Typos and Corrections for

Wakker (2010) "Prospect Theory: for Risk and Ambiguity"

August. 2023

1. Typos/corrections

P. 30 [Book instead of Dutch book]. In Exercise 1.6.7, and other places in the book, sometimes the term book is used instead of the term Dutch book. □

P. 57, top [Definition of SG method]:

> The ~~SG method~~ directly relates utility to decisions, in a very simple manner.
> above method for measuring utility, the *SG method*

□

P. 76: contrary to what the last sentence of Assignment 3.3.5a suggests, for two-outcome prospects risk aversion does not always imply aversion to higher variance. It remains as an assignment for students to show this claim by an example. The solution, only available to teachers, gives such an example. □

P. 88, top [Removing circle and two lines in right part of Figure 3.7.3]:

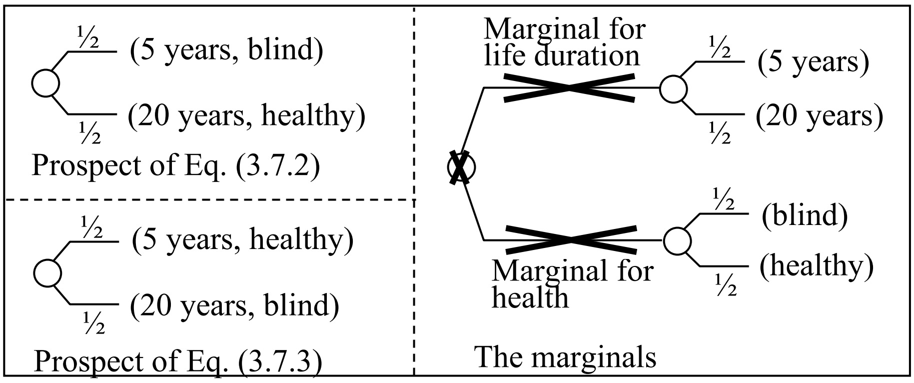


Figure 3.7.3 Two prospects with the same marginals.

□

P. 88, last para:

Before reading the following text, you are invited to determine your preference between the ~~chronic health states~~ prospects in Eqs. (3.7.2) and (3.7.3). For chronic health states

□

P. 105, Exercise 4.3.3: it is assumed that the subjective probabilities used in SEU in Figure 4.1.3 are the objective probabilities 0.5. □

P. 108, §4.5: $\alpha \ominus \beta$ is formally called a *tradeoff*. If we want to specify α and β, we say "the tradeoff of getting α instead of β," or, more tractably, "(getting) α instead of β," or, even shorter: alpha-beta. □

P. 117, Exercise 4.8.4: the assumptions of Theorem 4.6.4 not only concern the Structural Assumption 1.2.1, but also everything else in the theorem. In other words, the two statements (i) and (ii) are also assumed to hold. □

P. 120, Eq. (4.9.2): the existence of q_1 and q_2 is part of the definition of additivity. □

P. 132, Table 4.11.1: mistakes in statistics of PE^1 and PE^2

TABLE 4.11.1. *Descriptive statistics*

Variable	*Mean*	*Standard Dev.*	*Min*	*Max*	*Label*
α^0	10	0.0	10	10	starting value
α^1	21.4	4.9	17	28	1st value of 1st TO measurement (Fig 4.1.1a)
α^2	40.2	10.4	27	50	2nd value of 1st TO measurement (Fig 4.1.1b)
α^3	61.9	19.4	42.5	85	3rd value of 1st TO measurement (Fig 4.1.1c)
α^4	88.9	36.4	60	140	4th value of 1st TO measurement (Fig 4.1.1d)
β^2	40.1	13.0	27	56	2nd value of 2nd TO measurement (Fig 4.1.2b)
β^3	65.6	28.6	40	105	3rd value of 2nd TO measurement (Fig 4.1.2c)
β^4	93.4	48.8	52	160	4th value of 2nd TO measurement (Fig 4.1.2d)
γ^1	18.5	4.1	13.5	25	1st value of CE measurement (Fig 4.1.3b)
γ^2	32.4	9.0	20	45	2nd value of CE measurement (Fig 4.1.3a)
γ^3	51.6	18.3	30	75	3rd value of CE measurement (Fig 4.1.3c)
δ^0	22.0	10.7	13	40	1st value of reversed TO measurement (Fig 4.1.4d)
δ^1	32.0	11.4	22	50	2nd value of reversed TO measurement (Fig 4.1.4c)
δ^2	46.4	15.9	32	70	3rd value of reversed TO measurement (Fig 4.1.4b)
δ^3	64.4	24.4	45	100	4th value of reversed TO measurement (Fig 4.1.4a)
PE^1	~~0.40~~ 0.36	~~0.15~~ 0.16	0.25	0.63	1st value of probability equivalent (Fig. 4.1.5a)
PE^2	~~0.67~~ 0.64	~~0.17~~ 0.13	0.50	~~0.90~~ 0.75	2nd value of probability equivalent (Fig. 4.1.5b)
PE^3	0.84	0.07	0.75	0.90	3rd value of probability equivalent (Fig. 4.1.5c)

