ISEN 601
Location Logistics

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Some Basic Inventory Theory

\[ WH_1 + WH_2 = WH \]

ECG models
Det. Demand
Replenish at same time
Some Basic Inventory Theory

Stochastic Demand (Q,R model), Newsvendor
Safety stock, hedge against uncertainty in demand

Some Basic Inventory Theory

Newsvendor Model Reminder:

- \( C_0 \): - overage cost
- \( c_u \): - underage cost

Expected Cost NV:

\[
C(Q) = c_0 \int_0^Q (Q-x)f(x)dx + c_u \int_{Q}^{\infty} (x-Q)f(x)dx
\]

\[
(C'(Q)) = c_0 \int_0^Q f(x)dx + c_u \int_{Q}^{\infty} f(x)dx
\]

\[C(Q^*) = 0\]

\[F(Q) = \frac{c_u}{c_u + C_0}\]

RV: demands (D)

Demand to carry

Decide how much to carry

Assess costs

Safety stock

\( q \)

Know distribution

If demand is normal: \( Q^* = \mu + \sigma \cdot z \)
Some Basic Inventory Theory

\[ WH_1, \sigma_1 \]
\[ WH_2, \sigma_2 \]
\[ WH = (\sigma_1^2 + \sigma_2^2)^2 \]
\[ WH_1 \xleftarrow{D_1} N(\mu_1, \sigma_1^2) \]
\[ WH_2 \xleftarrow{D_2} N(\mu_2, \sigma_2^2) \]
\[ D = D_1 + D_2 \sim N(\mu_1 + \mu_2, \sqrt{\sigma_1^4 + \sigma_2^4}) \]

if \( D_1 \) and \( D_2 \) are independent.

Location and Inventory

Some conclusions:

"Risk pooling"