

229 In the fifth line of Exercise 229.1, replace “two” with “three”.

229 In the sixth line of Exercise 229.1, replace “S” with “s”.

236, 7 Replace the sentence starting “The following example …” with: “The following example shows, however, that there are games in which no perfect Bayesian equilibrium satisfies the requirement: in all perfect Bayesian equilibria of the game we describe, a player who at some point assigns probability zero to some history later assigns positive probability to this history.”

236, –8 Replace line with “player 2 chooses \( X \) with probability at least \( \frac{4}{5} \) at his information set \( I^2 \) (otherwise”

237 After “0.” on line 9 of Exercise 237.1, add “Take the set of possible offers to be finite, including 2 and 5.”

238, –12 Replace “Thus” at the end of the line and the following two lines with “Since \( \theta^H_1 > \theta^L_1 \), a separating equilibrium always exists; the messages \( \epsilon^L = 0 \) and”

241, –8 Delete “if”.

252 At the end of Example 252.1 the perturbed strategy of player 3 should be \( \sigma^*_3(R) = \sigma_3(R) \) if \( \sigma_3(R) < 1 \), and \( \sigma^*_3(R) = 1 - \epsilon \) if \( \sigma_3(R) = 1 \).

260 After “for all coalitions \( S \) and \( T \)” on the last line add “, where \( v(\varnothing) = 0 \).”

261 In Exercise 261.1b, insert “nonnegative” before “feasible payoff profiles”.
On line 12, insert “for all \( S \in C \)” before “by the left-hand inequality”, and replace the last sentence of this paragraph with “Thus \( x(N) = v(N) \), so that the payoff profile \( x \) is in the core.”

Replace the sentence starting “A standard result” with “A standard result in economic theory is that an exchange economy in which every agent’s preference relation is increasing has a competitive equilibrium (see, for example, Arrow and Hahn (1971, Theorem 5 on p. 119)\(^1\)).” and replace the last sentence of the footnote with “Note that every agent is resource related (in the sense of Arrow and Hahn) to every other agent if every agent’s preference relation is increasing.”

Add, between lines 7 and 8, the following paragraph. “Now, for every agent \( i \) we have \( x_i - \omega_i + \epsilon \in Q \) for every \( \epsilon > 0 \), so that \( p(x_i - \omega_i + \epsilon) \geq 0 \). Taking \( \epsilon \) small, we conclude that \( px_i \geq p\omega_i \) for all \( i \). But \( x \) is an allocation, so \( px_i = p\omega_i \) for all \( i \).”

Replace “Shubik (1969)” with “Shubik (1969a)”.


Replace “member” with “members”.

Replace \( \geq \) at end of line with \( \leq \).

Replace the last sentence with the following two sentences. “Consider a zerosum homogeneous weighted majority game \( \langle N, v \rangle \) in which \( w_i = 0 \) for every player \( i \) who does not belong to any minimal winning coalition. Show that the nucleolus of \( \langle N, v \rangle \) consists of the imputation \( x \) defined by \( x_i = w_i/w(N) \) for all \( i \in N \).”

Delete the suggested steps in Exercise 312.2. (The problem is easier to solve without the steps.)

Replace “Recherche” with “Recherche” on line −10.

Replace “[85]” with “[84]”.

Replace “[115]” with “[114]”.


Delete reference to Zermelo (1913).

Entry for “Dominant action” should be Exercise 18.3.

**Additional References**

The modifications on pages 114, 115, 217, and 218 require the following additional reference.

The modification on page 275 requires the following additional reference.


**Updates**

Aumann and Brandenburger (1991) is now


Battigalli (1993) is now


Geanakoplos (1993) is now


Glazer and Perry (1992) is now


Hart and Mas-Colell (1992) is now


Hendon, Jacobsen, and Sloth (1993) is now


Kohlberg and Reny (1993) is now

Krishna and Serrano (1993) is now


Mertens (1992) is now


Rubinstein (1992) is now


Shaked (1987) is now
