



Demand Forecasting for Expedia

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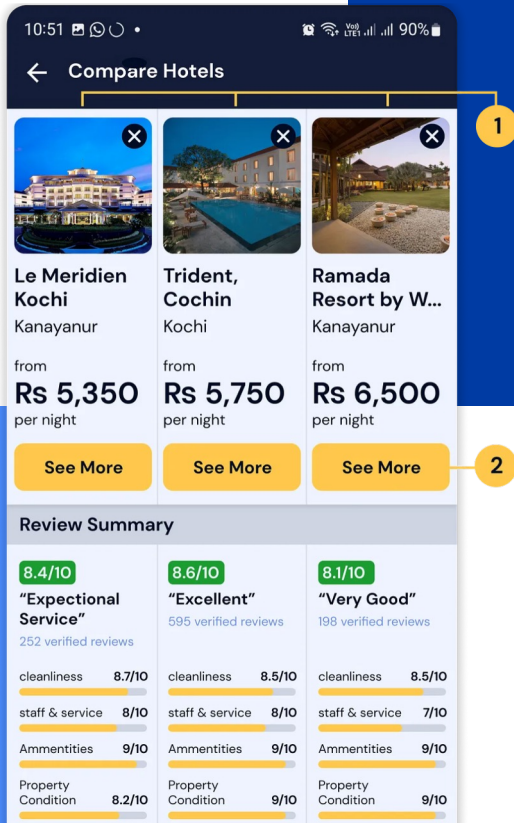
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**Recommendations
& Limitations**



01

Introduction



Challenge of High Customer Price Sensitivity

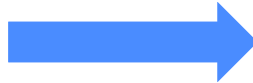
Exacerbated by the prevalent use of comparison websites by travellers eager to find the most advantageous deals