□

P. 132, Footnote 19 **{new in 26 Nov. 2016}**: Figure 4.1.4 iso 4.1.2.

P. 154, Eq. (5.3.3):

The more general formula

$$\sum_{j=1}^{n} w(p_j)U(x_j), \qquad (5.3.3)$$

allowing nonlinear utility, is similarly unsound. As soon as w is not the identity function, there are cases where increasing the utility of outcomes leads to a lower

(deceasing) a discontinuity and (higher)

□

P. 158 ℓ. 7:

important (Clark, Frijters, & Shields 2008; Easterlin 1995; van Praag & Ferrer-i-

P. 159, footnote 6:

w(1/6) 0.408,

=

P. 166, Step 4:

STEP 3. For all ranks, calculate their w value.

STEP 4. For each outcome α, calculate the marginal w contribution of its outcome probability p to its rank; i.e., calculate w(p + r) − w(r). Note that ~~w(~~p + r~~)~~ is the rank of the outcome in the prospect next-worse to α.

□

P. 173 Figure 6.3.2(b): $w(p) = \sqrt{p}$ (iso $w(p) = \sqrt{x}$)

P. 176 [Last line]

$$\pi(0.07^{0.06})(U(25K) - U(0)) \cancel{>} \pi(0.06^{b})(U(75K) - U(25K)) .$$

<

□

P. 179 [Prelec's weighting family of Eq. (6.4.1) and definition of compound invariance]; a and b should be positive. See also the correction concerning p. 207. □

P. 182:

EXERCISE 6.5.1.[!a] Make Assumption 4.10.1 (50-50). Show that not only under EU, but also under RDU, the β's in Figure ~~4.3.2~~ (4.1.2) are equally spaced in utility units and

□

P. 182: Exercise 6.5.2 is better done only after Exercise 6.5.6 (p. 188). □

P. 195 top:

p_{i+1}

Cancelling the terms $w(p_i + \cdots + p_1) - w(p_{i-1} + \cdots + p_1)$, we obtain $w(\cancel{p_{1+1}} + \cdots + p_1) - w(p_{i-1} + \cdots + p_1)$, which is exactly the decision weight of $U(x_i)$ with the two

□

Pp. 200-201 [τ's should be t's]. All τ's in Figures 6.9.1 and 6.9.2 should be t's, the symbol used in the text. The text one time, erroneously, with the last symbol preceding Eq. 6.9.2, writes τ which should be t:

outcome α with utility exceeding $\cancel{\tau}$.

t

$$\mathrm{RDU}(x) = \int_{\mathbb{R}^+} w\big(x(U(\alpha)>t)\big)\,dt - \int_{\mathbb{R}^-} [1 - w\big(x(U(\alpha)>t)\big)]\,dt. \qquad (6.9.2)$$

P. 207 [Prelec's weighting family of Eq. (6.4.1) on 179, and definition of compound invariance]; a and b should be positive:

d) Calculate the RDU value of the prospect in (c) and its certainty-equivalent. □

Prelec (1998) proposed the compound invariance family $\left(exp(-(-ln(\mathrm{p}))^{\mathrm{a}})\right)^{\mathrm{b}}$ (Eq. (6.4.1)) with a and b as parameters (Figure 7.2.2). Ongoing empirical research suggests that

>0 >0

□

P. 207:

In the definition of Prelec's compound invariance preference condition in Eq. (7.2.3):

$$[\gamma_p 0 \sim \beta_q 0,\ \gamma_r 0 \sim \beta_s 0, \text{ and } \gamma'_{p^m} 0 \sim \beta'_{q^m} 0] \Rightarrow \gamma'_{r^m} 0 \sim \beta'_{s^m} 0 \qquad (7.2.3)$$

all probabilities p, q, r, s and all outcomes γ, β, γ′, β′ should be positive.
Otherwise: the case of $\beta' > 0$, $s > 0$, and all other outcomes and probabilities 0, gives a violation of the condition. The same correction should be added to Prelec's (1998) definition of compound invariance (see his Definition 1 on p. 503). □

