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:] $Z_{\text{WDP}}$, $u^{\min}$, $\mathsf{UB}$
\item [Random variables:] $X$, $Y$
\item [Expected value:] $\Eb[X]$, $\Eb[g(Y)]$
\item [Set of real numbers:] $\Rb$, $\Rb^n$, $\Rb^n \times \Rb^m$, $\Rb^{n+m}$
\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_{WDP}, $u^{\min}$, 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: $\mathcal{T} = \{1, 2, ..., T\}$ 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:
   - $x_t = \sum_{\tau=t}^{T} y_\tau$

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

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

2. If you need to use bar/hat/tilde, try to keep the meaning of them consistent. For example:

   (a) If you use $\bar{x}$ to denote a solution obtained by CPLEX, then $\bar{y}$ should also be a solution obtained by CPLEX.

   (b) 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 $f(\mathbf{x})$.

3. Use Roman alphabets for primal variables x, y, z and Greek alphabets for dual variables ξ, γ, θ.

4. Try to avoid text in your notation. If you have to, try the followings:

   (a) Z_{WDP} instead of Z_{WDP}. Is W, D, and P are separate indices for Z? Or does it mean $W \times D \times P$?

   (b) (profit) = (revenue) − (cost) instead of $profit = revenue - cost$. It looks $profit = p \times r \times o \times f \times i \times t$.

   (c) 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: $\mathsf{UB} \leftarrow \min\{\mathsf{UB}, f(x^*) + g(x^*; \bar{y})\}$."

   - worst: The optimality gap is defined as $(UB - LB)/LB$.
   - better: The optimality gap is defined as (UB − LB)/LB.
   - best: The optimality gap is defined as $(\mathsf{UB} - \mathsf{LB})/\mathsf{LB}$.

   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}
   ```

   (d) 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.