

DSC 433/533 – Class 5 – Response Modeling

Task: Your company sells widgets and you have 1200 potential customers. A response model has allowed you to order the potential customers in 6 groups of 200 each, with response rates in each group of 18%, 15%, 12%, 9%, 6%, 3%. How many people should you target to maximize profit if it costs \$1 to contact a customer and you receive \$10 revenue for each widget sold?

Profit table (excluding indirect/opportunity costs):

		Contact	
		Yes	No
Buy	Yes	9	0
	No	-1	0

Profit table (including indirect/opportunity costs):

		Contact	
		Yes	No
Buy	Yes	9	-9
	No	-1	1

0 contacts:

		Contact		
		Yes	No	
Buy	Yes	0	126	126
	No	0	1074	1074
		0	1200	1200

Profit (excluding indirect/opportunity costs) = $0*9 - 0*1 = \$0$

Profit (including indirect/opportunity costs) = $0*9 - 0*1 - 126*9 + 1074*1 = -\60

200 contacts:

		Contact		
		Yes	No	
Buy	Yes	36	90	126
	No	164	910	1074
		200	1000	1200

Profit (excluding indirect/opportunity costs) = $36*9 - 164*1 = \$160$

Profit (including indirect/opportunity costs) = $36*9 - 164*1 - 90*9 + 910*1 = \260

400 contacts:

		Contact		
		Yes	No	
Buy	Yes	66	60	126
	No	334	740	1074
		400	800	1200

Profit (excluding indirect/opportunity costs) = $66*9 - 334*1 = \$260$

Profit (including indirect/opportunity costs) = $66*9 - 334*1 - 60*9 + 740*1 = \460

600 contacts:

		Contact		
		Yes	No	
Buy	Yes	90	36	126
	No	510	564	1074
		600	600	1200

Profit (excluding indirect/opportunity costs) = $90*9 - 510*1 = \$300$

Profit (including indirect/opportunity costs) = $90*9 - 510*1 - 36*9 + 564*1 = \540

800 contacts:

		Contact		
		Yes	No	
Buy	Yes	108	18	126
	No	692	382	1074
		800	400	1200

Profit (excluding indirect/opportunity costs) = $108*9 - 692*1 = \$280$

Profit (including indirect/opportunity costs) = $108*9 - 692*1 - 18*9 + 382*1 = \500

1000 contacts:

