Hotel Pricing Optimization

Metis DS Bootcamp
Business Fundamentals
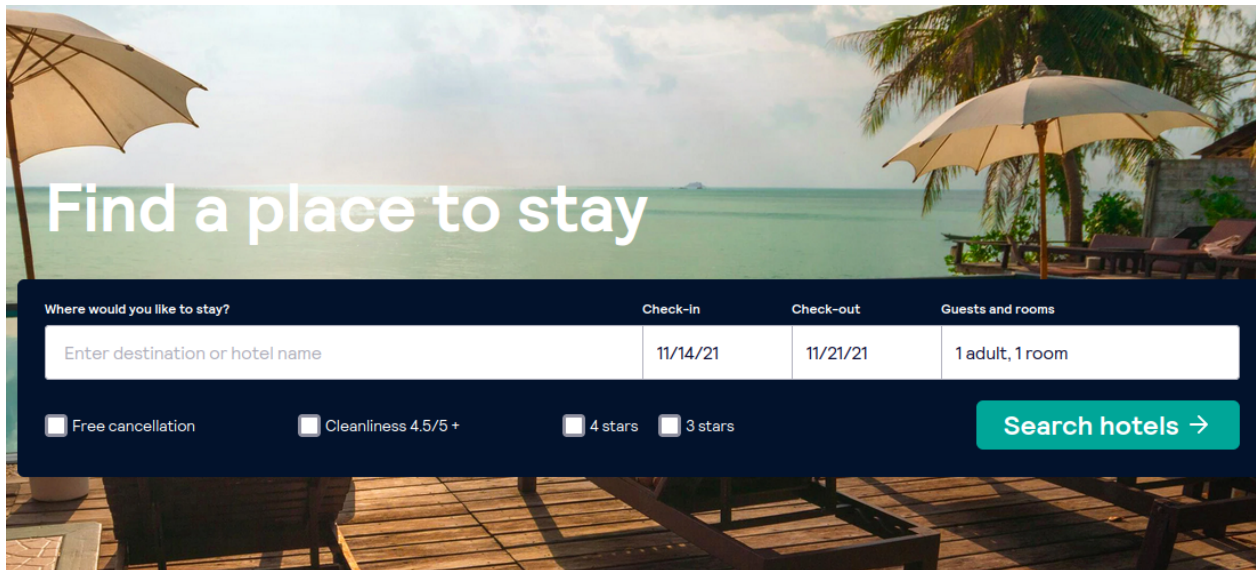
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Introduction

Both the pandemic and competition from Airbnb have taken a toll on the hospitality industry.

One area where DS can contribute meaningfully:

Price optimization

Image: skyscanner.com

Pricing factors:

- room features
- lead time of booking
- time of year
- market trends

Methodology

Exploring possibilities to optimize pricing for a hotel company,
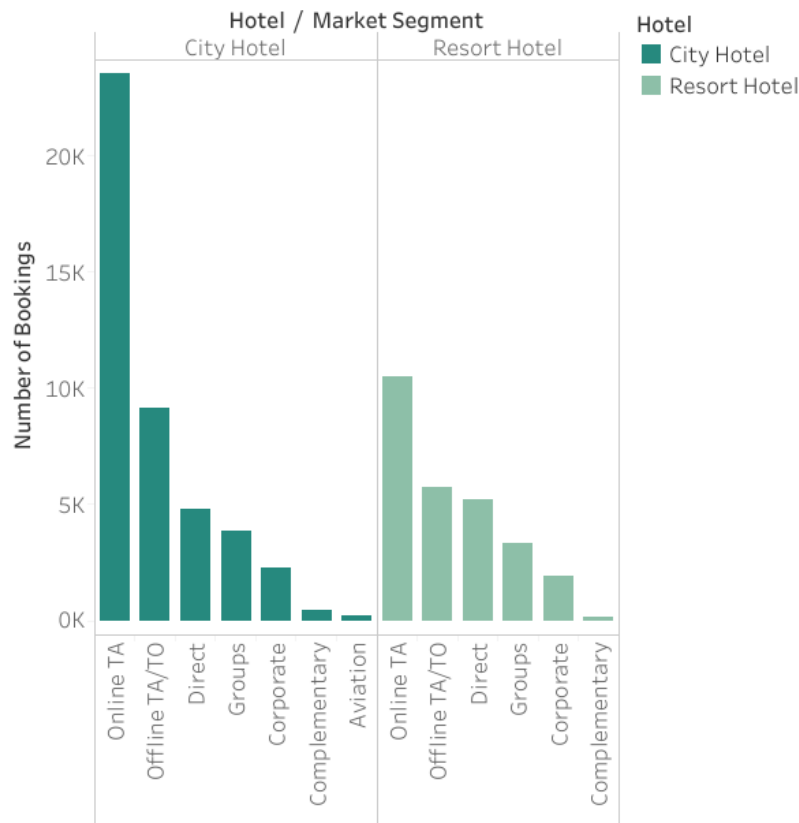based on a relevant sample dataset

