Components in an LP problem may change:
- production costs
- availability of resources
- value of goods

Some changes are structural...
(new variable, elimination of some constraints, \( \leq \) to \( \geq \))
... and others are parametric
(changes in \( A, b, c \))

So, we can change LP models in two ways:

1) **Structural Changes**
   - add/remove decision variables (change in \( n \))
   - add/remove constraints (change in \( m \))

2) **Parametric Changes**
   - change in obj. function coefficients (c)
   - change in RHS values (b)
   - change in coefficient matrix (A)

The investigation of how parametric changes affect the optimal solution is called **Sensitivity Analysis**.

**Key Observation** (max problem)

A Simplex tableau is optimal **if and only if**
- each constraint has a non-negative RHS
- each variable has a non-negative coefficient in the \( z \)-row

After changes in parameters we have the following possibilities:

1. old optimal solution remains optimal
2. old optimal solution remains feasible but not optimal
   - (i) old basis remains
   - (ii) change in basis

*Changes in components of the c vector (objective function)*

Do not affect feasibility

So: will the old optimal solution still be optimal?

→ check new reduced costs of non-basic variables
   - for \( \text{opt} = \text{max} \) need \( RC \geq 0 \)
   - for \( \text{opt} = \text{min} \) need \( RC \leq 0 \)
   - if **No** we need to find the new optimal solution

*Changes in components of b (RHS)*

Have no effect on reduced costs

So: will the old optimal solution still be feasible?

→ consider the new RHS values:
   - if one or more are negative then the old optimal solution is infeasible
   - otherwise
     - the new optimal solution has the same basis and the new optimal values are given by the new RHS.