Optimizing Supply Chain Robustness

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Abstract: hola

1 Introduction

hola

2 Parameters of the model

$$
\begin{aligned}
&c\\
&d\\
&K_1\\
&K_2\\
&\sigma.
\end{aligned}
$$

3 Functions Definitions

3.1 Storage Cost Function

$$
\begin{aligned}
&c, K_1 \in \mathbb{R}\\
&n \equiv q_t - s_t\\
&C(n) = \begin{cases} 0 & n \leq 0 \\ c \cdot n + K_1 & n > 0 \end{cases}.
\end{aligned}
$$

3.2 Penalization Cost Function

$$
\begin{aligned}
&d, K_2 \in \mathbb{R}\\
&n \equiv s_t - q_t\\
&\delta(n) = \begin{cases} 0 & n \leq 0 \\ d \cdot n + K_2 & n > 0 \end{cases}.
\end{aligned}
$$

3.3 Normal Density Function

$$
\begin{aligned}
&\sigma \in \mathbb{R}\\
&\Phi_{\mu,\sigma^2}(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}.
\end{aligned}
$$

3.4 Loss function

3.4.1 Theoretical:

$$
\begin{aligned}
loss(q_t) = &\int_{s_t}^{q_t} c(z, s_t) \cdot \Phi_{\mu,\sigma^2}(z)\, dz + \\
&+ \int_0^{s_t} \delta(z, s_t) \cdot \Phi_{\mu,\sigma^2}(z)\, dz.
\end{aligned}
$$

3.4.2 Aproximation:

$$
\begin{aligned}
loss(q_t) = &\sum_{i=s_t}^{q_t+step} c(i, s_t) \cdot \Phi_{\mu,\sigma^2}(i, q_t) + \\
&+ \sum_{j=0}^{s_t+step} \delta(j, s_t) \cdot \Phi_{\mu,\sigma^2}(j, q_t).
\end{aligned}
$$

4 Problem Goal

4.1 Theoretical

$$
\begin{cases}
min(q_t) = & loss(q_t) \\
& \textit{Subjecto to:} \\
& \quad 0 \leq q_t \leq c_t
\end{cases}.
$$