

Predicting the Cost of Hotel Booking in the United States

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Introduction

With the lifting of travel restrictions into the U.S. (<https://www.nytimes.com/2021/09/22/travel/us-international-travel-vaccine.html>) through the implementation of new travel guidelines, we believe that travel to the U.S. start to increase and look like as it did before the pandemic. Therefore, with travel and tourism in the U.S. increasing, we believe that the booking of hotels may start to increase as well. With this assumption, with the slower return to travel and society pre covid, we are interested in studying the characteristics of hotel room reservations in the United States. Specifically, we are interested in what relationship these characteristics have with the cost of a hotel. Our general research question is: How do the characteristics of a hotel booking affect the daily cost of a hotel stay in the United States? We believe there will be several significant points of relevance for understanding these relationships: understanding predictors of room cost could be used to help identify where new hotels could be successfully created, allow travelers to plan financially for future travel, allow hotels to predict future profit, etc. In this report, we are looking to use a variety of chosen models to understand the contributing factors to hotel room price, as well as identify the strongest predictors in the determining the average daily rate.

Data

The source of the dataset is Tiny Tuesday, <https://github.com/rfordatascience/tidytuesday/blob/master/data/2020/2020-02-11/readme.md>. This data set was originally collected from an open hotel booking demand dataset from Antonio, Almeida and Nunes, 2019. The data collected from hotels all around the world ranges from bookings in 2015 to 2017. It is sourced from this study <https://www.sciencedirect.com/science/article/pii/S2352340918315191#f0010>. Due to the dataset being over 100,000 observations, we have limited the observations to be only hotels from the US. The general characteristics being measured in the data are the different aspects of booking and staying at a hotel. For example, out of the 32 variables, some of the ones we find great interest in are hotel type, reserved room type, assigned room type, company, meal, number of adults/children/babies, the average daily rate or daily cost, and the reservation status. Therefore, each observation is one booking/stay at a specific hotel in America and all of its characteristics. Therefore, there can be multiple observations from the same hotel and even on the same time range. The full dataset dictionary can be found in the repository ReadMe.

Research Question

To better understand the contributing factors to the daily rate of hotel rooms in the U.S., we will build models to:

- 1) Evaluate the efficacy of this model to predict daily hotel room rates
- 2) Evaluate the statistical significance of each predictor, identifying the strongest contributing factors. We include the following variables in our analysis: hotel type, company, meal, number of adults/children/babies, the average daily rate or daily cost, and the reservation status.

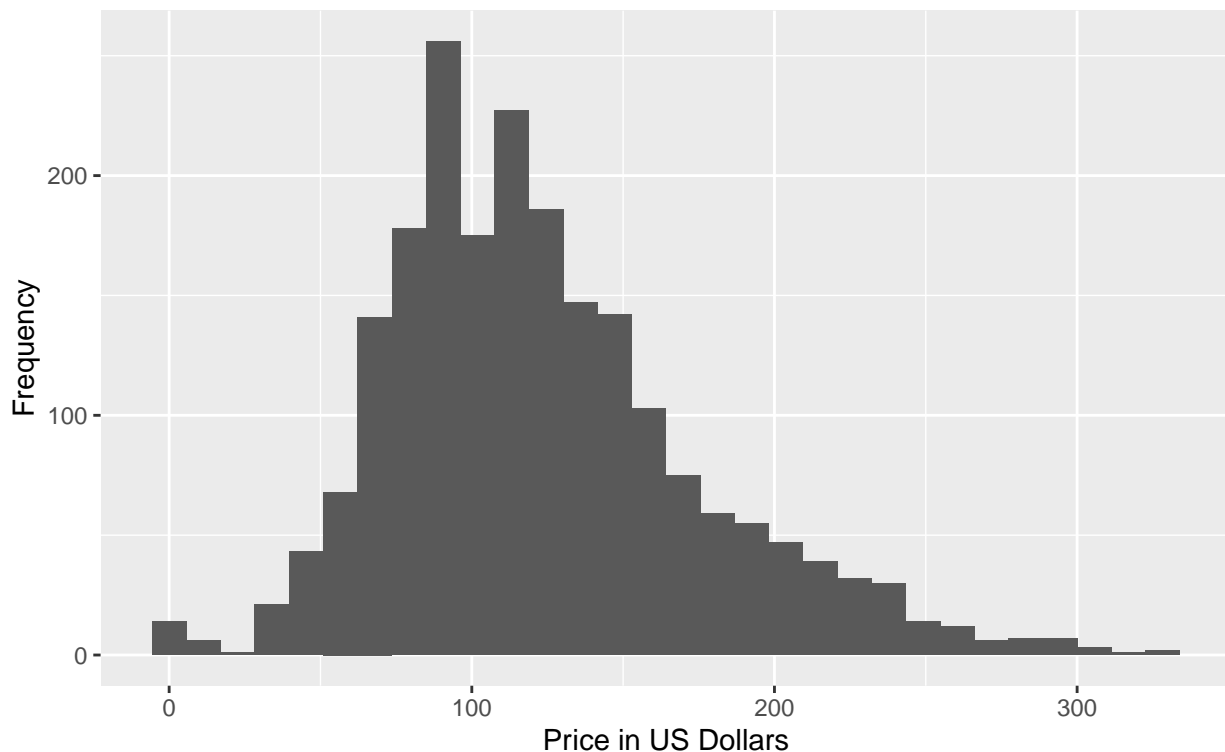
Exploratory data analysis

```
hotels$total_stay_length <- hotels$stays_in_week_nights + hotels$stays_in_weekend_nights
```

```
ggplot(data = hotels, aes(x = adr)) +  
  geom_histogram() +  
  labs(x = "Price in US Dollars",  
       y = "Frequency",  
       title = "Distribution of Average Daily Rate (Cost) of Hotel Bookings",  
       subtitle = "Collected from Hotels in the U.S. from 2015-2017")
```

```
## 'stat_bin()' using 'bins = 30'. Pick better value with 'binwidth'.
```