Impact hypothesis:

Dynamic pricing will add a competitive advantage to a medium-sized hotel,
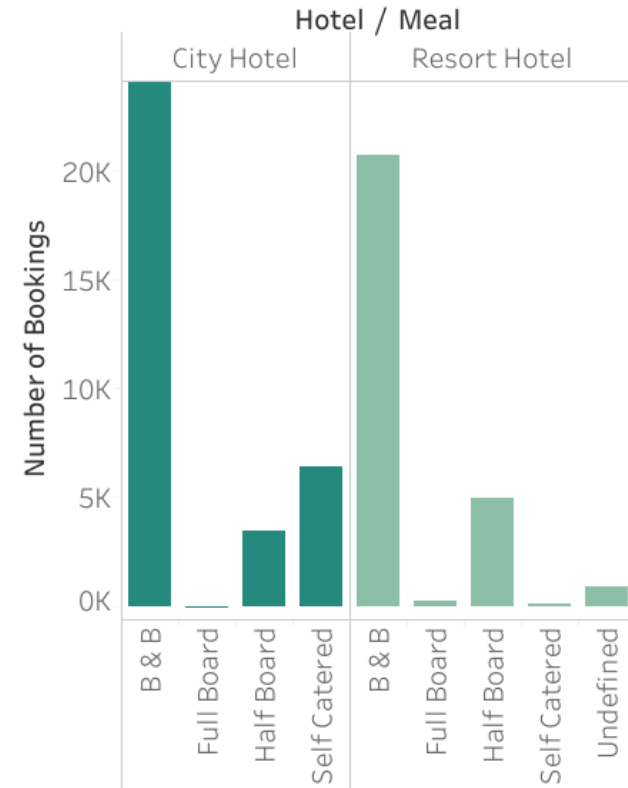increasing revenue with low overhead.

Methodology

Booking data from two hotel types, "City" and "Resort"
- all bookings between August 2015 - 2017
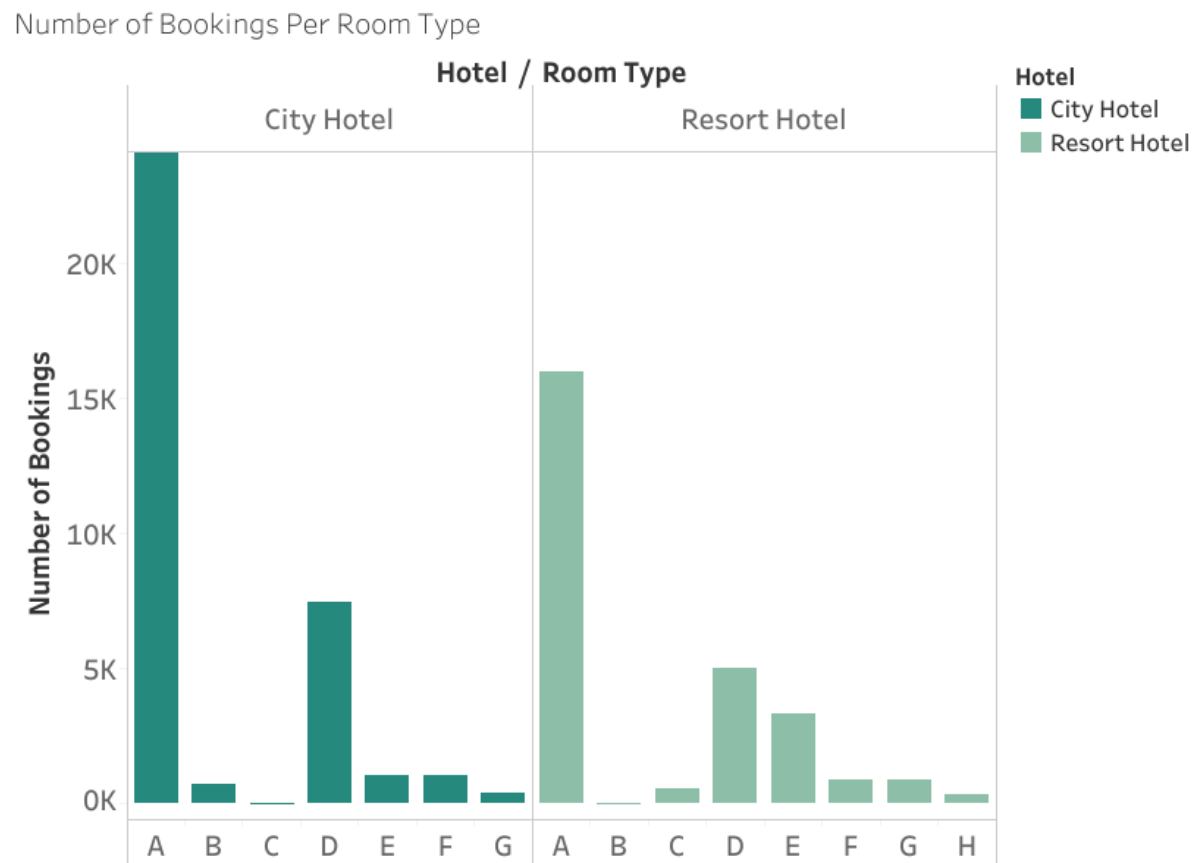

