



Advanced modelling techniques applied on a
Revenue Management solution

Eline Werkman

ORTEC
OPTIMIZE YOUR WORLD

Introduction Speaker

Introduction Topic

Pricing challenges for Holiday Resorts

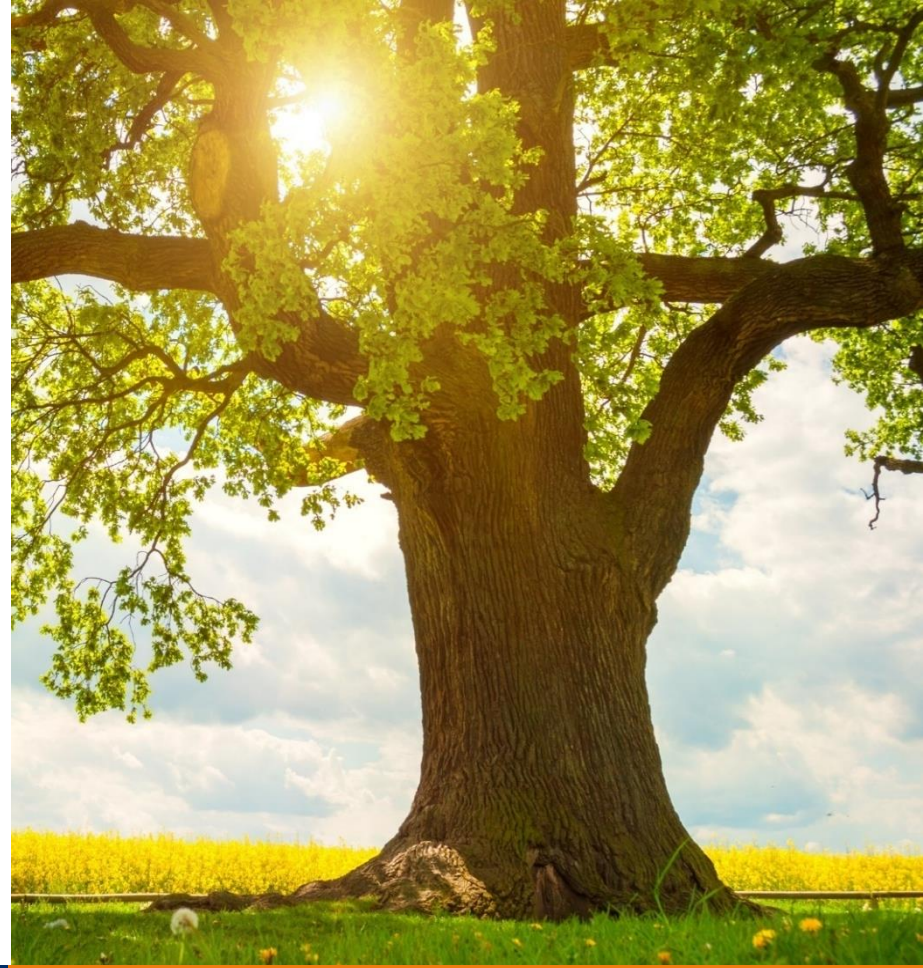
Revenue Management process

Demand Forecast

Price Elasticities

Price Optimization

TOPICS



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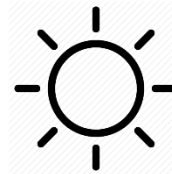
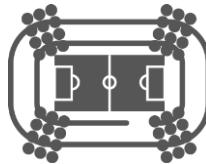
Education