Distribution of Average Daily Rate (Cost) of Hotel Bookings
Collected from Hotels in the U.S. from 2015–2017



```
hotels %>%  
  summarise(mean = mean(adr),  
            median = median(adr),  
            sd = sd(adr),  
            min = min(adr),  
            max = max(adr),  
            iqr = IQR(adr))%>%  
  kable(digits = 3)
```

mean	median	sd	min	max	iqr
122.992	115	51.617	0	328.33	61.99

The response variable, `adr`, has a somewhat skewed right, bimodal distribution. The average or mean average daily rate is \$122.992 and the median is \$115. Because the distribution is skewed, the median is most likely the best indicator for the center. The standard deviation is \$51.617 and the data ranges from \$0 to \$328.33 with an interquartile range of \$61.99.

```
adults <- sum(hotels$adults)
children <- sum(hotels$children)
babies <- sum(hotels$babies)

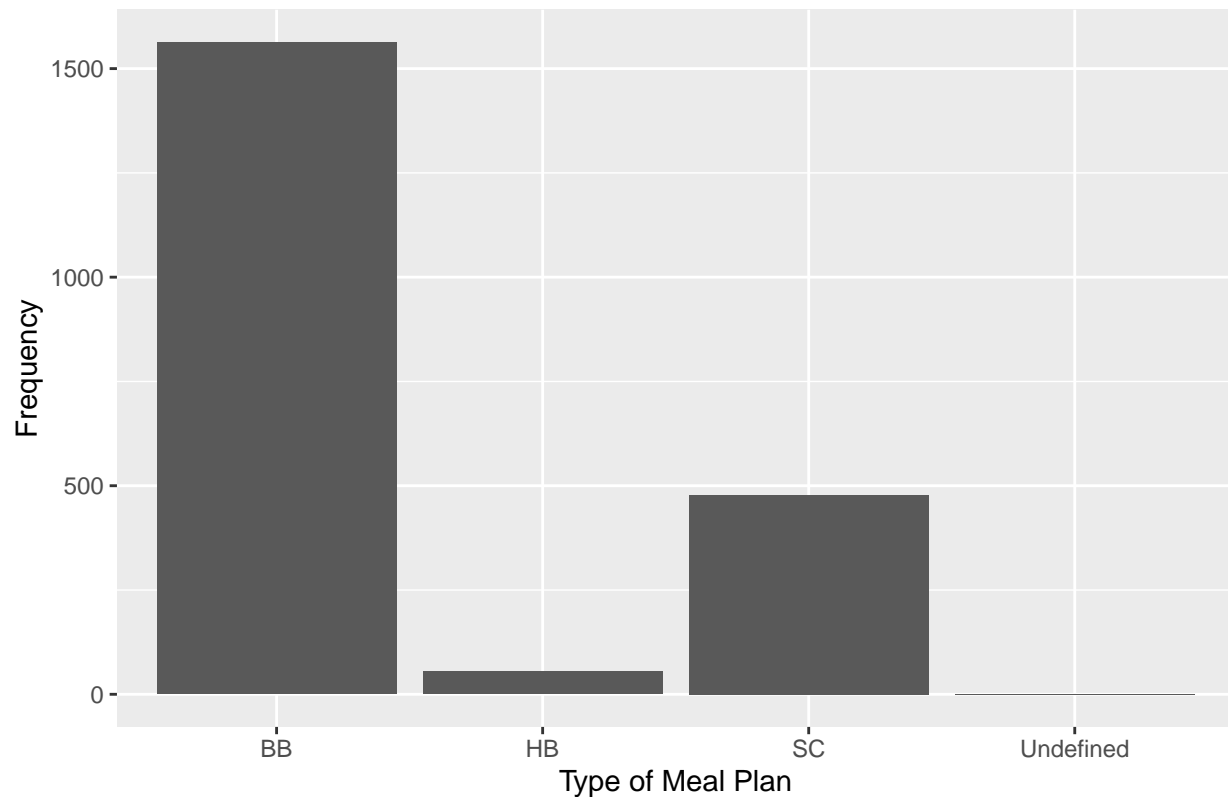
tb <- table(adults, children, babies)
kable(tb)
```

adults	children	babies	Freq
3950	362	6	1

This table provides insight on the type of people who were booking hotels in the U.S. during this time period. A large majority of customers were only adults with a total of 3,950 hotel bookings. The next largest customer group were people or adults with their children at a total of 362 bookings. Lastly, those who booked a stay with a baby was considerably less, with only 6 bookings.

```
ggplot(data = hotels, aes(x = meal)) +
  geom_bar() +
  labs(title = "Distribution of Meal Plan According to Booking Details",
       y = "Frequency",
       x = "Type of Meal Plan")
```

Distribution of Meal Plan According to Booking Details

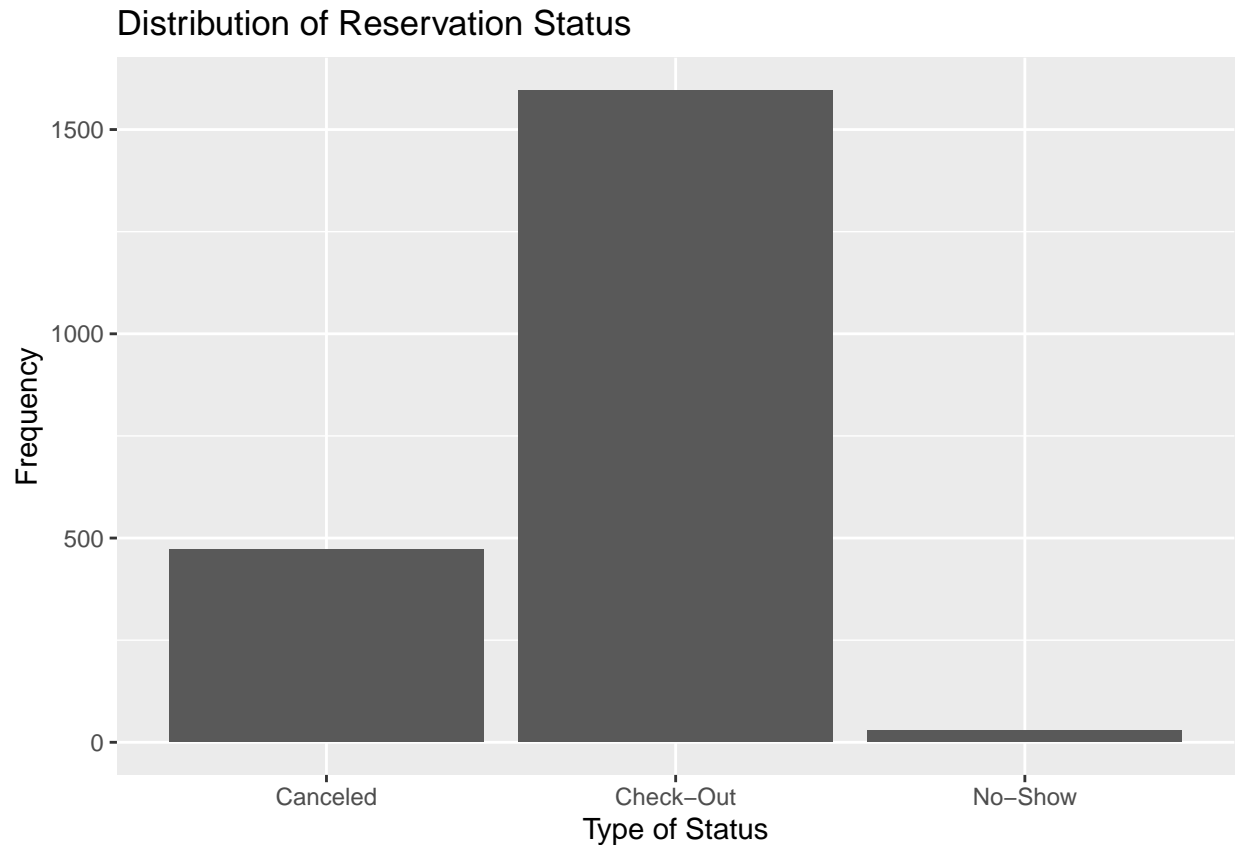


```
hotels %>%
  group_by(meal) %>%
  summarise(n = n(), mean = mean(adr), sd = sd(adr)) %>%
  kable(digits = 3)
```

