Solutions to Extra Exercises for

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

July, 2016

EXERCISE 1.6.14. The combination of the two prospects gives 6 for sure. Because CE is additive, 6 must be the sum of the CEs. So the CE of each is 3. □

EXERCISE 1.6.15. What John does is the principle of trade. It is no arbitrage because he did not combine preferences of one person, but of two different persons. If one could consider the pair {Peter,Paul} as one decision unit and they could easily have traded with each other, then it could have been argued that John had arbitraged this decision unit. But such is not the case. □

EXERCISE 2.6.7.

a. The indifference implies U(30) = 0.40U(100) + 0.60U(0) = 0.40.

b. The indifference implies (immediately crossing out a common term)

$$\tfrac{1}{2} \times U(30) + \cancel{\tfrac{1}{2} \times U(0)} = \tfrac{1}{2} \times 0.40 \times U(100) + \tfrac{1}{2} \times 0.60 \times U(0) + \cancel{\tfrac{1}{2} \times U(0)},$$

so,

$$\tfrac{1}{2} \times U(30) = \tfrac{1}{2} \times \big(0.40 \times U(100)\big) = \tfrac{1}{2} \times 0.40$$

so,

$$U(30) = 0.40.$$

c. The indifference implies U(70) = 0.80U(100) + 0.20U(0) = 0.80.

d. The indifference implies (immediately crossing out a common term)

$$\tfrac{1}{2} \times U(70) + \cancel{\tfrac{1}{2} \times U(0)} = \tfrac{1}{2} \times 0.80 \times U(100) + \tfrac{1}{2} \times 0.20 \times U(0) + \cancel{\tfrac{1}{2} \times U(0)},$$

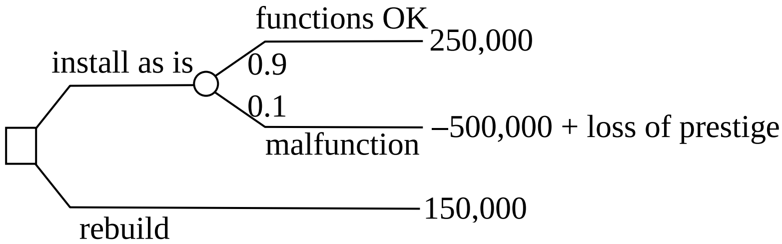
so,

$$\tfrac{1}{2} \times U(70) = \tfrac{1}{2} \times \big(0.80 \times U(100)\big) = \tfrac{1}{2} \times 0.80$$

so,

U(70) = 0.80. □

EXERCISE 3.3.8.



First I give a general analysis, and then a simplified.

EU(install as is) = 0.9U(250,000) + 0.1U(–500,000 + loss prestige).

EU(rebuild) = U(150,000).

EU difference is 0.9(U(250,000)–U(150,000)) + 0.1(U(–500,000 + loss prestige) –U(150,000)).

Exceeds 0, meaning that install as is is preferable, iff

$$\frac{U(250{,}000) - U(150{,}000)}{U(150{,}000) - U(-500{,}000 + \text{loss prestige})} \geq 1/9.$$

So the threshold is if the loss is nine times worse than the gain.

A simplified analysis results if we set U(–500,000 + loss of prestige) = 0 and U(250,000) = 1. The only unknown now is U(150,000), which is between 0 and 1. Its threshold value is 9/10, the EU of the upper prospect (install as is). □

EXERCISE 3.3.9. This elaboration takes 25 pages and is presented in Appendix A. □

EXERCISE 4.12.2. To discuss the sure-thing principle, we have to consider events. Take any events E_1, E_2, E_3 with probabilities given, with $P(E_1) = .01$, $P(E_2) = .89$, and $P(E_3) = .10$. The table shows event-contingent prospects.

	E_1	E_2	E_3
g^u	0	10×10^6	50×10^6
g^ℓ	10×10^6	10×10^6	10×10^6
h^u	0	0	50×10^6
h^ℓ	10×10^6	0	10×10^6

The prospect g^u corresponds to the Upper prospect in Fig. g, g^ℓ to the Lower prospect in that figure, and h^u and h^ℓ similarly correspond to the prospects in Fig. h. The sure-thing principle requires that a preference between two prospects be independent of common outcomes. Hence, the preference between g^u and g^ℓ should be independent of the outcome under event E_2, and the preference between h^u and h^ℓ should be similarly. If event E_2 is ignored, the g and h prospects become identical and the preference between them should be the same.

