

## Exercise 10

7.12.2021

### #1 Voting

- Consider two groups of DMs of sizes three (Group 1) and four (Group 2) who are choosing a meal from a menu with three options (A, B, and C). Alternatives and DMs' preferences are shown in Table 1. Using Borda count, establish the choice of each group as well as the choice of all seven DMs as one group.
- What would Group 1, Group 2, and a group of all seven DMs choose, if they made the choice by using plurality voting?

**Table 1.** Preferences of DMs of groups 1 and 2.

	Group 1			Group 2			
	$\succ_1$	$\succ_2$	$\succ_3$	$\succ_4$	$\succ_5$	$\succ_6$	$\succ_7$
most preferred	A	B	C	A	A	B	B
"middle" alternative	B	C	A	B	B	C	A
least preferred	C	A	B	C	C	A	C

### #2 Aggregated group value

Wife and her husband are choosing a hotel to stay in Barcelona. The two alternative hotels and their performance with regard to (preferentially independent) attributes quality and cost are presented in Table 2. The wife (DM1) thinks that an increase in quality by one point is equally preferred to a decrease of 5 euros in cost. The husband (DM2), on the other hand, thinks that increase in quality by one point is equally preferred to a 1 euro decrease in cost. Thus, for both the wife and her husband, the attribute-specific value functions are linear.

**Table 2**

	Cost (i=1)	Quality (i=2)
Worst level ( $x^0$ )	100	10
Hotel 1 ( $x^1$ )	98	20
Hotel 2 ( $x^2$ )	76	10
Best level ( $x^*$ )	70	20

- a) Formulate the wife's normalized additive value function  $V^W(x) = \sum_{i=1}^2 w_i^W v_i^W(x_i)$  such that  $V^W(x^0) = 0$  and  $V^W(x^*) = 1$ . Which hotel does she prefer?
- b) Formulate the husband's normalized additive value function  $V^H(x) = \sum_{i=1}^2 w_i^H v_i^H(x_i)$  such that  $V^H(x^0) = 0$  and  $V^H(x^*) = 1$ . Which hotel does he prefer?
- c) The couple uses an additive group value function  $V^G(x) = g_1 V^W(x) + g_2 V^H(x)$  and agrees that, since we are living in the 21st century, both should have an equal weight ( $g_1 = g_2 = 0.5$ ). Which hotel is preferred by the couple as a group?
- d) Change the best level for quality to 40 points and confirm that the preferred hotels for the wife and the husband do not change. What about the hotel preferred by the couple as a group? Explain your findings.