Pricing Strategies Balance Various Factors





**Offering competitive pricing while
maintaining high service standard**



**Sustained prominence
and competitive edge in
the online travel agency
space**

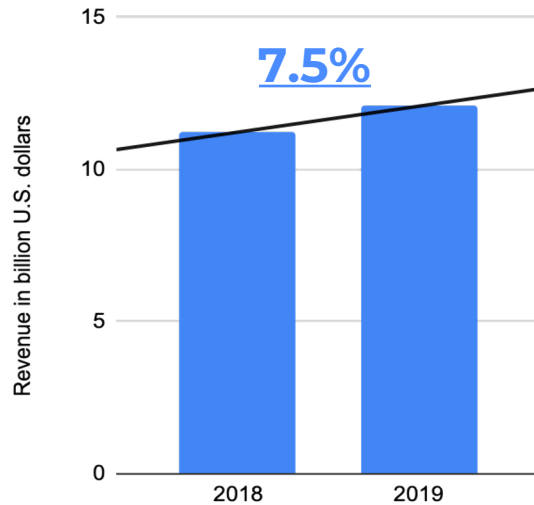
02

Business Problem

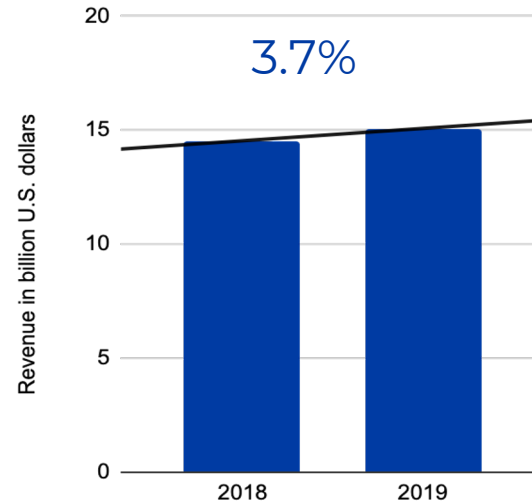


Pre-Pandemic Revenue

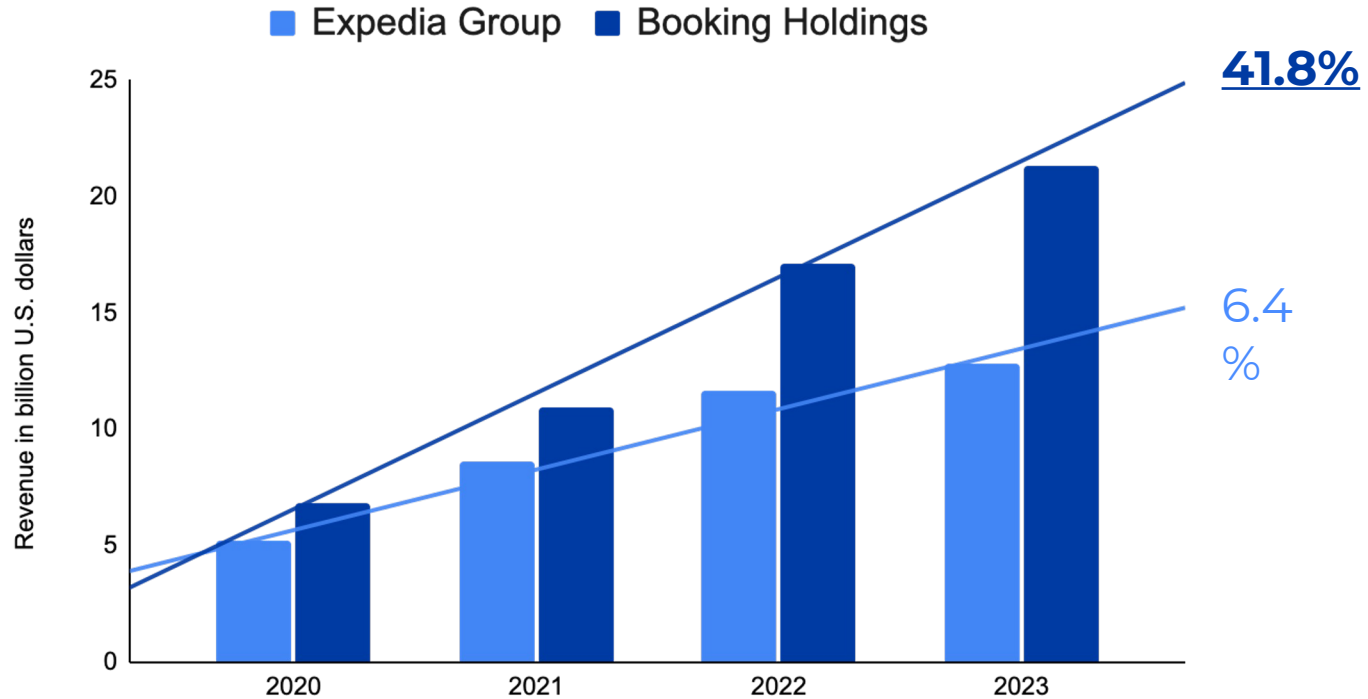
Expedia Group



Booking Holdings



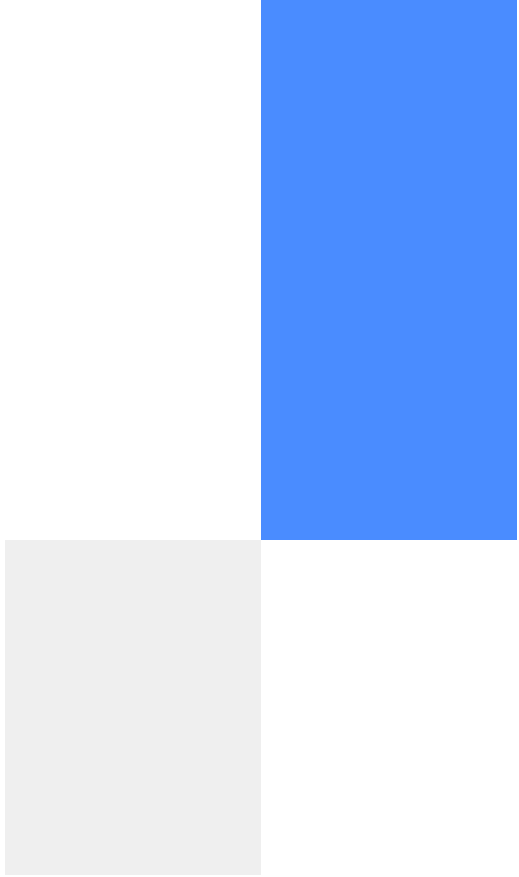
Post-Pandemic Revenue



A decorative graphic on the left side of the slide consisting of two overlapping squares. The bottom-left square is a dark blue, and the top-right square is a lighter blue, creating a cross-like shape.

Maximise Revenue Potential with Demand Forecasting

- Proactively modify prices, offerings, and marketing strategies aligned with consumer preferences
- Enhance market competitiveness and drive revenue growth
- Pinpoint emerging trends and opportunities