Number of Bookings Per Market Segment

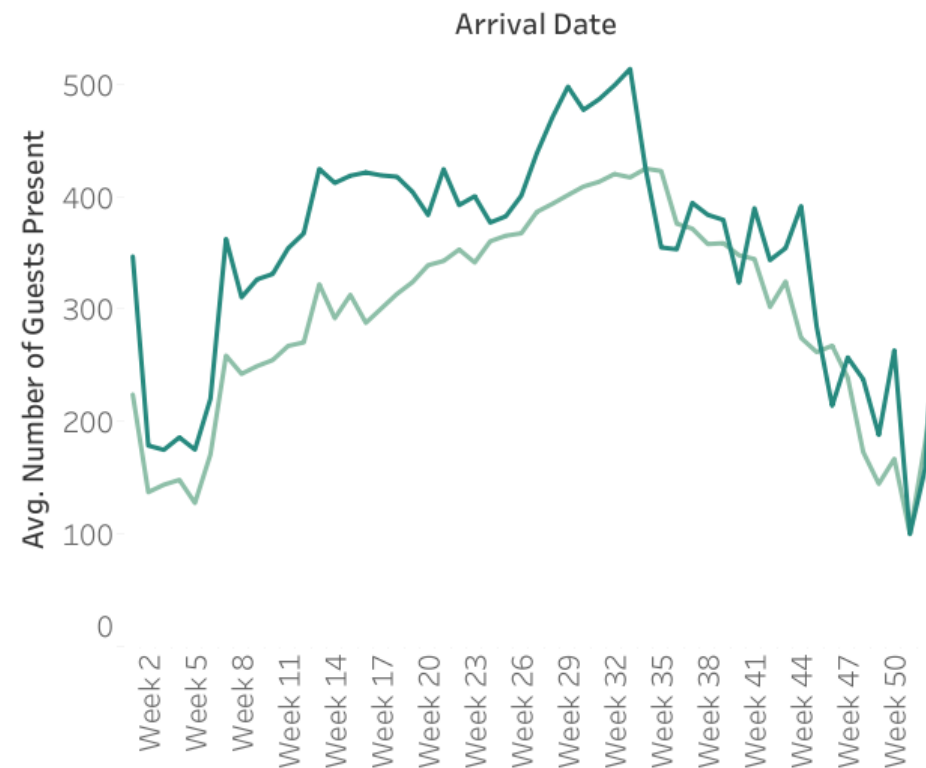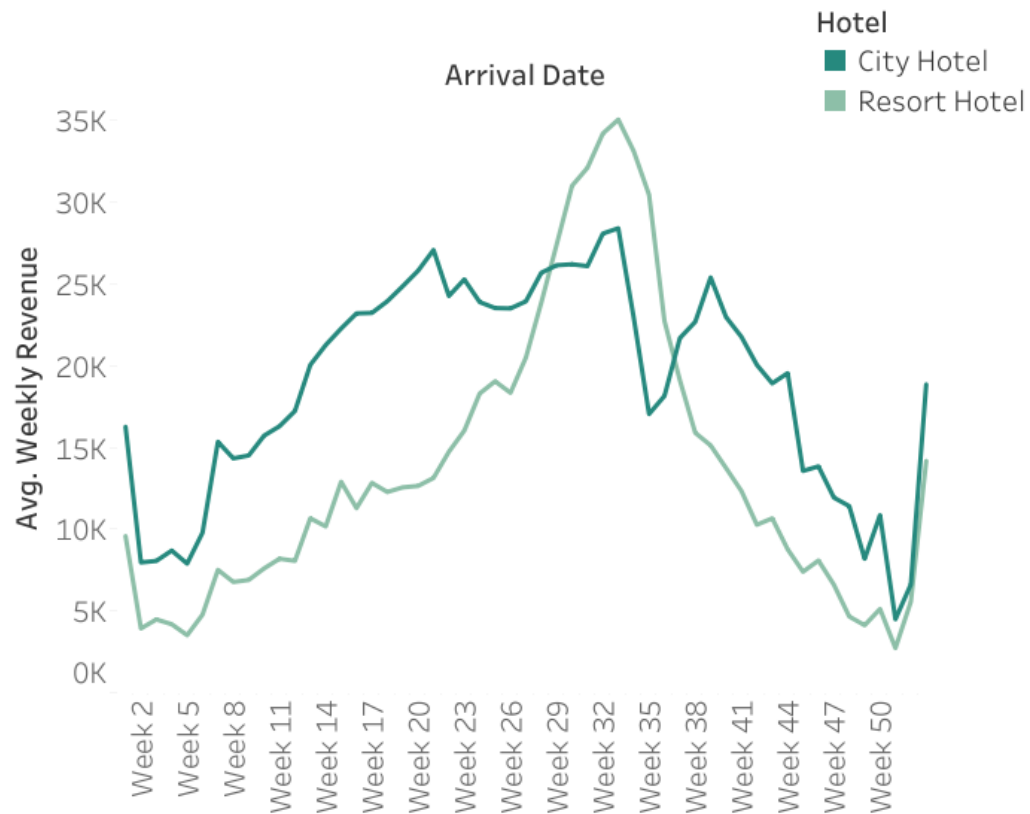Number of Bookings Per Meal Type