P. 208 [Parameters for Chinese students]. Five lines below Eq. 7.2.4:
insensitive (a ~~bigger~~ smaller) and more optimistic (b ~~smaller~~ larger). Diecidue, Schmidt, & Zank

□

P. 224 [Figure 7.7.1′]. $\pi(p_b)$ should be $\pi(p^b)$, to the left at the bottom of the figure. □

P. 228 top:

Gonzalez & Wu

formal definitions of likelihood insensitivity were given by Tversky & Wakker (1995). They were tested by Tversky & Fox (1995) and ~~Wu & Gonzalez~~ (1999 p. 155), under the name of bounded subadditivity. Tversky & Wakker (1995) and

□

Pp. 230-231 [Distance in §7.10]. The distance to determine best fits is the distance measure described in Appendix A (and used throughout the book). □

P. 245 middle of 2nd para:

large

at every level of wealth for p such that w(p) = ½. However, this p is ~~small~~, which

P. 256 [$\theta > 0$ implicitly in power utility α^θ]. Example 9.3.1: here, and in several other places in the book, for power utility α^θ (for $\alpha > 0$) we must have $\theta > 0$ because the function is increasing (and well defined at $\alpha = 0$). Similarly, $\theta' > 0$. □

P. 257 [Typo in 1st para of Example 9.3.2].

$w^+(p) = w^-(p) = p$ for all p. Thus, rank dependence plays no role. Assume i~~ntrinsi~~c

basic

□

P. 259 [last part of first para following Exercise 9.3.7].

loss averse than $\succcurlyeq_1$ so that $\lambda_2 > \lambda_1$, then $PT_2(y) = PT_1(y)$ (PT_i denotes the relevant PT functional), but $PT_2(x) < PT_1(x)$ $\big(= PT_1(y) = PT_2(y)\big)$. Hence, $x \prec_2 y$. The certainty equivalent for the pure gain prospect ~~x~~ is the same for both decision makers, but for the mixed prospect it is smaller for the more loss averse decision maker. This is the basic idea of Köbberling & Wakker (2005). y

□

P. 265 [Typo preceding Exercise 9.5.1].

basic

is in Huber, Ariely, & Fischer (2001), with an interesting separation of ~~intrinsic~~ utility and loss aversion.

The following exercise illustrates the extremity orientedness of PT, mostly driven by likelihood insensitivity.

□

P. 264 [bottom]. The four-fold pattern concerns prospects with ony one nonezero outcome. □

P. 283 ℓ. -7: uncertainty

To distinguish a rank R for decision under ~~risk~~ from (probability-)ranks, R can be called *event-rank*. No confusion will, however, arise from the concise term rank. □

P. 311 [ℓ. 1].

A maximal comonotonic set~~s~~ results if we specify a complete ranking of the entire state space and take the set of all prospects compatible with this ranking.

□

P. 321 [Add brackets 3 lines below Eq. 11.2.4].

$$1_{B_a}0 \sim 1_{R_a}0. \tag{11.2.4}$$

Then $W(B_a) = W(R_a)$. We define $P(B_a) = P(R_a) = ½$ and then define the source function w_a such that $w_a(½) = W(B_a) = W(R_a)$. If we restrict attention to the unknown urn then, indeed, RDU with probabilistic sophistication does hold and $W(\cdot) = w_aP(\cdot)$.

( )

□

P. 330 [Lines following Table 11.7.1].

The first four CEs concern decision under risk. Eqs. (11.7.1) and (11.7.2) (with $w(p) = p$) best fit the data for θ = ~~75~~ and $W(B_a) = 0.38$, with distance[10] \$2.25. The

0.75

□

P. 331 [Subscript a in Table 11.7.2].

TABLE 11.7.2. Optimal Fits of RDU for Data in Table 11.7.1 under Various Restrictions for Eqs. 11.7.1 and 11.7.2

Restrictions Assumed	θ (for U)	w(0.5)	$W(\underset{B_a}{\cancel{B^a}})$	distance from data	ambiguity aversion
EU for Risk (α-maxmin)	**0.75**	0.50*	**0.38**	2.25	0.12
RDU for risk with $U(\alpha) = \alpha$	1*	**0.41**	**0.31**	0.81	0.10
RDU in general	**0.95**	**0.42**	**0.32**	0.57	0.10

