Original problem formulation

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1 Nomenclature

$\{a, ..., b\}/[a, ..., b]$	: the subset of the integer / continuous numbers
	: between a and b (inclusive)
$s \in S$	: set of the scenarios
$c \in C$	: set of indices for the constraints for each of the scenario
	* the same number of the constraints per scenario
$i \in VC$	: set of indices for the continuous variables
	* the same number of variables per scenario
$j \in VI$	: set of indices for the integer variables
	* the same number of variables per scenario
$Q_{s,r}\ \forall s \in S, r \in \{0\} \cup C$	: symmetric matrices
	* not necessarily PSD
$f^{VC}_{s,r}, f^{VI}_{s,r}\ \forall s \in S, r \in \{0\} \cup C$	: sets of linear coefficients
	for the continuous and integer variables respectively
$f^{const}_{s,r}\ \forall s \in S, r \in C$	: sets of affine constants
	* big enough negative numbers
$X^L_i, X^U_i\ \forall i \in VC$	: lower and upper bound respectively
	for each of the continuous decision variables $x_{i,s}\ \forall s \in S$
	* the bounds are the same for all the scenarios
$Y^L_j, Y^U_j\ \forall j \in VI$	: lower and upper bound respectively
	for each of the integer decision variables $y_{j,s}\ \forall s \in S$
	* the bounds are the same for all the scenarios

2 Original model formulation

The original two-stage stochastic programming model is formulated as following:

$$
\begin{aligned}
\max \quad & \sum_{s\in\mathcal{S}} \frac{1}{|\mathcal{S}|}\Big(\sum_{j\in VI} c_j x_{j,s} + \sum_{i\in\mathcal{VC}}\sum_{j\in\mathcal{VC}} Q_{s,0,i,j}\ y_{i,s}y_{j,s} \\
& + \sum_{i\in\mathcal{VC}} f^{VC}_{s,0,i}\ y_{i,s}\Big) && (1)
\end{aligned}
$$

$$
\begin{aligned}
\text{s.t.:} \quad & \sum_{i\in\mathcal{VC}}\sum_{j\in\mathcal{VC}} Q_{s,r,i,j}\ y_{i,s}y_{j,s} \\
& + \sum_{i\in\mathcal{VC}} f^{VC}_{s,r,i}\ y_{i,s} + \sum_{j\in\mathcal{VI}} f^{VI}_{s,r,j}\ x_{j,s} + f^{const}_{s,r} \le 0 && \forall s\in\mathcal{S}, \forall r\in\mathcal{C} && (2) \\
& x_{i,s} \in \{X^L_i, X^U_i\} && \forall s\in\mathcal{S}, \forall i\in\mathcal{VI} && (3) \\
& y_{j,s} \in [Y^L_j, Y^U_j] && \forall s\in\mathcal{S}, \forall j\in\mathcal{VC} && (4) \\
& x_{i,1} - x_{i,s} = 0 && \forall s\in I_{2,|S|}, \forall i\in\mathcal{VI} && (5)
\end{aligned}
$$