meal	n	mean	sd
BB	1563	127.834	54.168
HB	55	167.216	60.824
SC	478	101.678	29.128
Undefined	1	311.000	NA

We can see that majority of customer bookings chose the Bed and Breakfast plan (BB), rather than Half Board plan or Full Board (HB and SC). While this does reflect the choice of those booking the hotel, this visualization and dataset can also be influenced by what type of meal plan each hotel is offering.

```
ggplot(data = hotels, aes(x = reservation_status)) +
  geom_bar() +
  labs(title = "Distribution of Reservation Status",
       x = "Type of Status",
       y = "Frequency")
```



A vast majority of the reservation statuses in this dataset resulted in a check-out, meaning that the customer arrived and stayed for the duration of the stay. It also important to note that a substantial proportion of hotel bookings were canceled, and if possible we would like to investigate what relationship might exist here.

```
hotels %>%
  group_by(hotel) %>%
  summarise(n = n(), mean = mean(adr), sd = sd(adr)) %>%
  kable(digits = 3)
```

hotel	n	mean	sd
City Hotel	1618	119.773	45.189
Resort Hotel	479	133.865	67.982

We can see that resort hotel is on average more expensive, and that most customers booked at city hotels. We are interested in whether the classification of City Hotel and Resort Hotel will proportionately have similar relationships with the other variables.

```
ggplot(data = hotels, aes(x = lead_time, y = adr, color = hotel)) +
  geom_point() +
  labs(title = "Relationship between how early people book hotel and price in the US dollars",
       x = "Subtraction of entering date from arrival date",
       y = "Price in the US Dollars")
```

Relationship between how early people book hotel and price in the US dollars



We can see that the more last minute visitors book a hotel, the more likely it is that the price in the US dollars varies. Besides, we can also see that the highest price in a hotel decreases as the difference between entering data and arrival date increases. This could suggest that the earlier you book a hotel, the price is more likely to be cheap.

```
ggplot(data = hotels, aes(x = adr, y = arrival_date_day_of_month, color=hotel)) +  
  geom_point() +  
  labs(title = "Relationship between day in the month when hotels are booked and price in the US dollars",  
        x = "Day in the month",  
        y = "Price in US Dollars")
```

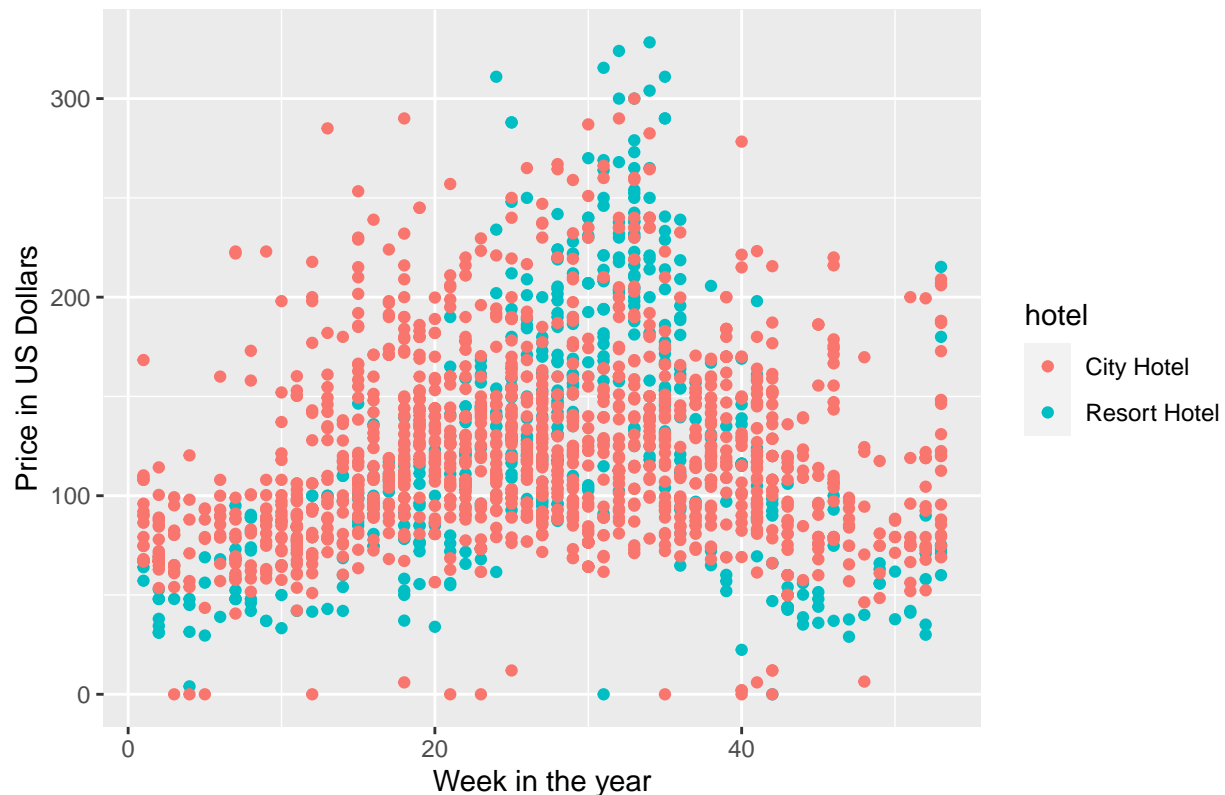
Relationship between day in the month when hotels are booked and price in