Methodology

Booking data from two hotel types, "City" and "Resort"
- all bookings between August 2015 - 2017

Number of Bookings Per Room Type

Methodology

Revenue and occupancy follow clear seasonal patterns

Methodology

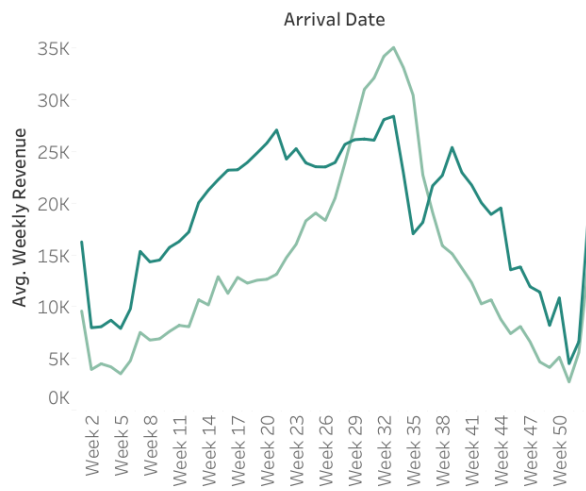Solution path

Phase 1 → **Phase 2** → **Phase 3**

Forecast a baseline level of demand/bookings

Collect data to accurately model customers' response to price adjustments at the client hotel

Optimize pricing based on a combination of room features, seasonality and price elasticity

Arrival Date

Methodology

Solution path

Phase 1

Forecast a baseline level of demand/bookings

Phase 2

Collect data to accurately model customers' response to price adjustments at the client hotel

Phase 3

Optimize pricing based on a combination of room features, seasonality and price elasticity

Arrival Date

Avg. Weekly Revenue

35K
30K
25K
20K
15K
10K
5K
0K

Week 2, Week 5, Week 8, Week 11, Week 14, Week 17, Week 20, Week 23, Week 26, Week 29, Week 32, Week 35, Week 38, Week 41, Week 44, Week 47, Week 50