- MSc. – Econometrics and Operations Research
- VU Amsterdam
- Graduated 2011



Professional

- Revenue Management Consultant
- ORTEC
- Since 2011



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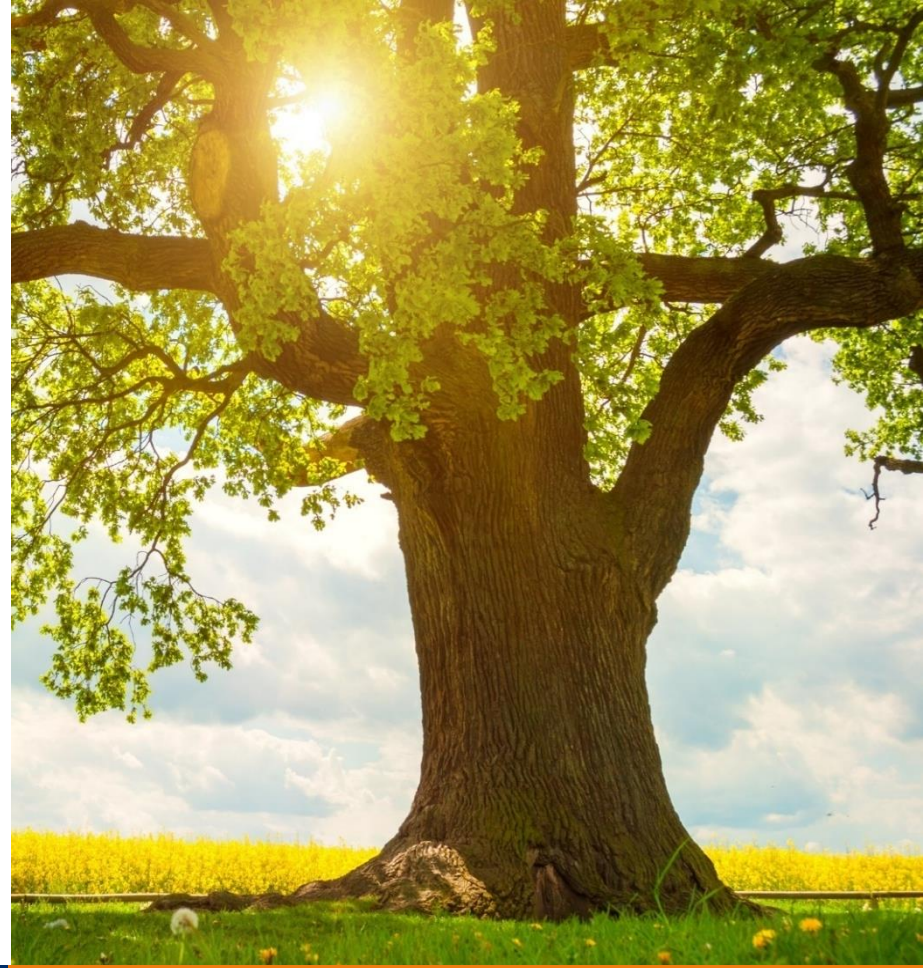
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The Idea behind Revenue Management

OPTIMAL
BALANCE



ALIGN DEMAND
WITH SUPPLY



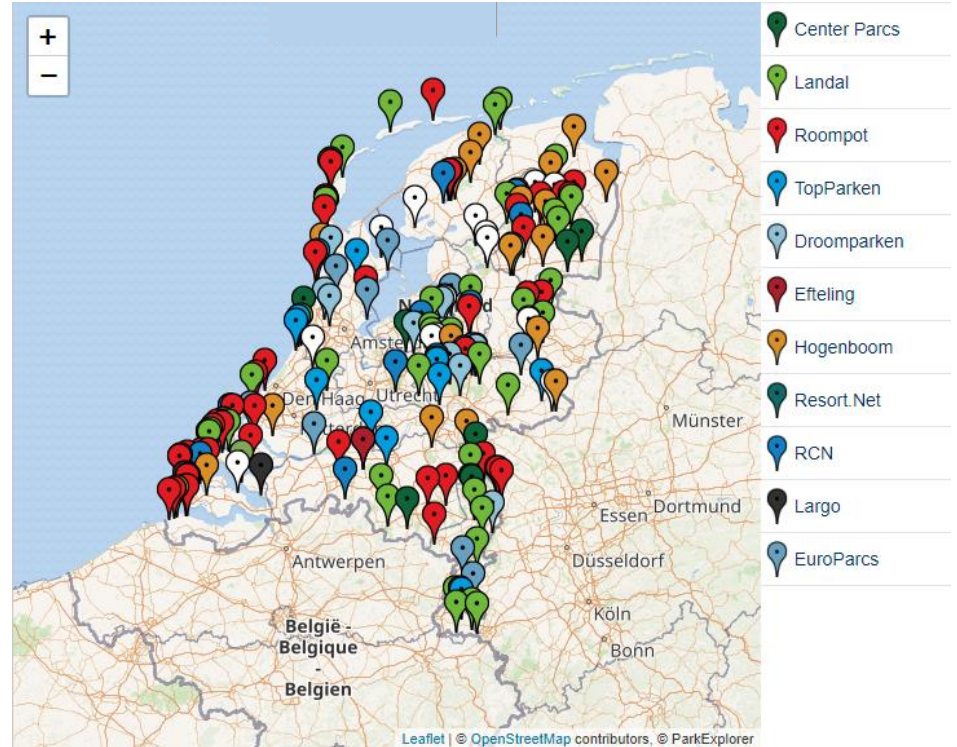
USE CUSTOMER
WILLINGNESS
TO PAY



Selling the right product, to the right customer, at the right time, for the right price