We cannot see any significant relationship between day in the month and the hotel price from this figure. However, we can see that summer is the busiest season for hotels and the price varies evenly. At the beginning of the year and the end of the year, hotels are not really booked as often.

```
ggplot(data = hotels, aes(x = arrival_date_week_number, y = adr, color=hotel)) +
  geom_point() +
  labs(title = "Relationship between week in the year when hotels are booked and price in the US dollars",
        x = "Week in the year",
        y = "Price in US Dollars")
```

Relationship between week in the year when hotels are booked and price in

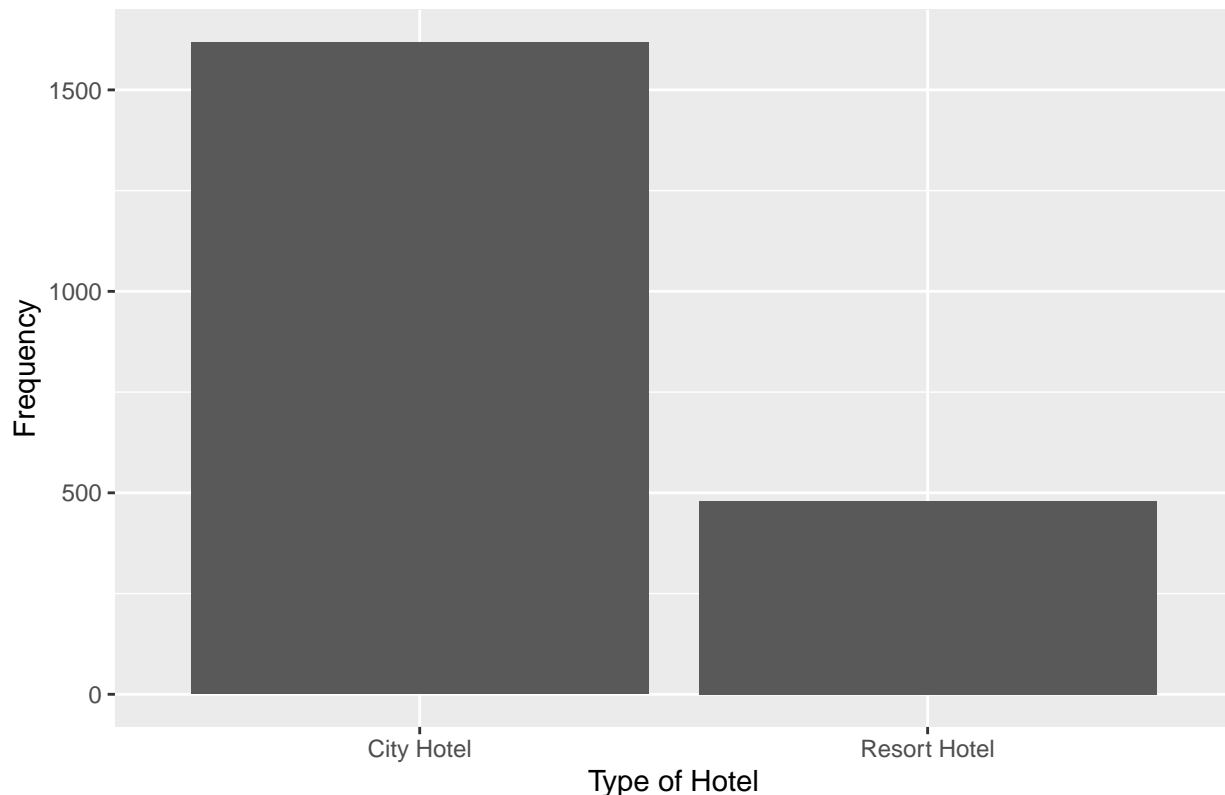


From this figure, we can also see that at the beginning and end of the year hotels are not as busy as during the summer. Besides, we can also observe that the price of hotel tends to become higher during summer time compared to the rest of the year.

We are particularly interested in using the hotel type (Resort versus City Hotel) as a predictor of average daily rate. As an initial analysis, we perform a t-test on the the average daily rates of bookings for resort versus city hotels. This t-test assesses if there is a significant difference between the two distributions, which would indicate that hotel type is likely to be a useful predictor of average daily rate. In this analysis, we find that our t-test produces a p-value of 0.002305%. Because this p-value is very low, we conclude that there is a statistically significant relationship between the average daily hotel rates of resort hotels and city hotels in our dataset, which provides evidence that hotel type is a useful predictor of average daily hotel rates.

```
ggplot(data = hotels, aes(x = hotel)) +
  geom_bar() +
  labs(title = "Distribution of Hotel Type",
       x = "Type of Hotel",
       y = "Frequency")
```


Distribution of Hotel Type



```
resort_adr <- hotels[hotels$hotel == "Resort Hotel",]$adr
city_adr <- hotels[hotels$hotel == "City Hotel",]$adr

hotel_type_p_value <- t.test(resort_adr, city_adr)$p.value
print(hotel_type_p_value)
```

```
## [1] 2.304792e-05
```

We are also particularly interested in using the presence of kids (children or babies) as a predictor of average daily rate. As an initial analysis, we perform a t-test on the the average daily rates of bookings for groups with only adults, versus groups with children or babies. This t-test assesses if there is a significant difference between the two distributions, which would indicate that the presence of kids is likely to be a useful predictor of average daily rate. In this analysis, we find that our t-test produces a p-value of 1.13e-33%. Because this p-value is very low, we conclude that there is a statistically significant relationship between the average daily hotel rates of groups with children or babies and groups with only adults in our dataset, which provides evidence that the presence of kids (children or babies) is a useful predictor of average daily hotel rates.

```
hotels$only_adults_present <- hotels$adults > 0 & hotels$children == 0 & hotels$babies == 0
hotels$kids_present <- hotels$children > 0 | hotels$babies > 0

adult_adr <- hotels[hotels$only_adults_present == TRUE,]$adr
kids_adr <- hotels[hotels$kids_present == TRUE,]$adr

resident_type_p_value <- t.test(adult_adr, kids_adr)$p.value
print(resident_type_p_value)
```

```
## [1] 1.134618e-35
```