In the notation used in the definition of the sure-thing principle in §4.8.1, define $x = g^u$, $y = g^\ell$, $\alpha = 10 \times 10^6$, $\beta = 0$, $E = E_2$. Then the sure-thing principle requires that $[\alpha_E x \succcurlyeq \alpha_E y \iff \beta_E x \succcurlyeq \beta_E y]$. In other words, $[g^u \succcurlyeq g^\ell \iff h^u \succcurlyeq h^\ell]$. □

EXERCISE 9.2.1. PT(0.1: 9, 0.3: 1, 0.5: −1, 0.1: −4)

= $0.01 \times 3.74 + 0.15 \times 1 - 2.25 \times (0.46 \times 1 + 0.32 \times 3.03) = -3.00$.

PT(0.5: 3, 0.5: −2) = $\frac{1}{4} \times 1.93 - 0.71 \times 2.25 \times 1.74 = -2.29$.

Hence, (0.5: 3, 0.5: −2) is preferred. □

EXERCISE 9.3.12.

a) Exercise 3.1.1 found 0.9524 as the switching utility. The answer $p = 0.97$, under an EU-althrough analysis, implies U(artificial speech) = 0.97, exceeding the switching utility. Hence, surgery is chosen.

b) Now U(artificial speech) = $w^+(0.97) \times 1 + (1 - w^+(0.97)) \times 0 = w^+(0.97) = 0.84$.

c) Now the utility U(artificial speech) = 0.84 is below the switching utility 0.9524, and radiotherapy is recommended.

In this exercise it is crucial for the optimal decision what descriptive theory we assume. □

EXERCISE 9.5.3. The attitude described is part of intrinsic utility and not of loss aversion, and it is rational. Utility concerns final wealth, and need not be affected by changes in frame or perceived reference point. If we were to change the perceived reference point, there will be a kink of utility not at the newly perceived reference point, but at the final wealth level corresponding with what is the reference point right now. □

EXERCISE 10.3.4. Note that we can use the same rank-ordering for the act and the generated probability distribution. The result follows from substitution and is not elaborated on. □

EXERCISE 10.5.7. In the upper prospect in Fig. g, the rank of event E_2 (having probability 0.89) must be E_3. In the lower prospect in Fig. h, the rank of event E_2 (having probability 0.89) must be the worst (E_3^c). Hence, the rank of the common-outcome event cannot be the same in both choice situations, and the rank-sure-thing principle is not being tested here. □

EXERCISE 11.3.3^b.

(a) The optimism index is 0.

(b) There is ambiguity neutrality in the sense of aversion, and the optimism component gives no manifestation of ambiguity. Yet the sensitivity component can still do so. This even holds if probabilistic sophistication holds within $\mathcal{A}$, i.e. if there exists a subjective probability measure P on $\mathcal{A}$ and a source function $w_{\mathcal{A}}$ such that RDU with weighting function $W(A) = w_{\mathcal{A}}(P(\cdot))$ holds on $\mathcal{A}$. Assume for example that w for risk is the identity, which implies that expected utility holds for $\mathcal{R}$, and that $w_{\mathcal{A}}$ is a symmetric inverse-S weighting function, such as $\frac{p^a}{p^a + (1-p)^a}$.(Eq. 7.2.4) with a = 0.69. □

EXERCISE A3.1.

(a) $\theta = 0.495$, with distance 0.0056. CE$(0.36_{0.50}0)$ = 0.089. We have $0.36_{0.50}0 \prec 0.10$.

TABLE. Theoretical CEs for $\theta = 0.495$

$0.09_{0.50}0.25$	$0.64_{0.50}0$	$0.16_{0.50}0$	$0.36_{0.50}0$
0.1599	0.1578	0.0394	0.0887

(b) $\theta = 0.482$, and distance 0.0141. CE$(0.36_{0.50}0)$ = 0.085. We have $0.36_{0.50}0 \prec 0.10$.

TABLE. Theoretical CEs for $\theta = 0.495$

$0.09_{0.50}0.25$	$0.64_{0.50}0$	$0.16_{0.50}0$	$0.36_{0.50}0$
0.1596	0.1519	0.0380	0.0855

(c) For $\theta = 6.8$, the distance is 0.0139. It is smaller than the distance found in Part (b). CE$(0.36_{0.50}0)$ = 0.325. We have $0.36_{0.50}0 \succ 0.10$.