Characteristics pricing for Holiday Resorts

- A **lot** of holiday providers
- Customer used to using **brochures** (one price independent of time)
- Customer not entirely ready for **continuous** dynamic pricing
- Using **legacy** reservation systems (not ready for heavy price changes)
- Typically accommodations are owned by an **investor** (not necessarily the holiday provider)



Terminology

Product



Capacity



Availability

Afbeeldingen	Omschrijving	Beschikbaarheid
januari 2015		
ma di wo do vr za zo		
1 2 3 4		
5 6 7 8 9 10 11		
12 13 14 15 16 17 18		
19 20 21 22 23 24 25		
26 27 28 29 30 31		
februari 2015		
ma di wo do vr za zo		
1 2 3 4 5 6 7 8		
9 10 11 12 13 14 15		
16 17 18 19 20 21 22		
23 24 25 26 27 28		
maart 2015		
ma di wo do vr za zo		
1 2 3 4 5 6 7 8		
9 10 11 12 13 14 15		
16 17 18 19 20 21 22		
23 24 25 26 27 28 29		
30 31		
april 2015		
ma di wo do vr za zo		
1 2 3 4 5		
6 7 8 9 10 11 12		
13 14 15 16 17 18 19		
20 21 22 23 24 25 26		
27 28 29 30		
mei 2015		
ma di wo do vr za zo		
1 2 3		
4 5 6 7 8 9 10		
11 12 13 14 15 16 17		
18 19 20 21 22 23 24		
25 26 27 28 29 30 31		
juni 2015		
ma di wo do vr za zo		
1 2 3 4 5 6 7		
8 9 10 11 12 13 14		
15 16 17 18 19 20 21		
22 23 24 25 26 27 28		
29 30		
juli 2015		
ma di wo do vr za zo		
augustus 2015		
ma di wo do vr za zo		
september 2015		
ma di wo do vr za zo		

Price point



SELECTEER EEN DATUM

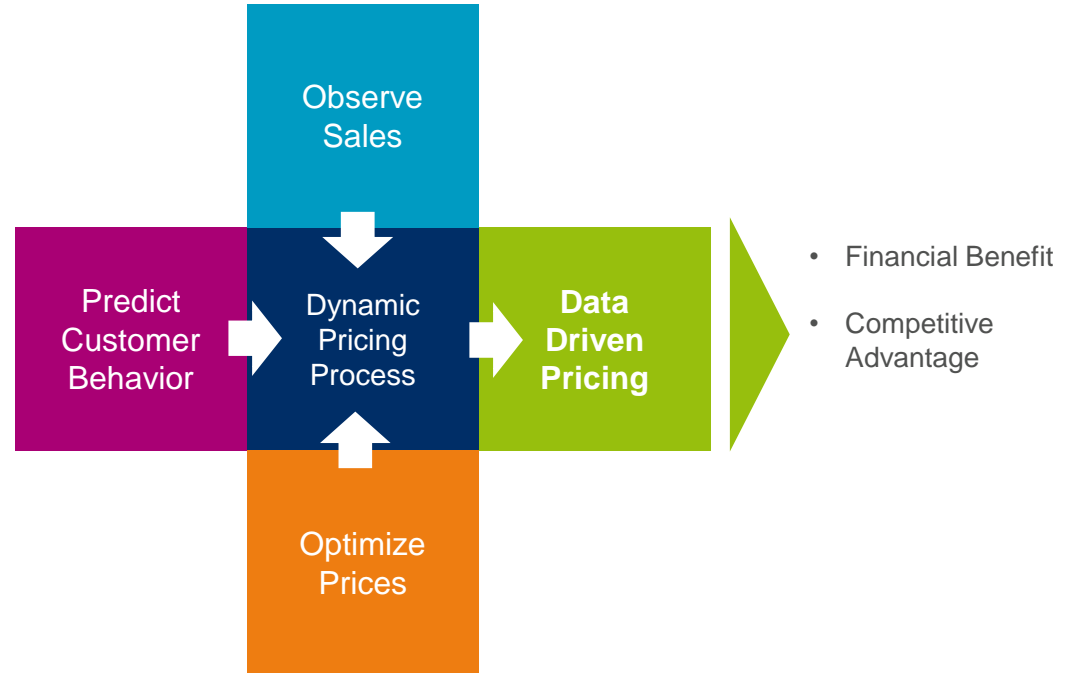
Aankomstdatum Vertrekdatum

Aankomst Vertrek **Tegereen** **Aanbreuk**

JANUARI 2019							FEBRUARI 2019						
MA	DI	WO	DO	VR	ZA	ZO	MA	DI	WO	DO	VR	ZA	ZO
1	2	3	4	5	6					1	2	3	
7	8	9	10	11	12	13	4	5	6	7	8	9	10
14	15	16	17	18	19	20	11	12	13	14	15	16	17
21	22	23	24	25	26	27	18	19	20	21	22	23	24
28	29	30	31				25	26	27	28			