Methodology

Modeling Choices (Description)

- Data transformations (if applied)
- Model Type Justification
- Model selection criteria
- Handling Interaction Terms
- Any other technical choices

It is important to note that there are a few variables in the dataset that do not provide insight to our research question and as a result we will remove from the dataset. First is the category `hotels$country`, due to the fact that every hotel in this subset of the data is located in the U.S., this is a redundant variable. Next, the two variables `hotels$reserved_room_type` and `hotels$assigned_room_type` are both categorical variables that have letters assigned to each room type. However, due to the confidentiality of the customers, the classification of these letters have not been identified by those who collected the data. Therefore, we will be removing these variables from the dataset.

```
hotels$country <- NULL
hotels$reserved_room_type <- NULL
hotels$assigned_room_type <- NULL
```

As of now, we know we are going to use hotel (Resort Hotel or City Hotel), company, customer_type, stays_in_weekend_nights, stays_in_week_nights, and meal(type of meal) as predictor variables. We are interested in how the food is served at a hotel and what type of hotel can indicate how much a night in a hotel could cost. As we explore more of the relationships in our dataset, we may add other possible predictor variables as we see fit.

We plan to use multiple linear regression with a variety of combinations of interested predictor variables and their interaction. Based on whether conditions or fit or not or based on the visualization, we believe we may be utilizing logarithmic regression as well. We would also be interested in seeing how stays in the weekend or the weekday may affect the average daily rate for a hotel, and if they differ between the two hotel types, City and Resort hotels.

```
full_model <- lm(adr ~ ., data = hotels)
tidy(full_model) %>%
  kable(digits = 3)
```

term	estimate	std.error	statistic	p.value
(Intercept)	-19317.042	26084.163	-0.741	0.459
hotelResort Hotel	-17.923	8.101	-2.213	0.027
is_canceled	3.456	3.264	1.059	0.290
lead_time	-0.192	0.015	-12.376	0.000
arrival_date_year	9.613	12.936	0.743	0.458
arrival_date_monthAugust	172.551	56.755	3.040	0.002
arrival_date_monthDecember	260.036	112.895	2.303	0.021
arrival_date_monthFebruary	-104.285	28.984	-3.598	0.000
arrival_date_monthJanuary	-131.462	42.844	-3.068	0.002
arrival_date_monthJuly	120.646	42.450	2.842	0.005

term	estimate	std.error	statistic	p.value
arrival_date_monthJune	82.094	28.933	2.837	0.005
arrival_date_monthMarch	-66.790	15.959	-4.185	0.000
arrival_date_monthMay	43.685	14.886	2.935	0.003
arrival_date_monthNovember	245.016	99.487	2.463	0.014
arrival_date_monthOctober	220.269	85.734	2.569	0.010
arrival_date_monthSeptember	190.635	71.521	2.665	0.008
arrival_date_week_number	-7.916	3.244	-2.440	0.015
arrival_date_day_of_month	1.376	0.488	2.818	0.005
stays_in_weekend_nights	0.710	1.317	0.539	0.590
stays_in_week_nights	2.055	0.710	2.896	0.004
adults	19.758	1.754	11.265	0.000
children	44.404	4.775	9.299	0.000
babies	-10.106	19.293	-0.524	0.601
mealHB	30.585	5.787	5.285	0.000
mealSC	-22.402	2.421	-9.254	0.000
mealUndefined	72.492	35.272	2.055	0.040
market_segmentComplementary	79.067	91.048	0.868	0.385
market_segmentCorporate	19.032	52.034	0.366	0.715
market_segmentDirect	80.861	75.033	1.078	0.281
market_segmentGroups	57.622	72.690	0.793	0.428
market_segmentOffline TA/TO	57.005	73.646	0.774	0.439
market_segmentOnline TA	74.162	73.850	1.004	0.315
distribution_channelDirect	-80.595	70.229	-1.148	0.251
distribution_channelGDS	-38.644	73.843	-0.523	0.601
distribution_channelTA/TO	-70.463	68.698	-1.026	0.305
is_repeated_guest	-55.795	10.130	-5.508	0.000
previous_cancellations	NA	NA	NA	NA
previous_bookings_not_canceled	32.723	12.023	2.722	0.007
booking_changes	2.700	1.082	2.495	0.013
deposit_typeRefundable	-25.013	32.484	-0.770	0.441
agent11	-8.927	19.835	-0.450	0.653
agent128	0.104	29.659	0.004	0.997
agent129	26.666	24.160	1.104	0.270
agent138	-10.165	24.167	-0.421	0.674
agent14	12.473	19.381	0.644	0.520
agent142	57.961	45.420	1.276	0.202
agent15	3.834	27.232	0.141	0.888
agent150	-40.650	54.178	-0.750	0.453
agent152	-28.271	18.734	-1.509	0.131
agent157	-13.181	26.054	-0.506	0.613
agent177	-22.570	29.740	-0.759	0.448
agent185	-34.449	48.640	-0.708	0.479
agent19	15.541	26.753	0.581	0.561
agent191	-46.962	76.881	-0.611	0.541
agent195	NA	NA	NA	NA
agent196	-24.516	46.657	-0.525	0.599
agent2	0.955	24.865	0.038	0.969
agent21	-11.349	42.243	-0.269	0.788
agent229	28.344	17.802	1.592	0.112
agent234	51.250	24.671	2.077	0.038
agent240	16.669	19.239	0.866	0.386
agent241	1.713	19.377	0.088	0.930