		Contact		
		Yes	No	
Buy	Yes	120	6	126
	No	880	194	1074
		1000	200	1200

Profit (excluding indirect/opportunity costs) = $120*9 - 880*1 = \$200$

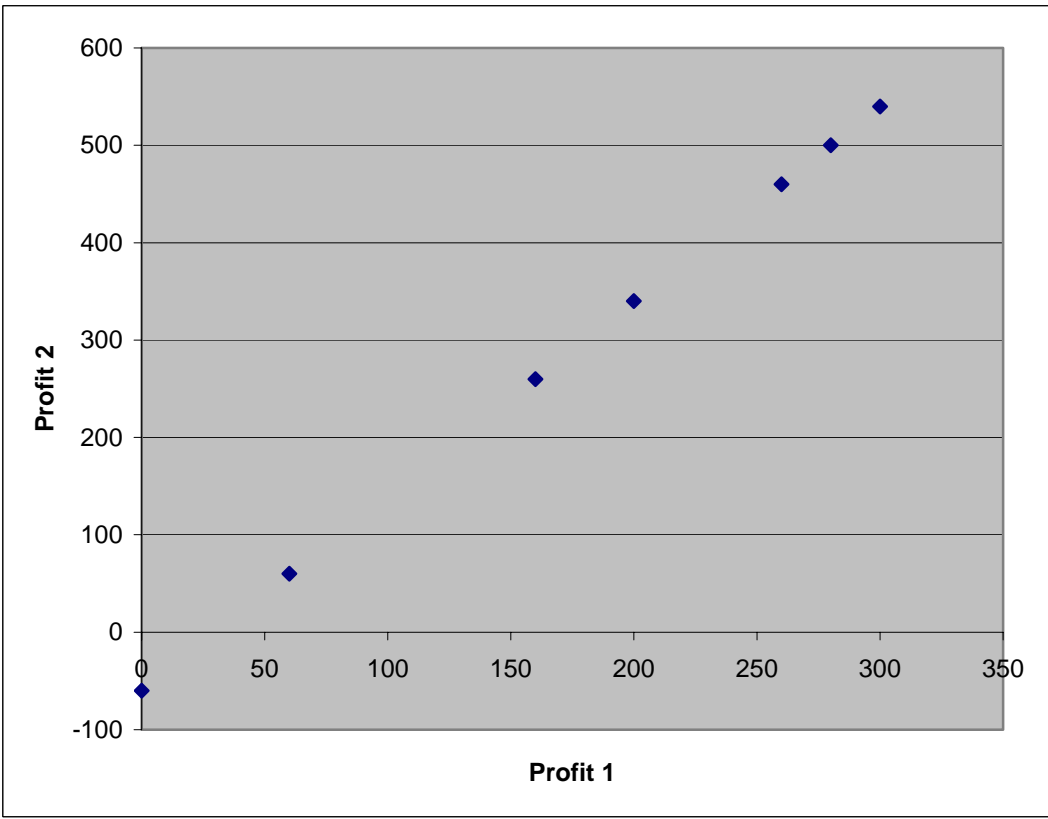
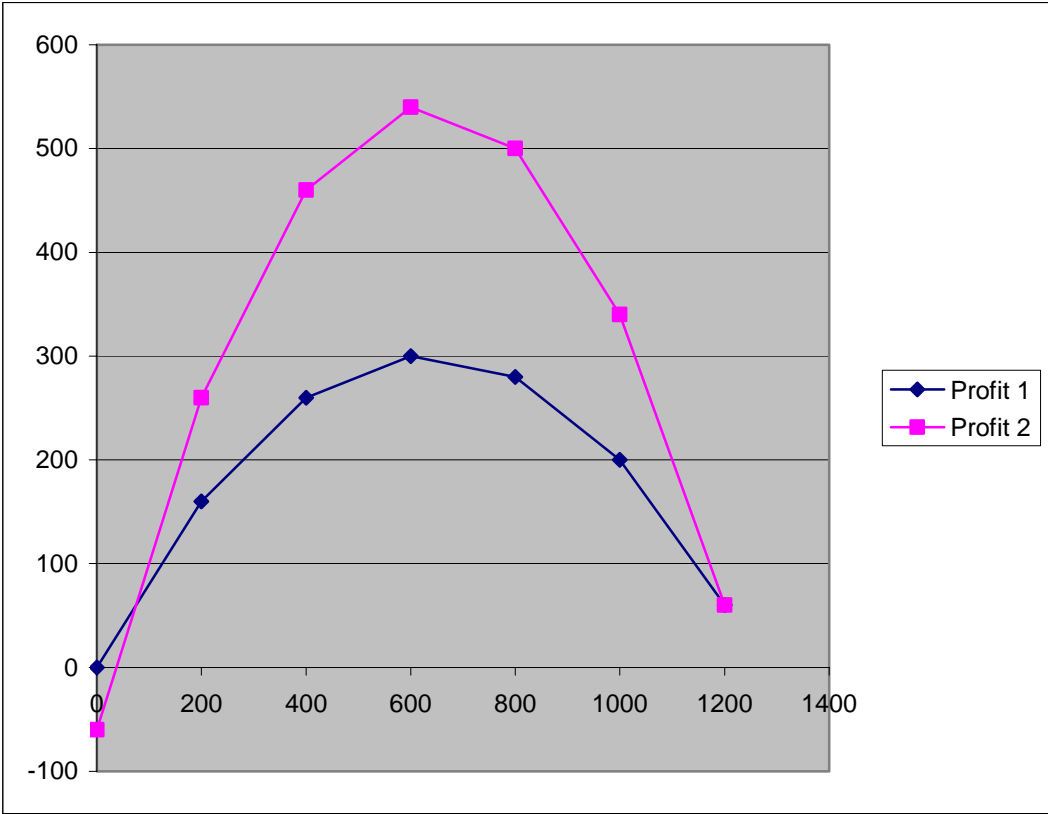
Profit (including indirect/opportunity costs) = $120*9 - 880*1 - 6*9 + 194*1 = \340

1200 contacts:

		Contact		
		Yes	No	
Buy	Yes	126	0	126
	No	1074	0	1074
		1200	0	1200

Profit (excluding indirect/opportunity costs) = $126*9 - 1074*1 = \$60$

Profit (including indirect/opportunity costs) = $126*9 - 1074*1 - 0*9 + 0*1 = \60



Algebraically:

Profit table (excluding indirect/opportunity costs):

		Contact	
		Yes	No
Buy	Yes	R-M	0
	No	-M	0

Profit table (including indirect/opportunity costs):

		Contact	
		Yes	No
Buy	Yes	R-M	-R+M
	No	-M	M

X contacts, Y potential sales, Z actual sales, N potential customers:

		Contact		
		Yes	No	
Buy	Yes	Z	Y-Z	Y
	No	X-Z	N-X-Y+Z	N-Y
		X	N-X	N

Profit (excluding indirect/opportunity costs) = $Z*(R-M) - (X-Z)*M = ZR - XM$

Profit (including indirect/opportunity costs) =

$$Z*(R-M) - (X-Z)*M + (Y-Z)*(-R+M) + (N-X-Y+Z)*M = 2(ZR - XM) + NM - YR$$

Since N, M, Y, and R are “fixed”, maximizing profit (excluding indirect/opportunity costs) is equivalent to maximizing profit (including indirect/opportunity costs).

Since the calculations excluding indirect/opportunity costs are easier and the two methods are equivalent, we will use this method only from now on.