

Note on the Use of Solver in Excel

This note is intended to be used with *Note on Linear Programming: A Brief Overview* (WDI Publishing #1429307)

Spreadsheet programs make it very easy to solve linear and non-linear programming (LP and NLP) problems that previously could be solved only by using very specialized programming software. The feature that allows this in Excel is called *Solver*.

The main idea behind spreadsheet modeling is to designate some cells as *input cells* and link all other quantities of interest to these cells. *Input cells* are the ones with values we want to find, e.g., optimal production quantities. It may be helpful to think of these cells as decision variables, since the purpose of developing an LP model is to assist in the decision-making process. (If you are mathematically inclined, decision variables are independent variables in a series of linear relationships that define the problem.) Solver also allows for inclusion of various *constraints* (e.g., available budget, storage space, or maximum work-hours). By varying the values of *input cells*, we can see how the value of our *objective function* (say, profit) changes. Consequently, for small problems we can manually find the best values of *input cells*. For bigger problems, however, the manual search becomes quite tedious. Solver is very systematic and efficient in performing the search. Especially for LP problems, the speed is rapid and the solutions are exact.

The three main steps in spreadsheet modeling are:

- Set up**—Establish the spreadsheet dependencies (links).
- Configure Solver**—Indicate the objective function, changeable cells (input cells), and constraints.
- Run Solver**—Find optimal values of changeable cells (input cells).

Step (A) may be time consuming, but after the initial time investment, it is possible to not only find the solution quickly, but also perform various “what-if” analyses with little additional time requirement.

The following is a Solver illustration that uses the problem described in the WDI Publishing companion *Note on Linear Programming: A Brief Overview* (WDI Publishing 1-429-307). The LP formulation derived in that note is as follows:

Maximize:	$C = 2A + 2.5B$
Subject to:	$5A + 2.5B \leq 500$ $3A + 5B \leq 600$ $A \leq 90$ $A \geq 0, B \geq 0$

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