ORTEC's Vision on Dynamic Pricing

- In this age of Big Data most companies have a wealth of **data on customer behavior** available
- Use this data to **predict future customer behavior**
- **Optimize prices** to maximize profit using these predictions



Dynamic Pricing in holiday resort case



OBSERVE SALES

- Bookings
- Availability

PREDICT CUSTOMER BEHAVIOR

- Unconstrained demand forecast
- Price elasticity

OPTIMIZE PRICES

- Optimize prices per price point

FACTS

- Data engineering

PREDICTIONS

- Machine Learning

DECISIONS

- Operations Research

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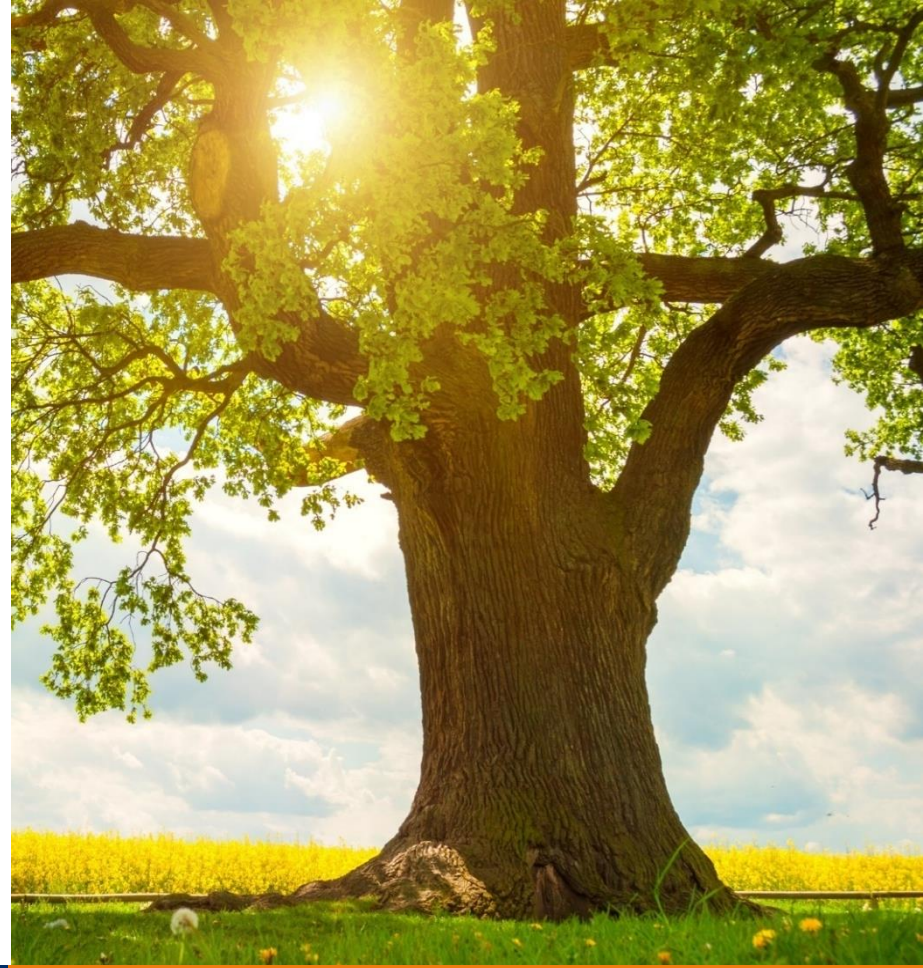
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General Holiday Resorts RM Challenges

Large scope

- A lot of resorts
- A lot of different accommodation types on each resort
- Resulting in a lot of price points

Different products

- No resort is the same due to different facilities and geographical location
- No accommodation type is alike

Products using same capacity

- Multiple length of stay and arrival day of week options require the same capacity

Constant capacity

- Accommodations are available entire year (even in low season)