TABLE. Theoretical CEs for $\theta = 0.495$

$0.09_{0.50}0.25$	$0.64_{0.50}0$	$0.16_{0.50}0$	$0.36_{0.50}0$
0.2266	0.5780-	0.1406	0.3252

DISCUSSION. The value $\theta = 0.482$ found in part (b) is only a local optimum. $\theta = 6.8$ of part (c) fits the data better. Every θ larger than 6.8 fits the data even better, and the distance can be made arbitrarily small by taking θ sufficiently large. The reason is that for large θ all utility values become extremely small. For instance, $0.64^{6.8}$ = 0.048. Obviously, their differences and all distances then also are extremely small. These θ values imply extreme risk seeking, and their empirical predictions are completely off.

Similar anomalies do not occur for the distance measure used in this book and in Part a. The value $\theta = 0.495$ found there is a global optimum. For large values of θ the distance becomes larger. For $\theta = 6.8$ the distance is 0.26. □

Appendix A. Elaboration of Exercise 3.3.9

The details of this exercise will take 25 pages. Their end will be indicated by two rows of squares.

(a) Calculations for r = 1.21

ANALYSIS OF DRIL100%

EU(dril100%) =

$0.70 \times U(-68000.00) +$

$0.05 \times U(-20000.00) +$

$0.15 \times U(28000.00) +$

$0.05 \times U(412000.00) +$

$0.05 \times U(892000.00)$

=

$0.70 \times 882500.10 +$

$0.05 \times 1541244.20 +$

$0.15 \times 2254281.79 +$

$0.05 \times 9061100.38 +$

0.05×19125814.53

=

617750.07 +

77062.21 +

338142.27 +

453055.02 +

956290.73

=

2442300.29.

EU of drill100% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.10.

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

2442300.29$^{0.83}$ – 150000 =

40183.47.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times$ U(–34000.00) +

$0.05 \times$ U(–10000.00) +

$0.15 \times$ U(14000.00) +

$0.05 \times$ U(206000.00) +

$0.05 \times$ U(446000.00)

=

0.70×1342746.93 +

0.05×1685834.45 +

0.15×2041554.87 +

0.05×5215002.22 +

0.05×9728546.84

=

939922.85 +

84291.72 +

306233.23 +

260750.11 +

486427.34

=

2077625.25

EU of drill50% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.08.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

EU(dril50%)$^{1/r}$ – 150000 =

2077625.25$^{0.83}$ – 150000 =

16391.04.

ANALYSIS OF OVERR8

EU(overr8) =

0.70 × U(0.00) +

0.05 × U(6000.00) +

0.15 × U(12000.00) +

0.05 × U(60000.00) +

0.05 × U(120000.00)

=

0.70 × 1832611.57 +

0.05 × 1921678.65 +

0.15 × 2011468.18 +

0.05 × 2753501.69 +

0.05 × 3732073.21

=

1282828.10 +

96083.93 +

301720.23 +

137675.08 +

186603.66

=

2004911.00.

EU of override 8 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.08.

CE of override 1/8 =

U^{-1}(EU(overr8)) =

EU(overr8)$^{1/r}$ – 150000 =

2004911.00$^{0.83}$ – 150000 =

11563.43.

ANALYSIS OF OVERR16

EU(overr16) =

$0.70 \times$ U(10000.00) +

$0.05 \times$ U(13000.00) +

$0.15 \times$ U(16000.00) +

$0.05 \times$ U(40000.00) +

$0.05 \times$ U(70000.00)

=

0.70×1981459.40 +

0.05×2026501.83 +

0.15×2071718.70 +

0.05×2439449.64 +

0.05×2912939.36

=

1387021.58 +

101325.09 +

310757.81 +

121972.48 +

145646.97

=

2066723.93.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.08.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

EU(overr16)$^{1/r}$ – 150000 =

$2066723.93^{0.83} - 150000 =$

15669.17.

ANALYSIS OF NO DRILLING

EU of not drilling = 1832611.57

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.07

CE of Nodril = 0.

(b) Calculations for r = 0.961

ANALYSIS OF DRIL100%

EU(dril100%) =

$0.70 \times$ U(−68000.00) +

$0.05 \times$ U(−20000.00) +

$0.15 \times$ U(28000.00) +

$0.05 \times$ U(412000.00) +

$0.05 \times$ U(892000.00)

=

0.70×52744.25 +

0.05×82129.57 +

0.15×111084.54 +

0.05×335348.68 +

0.05×606975.10

=

36920.97 +

4106.48 +

16662.68 +

16767.43 +

30348.76

=

104806.32.

