Yield Management EX3 - solutions

Prof. Alberto Portioli Staudacher
Bassel Kassem

Lean excellence Centre www.lean.polimi.it
Politecnico di Milano
Dep. Management, Economics and Industrial Engineering
bassel.kassem@polimi.it

Theory link

- It is possible to cluster customers in more than two clusters in order to maximise profit

- It is possible to exploit the no-show event through the introduction of last-minute tickets

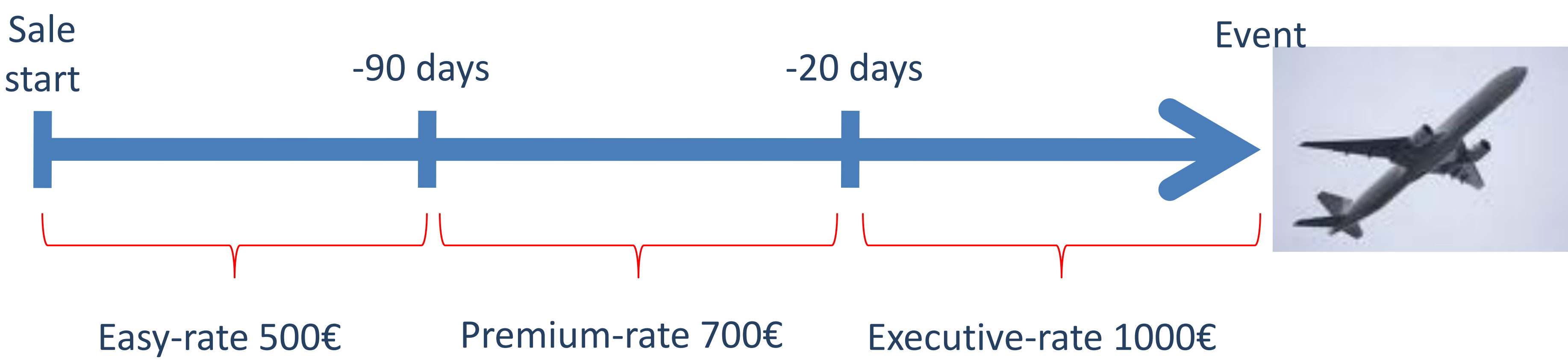
Key messages from the lesson

- Understand how to use heuristic EMSR framework
- Understand how to calculate underestimation costs and overestimation costs in the EMSR framework

Easy Fly

the offer is composed by 3 different rates

Heuristic EMSR



Heuristic framework

1. Calculate protection Level for class 1, ϑ_1 (highest class)
2. Calculate protection Level for class 1+2, ϑ_2 (highest class + next lower class)
3. ....calculate the protection level for class 1+2+3+..+n, ϑ_n ....
4. The number of seats reserved to the lowest class (the cheapest) isn't determined by protection level formula. It depends on the available capacity.

HEURISTIC EMSR

$$\overline{f_i} * P(D_i \geq \vartheta_i) = f_{i+1}$$

$$\overline{f_i} = \frac{\sum_{j=1}^{i} \mu_j f_j}{\sum_{j=1}^{i} \mu_j}$$

average revenue of i-rate and «more expensive than i» rates

$D_i \sim$ N

$$\overline{\mu}(i) = \sum_{j=1}^{i} \mu_j \qquad \overline{\sigma}^2(i) = \sum_{j=1}^{i} \sigma_j^2$$

$$\overline{f_i} * [1 - P(D_i < \vartheta_i)] = f_{i+1}$$

$$P(D_i < \vartheta_i) = 1 - \frac{f_{i+1}}{\overline{f_i}}$$

$$F(z_\alpha) = 1 - \frac{f_{i+1}}{\overline{f_i}}$$

$$\vartheta_i = \overline{\mu}(i) + z_\alpha \overline{\sigma}(i)$$

Protection level ϑ_1

Executive rate

Price: 1000 €

Average demand: 100

Variance: 70

$$P(D_i < \vartheta_i) = 1 - \frac{f_{i+1}}{\overline{f_i}}$$

$$P(D_i < \vartheta_i) = 1 - \frac{700}{1000} += 1 - 0,7 = 0.3$$

$Z\alpha$ = - 0,52

class 1 Protection Level (Executive rate):

$$100 - 0,53\sqrt{70}$$ = 96 seats

protection level ϑ_2

Executive + Premium rates

Weighted average price: 785,71 € $= \frac{100 * 1000 + 250 * 700}{100 + 250}$

Average demand: 350

Variance: 120

$$P(D_i < \vartheta_i) = 1 - \frac{f_{i+1}}{\overline{f_i}}$$

$$P(D_i < \vartheta_i) = 1 - \frac{500}{785.71} += 1 - 0,634 = 0.364$$

Zα = - 0,35

Classe 2 protection Level (Executive + Premium rates):