term	estimate	std.error	statistic	p.value
agent242	21.186	20.241	1.047	0.295
agent250	39.456	19.904	1.982	0.048
agent251	6.270	42.784	0.147	0.884
agent253	36.948	37.457	0.986	0.324
agent27	-40.934	26.268	-1.558	0.119
agent273	-17.317	37.128	-0.466	0.641
agent28	-19.483	22.693	-0.859	0.391
agent29	15.033	29.611	0.508	0.612
agent3	-11.498	26.228	-0.438	0.661
agent306	-38.168	21.657	-1.762	0.078
agent314	-6.598	28.429	-0.232	0.817
agent328	-47.528	48.654	-0.977	0.329
agent330	-12.582	23.192	-0.543	0.588
agent36	13.944	28.821	0.484	0.629
agent360	20.329	24.020	0.846	0.397
agent42	-35.492	24.942	-1.423	0.155
agent423	-38.043	35.796	-1.063	0.288
agent449	-41.680	28.550	-1.460	0.145
agent45	NA	NA	NA	NA
agent495	-14.109	51.546	-0.274	0.784
agent5	-17.867	46.603	-0.383	0.701
agent52	-60.632	36.194	-1.675	0.094
agent6	-28.107	24.112	-1.166	0.244
agent69	-65.106	31.689	-2.055	0.040
agent7	-11.802	17.948	-0.658	0.511
agent77	-3.189	36.654	-0.087	0.931
agent8	14.467	18.299	0.791	0.429
agent81	-37.906	54.586	-0.694	0.488
agent83	-6.883	21.265	-0.324	0.746
agent85	-64.254	31.416	-2.045	0.041
agent86	2.159	17.376	0.124	0.901
agent9	7.384	17.808	0.415	0.678
agent90	21.489	45.433	0.473	0.636
agent95	33.727	46.422	0.727	0.468
agent96	9.663	45.847	0.211	0.833
agent98	-43.569	25.260	-1.725	0.085
agentNULL	-3.483	18.209	-0.191	0.848
company153	NA	NA	NA	NA
company169	-26.994	58.855	-0.459	0.647
company174	-65.651	58.389	-1.124	0.261
company183	92.729	58.282	1.591	0.112
company197	5.773	43.817	0.132	0.895
company223	0.126	52.770	0.002	0.998
company281	NA	NA	NA	NA
company293	-10.357	55.211	-0.188	0.851
company332	41.665	52.145	0.799	0.424
company351	-23.957	52.295	-0.458	0.647
company360	39.592	47.454	0.834	0.404
company498	-30.733	52.440	-0.586	0.558
company73	NA	NA	NA	NA
company9	-41.658	59.578	-0.699	0.485
companyNULL	20.855	39.975	0.522	0.602

term	estimate	std.error	statistic	p.value
days_in_waiting_list	-0.179	0.208	-0.863	0.388
customer_typeGroup	-7.346	17.372	-0.423	0.672
customer_typeTransient	-10.002	13.169	-0.760	0.448
customer_typeTransient-Party	-7.959	14.110	-0.564	0.573
required_car_parking_spaces	6.217	3.740	1.662	0.097
total_of_special_requests	1.016	1.165	0.872	0.383
reservation_statusCheck-Out	NA	NA	NA	NA
reservation_statusNo-Show	-9.585	7.505	-1.277	0.202
reservation_status_date1/1/17	34.679	32.961	1.052	0.293
reservation_status_date1/10/16	-5.585	36.999	-0.151	0.880
reservation_status_date1/10/17	54.208	42.491	1.276	0.202
reservation_status_date1/11/16	0.754	25.577	0.029	0.976
reservation_status_date1/11/17	30.644	34.628	0.885	0.376
reservation_status_date1/12/16	16.821	25.840	0.651	0.515
reservation_status_date1/12/17	20.953	30.522	0.686	0.493
reservation_status_date1/13/16	-10.660	32.905	-0.324	0.746
reservation_status_date1/13/17	19.991	35.158	0.569	0.570
reservation_status_date1/14/16	10.909	37.683	0.290	0.772
reservation_status_date1/14/17	-18.518	35.582	-0.520	0.603
reservation_status_date1/15/16	-6.310	31.615	-0.200	0.842
reservation_status_date1/16/16	-8.784	37.077	-0.237	0.813
reservation_status_date1/16/17	-18.460	40.443	-0.456	0.648
reservation_status_date1/17/16	-9.172	37.766	-0.243	0.808
reservation_status_date1/17/17	-4.113	32.345	-0.127	0.899
reservation_status_date1/18/16	-31.921	27.286	-1.170	0.242
reservation_status_date1/18/17	45.101	39.938	1.129	0.259
reservation_status_date1/19/16	9.532	38.231	0.249	0.803
reservation_status_date1/2/16	22.841	31.365	0.728	0.467
reservation_status_date1/2/17	40.257	33.254	1.211	0.226
reservation_status_date1/20/17	4.380	40.180	0.109	0.913
reservation_status_date1/21/16	2.398	29.520	0.081	0.935
reservation_status_date1/22/16	-14.850	36.970	-0.402	0.688
reservation_status_date1/22/17	-4.524	34.470	-0.131	0.896
reservation_status_date1/23/16	-12.097	30.804	-0.393	0.695
reservation_status_date1/23/17	-9.410	40.533	-0.232	0.816
reservation_status_date1/24/16	-57.422	38.149	-1.505	0.132
reservation_status_date1/24/17	-0.338	40.717	-0.008	0.993
reservation_status_date1/25/17	NA	NA	NA	NA
reservation_status_date1/26/17	11.819	34.349	0.344	0.731
reservation_status_date1/27/17	17.935	40.610	0.442	0.659
reservation_status_date1/28/16	18.130	37.808	0.480	0.632
reservation_status_date1/28/17	-28.287	32.054	-0.882	0.378
reservation_status_date1/29/16	17.580	37.731	0.466	0.641
reservation_status_date1/29/17	-22.871	34.903	-0.655	0.512
reservation_status_date1/3/16	12.428	26.356	0.472	0.637
reservation_status_date1/3/17	-7.558	29.761	-0.254	0.800
reservation_status_date1/30/17	1.747	34.245	0.051	0.959
reservation_status_date1/31/16	-19.400	38.274	-0.507	0.612
reservation_status_date1/4/17	4.388	32.043	0.137	0.891
reservation_status_date1/5/16	-1.223	28.346	-0.043	0.966
reservation_status_date1/5/17	37.505	31.412	1.194	0.233
reservation_status_date1/6/16	79.801	42.138	1.894	0.058