EU of drill100% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

104806.32$^{1.04}$ – 150000 =

17543.85.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times U(-34000.00)$ +

$0.05 \times U(-10000.00)$ +

$0.15 \times U(14000.00)$ +

$0.05 \times U(206000.00)$ +

$0.05 \times U(446000.00)$

=

0.70×73611.24 +

0.05×88191.97 +

0.15×102675.05 +

0.05×216243.69 +

0.05×354822.91

=

51527.87 +

4409.60 +

15401.26 +

10812.18 +

17741.15

=

99892.05.

EU of drill50% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

EU(dril50%)$^{1/r}$ – 150000 =

99892.05$^{1.04}$ – 150000 =

9376.96.

ANALYSIS OF OVERR8

EU(overr8) =

$0.70 \times$ U(0.00) +

$0.05 \times$ U(6000.00) +

$0.15 \times$ U(12000.00) +

$0.05 \times$ U(60000.00) +

$0.05 \times$ U(120000.00)

=

0.70×94237.49 +

0.05×97857.19 +

0.15×101471.46 +

0.05×130212.52 +

0.05×165783.22

=

65966.24 +

4892.86 +

15220.72 +

6510.63 +

8289.16

=

100879.61.

EU of override 8 if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of override 1/8 =

U^{-1}(EU(overr8)) =

EU(overr8)$^{1/r}$ − 150000 =

100879.61$^{1.04}$ − 150000 =

11016.87.

ANALYSIS OF OVERR16

EU(overr16) =

$0.70 \times$ U(10000.00) +

$0.05 \times$ U(13000.00) +

$0.15 \times$ U(16000.00) +

$0.05 \times$ U(40000.00) +

$0.05 \times$ U(70000.00)

=

0.70×100267.30 +

0.05×102073.33 +

0.15×103878.07 +

0.05×118272.07 +

0.05×136165.85

=

70187.11 +

5103.67 +

15581.71 +

5913.60 +

6808.29

=

103594.38.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

$EU(overr16)^{1/r} - 150000 =$

$103594.38^{1.04} - 150000 =$

15528.28.

ANALYSIS OF NO DRILLING

EU of not drilling = 94237.49.

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.11.

(c) Calculations for r = 0.936

ANALYSIS OF DRIL100%

EU(dril100%) =

$0.70 \times U(-68000.00)$ +

$0.05 \times U(-20000.00)$ +

$0.15 \times U(28000.00)$ +

$0.05 \times U(412000.00)$ +

$0.05 \times U(892000.00)$

=

0.70×39749.33 +

0.05×61185.85 +

0.15×82109.45 +

0.05×240853.63 +

0.05×429263.72

=

27824.53 +

3059.29 +

12316.42 +

12042.68 +

21463.19

=

76706.10.

EU of drill100% if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.13.

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

76706.10$^{1.07}$ – 150000 =

15514.25.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times$ U(–34000.00) +

$0.05 \times$ U(–10000.00) +

$0.15 \times$ U(14000.00) +

$0.05 \times$ U(206000.00) +

$0.05 \times$ U(446000.00)

=

0.70×54996.20 +

0.05×65580.67 +

0.15×76049.06 +

0.05×157093.13 +

0.05×254466.43

=

38497.34 +

3279.03 +

11407.36 +

7854.66 +

12723.32

=

73761.71.

EU of drill50% if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

$EU(dril50\%)^{1/r}$ – 150000 =

$73761.71^{1.07}$ – 150000 =

8735.52.

ANALYSIS OF OVERR8

EU(overr8) =

$0.70 \times U(0.00)$ +

$0.05 \times U(6000.00)$ +

$0.15 \times U(12000.00)$ +

$0.05 \times U(60000.00)$ +

$0.05 \times U(120000.00)$

=

0.70×69955.43 +

0.05×72571.25 +

0.15×75180.65 +

0.05×95851.14 +

0.05×121270.87

=

48968.80 +

3628.56 +

11277.10 +

4792.56 +

6063.54

=

74730.56.

EU of override 8 if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of override 1/8 =

U^{-1}(EU(overr8)) =

EU(overr8)$^{1/r}$ – 150000 =

74730.56$^{1.07}$ – 150000 =

10964.05.

ANALYSIS OF OVERR16

EU(overr16) =

$0.70 \times$ U(10000.00) +

$0.05 \times$ U(13000.00) +

$0.15 \times$ U(16000.00) +

$0.05 \times$ U(40000.00) +

$0.05 \times$ U(70000.00)

=

0.70×74311.55 +

0.05×75614.94 +

0.15×76916.79 +

0.05×87279.73 +

0.05×100116.95

=

52018.08 +

3780.75 +

11537.52 +

4363.99 +

5005.85

=

76706.18.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.13.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

EU(overr16)$^{1/r}$ – 150000 =

76706.18$^{1.07}$ – 150000 =

15514.43.

