Advanced Operations Research Techniques
IE316

Lecture 8

Dr. Ted Ralphs

Reading for This Lecture

- Bertsimas 3.3

What the Tableau Looks Like

- The tableau looks like this

$-c_B^T B^{-1} b$	$c^T - c_B^T B^{-1} A$
$B^{-1} b$	$B^{-1} A$

- In more detail, this is

$-c_B^T x_B$	$\bar{c}_1$	$\cdots$	$\bar{c}_n$
$x_{B(1)}$ $\vdots$ $x_{B(m)}$	$B^{-1} A_1$	$\cdots$	$B^{-1} A_n$

Parts of the Tableau

- Row zero contains the reduced costs.
- Column zero contains the values of the current basic variables.
- The upper left-hand corner entry is the opposite of the current objective function value.
- Each nonbasic column contains the feasible direction corresponding to increasing the given nonbasic variable.
- The basic columns are the columns of $B^{-1}B = I$, i.e., they are the unit vectors.
- All the information needed to perform an iteration of the simplex method is readily available.
- If variable j is to enter the basis, perform elementary row operations to turn column j of the tableau into the i^{th} unit vector, where i is the variable leaving the basis.

Implementing the Tableau Method

1. Start with the tableau associated with a specified BFS and associated basis B.
2. Examine the reduced costs in row zero and select a *pivot column* with $\bar{c}_j < 0$ if there is one. Otherwise, the current BFS is optimal.
3. Consider $u = B^{-1}A_j$, the j^{th} column of the tableau. If no component of u is positive, then the LP is unbounded.
4. Otherwise, compute the step size using the minimum ratio rule and determine the *pivot row*.
5. Scale the pivot row so that the *pivot element* becomes one.
6. Add a constant multiple of the pivot row to each other row of the tableau so that all other elements of the pivot column become zero.
7. Go to Step 2.