term	estimate	std.error	statistic	p.value
reservation_status_date1/6/17	-10.648	30.934	-0.344	0.731
reservation_status_date1/7/16	3.494	38.151	0.092	0.927
reservation_status_date1/7/17	34.647	33.016	1.049	0.294
reservation_status_date1/8/16	12.237	26.776	0.457	0.648
reservation_status_date1/8/17	-4.967	30.374	-0.164	0.870
reservation_status_date1/9/16	-26.687	43.857	-0.609	0.543
reservation_status_date1/9/17	6.814	34.092	0.200	0.842
reservation_status_date10/1/15	-42.004	37.956	-1.107	0.269
reservation_status_date10/1/16	13.290	30.509	0.436	0.663
reservation_status_date10/10/15	-17.408	38.143	-0.456	0.648
reservation_status_date10/10/16	22.136	27.373	0.809	0.419
reservation_status_date10/11/15	26.583	29.244	0.909	0.364
reservation_status_date10/11/16	19.573	33.282	0.588	0.557
reservation_status_date10/12/16	-3.117	29.855	-0.104	0.917
reservation_status_date10/13/15	-24.065	32.034	-0.751	0.453
reservation_status_date10/13/16	9.212	29.709	0.310	0.757
reservation_status_date10/14/15	-47.642	38.117	-1.250	0.212
reservation_status_date10/14/16	6.683	28.678	0.233	0.816
reservation_status_date10/15/15	-93.640	38.367	-2.441	0.015
reservation_status_date10/15/16	27.500	29.022	0.948	0.344
reservation_status_date10/16/15	44.510	38.055	1.170	0.242
reservation_status_date10/16/16	35.599	31.040	1.147	0.252
reservation_status_date10/17/16	-0.400	29.824	-0.013	0.989
reservation_status_date10/18/15	15.847	32.067	0.494	0.621
reservation_status_date10/18/16	-14.045	33.483	-0.419	0.675
reservation_status_date10/19/15	30.051	38.057	0.790	0.430
reservation_status_date10/19/16	7.792	31.083	0.251	0.802
reservation_status_date10/2/16	15.030	30.876	0.487	0.626
reservation_status_date10/20/15	-22.045	38.211	-0.577	0.564
reservation_status_date10/20/16	-41.263	28.455	-1.450	0.147
reservation_status_date10/22/15	8.402	26.462	0.318	0.751
reservation_status_date10/22/16	14.625	39.426	0.371	0.711
reservation_status_date10/23/15	0.212	29.744	0.007	0.994
reservation_status_date10/23/16	17.309	29.920	0.579	0.563
reservation_status_date10/24/15	3.503	40.219	0.087	0.931
reservation_status_date10/24/16	7.878	29.198	0.270	0.787
reservation_status_date10/25/15	-1.376	40.240	-0.034	0.973
reservation_status_date10/26/15	45.926	46.155	0.995	0.320
reservation_status_date10/26/16	-10.380	29.041	-0.357	0.721
reservation_status_date10/27/15	1.982	38.504	0.051	0.959
reservation_status_date10/28/16	16.529	31.046	0.532	0.595
reservation_status_date10/29/16	10.911	28.039	0.389	0.697
reservation_status_date10/3/15	-15.441	38.143	-0.405	0.686
reservation_status_date10/3/16	32.633	27.501	1.187	0.236
reservation_status_date10/30/15	-21.417	40.453	-0.529	0.597
reservation_status_date10/31/15	-64.135	38.158	-1.681	0.093
reservation_status_date10/31/16	-16.234	32.443	-0.500	0.617
reservation_status_date10/4/16	35.020	28.516	1.228	0.220
reservation_status_date10/5/15	-8.748	38.091	-0.230	0.818
reservation_status_date10/5/16	-4.264	28.494	-0.150	0.881
reservation_status_date10/6/15	0.213	29.364	0.007	0.994
reservation_status_date10/6/16	1.856	29.730	0.062	0.950

term	estimate	std.error	statistic	p.value
reservation_status_date10/7/15	-0.171	29.026	-0.006	0.995
reservation_status_date10/7/16	21.682	29.523	0.734	0.463
reservation_status_date10/8/15	-23.227	37.817	-0.614	0.539
reservation_status_date10/8/16	-8.084	39.351	-0.205	0.837
reservation_status_date10/9/16	24.352	33.370	0.730	0.466
reservation_status_date11/1/15	-60.565	31.930	-1.897	0.058
reservation_status_date11/10/15	-2.834	38.706	-0.073	0.942
reservation_status_date11/11/16	61.961	29.843	2.076	0.038
reservation_status_date11/12/15	NA	NA	NA	NA
reservation_status_date11/12/16	-25.128	35.014	-0.718	0.473
reservation_status_date11/13/15	-25.087	40.570	-0.618	0.536
reservation_status_date11/13/16	0.592	28.601	0.021	0.983
reservation_status_date11/14/15	11.331	39.180	0.289	0.772
reservation_status_date11/14/16	15.328	29.840	0.514	0.608
reservation_status_date11/15/15	NA	NA	NA	NA
reservation_status_date11/16/15	NA	NA	NA	NA
reservation_status_date11/17/16	-6.341	40.008	-0.158	0.874
reservation_status_date11/18/16	NA	NA	NA	NA
reservation_status_date11/19/16	-23.197	34.126	-0.680	0.497
reservation_status_date11/2/15	NA	NA	NA	NA
reservation_status_date11/2/16	-8.437	33.660	-0.251	0.802
reservation_status_date11/20/15	12.779	38.931	0.328	0.743
reservation_status_date11/20/16	-32.287	40.061	-0.806	0.420
reservation_status_date11/21/16	3.902	30.861	0.126	0.899
reservation_status_date11/22/16	-17.360	40.029	-0.434	0.665
reservation_status_date11/23/16	-16.566	40.096	-0.413	0.680
reservation_status_date11/24/15	-39.418	38.753	-1.017	0.309
reservation_status_date11/24/16	-5.357	29.867	-0.179	0.858
reservation_status_date11/27/16	-16.225	40.322	-0.402	0.687
reservation_status_date11/28/16	-31.641	34.199	-0.925	0.355
reservation_status_date11/29/15	26.966	43.432	0.621	0.535
reservation_status_date11/3/16	-8.487	33.564	-0.253	0.800
reservation_status_date11/4/16	-7.835	34.015	-0.230	0.818
reservation_status_date11/5/16	20.180	36.055	0.560	0.576
reservation_status_date11/6/16	-39.660	45.936	-0.863	0.388
reservation_status_date11/7/15	-4.141	28.176	-0.147	0.883
reservation_status_date11/7/16	29.659	30.513	0.972	0.331
reservation_status_date11/9/15	16.461	33.251	0.495	0.621
reservation_status_date11/9/16	15.902	39.987	0.398	0.691
reservation_status_date12/1/16	52.312	40.458	1.293	0.196
reservation_status_date12/11/16	0.162	32.514	0.005	0.996
reservation_status_date12/12/16	7.630	30.029	0.254	0.799
reservation_status_date12/13/16	-24.111	32.686	-0.738	0.461
reservation_status_date12/14/16	-0.947	38.866	-0.024	0.981
reservation_status_date12/16/16	8.505	29.620	0.287	0.774
reservation_status_date12/17/16	NA	NA	NA	NA
reservation_status_date12/19/15	19.948	37.145	0.537	0.591
reservation_status_date12/19/16	-14.454	33.866	-0.427	0.670
reservation_status_date12/2/15	14.298	37.165	0.385	0.701
reservation_status_date12/2/16	-2.625	30.501	-0.086	0.931
reservation_status_date12/20/15	-3.567	30.983	-0.115	0.908
reservation_status_date12/20/16	112.520	38.720	2.906	0.004

