Guidelines

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This work is originaly for the Stochastic Programming course. We firstly wrote one general function which couples with one inner function for solving subproblems to realize the Benders decomposition with multi-cut for solving two-stage stochastic linear programming probelms. We formed this function which has vectors and matrices of the standard form as its parameters. Then we transformed them as one program to solve our course final project. We set several guidelines below.

1. Standard problem form.

$$\begin{aligned} \min_{x,y}\ & c^\top x + E_\omega[{f_\omega}^\top y_\omega] \\ s.t.\ & Ax \le b \\ & D_\omega y_\omega = B_\omega x + d_\omega \\ & x, y_\omega \ge 0 \\ & \omega \in \Omega \end{aligned}$$

2. **Benders.m**: With vectors and matrices in the standard form above as parameters. **dim_x** (**dim_y**) is one 3 column vector which its entries represent the dimension of the continuous, integer and binary variables of the decision variable x (y). For instance, **dim_x**= $\begin{pmatrix} 3 \\ 2 \\ 1 \end{pmatrix}$ represents x is one column vector with 3 continuous variables, 2 integer variables and 1 binary variable from the first row to the last row.

   eps is the accuracy you want to set for the stopping criteria Upper bound $\bar{z}-$ lower bound $\underline{z} \le \epsilon * \max(|\text{Upper bound } \bar{z}|, |\text{lower bound } \underline{z}|)$.

   IteMax is the maximal iteration numbers.

3. **Subproblem.m** is the inner function in **Benders.m** for solving subproblems of each scenarios.

   test.m is a test problem. The problem is found in this link. `https://www.youtube.com/watch?v=mBxnwpsifjc`

4. We chose **GUROBI** to solve the LP and **YALMIP** to model on **MATLAB**.