Results

Price variation is confounded with booking and arrival time of year

(Tableau demo
recording)

Methodology

Solution path
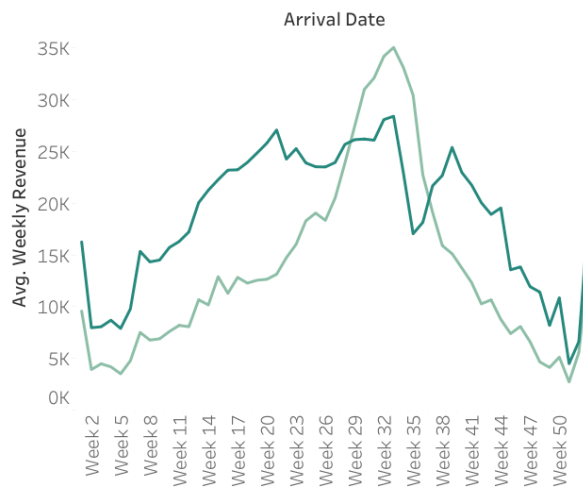
Phase 1 → **Phase 2** → Phase 3

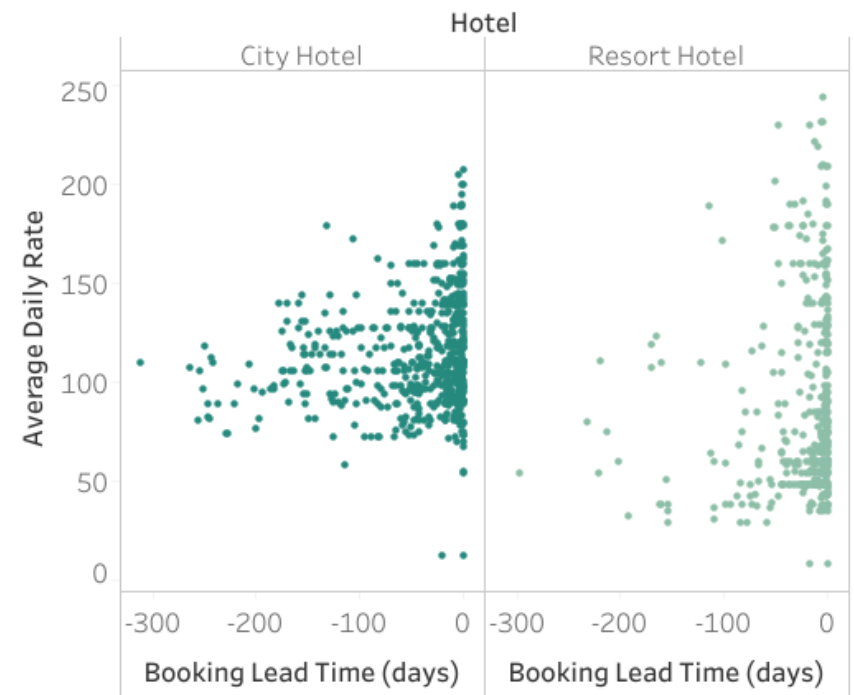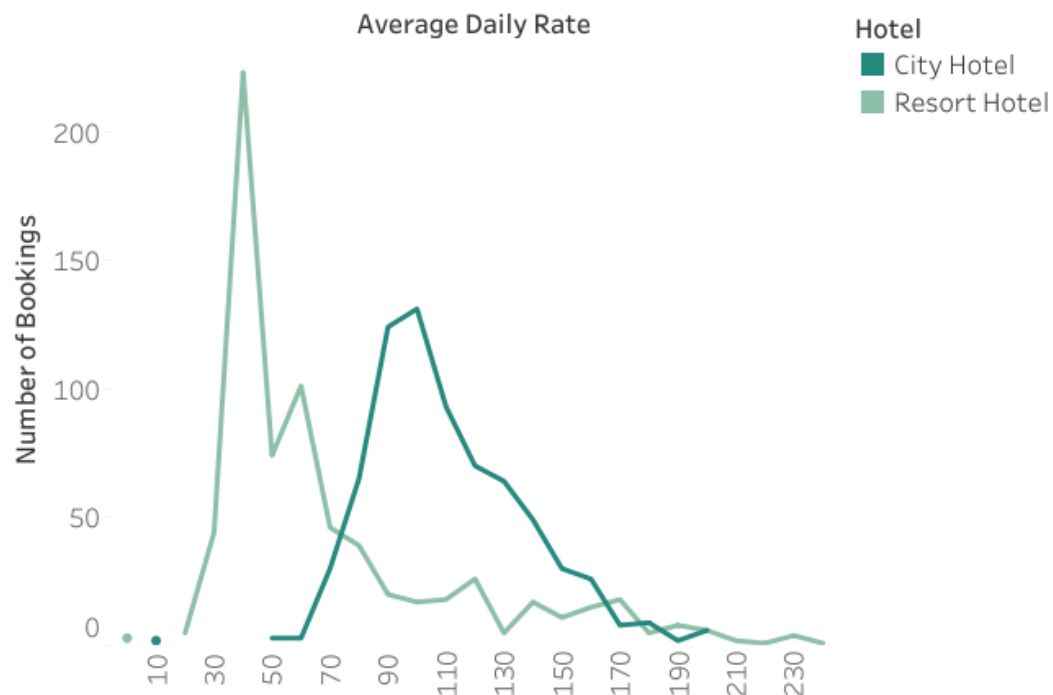Forecast a baseline level of demand/bookings