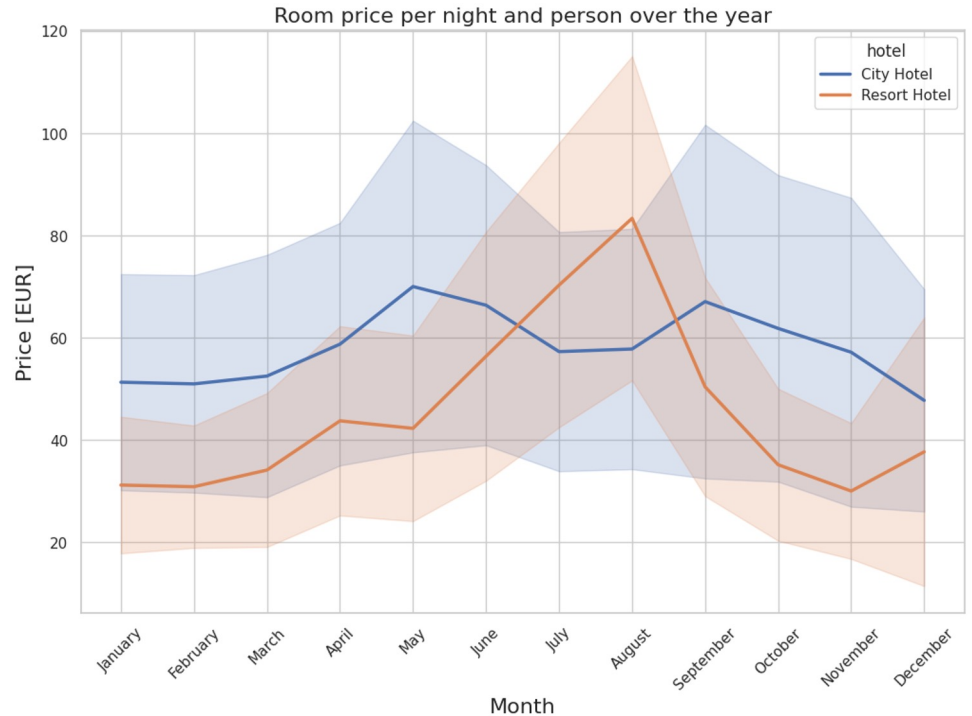


03

Data Exploration

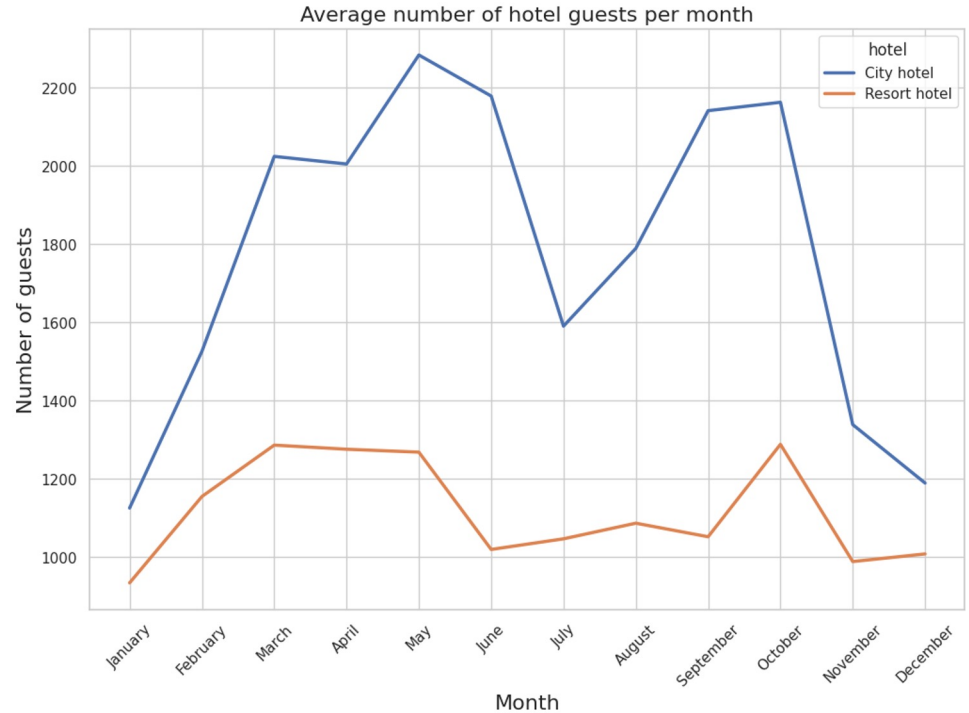
Room Prices Over the Year

- Resort Hotel prices peak in summer due to holiday season.
- City Hotel prices highest in spring and autumn for business conferences and tourism.
- Seasonal fluctuations evident in pricing trends.



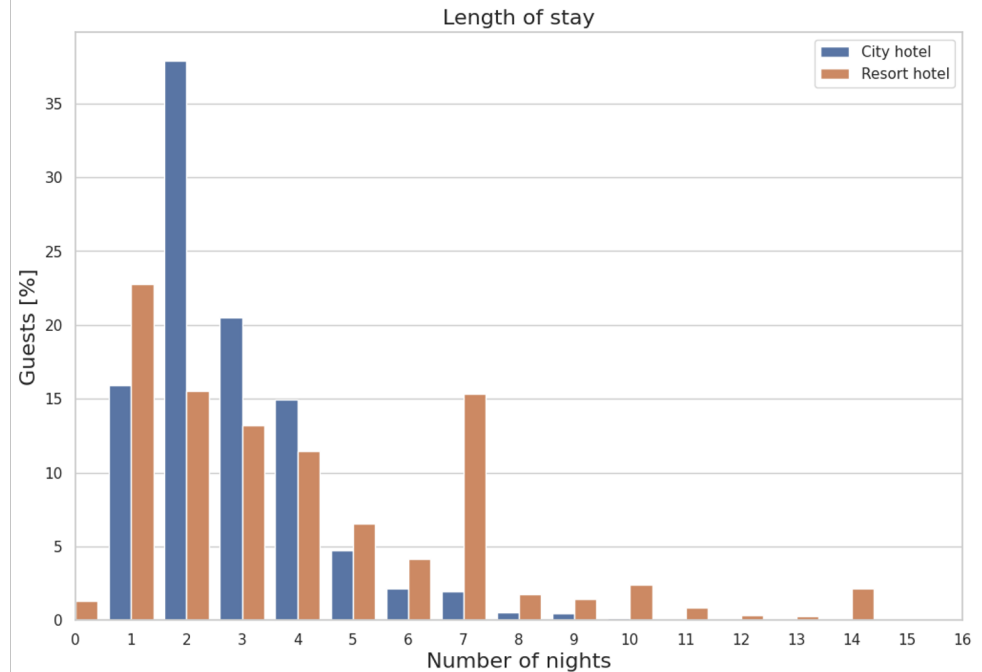
Busiest Months

- City Hotels peak in spring and autumn; Resort Hotels peak in summer.
- Occupancy rates align with seasonal trends observed in pricing.
- Understanding peak months crucial for resource allocation and revenue optimization.



Length of Stay

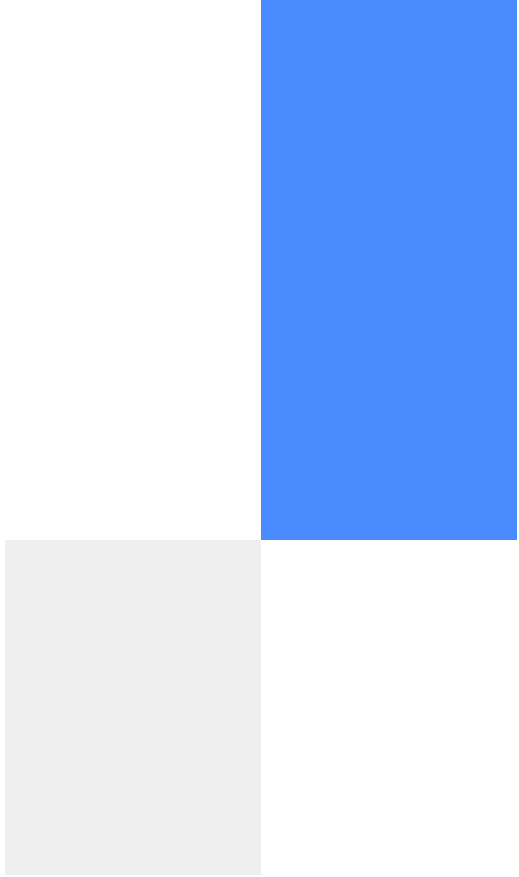
- For the city hotel there is a clear preference for 1-4 nights.
- For the resort hotel, 1-4 nights are also often booked, but 7 nights also stand out as being very popular.
- Understanding guest preferences aids in service customization and revenue forecasting.



