

Suggestions for the Mathematical Notation

A good notation helps easier reading. Consistency is the key. Try to follow these suggestions.

```
\begin{description}
\item [Sets:]  $\set{B}_i$ ,  $\set{K}$ 
\item [Vectors:]  $\vec{x}$ ,  $\vec{\xi}$ 
\item [Matrices:]  $\mat{A}$ 
\item [Elements of vectors and matrices:]  $x_j$ ,  $\xi_j$ ,  $a_{ij}$ 
\item [Textual names:]  $Z_{\text{WDP}}$ ,  $u^{\min}$ ,  $\text{UB}$ 
\item [Random variables:]  $X$ ,  $Y$ 
\item [Expected value:]  $\mathbb{E}[X]$ ,  $\mathbb{E}[g(Y)]$ 
\item [Set of real numbers:]  $\mathbb{R}$ ,  $\mathbb{R}^n$ ,  $\mathbb{R}^n \times \mathbb{R}^m$ ,  $\mathbb{R}^{n+m}$ 
\end{description}
```

Sets: $\mathcal{B}_i, \mathcal{K}$

Vectors: $\mathbf{x}, \boldsymbol{\xi}$

Matrices: \mathbf{A}

Elements of vectors and matrices: x_j, ξ_j, a_{ij}

Textual names: $Z_{\text{WDP}}, u^{\min}, \text{UB}$

Random variables: X, Y

Expected value: $\mathbb{E}[X], \mathbb{E}[g(Y)]$

Set of real numbers: $\mathbb{R}, \mathbb{R}^n, \mathbb{R}^n \times \mathbb{R}^m, \mathbb{R}^{n+m}$

Note that many macros are used. Check the preamble of this `.tex` file.

Some other suggestions:

1. Try to use the same alphabet for related concepts. For example:

(a) A vector \mathbf{x} belongs to set \mathcal{X} . Similarly, $\boldsymbol{\gamma} \in \Gamma$

(b) The bound on variable q_i is Q_i .

(c) Set of time periods: $\mathcal{T} = \{1, 2, \dots, T\}$ and each time period $t \in \mathcal{T}$. The final time period is T . If you need a dummy index for time, consider τ or s :

$$\bullet \quad x_t = \sum_{\tau=t}^T y_\tau$$

- $y_t = \sum_{s=t}^T z_s$

(d) When $\phi(\cdot)$ is a function, its integral may be $\Phi(x) = \int_0^x \phi(y) dy$. Similarly $F(x) = \int_0^x f(y) dy$.

- If you need to use bar/hat/tilde, try to keep the meaning of them consistent. For example:
 - If you use \bar{x} to denote a solution obtained by CPLEX, then \bar{y} should also be a solution obtained by CPLEX.
 - If you use $\tilde{\mathbf{x}}$ to denote an approximation to vector \mathbf{x} , then $\tilde{\mathbf{A}}$ should also be an approximation to matrix \mathbf{A} and $\tilde{f}(\mathbf{x})$ should be an approximation to function $f(\mathbf{x})$.
- Use Roman alphabets for primal variables x, y, z and Greek alphabets for dual variables ξ, γ, θ .
- Try to avoid text in your notation. If you have to, try the followings:

- Z_{WDP} instead of Z_{WDP} . Is W, D , and P are separate indices for Z ? Or does it mean $W \times D \times P$?
- $(\text{profit}) = (\text{revenue}) - (\text{cost})$ instead of $\text{profit} = \text{revenue} - \text{cost}$. It looks $\text{profit} = p \times r \times o \times f \times i \times t$.
- If you want to define a textual variable name such as UB and LB for upper and lower bounds, for example, then try to use UB and LB. While UB can be a *generic* shorthand for the text “upper bound”, UB is a mathematical symbol that has a *specific* definition. You can use UB during the algorithm description; for example, “Update as follows: $\text{UB} \leftarrow \min\{\text{UB}, f(x^*) + g(x^*; \bar{y})\}$.”
 - worst: The optimality gap is defined as $(\text{UB} - \text{LB})/\text{LB}$.
 - better: The optimality gap is defined as $(\text{UB} - \text{LB})/\text{LB}$.
 - best: The optimality gap is defined as $(\text{UB} - \text{LB})/\text{LB}$.

It may be useful to define macros

```
\newcommand{\LB}{\mathsf{LB}}
\newcommand{\UB}{\mathsf{UB}}
```

Then use as

```
(\UB - \LB) / \LB
\frac{\UB - \LB}{\LB}
```

- Similarly, CVaR is a *generic* acronym for the text ‘conditional value-at-risk’, and CVaR_α is a *specific* math symbol with α as a probability threshold.