Small number of observations

- Due to limited amount of accommodations per accommodation type

Seasonality

- Huge impact of holiday periods on demand forecast

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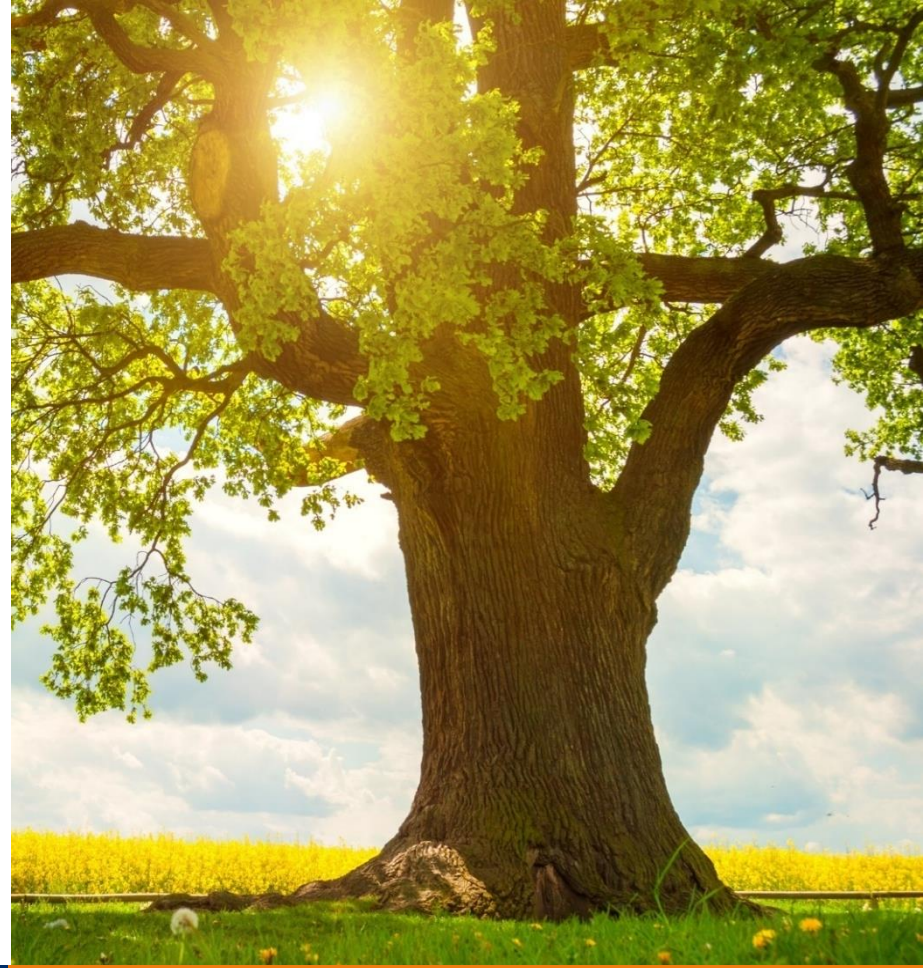
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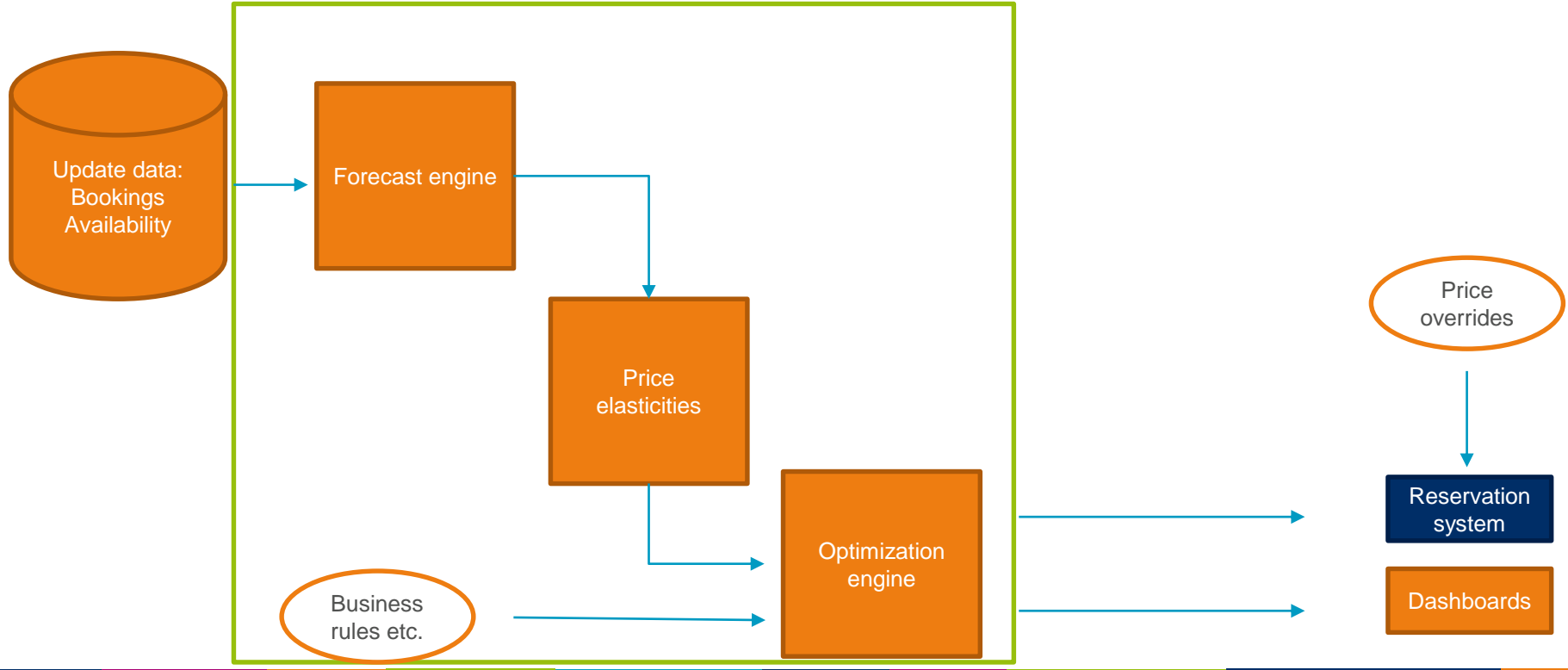
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The Revenue Management Process



