

Sets:	
$I$	Set of products
$J$	Set of product groups
$SC$	Set of demand scenarios
Parameters:	
$Cap_i$	production capacity of product i
$MTP$	macro target percentage
$D_i$	Nominal demand value of product i
$D_i^{sc}$	uncertain demand value of product i under scenario sc
$COGS_i$	Cost of goods sold
$M_i$	Marginal profit of product i
$p_{sc}$	The probability of occurrence of scenario i
Decision variables:	
$S_i$	Surplus production quantity of the product
$A_i^{sc}$	quantity of product i sold under scenario sc
$U_i^{sc}$	Excess inventory level of product i under scenario sc
$L_i^{sc}$	shortage quantity of product i under scenario sc
$O_{ii'}^{sc}$	inventory quantity of item i replaced by product i' of the same group under scenario sc

Stochastic mathematical model formulation:

$Max \quad Z = \sum_{i,sc} M_i \cdot p_{sc} \cdot A_i^{sc} - \sum_i (S_i + D_i) COGS_i$		1
$S_i + D_i \leq Cap_i$	$\forall i$	2
$\sum_i S_i \leq \sum_i D_i \cdot MTP$	$\forall i$	3
$A_i^{sc} = Min(S_i + D_i, D_i^{sc})$	$\forall i, sc$	4
$L_i^{sc} = Max(0, S_i - D_i^{sc})$	$\forall i, sc$	5
$U_i^{sc} = Max(0, D_i^{sc} - S_i)$	$\forall i, sc$	6
$L_i^{sc} = \sum_{i' \in J_i} O_{ii'}^{sc}$	$\forall i, sc$	7
$U_i^{sc} = \sum_{i' \in J_i} O_{ii'}^{sc}$	$\forall i, sc$	8
$A_i^{sc}, L_i^{sc}, U_i^{sc}, O_{ii'}^{sc}, S_i \geq 0$		9