ANALYSIS OF NO DRILLING

EU of not drilling = 69955.43.

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.11.

(d) Calculations for r = 0.912

ANALYSIS OF DRIL100%

EU(dril100%) =

0.70 × U(–68000.00) +

0.05 × U(–20000.00) +

0.15 × U(28000.00) +

0.05 × U(412000.00) +

0.05 × U(892000.00)

=

0.70 × 30296.90 +

0.05 × 46122.87 +

0.15 × 61430.36 +

0.05 × 175290.96 +

0.05×307818.96

=

21207.83 +

2306.14 +

9214.55 +

8764.55 +

15390.95

=

56884.02.

EU of drill100% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.13

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

$56884.02^{1.10}$ – 150000 =

13608.24.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times U(-34000.00)$ +

$0.05 \times U(-10000.00)$ +

$0.15 \times U(14000.00)$ +

$0.05 \times U(206000.00)$ +

$0.05 \times U(446000.00)$

=

0.70×41570.54 +

0.05×49347.91 +

0.15×57008.23 +

0.05×115590.57 +

0.05×184937.33

=

29099.38 +

2467.40 +

8551.24 +

5779.53 +

9246.87

=

55144.41.

EU of drill50% if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.12.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

EU(dril50%)$^{1/r}$ − 150000 =

55144.41$^{1.10}$ − 150000 =

8130.18.

ANALYSIS OF OVERR8

EU(overr8) =

$0.70 \times$ U(0.00) +

$0.05 \times$ U(6000.00) +

$0.15 \times$ U(12000.00) +

$0.05 \times$ U(60000.00) +

$0.05 \times$ U(120000.00)

=

0.70×52552.72 +

0.05×54466.52 +

0.15×56373.85 +

0.05×71427.26 +

0.05×89826.35

=

36786.91 +

2723.33 +

8456.08 +

3571.36 +

4491.32

=

56028.99.

EU of override 8 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.13.

CE of override 1/8 =

U^{-1}(EU(overr8)) =

EU(overr8)$^{1/r}$ − 150000 =

56028.99$^{1.10}$ − 150000 =

10913.68.

ANALYSIS OF OVERR16

EU(overr16) =

0.70 × U(10000.00) +

0.05 × U(13000.00) +

0.15 × U(16000.00) +

0.05 × U(40000.00) +

0.05 × U(70000.00)

=

0.70 × 55738.78 +

0.05 × 56691.13 +

0.15 × 57641.94 +

0.05 × 65196.35 +

0.05 × 74522.86

=

39017.14 +

2834.56 +

8646.29 +

3259.82 +

3726.14

=

57483.95.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.13.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

EU(overr16)$^{1/r}$ – 150000 =

57483.95$^{1.10}$ – 150000 =

15501.18.

ANALYSIS OF NO DRILLING

EU of not drilling = 52552.72.

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.11.

(e) Calculations for r = 0.500

ANALYSIS OF DRIL100%

EU(dril100%) =

0.70 × U(–68000.00) +

0.05 × U(–20000.00) +

0.15 × U(28000.00) +

0.05 × U(412000.00) +

0.05 × U(892000.00)

=

0.70 × 286.36 +

0.05×360.56 +

0.15×421.90 +

0.05×749.67 +

0.05×1020.78

=

200.45 +

18.03 +

63.29 +

37.48 +

51.04

=

370.28.

EU of drill100% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.18.

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

$370.28^{2.00}$ – 150000 =

–12889.13.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times$ U(–34000.00) +

$0.05 \times$ U(–10000.00) +

$0.15 \times$ U(14000.00) +

$0.05 \times$ U(206000.00) +

$0.05 \times$ U(446000.00)

=

0.70×340.59 +

0.05×374.17 +

0.15×404.97 +

0.05×596.66 +

0.05×772.01

=

238.41 +

18.71 +

60.75 +

29.83 +

38.60

=

386.30

EU of drill50% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.20.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

EU(dril50%)$^{1/r}$ – 150000 =

$386.30^{2.00}$ – 150000 =

–773.51.