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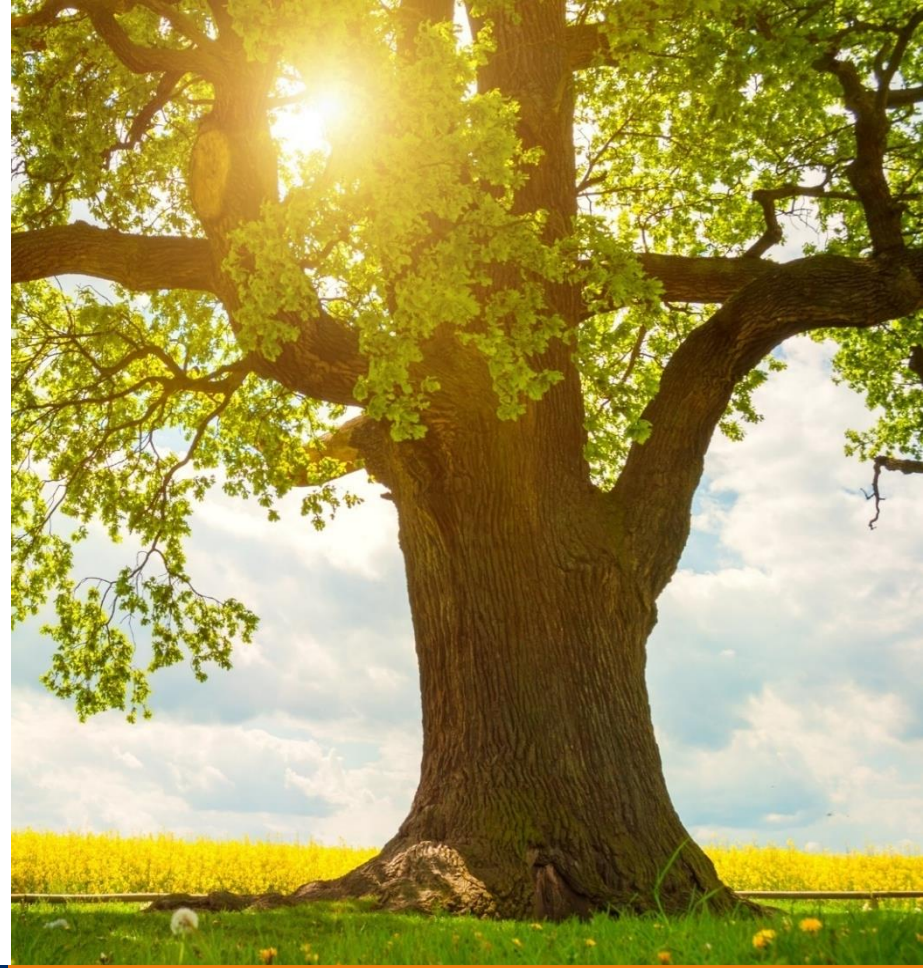
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Demand Forecast method

Additive Booking Curve Forecast

Forecast based on historical number of bookings

- + Forecast stable
- + Reliable forecast long before arrival
- Forecast does not pick up trends in current bookings

