Lab Exercise 2, Simulation

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Exercise 1: Product Mix Problem

Part 1

The optimal values for x_1 and x_2 respectively y_1, y_2, and y_3 can be found in table 1.

The optimal value for the primal problem was 4335. And the optimal value for the dual problem was 4410 given an integer solution and 4335 given an continuous one.

x_1	x_2	$13x_1 + 11x_2$	y_1	y_2	y_3	$1500y_1 + 1575y_2 + 420y_3$
270	75	4335	0	2	3	4410
270	75	4335	0	2.1429	2.2857	4335

Table 1: Optimal values for part 1 variables. The first row is given integer values, the second row is continuous values. The equations are the ones we're trying to maximize for the primal (x) problem and minimize for the dual (y) problem.

Part 2

Part 2.1

Shadow Price: 2.14285714285714

Part 2.2

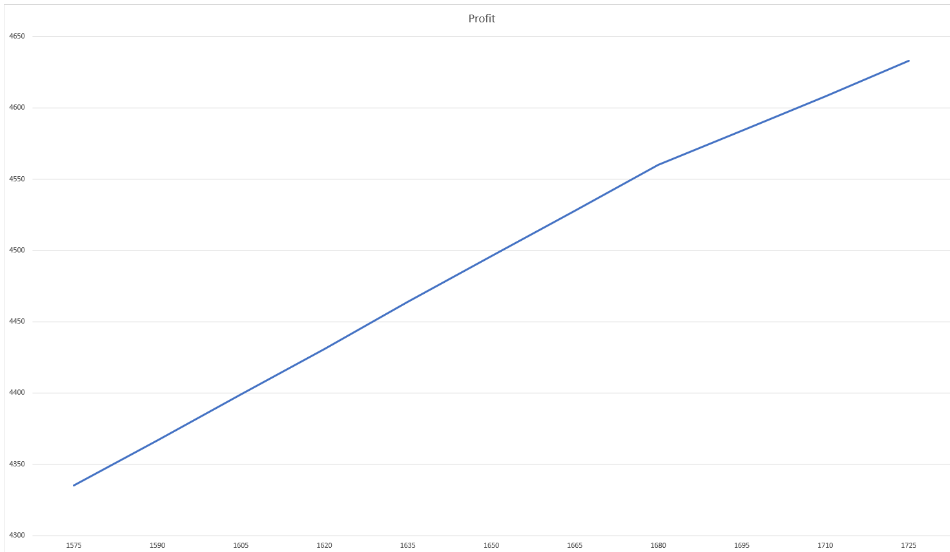

Figure 1: Profit as a function of the raw materials capacity

Part 2.3

The slope changed at datapoint $capacity = 1680$ as seen in figure 1
Slope before 1680(raw materials) $2,1$ and after $1,6$ and they directly correlate to the shadow price

Exercise 2: Staff Scheduling Problem

Part 1

x_1	x_2	x_3	x_4	x_5	x_6	x_7	$fval$
0	1	0	1	4	2	2	10

Table 2: Optimal solution to the problem.

Part 2

The solution with real-value positive variables is better since we got a lower $fval$. Both solutions are feasible. We cannot find a general relation between the solutions. One way to find a integer solution from an LR is to use the branch-and-bound method in order to find solutions that will find it.

x_1	x_2	x_3	x_4	x_5	x_6	x_7	$fval$
0.00	1.00	0.00	1.00	4.00	2.00	2.00	10.00
0.33	0.00	1.33	0.33	4.00	1.33	2.00	9.33

Table 3: Optimal solution to the problem compared to the previous run