04 Data Visualisation

Performed using Tableau Dashboard





05

Insights

Business Roadmap

Phase 1

- Moving Average
- Classical Seasonal Decomposition

Phase 2

- Simple Exponential Smoothing
- Holt's Method
- Holt-Winters Method

Phase 3

- Random Forest
- Model Evaluation

Understanding the Problem



Search Volume

Customer Stickiness



Hotel Demand

Trend and Seasonality

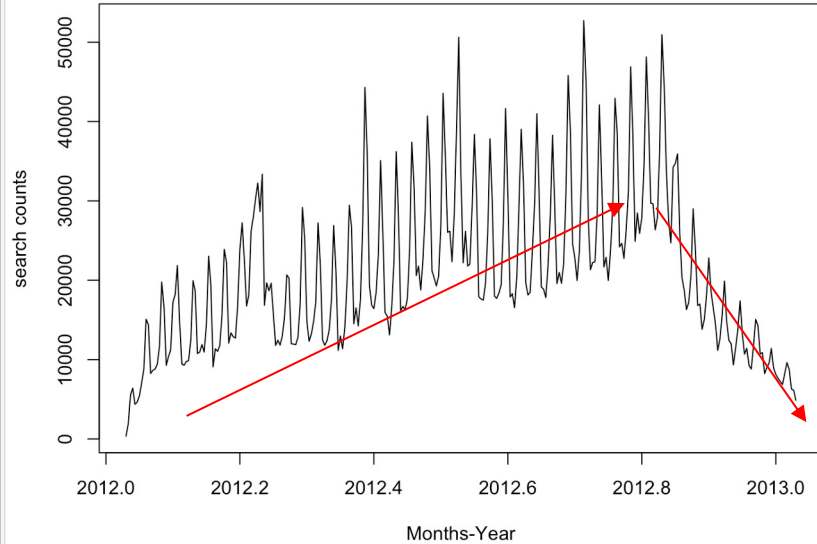


Competitor

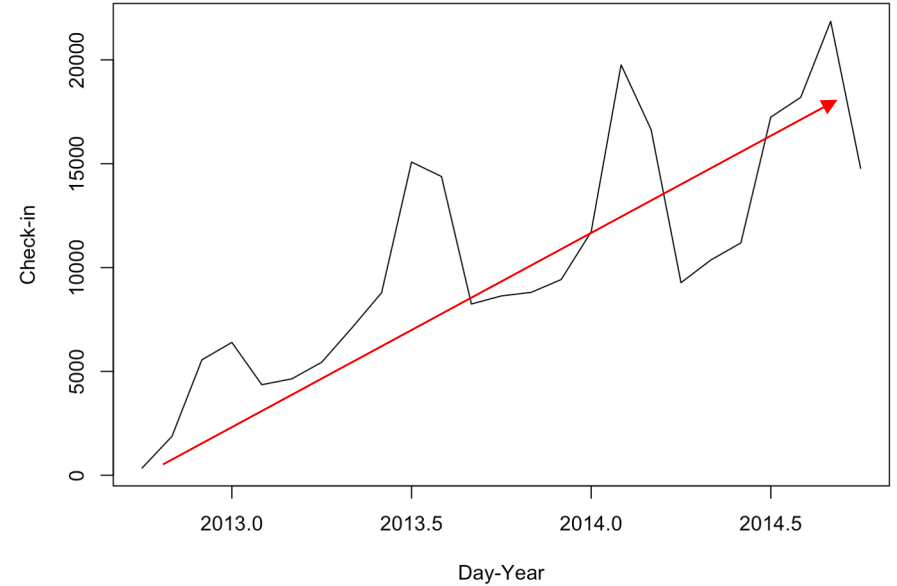
Pricing Strategy

Insights - Moving Average

Number of search counts



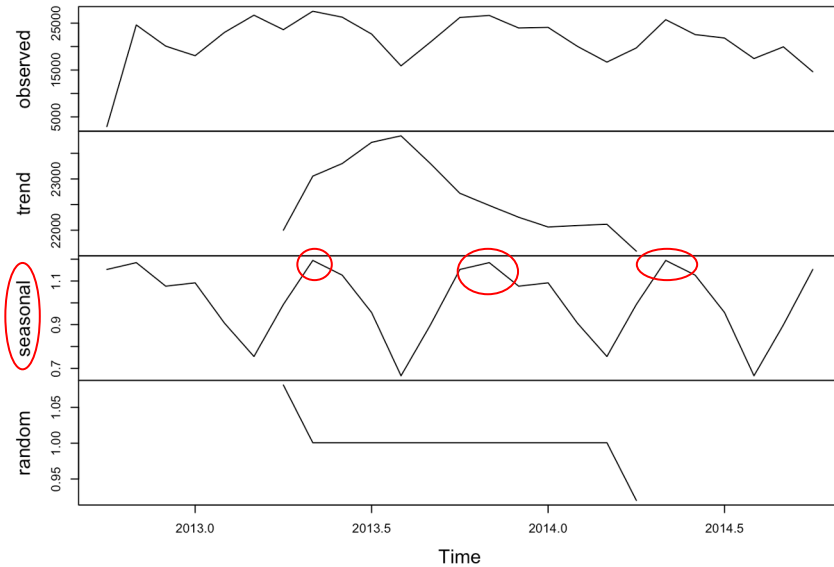
Number of check-in



Insights - Seasonal Decomposition