$\times y\%$

+

$(1-y)\% \times$

Multiplicative Booking Curve Forecast

Forecast based on current number of bookings

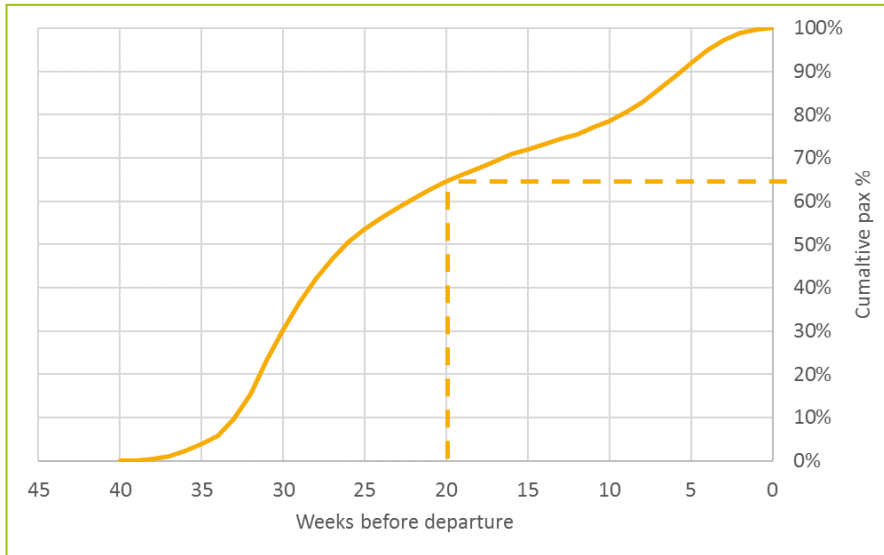
- + Forecast picks up trends in current bookings
- + Reliable forecast short before arrival
- Volatile forecast long before arrival, not reliable

=

Final Forecast

Demand forecast explained

- Based on historical data we expect 35% of the historical number of bookings is still to come
- Based on current data we assume this number of bookings represent 65% of the final forecast



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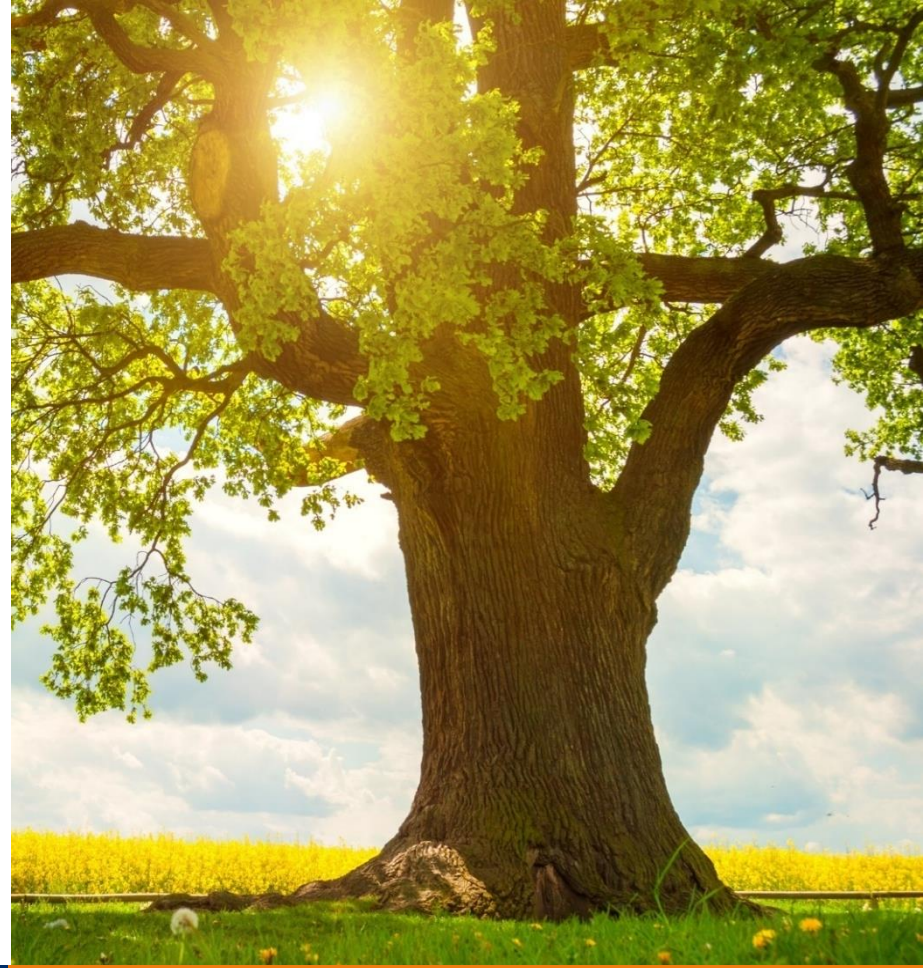
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Price Elasticities