$$350 - 0,35\sqrt{120}$$ = 346 seats

Protection Level

Sale start

-90 days

-20 days

Easy-rate 500€

Premium-rate 700€

Executive-rate 1000€

 # seats: 154

 # seats : 96

 # seats : 346

Reduction Easy-rate

Assumptions: no changes on average and variance of demands' distributions

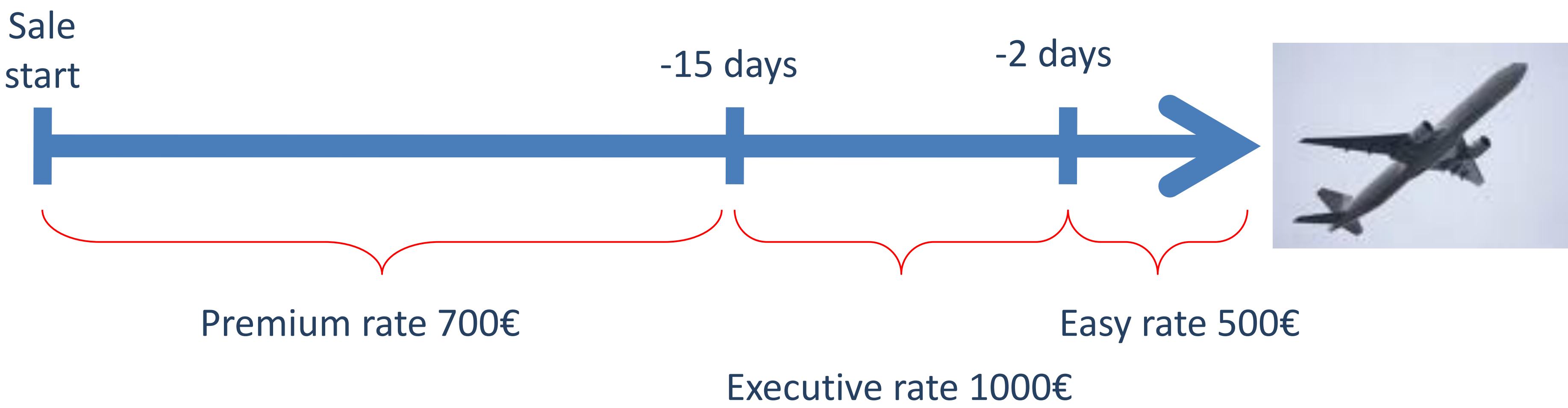
$$\overline{f_i} * P(D_i \geq \vartheta_i) = f_{i+1}$$

If Easy rate is decreased, what happens to protection levels?

Revenue by Easy ticket is lower.
ϑ_2 Protection level 2 (Exec. + Prem.) increases.

Protection level 1, only for Executive tickets, doesn't change
Protection level 2, only for Premium tickets, changes (it increases)

Company modifies its sales strategy



Problem setting

In this case Easy rate becomes last minute ticket.

It will be used only if company doesn't sell all Executive tickets

Company has only two main fares: Premium and Executive

Strategic use of Easy rate to saturate airplane capacity

Define protection level for Executive rate

In case that all dedicated Executive rate seats weren't occupied, company could sell remaining seats at Easy rate.

It descreases risk, overestimated cost is lower!

Marginal Analysis

$$P(X_1 \geq S_1) * C_u \geq P(X_1 < S_1) * C_o$$

$$[1 - P(X_1 < S_1)] * C_u \geq P(X_1 < S_1) * C_o$$

$$P(X_1 < S_1) \leq \frac{C_u}{C_u + C_o}$$

Underestimated cost → lost margin because company sold at discounted price (Premium rate) a place that could be sold at full price (Executive rate)

$$C_u = 1000 - 700 = 300\ €$$

Overestimated cost → lost margin: a seat reserved to executive rate isn't sold at full price because the demand was lower than protection level and it is sold at a last minute rate (Easy) instead of discounted rate (Premium)

$$C_o = 700 - 500 = 200\ €$$

P(X≤160)=85%
Zα=1,04
Dev. std. = (160-100)/1,04
Dev. Std = 57,69

Protection Level

$$P(X_1 < S_1) \le \frac{C_u}{C_u + C_o} = \frac{300}{300+200} = 0,6$$

Zα=0,25

S_1= 100 + 0,25*57,69 = 114 seats

Some examples – How to shape the following systems?

1. In the last year, a cinema in Milan had some problems in terms of profit by risking the bankrupting. The manager wants to find a solution by changing the cinema strategy in order to maximise its revenues.

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