Collect data to accurately model customers' response to price adjustments at the client hotel

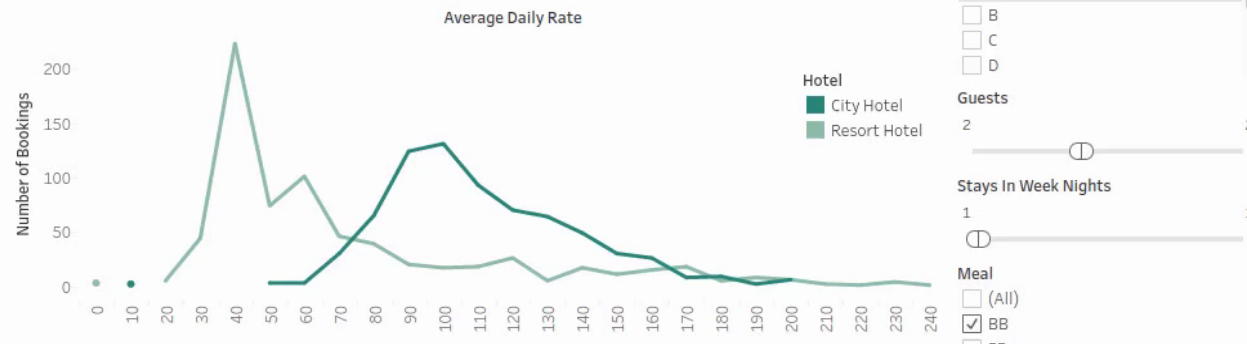Optimize pricing based on a combination of room features, seasonality and price elasticity

Arrival Date

Bookings

Price

Methodology

Solution path

Phase 1 → **Phase 2** → **Phase 3**
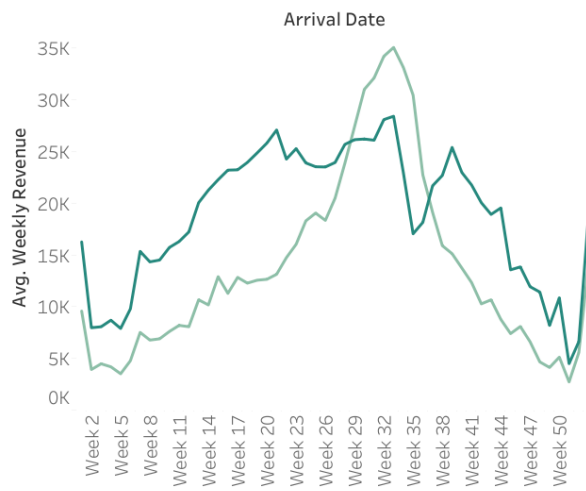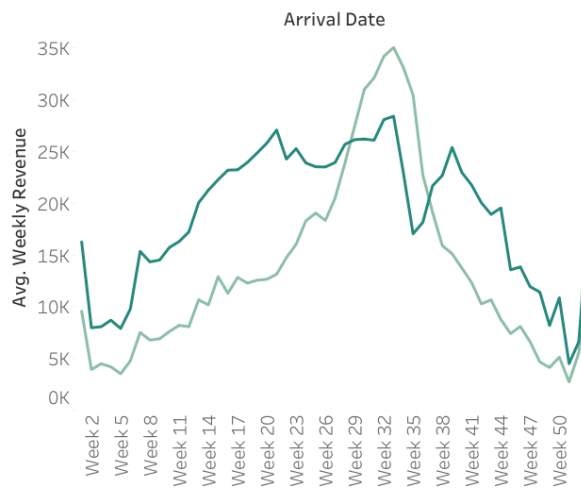
Phase 1	Phase 2	Phase 3
Forecast a baseline level of demand/bookings	Collect data to accurately model customers' response to price adjustments at the client hotel	Optimize pricing based on a combination of room features, seasonality and price elasticity