What: Indicator for price sensitivity of customers



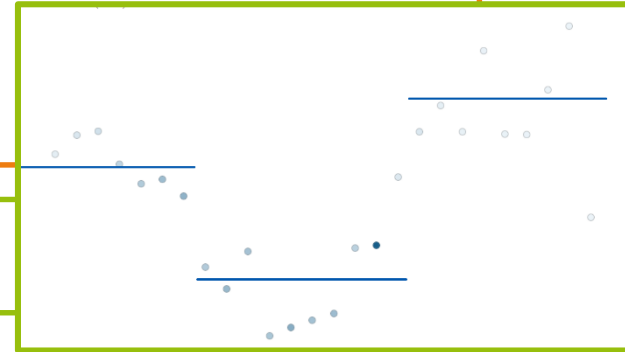
Why: Determine forecast using another price



How: Machine learning approach
Split two years of historical data in:
1. Training set
2. Test set
Minimize error while not overfitting



Price elasticity value depends on multiple characterists



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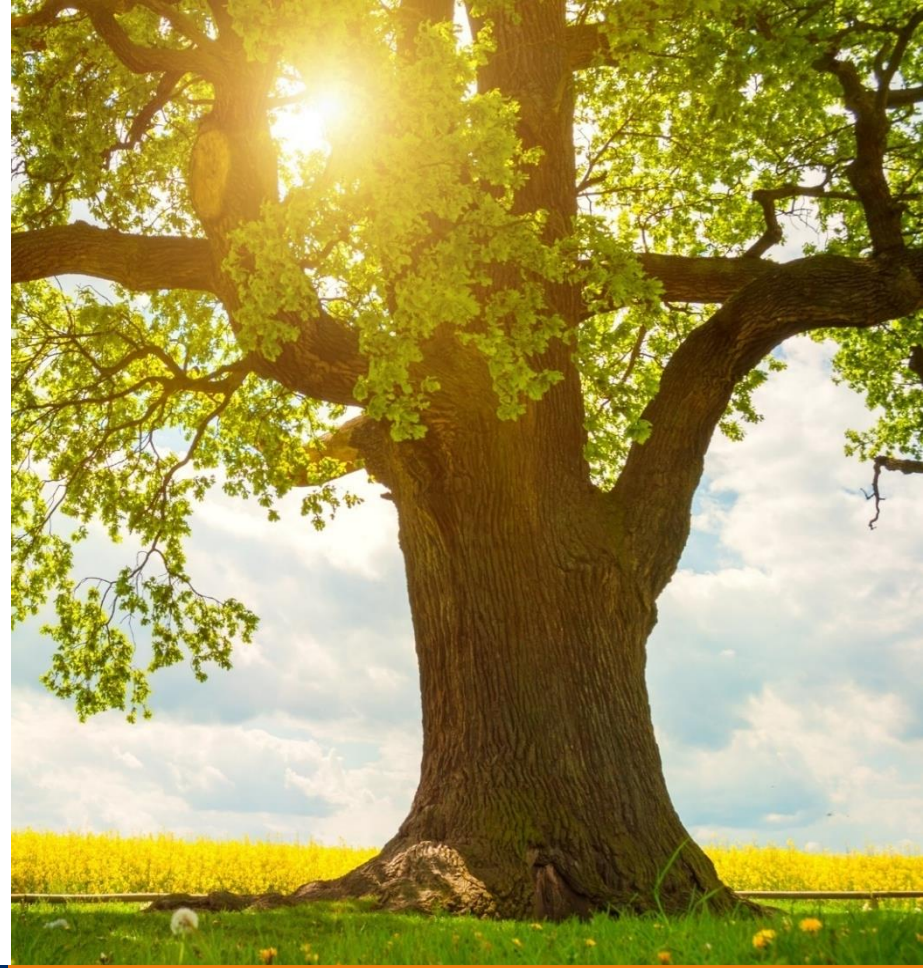
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Price Optimization



What: Find optimal price per price point taking into account:

- optimal ratio between offered products
- business rules



Why: Optimize turnover



How: LP-model using coin solver



Business rules applied:

- Individual prices (e.g. price overrides / rounding)
- Other revenues (e.g. on park spends)

Questions



eline.werkman@ortec.com

Let's optimize your world!