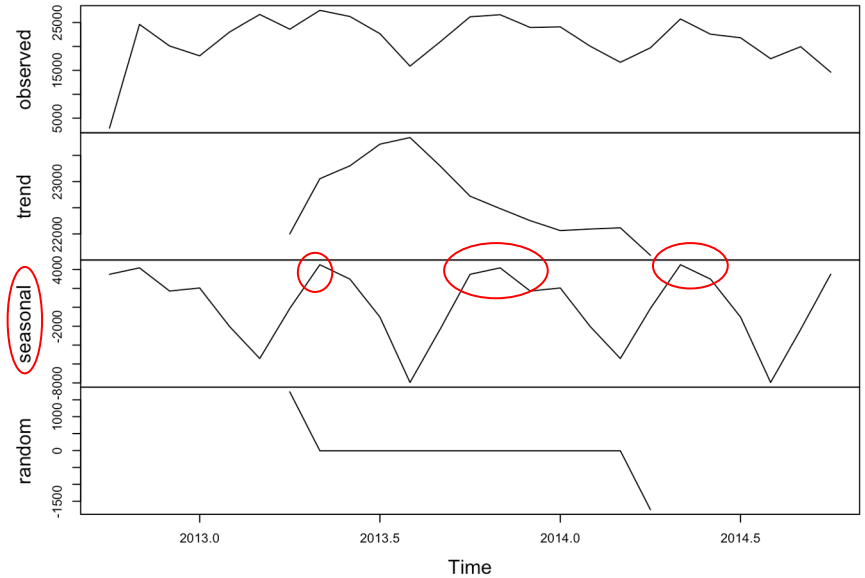
Search Volume

Decomposition of multiplicative time series

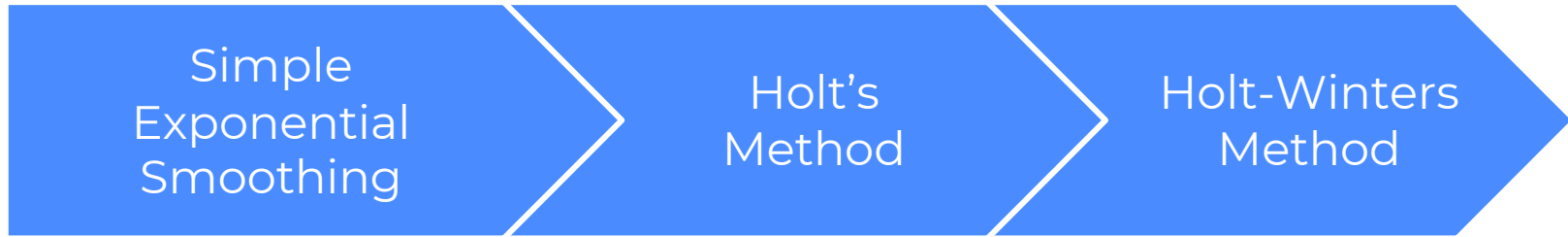


Check-In

Decomposition of additive time series



Insights - Exponential Smoothing



- Simplicity
- Adaptability
- Efficiency

- Trend Incorporation
- Flexibility
- Stability

- Seasonality Handling
- Enhance Accuracy
- Robustness

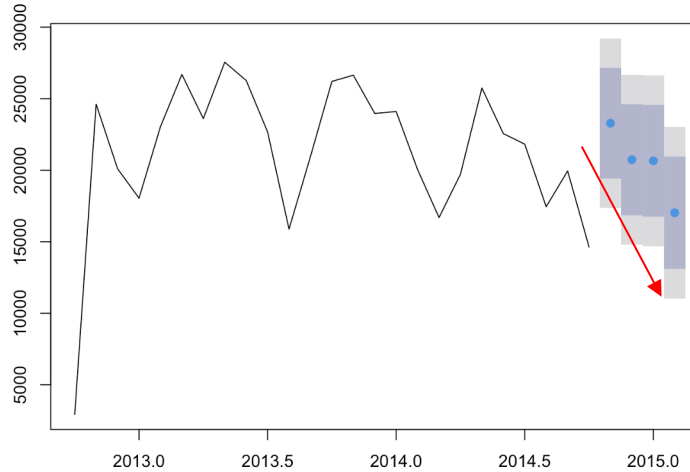
Root Squared Mean Error (RMSE)

Methods	Search Volume	Check-In
Simple Exponential Smoothing	7314	4042
Holt's Method	5759	3777
Holt-Winters Method	3002	3640

Insights - Holt-Winters Method (Short Term)

