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**Uniform Distribution**

**Normal Distribution**


supply chain profit

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Normal Distribution
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List of Symbols & Notations

\( \gamma \)
First parameter of the warranty dependent demand function

\( \delta \)
Second parameter of the warranty dependent demand function

\( \phi \)
Third parameter of the warranty dependent demand function

\( d \)
Stochastic part of the demand distribution

\( s \)
Lower limit of the uniform distribution followed by \( d \)

\( t \)
Upper limit of the uniform distribution followed by \( d \)

\( \mu \)
Mean of the normal distribution followed by \( d \)

\( \sigma \)
Standard deviation of the normal distribution followed by \( d \)

\( \lambda \)
Parameter (Poisson arrival rate) of the exponential distribution followed by \( d \)

\( w \)
Wholesale price per unit

\( c_m \)
Manufacturer’s production cost per unit

\( c_r \)
Retailer’s procuring cost per unit

\( c \)
Supply chain’s total cost of production and distribution per unit

\( g_m \)
Manufacturer’s cost of lost sales per unit

\( g_r \)
Retailer’s cost of lost sales per unit

\( g \)
Total supply chain’s cost of lost sales per unit.

\( v \)
Salvage value per unit

\( p \)
Retail price per unit

\( q \)
Number of units ordered

\( b \)
The buyback rate at which the manufacturer buys back the unsold units from the retailer

\( \alpha \)
Parameter for quantity flexibility contract such that the manufacturer gives full credit to the retailer up to \( \alpha q \) no of unsold units.

\( \theta \)
Portion of the warranty cost borne by the retailer

\( k \)
Length of the warranty period

\( S(q,k) \)
Expected sales

\( I(q,k) \)
Expected leftover inventory

\( I_r(q,k) \)
Expected leftover inventory at the retailer’s end after implementation of return policy

\( I_m(q,k) \)
Expected leftover inventory at the manufacturer’s end after implementation of
return policy  
\( L(q,k) \quad \text{Expected lost sales} \)

\( \mu(k) \quad \text{Expected total demand given the warranty length} \)

\( X | K \quad \text{Conditional random variable of demand given the warranty length } k \)

\( Y \quad \text{Random variable denoting the time required for the first failure of the product} \)

\( \beta \quad \text{Failure rate of the product} \)

\( r \quad \text{Cost of warranty per unit} \)

\( x(k,d) \quad \text{Total demand} \)

\( y(k) \quad \text{Warranty dependent demand function} \)

\( f(X | K) \quad \text{Probability density function (Pdf) corresponding to the conditional demand distribution} \)

\( F(X | K) \quad \text{Cumulative distribution function (Cdf) corresponding to the conditional demand distribution} \)

\( h \quad \text{Probability density function (Pdf) of } d \)

\( H \quad \text{Cumulative distribution function (Cdf) of } d \)

\( \pi_m(q,k) \quad \text{Expected profit earned by the manufacturer} \)

\( \pi_r(q,k) \quad \text{Expected profit earned by the retailer} \)

\( \pi(q,k) \quad \text{Expected profit earned by the entire supply chain.} \)

\( k_T \quad \text{Maximum risk borne by total supply chain in case of a risk-averse supply chain} \)

\( k_M \quad \text{Maximum risk borne by the manufacturer in case of a risk-averse manufacturer} \)

\( k_R \quad \text{Maximum risk borne by the retailer in case of a risk-averse retailer} \)