

Sensitivity Analysis

Changes	Graphical interpretation	Impact	Excel output
Change a <i>non-basic decision variable</i> to basic	Change from one <i>corner point</i> to the other	Impair the optimal <i>objective function value</i> (i.e., Z or C)	The magnitude of impairment can be derived from the column "Reduced Cost" under the block <i>Adjust Cells</i>
Change the <i>coefficient</i> of a given decision variable in the objective function	Change the <i>slope</i> of the objective function	May or may not change the optimal <i>solution mix</i> depending on the allowable range associated with that decision variable	The range can be derived from the column "Allowable Increase" and "Allowable Decrease" under the block <i>Adjust Cells</i>
Change the <i>right hand side</i> (RHS) value of a given constraint	<i>shift</i> the constraint	May or may not change the optimal <i>objective function value</i> depending on the allowable range associated with that RHS	The change in optimal objective function value can be derived from the column "Shadow Price" under the block <i>Constraints</i> . The allowable range can be derived from the column "Allowable Increase" and "Allowable Decrease" under the block <i>Constraints</i>

Objective function:

1. The **opportunity/reduced cost** of a given decision variable can be interpreted as the rate at which the value of the objective function (i.e., profit) will deteriorate for each unit change in the optimized value of the decision variable with all other data held fixed.
2. The allowable increase/decrease associated with the original coefficient of a decision variable tells us the range in which the coefficient of a given decision variable in the objective function may be increased/decreased without changing the optimal solution, where all other data are fixed.

Constraint:

1. The **shadow price** of a given constraint can be interpreted as the rate of improvement in the optimal objective function value, (e.g., Z in maximizing profit or C in minimizing cost) as RHS of that constraint increases with all other data held fixed. "Rate of improvement" means "rate of increase" for a maximization model; and "rate of decrease" for a minimization model. If the RHS is decreased, the shadow price is the rate at which Z (or C) is impaired.
2. The above interpretation of shadow price is valid only within a range of the given RHS. The shadow price may change to a different value outside this allowable range. The shadow price information does not tell us how the optimal solution mix (i.e., the values for decision variables X_1 , X_2 , etc.) changes.