Arrival Date

(chart: Avg. Weekly Revenue vs. Week 2 – Week 50, values 0K–35K)

Bookings

(curve: Price vs. # Bookings)

Conclusions

There is still room for improvement on the hotels' current dynamic pricing scheme.

Recommendations:

- Setting prices within a small range to collect more data on price elasticity

- Predicting and dynamically setting optimal prices based on historical data and experimental results

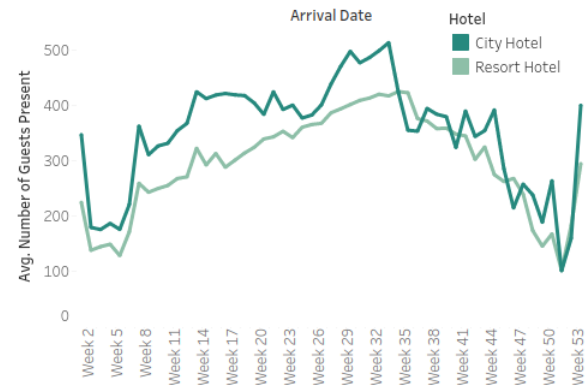- Iteratively training the model for long-term improvements
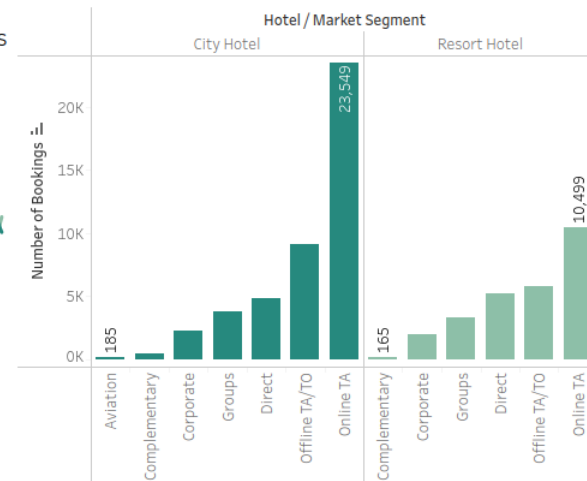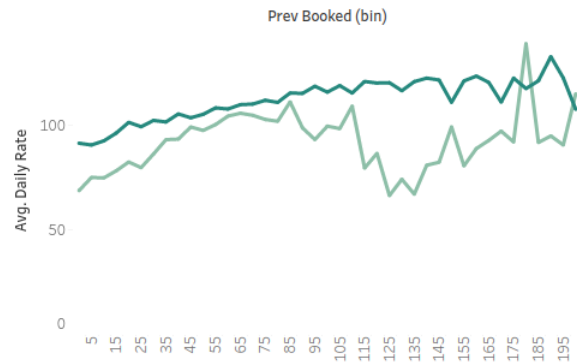
Appendix

Tableau EDA

Revenue varies predictably over the year
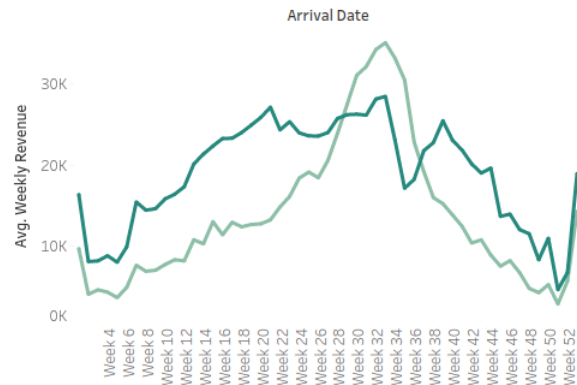
Hotels are usually well under full capacity

Average rate increases with # of existing reservations for arrival date (occupancy)

Appendix

Tableau
Weekly Rate View