

Linear Programming Problem EX 1 Exam

[Bella Abdelouahab — Master Big Data]

Problem Formulation

An enterprise produces three different qualities of olive oil. The maximum quantities that can be sold each month and the selling prices are given in the table below:

Product	Maximum Sales (liters)	Selling Price (euro/liter)
Oil A	3000	4
Oil B	3000	6
Oil C	2000	10

The company pays 1000 euros per ton of olives. Each ton of olives produces either 300 liters of oil A or 200 liters of oil B (the costs of these transformations are not modeled). Each liter of oil A can be refined to produce 0.6 liters of oil B and 0.3 liters of oil C. The cost of such refining is 0.5 euros per liter. Similarly, each liter of oil B can be refined to obtain 0.8 liters of oil C. The cost of this refining is 0.3 euros per liter. Formulate the linear programming problem modeling this situation.

Linear Programming Model

Variables

Let:

- x_A be the number of liters of oil A produced per month.
- x_B be the number of liters of oil B produced per month.
- x_C be the number of liters of oil C produced per month.
- r_{AB} be the number of liters of oil A refined to produce oil B.
- r_{BC} be the number of liters of oil B refined to produce oil C.

Objective Function

Maximize the profit P :

$$P = 4x_A + 6x_B + 10x_C - 0.5r_{AB} - 0.3r_{BC}$$

Constraints

Production limits:

$$x_A \leq 3000$$

$$x_B \leq 3000$$

$$x_C \leq 2000$$

Total oil produced from olives:

$$x_A + x_B + x_C \leq 300$$

Refinement limits:

$$r_{AB} \leq x_A$$

$$r_{BC} \leq x_B$$

$$x_B \geq 0.6r_{AB}$$

$$x_C \geq 0.3r_{AB} + 0.8r_{BC}$$

Non-negativity:

$$x_A, x_B, x_C, r_{AB}, r_{BC} \geq 0$$