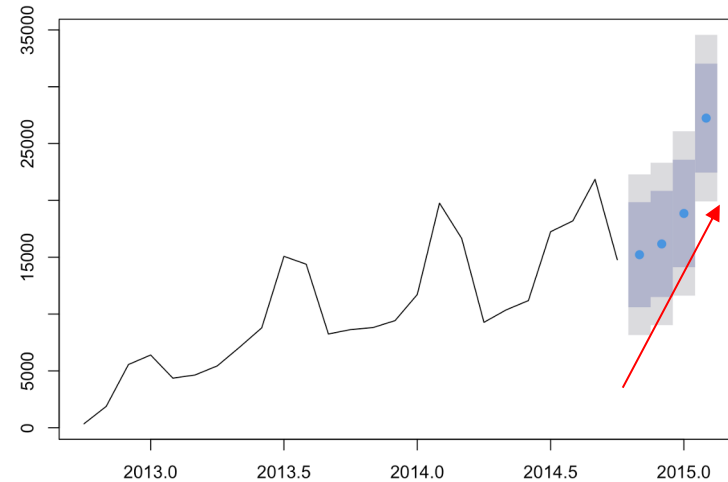
Search Volume

4 Period Ahead Forecasts based on Winters Method



Check-In

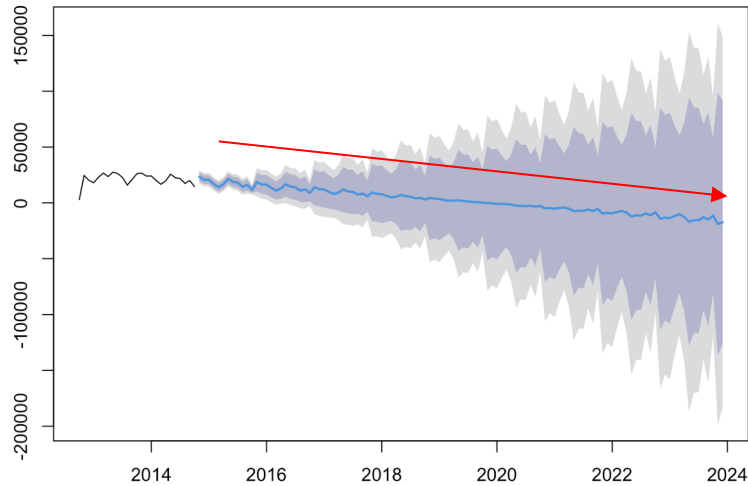
4 Period Ahead Forecasts based on Winters Method



Insights - Holt-Winters Method (Long Term)

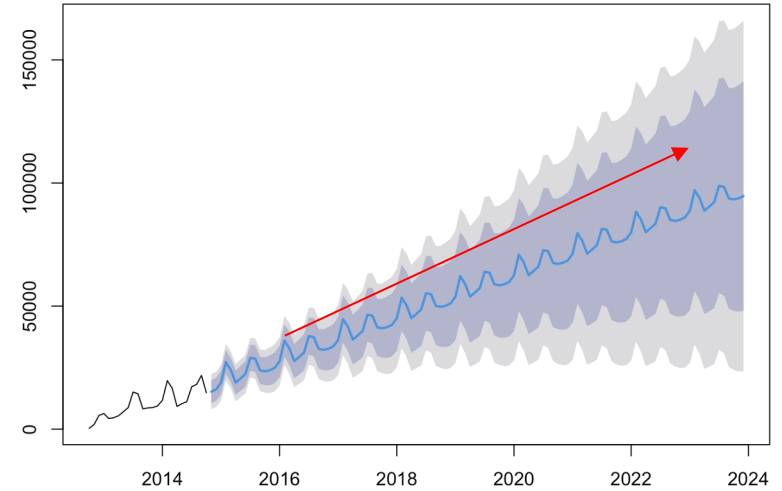
Search Volume

110 Period Ahead Forecasts based on Winters Method



Check-In

110 Period Ahead Forecasts based on Winters Method



Insights - Competitor Analysis

Expedia	No. Same Price Hotel	No. Lower Price Hotel	No. Higher Price Hotel
Company 1	54,011	88,654	12,399
Company 2	2,149,965	335,169	214,518
Company 3	1,605,520	231,442	195,437
Company 4	278,081	66,113	73,592
Company 5	2,165,285	439,328	371,413
Company 6	216,188	75,719	32,726
Company 7	273,631	108,168	44,791
Company 8	1,974,286	208,824	362,085

Insights - Random Forest

Search Score

- Combines various search parameters.
- Normalized to 0-1 range.

Binary Classification (Criteria for high_demand):

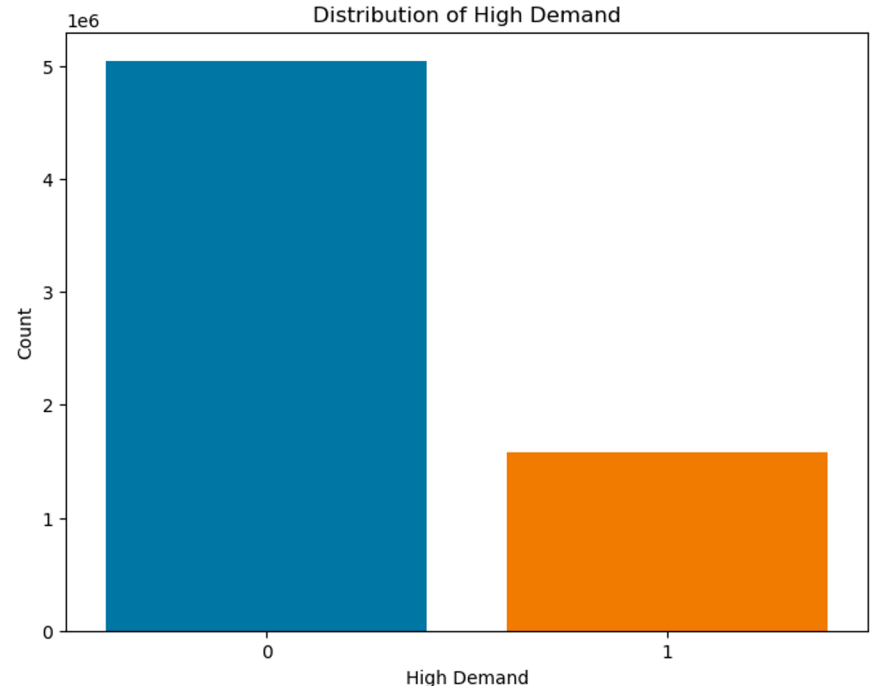
- Score > 0.05.
- Price > \$200 or promotion.

