

Digital Technologies and Value Creation (Lecturer: Philippe Blaettchen) – Integer Programming Exercises

For each of the following situations:

1. What are the decision variables?
2. What are the constraints?
3. What is the objective?
4. Write down the corresponding optimization problem
5. Solve the optimization problem using Excel Solver

Make sure that the objective is a linear functions and that the constraints are either linear or integer/binary!

Situation 1

A large supermarket chain is preparing their advent calendar display unit before the holidays. They have three different types of advent calendars to sell with the following characteristics:

	Brand 1	Brand 2	Brand 3
Surface (sqm)	0.0875	0.104	0.12
Min. number enforced	5	10	5
Weight (kg)	0.15	0.09	0.5
Margin made by supermarket (£)	1.2	0.8	1.8

The minimum number enforced is the number of calendars the supermarket has grudgingly said they would expose to the brand representative. Assuming that (i) any kind of juxtaposition of the calendars can be made, (ii) the supermarket sells a number of calendars of Brand 1 (or 2 or 3) which is proportional to the number of calendars in the display (irrespective of where they are placed), (iii) the display unit is 5sq meters and can support 15kgs in weight, find the combination of calendars that will lead to the highest margin for the supermarket.

Situation 2

A venture capital firm is considering investments into 6 different projects. Each project has an initial cost, an expected profit rate (one year from now) expressed as a percentage of the initial cost, and an associated risk of failure. These numbers are given below:

	P1	P2	P3	P4	P5	P6
Initial cost (in M)	1.3	0.8	0.6	1.8	1.2	2.4
Profit rate (in %)	10	20	20	10	10	10
Failure risk (in %)	6	4	6	5	5	4

Which projects should the venture capital firm pick so as to maximize total expected profit, while investing no more than 4M and keeping its average failure risk below 5%?