Project One : Portfolio Optimization (CVaR Risk Measure)

Creating the system :

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Maximize m.T \* x - p \* (xp + xm) + xf \* rf - delta \* (cvar\_term)

subject to

1.T \* x + a \* K + fp \* yp + fm \* ym + vm \* ym + vp \* yp + xf = 1

(K, 1, x) belongs to PowerCone (1/beta)

t + 1 \* P.T \* U/ (1 - alpha) <= gamma

U + t >= -R.T \* x

U >= 0

x = xp - xm

y1 + y2 <= 1 ( y is a binary variable)

xp + xm <= 2.0 (gross exposure)

xm <= M \* y1

xp <= M \* y2

where :

x = array of weights allocated to each scrip

m = array of mean returns over the time period (h)

p = transaction Cost penalty coeficient

xp = positive fraction of holdings

xm = short selling fraction of holdings

xf = risk free asset allocation

rf = risk free return

delta = risk coeficient

a = Market Impact cost coeficient

K = Market Impact cost auxiliary variable (Height of our cone)

f (p,m) = fixed transaction cost

y (p,m) = Binary variable (signalling transaction) (1 for buy or sell and 0 otherwise)

v (p,m) = Variable transaction cost

t = auxiliary variable

U = auxiliary variable

R = return scenarios

M = Exposure (Leverage Index)

P = Probability of each scenario taking place

gamma = Pre-Decided level of CVaR risk

alpha = significance level (0.05)

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