Bland's Rule Proof

Linear programing course - M.Ardestani May 9, 2020

Part I introducito

1 Basic terms

We already know that we have 4 type of situation can happen in Linear programing problems:

- one unique optimal solution
- there isn't any solution (infeasible problem)
- unbounded optimal solution
- alternative optimal solution

In each first three cases, we can use Big M algorithem (or Two phase method) and easily come up with the solution.

But we can not use this methods in last case. Actually we can fell into loop and never exit it.

We can save our basic variables set and check it after each itration. if we visit one basis that we had visited it before, we can make sure that we heve fell into loop and now we should use "Bland's rule".

2 Bland's rule

Suppose we have a minimization problem (also same way for maximazation problem with a llitle difference).

In this rule, the variables are first ordered in some sequence, say, $x_1, x_2, ..., x_n$, without loss of generality.

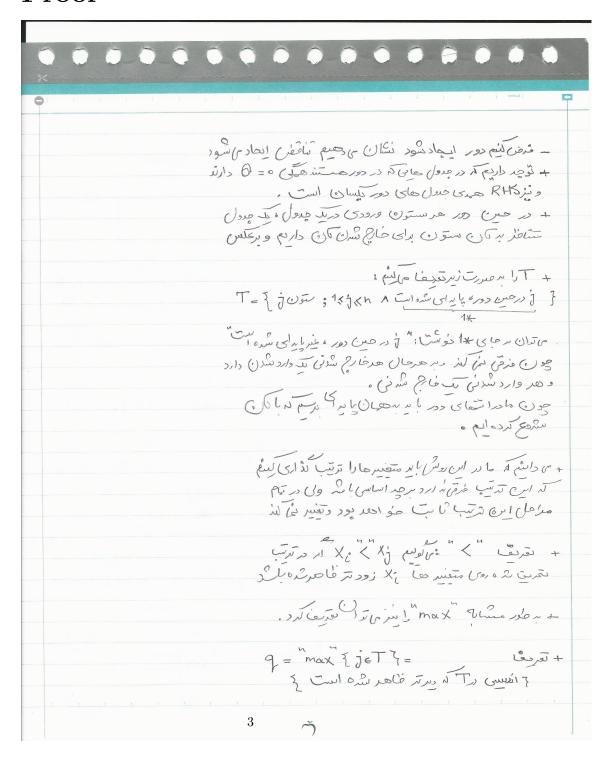
Suppose A is a set of NBVs that have a non-negative reduced cost coefficient. The one that has the smallest index is selected to enter the basis. (compare this step with simplex algorithem)

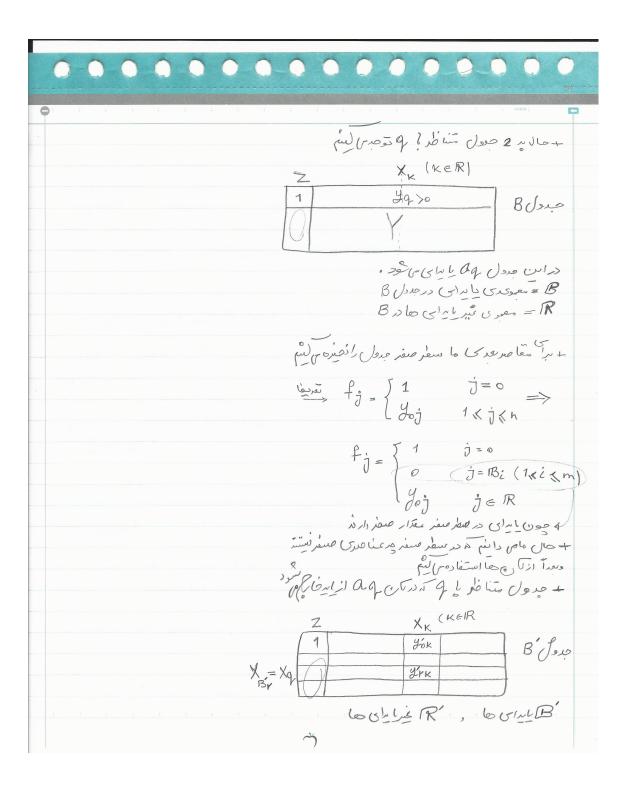
For example $x_i \in A$ is selected in last step as .

And Suppose B is a set of BVs which tie in the usual minimum ratio test in the corresponding column of x_i .

Similarly, the one that has the smallest index is chosen as the exiting variable. we repeat these step until we reach to optimal table.

Part II Proof





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