Note: * assumed; bold print: fitted

□

Pp. 334-335 [Distance in §11.8]. The distance to determine best fits is the distance measure described in Appendix A (and used throughout the book). □

P. 343 [Typos in lowest displayed formula].

$$\begin{aligned}\sum_{j=1}^{n}\pi_j U(x_j) &= \sum_{i=1}^{k}\pi(E_i{}^{E_{i-1}\cup\cdots\cup E_1})U(x_i) + \sum_{j=k+1}^{n}\pi(E_{j_{E_{j+1}\cup\cdots\cup E_n}})U(x_j) \\ &= \sum_{i=1}^{k}\big(W^+(E_i\cup\cdots\cup E_1) - W^+(E_{i-1}\cup\cdots\cup E_1)\big)U(x_i) \\ &\quad + \underset{\sum_{j=k+1}^{n}}{\cancel{\sum_{j=1}^{k}}}\big(W^-(E_j\cup\cdots\cup E_n) - \underset{W^-}{\cancel{W^+}}(E_{j+1}\cup\cdots\cup E_n)\big)U(x_j),\end{aligned}$$

□

P. 347 [Typo in unnumbered formula and below].

E^c

$$W^+(E)\big(u(\mu)-u(2)\big) = (1-W^+(E))\big(u(1)-u(0)\big)$$
$$W^+(E)\big(u(\mu)-u(2)\big) = W^-(\cancel{E})\lambda\big(u(0)-u(-\alpha)\big)\ .$$

With the pragmatic assumptions that $1-W^+(E) = W^-(\cancel{E})$ and that u is linear near zero, we get

□

P. 348 [Typo in last displayed formula].

$[\alpha_{E^G}x \succcurlyeq \alpha_{E^G}y \Leftrightarrow \gamma_{E_L}x \succcurlyeq \gamma_{E_L}y]$ for all gains $\alpha > 0$ and losses $\cancel{\beta} < 0$ whenever E has the same gain-rank in all four prospects.

γ

□

P. 354 ℓ. 10 [Two typos in names]

ambiguity seeking (Abdellaoui, Vossman, & Web~~b~~er 2005; Chakravarty & Roy 2009;

n

□

P. 391 [Typo in last line]

$$x_1 - \sum_{j=2}^{n} a \times \max(x_j - x_1, 0) \cancel{+} \sum_{j=2}^{n} b \times \min(x_j - x_1, 0) \text{ with } a > 0 \text{ and } b > 0.$$

$+$

□

P. 400 [Elaboration of Exercise 1.2.2] End of part (a): the claim that part (a) $([x \succ y \Leftrightarrow V(x) > V(y)])$ would imply that V is representing is not correct. It is correct if $\succcurlyeq$ is complete (so if it is a weak order).

COUNTEREXAMPLE. To see the incorrectness of the claim, start from a weak order represented by V with nontrivial indifferences, so, $x \sim y$ for some $x \neq y$. In the indifference class of x and y, change all indifferences into incompletenesses. So. whenever $v \sim w \sim y$ we remove $v \succcurlyeq w$ and $w \succcurlyeq v$ to get v and w incomparable. (a) still holds (and also transitivity), but V is obviously not representing.

□

P. 403 [Elaboration of Exercise 1.5.3b] End of part (a): the claim in the first line that $x \prec y$ implies $CE(x) < CE(y)$ can be shown as follows, where we cannot use monotonicity: $CE(x) > CE(y)$ cannot be because, by Part (a), it would imply $x \succ y$. $CE(x) = CE(y)$ cannot be either because, by transitivity, from $x \sim CE(x) = CE(y) \sim y$ the contradictory $x \sim y$ would follow. □

