Package ‘RM2’

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Title  Revenue Management and Pricing Package
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Depends  R (>= 2.7.1), msm
Description  RM2 is a simple package that implements functions used in
             revenue management and pricing environments.
License  GPL (>= 3)
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EM  Unconstrain the demand using the Expectation-Maximization algorithm

Description

EM unconstrains demand data in quantity-based revenue management.
Usage
EM(demand = demand, eps = 0.005)

Arguments
demand demand vector with constrained and unconstrained entries. A 0 in the name of an entry means that the corresponding demand is unconstrained. Conversely, a 1 in the name of an entry suggests that the corresponding demand is constrained.
deps small number used as the stopping criterion. The default value is 0.005.

Details
EM unconstrains demand data in quantity-based revenue management. The observed demand entries, some of which are constrained because the product class was closed, are assumed to be realizations from an underlying normal distribution with mean $\mu$ and standard deviation $\sigma$. The objective is to find the parameters $\mu$ and $\sigma$ of this underlying demand distribution.

Value
param parameters of demand distribution
niter number of iterations
demand unconstrained demand vector
history parameter convergence history

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References

Examples
# SPECIFY THE SEED
set.seed(333)
# SPECIFY REAL PARAMETERS OF THE DEMAND DISTRIBUTION
rmean <- 20
rsd <- 4
nrrn <- 20
# GENERATE REAL DEMAND
rdrawn <- round(rnorm(nrrn, rmean, rsd))
# GENERATE BOOKING LIMITS
b1 <- round(rnorm(nrrn, rmean, rsd))
# GENERATE OBSERVED DEMAND
demand <- rdrawn * (rdrawn <= b1) + b1 * (rdrawn > b1)
Perform EMSR-b with Buy-up Heuristic for the Single-Resource Problem

Description

EMSRb heuristic sets the protection levels for multiple fare classes.

Usage

EMSRb(Fare = Fare, Mean = Mean, Var = Var, p_up = numeric(length(Fare)), cap = cap)

Arguments

- **Fare**: revenue vector associated with selling the offered products
- **Mean**: mean product demand
- **Var**: product demand variance
- **p_up**: buy-up probabilities. The default entails no buy-up probabilities.
- **cap**: available capacity

Details

EMSRb sorts internally the Fare vector together with all other input vectors in descending order of the revenues. If p_up is missing, EMSRb performs the classical EMSRb heuristic.

Value

- **p**: protection levels

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Examples

```r
# Run a simple EMRSb instance
Fare <- c(150, 100, 50, 250)
Mean <- c(75, 125, 500, 50)
Var <- c(75, 125, 500, 50)
cap <- 400
p <- EMSRb(Fare = Fare, Mean = Mean, Var = Var, cap = cap)
p
```

Description

PD unconstrains demand data in quantity-based revenue management.

Usage

```r
PD(demand = demand, tau = 0.5, eps = 0.005)
```

Arguments

demand demand vector with constrained and unconstrained entries. A 0 in the name of an entry means that the corresponding demand is unconstrained. Conversely, a 1 in the name of an entry suggests that the corresponding demand is constrained.

tau fixed constant that reflects how aggressive the unconstraining is. The default value is 0.5.

eps small number used as the stopping criterion. The default value is 0.005.

Details

PD unconstrains demand data in quantity-based revenue management. The observed demand entries, some of which are constrained because the product class was closed, are assumed to be realizations from an underlying normal distribution with mean $\mu$ and standard deviation $\sigma$. The objective is to find the parameters $\mu$ and $\sigma$ of this underlying demand distribution.

Value

- param parameters of demand distribution
- niter number of iterations
- demand unconstrained demand vector
- history parameter convergence history
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References


Examples

# SPECIFY THE SEED
set.seed(333)
# SPECIFY REAL PARAMETERS OF THE DEMAND DISTRIBUTION
rmean <- 20
rsd <- 4
nrn <- 20
# GENERATE REAL DEMAND
rdemand <- round(rnorm(nrnn, rmean, rsd))
# GENERATE BOOKING LIMITS
bl <- round(rnorm(nrnn, rmean, rsd))
# GENERATE OBSERVED DEMAND
demand <- rdemand * (rdemand <= bl) + bl * (rdemand > bl)
# IDENTIFIED PERIODS WITH CONSTRAINED DEMAND: 1 - CONSTRAINED DEMAND
names(demand) <- as.character(as.numeric(rdemand>bl))
demand
# UNTRUNCATE DEMAND
PD(demand)
PD(demand, tau=0.5, eps=0.005)
PD(demand, tau=0.5, eps=0.00005)
# MODIFY DEMAND VECTOR - NO CONSTRAINED INSTANCES ARE OBSERVED
names(demand) <- rep(0, length(demand))
# ATTEMPT TO UNTRUNCATE THE DEMAND
PD(demand, tau=0.5, eps=0.005)
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