ANALYSIS OF OVERR8

EU(overr8) =

$0.70 \times$ U(0.00) +

$0.05 \times$ U(6000.00) +

$0.15 \times$ U(12000.00) +

$0.05 \times$ U(60000.00) +

$0.05 \times$ U(120000.00)

=

0.70×387.30 +

0.05×394.97 +

0.15×402.49 +

0.05×458.26 +

0.05×519.62

=

271.11 +

19.75 +

60.37 +

22.91 +

25.98

=

400.12.

EU of override 8 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.22.

CE of override 1/8 =

U^{-1}(EU(overr8)) =

EU(overr8)$^{1/r}$ − 150000 =

$400.12^{2.00}$ − 150000 =

10099.80.

ANALYSIS OF OVERR16

EU(overr16) =

$0.70 \times$ U(10000.00) +

$0.05 \times$ U(13000.00) +

$0.15 \times$ U(16000.00) +

$0.05 \times$ U(40000.00) +

$0.05 \times$ U(70000.00)

=

0.70×400.00 +

0.05×403.73 +

0.15×407.43 +

0.05×435.89 +

0.05×469.04

=

280.00 +

20.19 +

61.11 +

21.79 +

23.45

=

406.55.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.23.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

EU(overr16)$^{1/r}$ – 150000 =

406.55$^{2.00}$ – 150000 =

15281.15.

ANALYSIS OF NO DRILLING

EU of not drilling = 387.30.

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.20.

(f) Calculations for r = 0.010

ANALYSIS OF DRIL100%

EU(dril100%) =

$0.70 \times$ U(−68000.00) +

$0.05 \times$ U(−20000.00) +

$0.15 \times U(28000.00)$ +

$0.05 \times U(412000.00)$ +

$0.05 \times U(892000.00)$

=

0.70×1.12 +

0.05×1.12 +

0.15×1.13 +

0.05×1.14 +

0.05×1.15

=

0.78 +

0.06 +

0.17 +

0.06 +

0.06

=

1.1239.

EU of drill100% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.2793.

CE of drill 100% =

U^{-1}(EU(dril100%)) =

EU(dril100%)$^{1/r}$ – 150000 =

1.12^{100} – 150000 =

–31872.20.

ANALYSIS OF DRIL50%

EU(dril50%) =

$0.70 \times U(-34000.00)$ +

$0.05 \times U(-10000.00)$ +

$0.15 \times U(14000.00)$ +

$0.05 \times U(206000.00) +$

$0.05 \times U(446000.00)$

=

$0.70 \times 1.12 +$

$0.05 \times 1.13 +$

$0.15 \times 1.13 +$

$0.05 \times 1.14 +$

0.05×1.14

=

0.79 +

0.06 +

0.17 +

0.06 +

0.06

=

1.1259.

EU of drill50% if U is normalized at –100,000 and 900,000, as in Winkler (1972), is 0.3387.

CE of drill 50% =

U^{-1}(EU(dril50%)) =

EU(dril50%)$^{1/r}$ – 150000 =

1.13^{100} – 150000 =

–8298.73.

ANALYSIS OF OVERR8

EU(overr8) =

$0.70 \times U(0.00) +$

$0.05 \times U(6000.00) +$

$0.15 \times U(12000.00) +$

$0.05 \times U(60000.00) +$

$0.05 \times U(120000.00)$

=

0.70×1.13 +

0.05×1.13 +

0.15×1.13 +

0.05×1.13 +

0.05×1.13

=

0.79 +

0.06 +

0.17 +

0.06 +

0.06

=

1.1273.

EU of override 8 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.3769.

CE of override 1/8 =

$U^{-1}(EU(overr8))$ =

$EU(overr8)^{1/r} - 150000$ =

$1.13^{100} - 150000$ =

9246.81.

ANALYSIS OF OVERR16

EU(overr16) =

$0.70 \times U(10000.00)$ +

$0.05 \times U(13000.00)$ +

$0.15 \times U(16000.00)$ +

$0.05 \times U(40000.00)$ +

$0.05 \times U(70000.00)$

=

0.70×1.13 +

0.05×1.13 +

0.15×1.13 +

0.05×1.13 +

0.05×1.13

=

0.79 +

0.06 +

0.17 +

0.06 +

0.06

=

1.1277.

EU of override 16 if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.3886.

CE of override 1/16 =

U^{-1}(EU(overr16)) =

EU(overr16)$^{1/r}$ – 150000 =

1.13^{100} – 150000 =

15036.89.

ANALYSIS OF NO DRILLING

EU of not drilling = 1.1266.

EU of nodrill if U is normalized at −100,000 and 900,000, as in Winkler (1972), is 0.3573.

□□□

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