Percentage Distribution

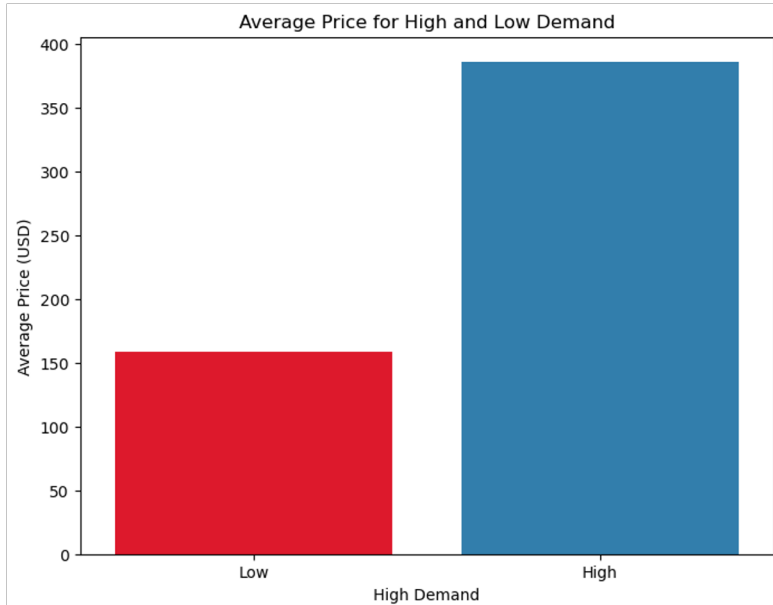
- 23.79% high demand, 76.21% low demand.

Feature Selection

- Removed column with more than 70% of missing values

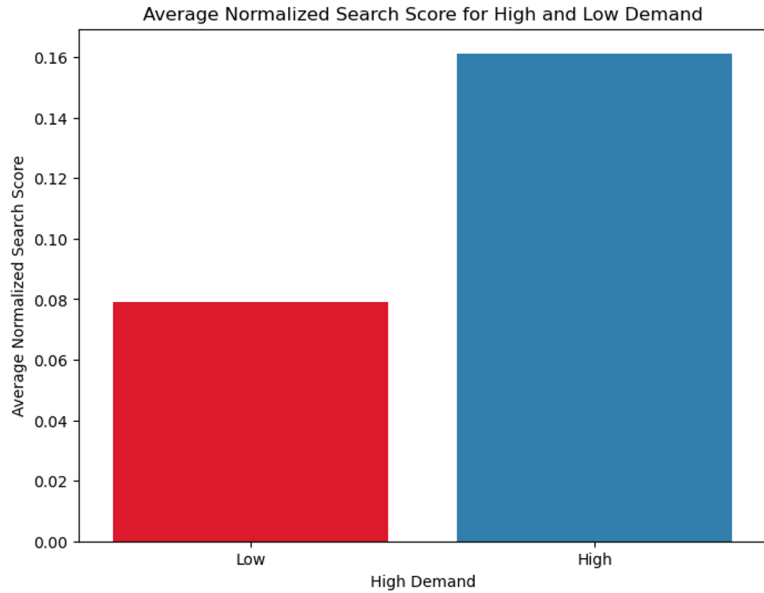


Insights - Demand Indicator



Low-demand searches: Avg. price
~**158.96 USD.**

High-demand searches: Avg. price
~**386.50 USD.**



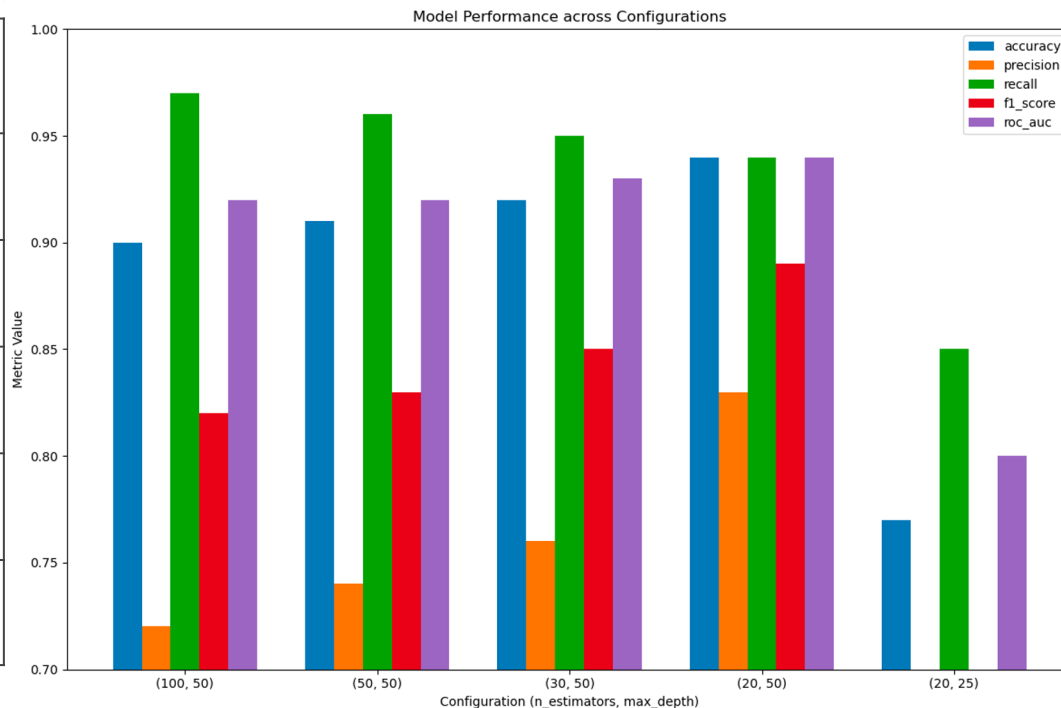
Low-demand searches: Avg. normalized
score ~**0.079.**

