Project 607

we need to use CVXOPT package to solve an optimization problem.

Format:

min
$$\frac{1}{2}x^TPx+q^Tx$$

subject to $Gx \leq h$
 $Ax = b$

we need to figure out matrix

P, q, G, h, A, b and X to solve

the problem

constrain 3 and 6 (matrix G and h)

Pi > 0 for all P

h (91x1)

constrain 4 (matrix A and b)

$$u \cdot \sum Pi = 1$$

A

 $\begin{bmatrix} 0,0,\cdots 0 \ u,u,\cdots u \end{bmatrix} \cdot \overrightarrow{X}$
 $\begin{bmatrix} 1 \end{bmatrix}$

constrain 5, (matrix A and b)

 $C_1 = S.e^{ct \cdot t_1 t_2} - k_1$
 $C_{50} = 0$

A

 $\begin{bmatrix} 1,0,0\cdots 0,0,0\cdots 0,0 \end{bmatrix} \cdot \overrightarrow{X} = \begin{bmatrix} S_{50} \cdot e^{(r^{4} \cdot r^{5})} \cdot T_{-k_1} \\ 0 \end{bmatrix}$

constrain 1, matrix A and b

 $C_{144} + C_{1-1} \cdot T_{2} \cdot C_{1} = (\frac{2}{3}P_{1} + \frac{1}{6}P_{1+1} + \frac{1}{6}P_{1-1})u^{2}$
 $\begin{bmatrix} 1,-2,1 & 0 & 0 & 0 & -\frac{2}{3}u^{2}, -\frac{1}{6}u^{2}, & 0 & 0 & -\frac{2}{3}u^{2}, -\frac{1}{6}u^{2}, & 0 & -\frac{2}{3}u^{2}, & -\frac{1}{6}u^$

constrain 2 (matrix A and b

$$C(k_{\bar{j}}) = \alpha c_{\bar{i}} + b c_{\bar{i}+1} + \frac{(a^3 - a)u^2}{b} P_{\bar{i}} + \frac{(b^3 - b)u^2}{b} P_{\bar{i}+\bar{i}}$$

$$\alpha = \frac{k_{\bar{i}+1} - k_{\bar{j}}}{u} \quad b = 1 - a$$

[ki, ki+1] represent where kj falls in

Logic:

Since we have 5 kj value, since k list is arange (kmin, kmax, u)

we can find kit is index within k list based on kj 's value

once we sfind the exact index of ki and kit,

we calculate α , b. $\frac{(a^3-a)u^2}{b}$, $\frac{(b^3-b)u^2}{b}$ and place them

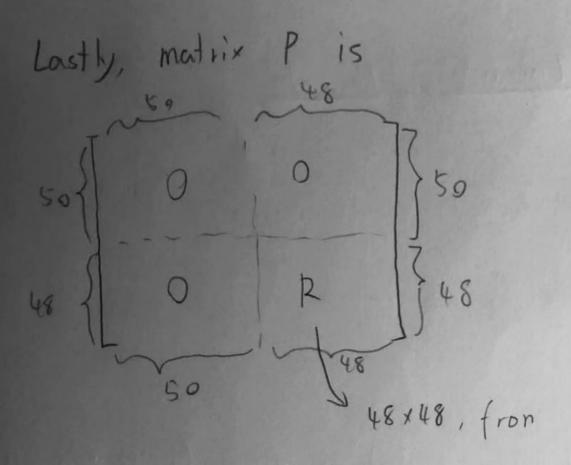
in to a matrix

A $\begin{bmatrix}
0,0,a,b,-0; \mathbf{X},0,c,d,--1\\
k; \\
k;
\end{bmatrix}$ | Sthing is arange (kmin, kmax, u)

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we concate all A for constrain 4,5,1 and 2
to a single matrix A, and same for b,

Then plug all matrix to the solver, and its done



R is from constrain 1, refer to project quide for details