P. 406 [Elaboration of Exercise 2.1.2b].

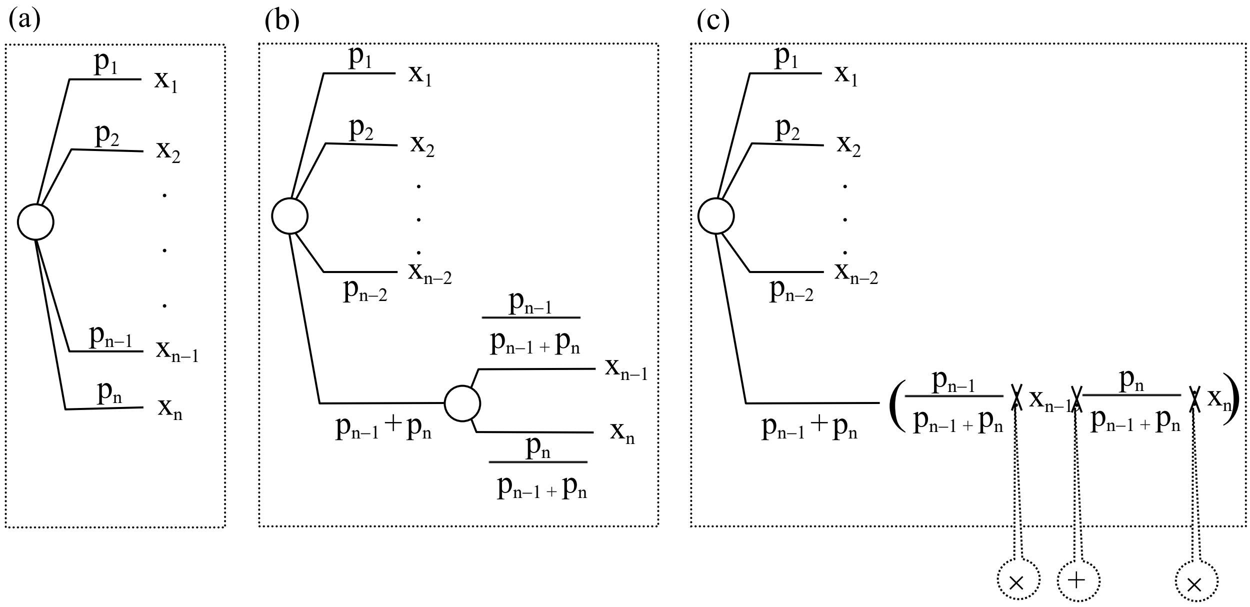
b) $[0,\frac{1}{4})\cancel{8}[\frac{1}{4},1)\cancel{2}$ and $[0,\frac{3}{4})\cancel{2}[\frac{3}{4},1)\cancel{8}$ are two examples. $[0,\frac{3}{8})\cancel{2}[\frac{3}{8},\frac{5}{8})\cancel{8}[\frac{5}{8},1)\cancel{2}$ is yet another example.

2 8 8 2 8 2 8

□

P. 408 [Fig. c in elaboration of Exercise 3.2.1].

EXERCISE 3.2.1. We only treat the case of concavity and risk aversion, the other cases being similar.



□

P. 416 [ℓ. 1].

CE($300_{2/3}250$) = 281.62 and CE($285_{2/3}276$) = 281.95, so that the safer ($28\cancel{6}_{2/3}27\cancel{3}$) is just preferred.
5 6

□

P. 422 [ℓ. 6].

EXERCISE 4.10.1. Under EU with utility U, α^i should satisfy

$$½ \times U(\alpha^i) + ½ \times U(1) = ½ \times U(\alpha^{i-1}) + ½ \times U(8)$$

so that

$\cancel{U}(\alpha^i\cancel{)} = U^{-1}\big(2(½ \times U(\alpha^{i-1}) + ½ \times U(8) - ½ \times U(1))\big)$. Previous exercises have shown that the β's, γ's, and δ's are equal to the α's, and that the PE^j's are j/4. Hence, we only calculate the α's.

□

P. 425 last line.

Figs. 2.4.1g and h violate the ~~owe~~-thing principle for risk.
sure

□

P. 426 ℓ. −6 ff.;

(a) Take utility linear. We take w(0.8) very small (say 0.01), so that the risky prospect in Figure 2.~~2~~.1e is evaluated much lower than the riskless prospect there (20 times lower). If w(0.04) and w(0.05) are similar (say you take w linear between 0 and 0.8), then the bigger prize will decide and the upper prospect in Figure ~~2.2.1~~g will have a much higher value than the lower one (four times higher). Then the commonly found preferences are accommodated. □

P. 426 ℓ. −2.

Figure 2.2.1g

□

P. 446 [Exercise 10.4.6].

Exercise 10.4.6. We want to use Eq. (10.4.5) to obtain $\pi(E_2^b) \geq \pi(E_2^A)$, which gives the weakened implication of Case 1. Equation (10.4.5) can only be used if $E_3^c =$ $E_2 \cup A \preccurlyeq W_{rb}$. We similarly want to use Eq. (10.4.6) to obtain $\pi(E_3^w) \geq \pi(\cancel{E_3E2})$ $E_3^{E_2}$, which gives the weakened implication of Case 3. Equation (10.4.6) can only be used if $E_2 \succcurlyeq B_{rb}$. □