High-demand searches: Avg. normalized
score ~**0.161.**

Insights - Model Evaluation

Best n_estimators = 20 and max_depth= 50

Metric	Value
Accuracy	0.94
Precision	0.83
Recall	0.94
F1 Score	0.89
ROC-AUC Score	0.94



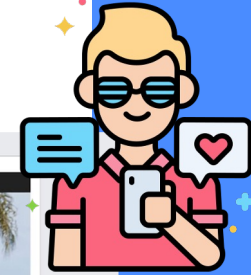
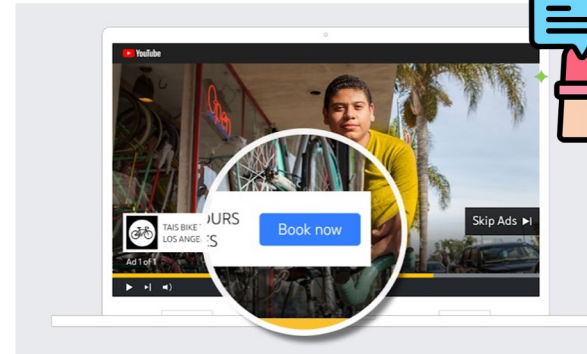
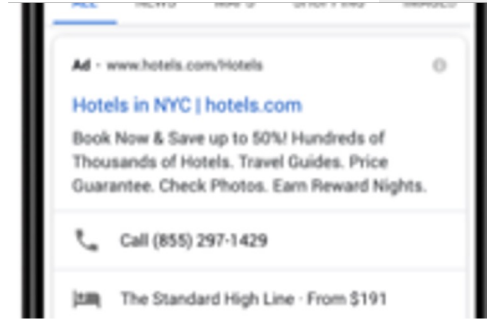
06

Recommendations & Limitations



Recommendation #1: Marketing

- Investing in advertisements, social media presence, search engine optimisation (SEO)
- Eg. Influencer marketing, Google Ads, YouTube Ads
- **Increases Expedia's visibility on the internet**, especially with the increasing usage of social media and other platforms amongst the newer generation



Recommendation #2:

Packages and Partnerships with Association Rule

- Expedia uses **Association Rules** to analyze hotel bookings with other items like flights, insurance, parking, and breakfast for better customer insights.
- Partnering with local attractions creates package deals for users, encouraging exploration and providing trip ideas.
- Collaborating with events in the area expands Expedia's audience reach (e.g., Taylor Swift Eras Tour package with Klook) and boosts consideration for future trip planning.



TAYLOR SWIFT THE ERAS TOUR

Package and Inclusions ✨

Two concert tickets and a room night in a 4-star hotel	Two concert tickets and a room night in a 5-star hotel
from \$542	from \$716
Ticket Types VIP1, VIP2, VIP3, VIP4, VIP5, VIP6 Cat 1, Cat 2, Cat 3, Cat 4, Cat 5, Cat 6	Ticket Types VIP1, VIP2, VIP3, VIP4, VIP5, VIP6 Cat 1, Cat 2, Cat 3, Cat 4, Cat 5, Cat 6
What's included? 2 tickets* + a fixed dated standard hotel room Choose from 29 hotels	What's included? 2 tickets* + a fixed dated standard hotel room Choose from 29 hotels
<ul style="list-style-type: none">Hotel 8 SingaporeVillage Hotel SentosaFunaria RiverfrontOrchard Hotel SingaporeM Hotel SingaporeMarina Singapore BugisM Social SingaporeCapri China Square ... and more!	<ul style="list-style-type: none">Buffet HotelFullerton Hotel SingaporePan Pacific SingaporeSwissotel The StamfordGrand Capricorn WaterfrontAndaz SingaporeFairmont Singapore ... and more!

*Tickets are capped at a maximum of 4 per user. **All tickets purchased on Klook requires a valid Ticketmaster account. Sign up via <https://ticketmaster.sg/sg/en>

Recommendation #3: Corporate Partnerships

- Expedia could also reach out to companies and offer corporate packages for company welfare, company trips, business trips etc.
- Offer special packages and privileges to employees of partner organisations
- Encourage employees to **use the platform for their own personal trips**, or even encourage their friends and families to use the platform as well, effectively **increasing Expedia's outreach and likely revenue**



Limitations

- The limited availability and dated nature of datasets have impacted demand forecasting model accuracy, **resulting in larger RMSE.**
- Addressing **missing competitor data** is crucial for gaining a holistic understanding of market conditions and refining forecast accuracy.

To address this limitation:

- Focus on enriching the dataset
- Leveraging advanced data extraction techniques and tapping into real-time data sources can provide a more current and detailed basis for analysis.

Thank You



Appendix

Tableau Dashboard:

https://public.tableau.com/app/profile/yutao.luo7622/viz/HotelBooking_17118796150800/Dashboard1