□

P. 451 [Exercise 11.8.1].

a_k and b_k have been rounded. More precisely, $a_k = 0.725$ and $b_k = 0.975$. The values of a_a and b_a are incorrect. It should be $a_a = 0.50$ and $b_a = 0.15$. The optimism index for risk is exactly 0.46, and the likelihood sensitivity index for risk is 0.725. The optimism index for ambiguity is 0.40, as written. The likelihood sensitivity index for ambiguity is 0.50. The index of ambiguity aversion is 0.06 as written. The index of likelihood insensitivity due to ambiguity is $0.725 - 0.50 = 0.225$. □

P. 467 [Chew Soo Hong,, King King, et al. (2008) reference corrected].

The reference should be (with editor, book, and publisher corrected):

Chew, Soo Hong, King King Li, Robin Chark, & Songfa Zhong (2008) "Source Preference and Ambiguity Aversion: Models and Evidence from Behavioral and Neuroimaging Experiments." *In* Daniel Houser & Kevin McGabe (eds.) *Neuroeconomics. Advances in Health Economics and Health Services Research* 20, 179–201, JAI Press, Bingley, UK.

□

P. 484 [Rapoport (1984) reference corrected].

Amnon

Rapoport, ~~Anatol~~ (1984) "Effects of Wealth on Portfolios under Various Investment Conditions," *Acta Psychologica* 55, 31–51.

□

2. Minor typos and corrections (not worth your time)

P. 15 & 399. Exercise 1.1.1 and its elaboration: no hyphen in no-one. □

P. 120 ℓ. -2. cross-check with hyphen. □

P. 262 [Title § 9.4.2; also in contents on p. ix].

9.4.2 Measuring utility, ~~event~~ weighting, and loss aversion
probability

□

P. 312 [Middle of penultimate para].

Denneberg 1994 Ch. 4; Dhaene *et al.* 2002). We next discuss relations between ranks uand comonotonicity, first verbally and then formalized. We also discuss in more detail the construction of a probability measure for a comoncone such that RDU on that comoncone coincides with EU for that probability measure. For a comonotic set of
on

□

P. 372. Add hyphen to quasiconvexity. □

P. 406 Exercise 2.1.2(b): Interchange the outcomes 2 and 8 throughout. □

P. 470.

1

Di Mauro, Camela & Anna Maffioletti (200~~2~~) "The Valuation of Insurance under Uncertainty: Does Information Matter?," *Geneva Papers on Risk and Insurance Theory* 26, 195–224.

about Probability

☐

P. 461:.

Abdellaoui, Mohammed (2000) "Parameter-Free Elicitation of Utilitie~~s~~ and Probability Weighting Functions," *Management Science* 46, 1497–1512.

P

☐

P. 470.

Easterlin~~g~~, Richard A. (1995) "Will Raising the Incomes of All Increase the Happiness of All?," *Journal of Economic Behavior and Organization* 27, 35–48.

☐

P. 470.

Epstein, Larry G. & Jian~~g~~kang Zhang (2001) "Subjective Probabilities on Subjectively Unambiguous Events," *Econometrica* 69, 265–306.

☐

P. 482:.

s

Nakamura, Yutaka (1992) "Multi-~~S~~ymmetric Structures and Non-Expected Utility," *Journal of Mathematical Psychology* 36, 375–395.

☐

P. 483:.

Offerman, Theo, Joep Sonnemans, Gijs van de Kuilen, & Peter P. Wakker (2009) "A Truth-Serum for Non-Bayesians: Correcting Proper Scoring Rules for Risk Attitudes," *Review of Economic Studies* 76, 1461–1489.

space iso hyphen

☐

P. 487:.

Seo, Kyoungwon (2009) "Ambiguity and Second-Order Belief~~s~~," *Econometrica* 77, 1575–1605.

☐

P. 491:.

Winkler, Robert L. (1991) "Ambiguity, Probability, and Decision Analysis," *Journal of Risk and Uncertainty* 4, 285–297.

Preference,

☐

P. 493 2nd column:.

Easterlin~~g~~, Richard A. 158, 468, 470

☐

P. 499 2nd column middle:

Wu, George, ~~Richard~~ 134, 204, 209, 215, 217, 228, 230, 275, 292, 298, 351, 352, 360, 474, 491

☐