term	estimate	std.error	statistic	p.value
reservation_status_date12/21/16	15.900	30.998	0.513	0.608
reservation_status_date12/22/16	13.330	38.989	0.342	0.732
reservation_status_date12/24/15	2.380	37.228	0.064	0.949
reservation_status_date12/24/16	-6.710	32.635	-0.206	0.837
reservation_status_date12/25/16	75.727	39.273	1.928	0.054
reservation_status_date12/26/16	0.856	33.372	0.026	0.980
reservation_status_date12/27/16	3.244	29.360	0.111	0.912
reservation_status_date12/28/15	7.639	37.792	0.202	0.840
reservation_status_date12/28/16	11.354	30.496	0.372	0.710
reservation_status_date12/29/15	-9.143	28.259	-0.324	0.746
reservation_status_date12/29/16	30.120	32.758	0.919	0.358
reservation_status_date12/3/16	7.097	33.470	0.212	0.832
reservation_status_date12/30/15	5.580	37.327	0.149	0.881
reservation_status_date12/30/16	-3.104	33.099	-0.094	0.925
reservation_status_date12/31/15	36.588	37.261	0.982	0.326
reservation_status_date12/31/16	52.177	29.430	1.773	0.076
reservation_status_date12/4/16	12.166	28.905	0.421	0.674
reservation_status_date12/6/16	-8.943	30.397	-0.294	0.769
reservation_status_date12/7/16	9.966	29.472	0.338	0.735
reservation_status_date12/8/16	-9.642	32.913	-0.293	0.770
reservation_status_date12/9/16	-14.686	39.525	-0.372	0.710
reservation_status_date2/1/17	-7.369	35.081	-0.210	0.834
reservation_status_date2/10/17	24.674	40.427	0.610	0.542
reservation_status_date2/11/16	-12.007	28.190	-0.426	0.670
reservation_status_date2/11/17	-3.123	34.582	-0.090	0.928
reservation_status_date2/12/16	-19.908	30.977	-0.643	0.521
reservation_status_date2/12/17	0.671	34.473	0.019	0.984
reservation_status_date2/13/16	-12.869	37.711	-0.341	0.733
reservation_status_date2/13/17	-21.937	32.200	-0.681	0.496
reservation_status_date2/14/17	23.809	40.698	0.585	0.559
reservation_status_date2/15/16	7.243	29.510	0.245	0.806
reservation_status_date2/15/17	24.329	39.928	0.609	0.542
reservation_status_date2/16/17	-24.252	31.981	-0.758	0.448
reservation_status_date2/17/16	15.036	37.818	0.398	0.691
reservation_status_date2/17/17	62.691	34.791	1.802	0.072
reservation_status_date2/18/16	24.695	37.149	0.665	0.506
reservation_status_date2/18/17	31.885	35.251	0.905	0.366
reservation_status_date2/19/17	4.685	32.730	0.143	0.886
reservation_status_date2/2/17	3.231	31.988	0.101	0.920
reservation_status_date2/20/16	46.786	31.209	1.499	0.134
reservation_status_date2/20/17	26.108	30.523	0.855	0.393
reservation_status_date2/21/16	6.362	31.427	0.202	0.840
reservation_status_date2/21/17	-9.486	31.268	-0.303	0.762
reservation_status_date2/22/16	37.630	38.513	0.977	0.329
reservation_status_date2/22/17	24.045	29.736	0.809	0.419
reservation_status_date2/23/17	21.710	39.781	0.546	0.585
reservation_status_date2/24/16	-15.028	31.773	-0.473	0.636
reservation_status_date2/24/17	24.290	30.531	0.796	0.426
reservation_status_date2/25/16	5.784	37.657	0.154	0.878
reservation_status_date2/25/17	12.408	32.038	0.387	0.699
reservation_status_date2/26/16	41.692	30.924	1.348	0.178
reservation_status_date2/26/17	-2.201	29.454	-0.075	0.940

term	estimate	std.error	statistic	p.value
reservation_status_date2/27/17	-32.900	29.941	-1.099	0.272
reservation_status_date2/28/16	11.352	31.315	0.363	0.717
reservation_status_date2/28/17	28.091	35.008	0.802	0.422
reservation_status_date2/29/16	-14.068	37.674	-0.373	0.709
reservation_status_date2/4/16	25.305	30.820	0.821	0.412
reservation_status_date2/4/17	-15.843	36.437	-0.435	0.664
reservation_status_date2/5/16	51.227	41.344	1.239	0.216
reservation_status_date2/6/16	8.823	31.225	0.283	0.778
reservation_status_date2/7/17	8.213	28.449	0.289	0.773
reservation_status_date2/8/16	-41.705	37.821	-1.103	0.270
reservation_status_date2/9/16	-15.930	30.829	-0.517	0.605
reservation_status_date2/9/17	6.415	33.968	0.189	0.850
reservation_status_date3/1/16	8.796	37.247	0.236	0.813
reservation_status_date3/1/17	24.881	30.404	0.818	0.413
reservation_status_date3/10/16	34.668	32.572	1.064	0.287
reservation_status_date3/10/17	34.650	34.333	1.009	0.313
reservation_status_date3/11/16	1.299	31.075	0.042	0.967
reservation_status_date3/11/17	-13.568	32.669	-0.415	0.678
reservation_status_date3/12/16	15.596	37.536	0.415	0.678
reservation_status_date3/12/17	40.128	29.249	1.372	0.170
reservation_status_date3/13/16	-11.690	37.636	-0.311	0.756
reservation_status_date3/13/17	11.687	36.594	0.319	0.749
reservation_status_date3/14/16	14.999	27.012	0.555	0.579
reservation_status_date3/14/17	-10.786	32.226	-0.335	0.738
reservation_status_date3/15/17	22.317	30.731	0.726	0.468
reservation_status_date3/16/17	35.931	32.333	1.111	0.267
reservation_status_date3/17/16	25.231	30.874	0.817	0.414
reservation_status_date3/17/17	20.902	30.840	0.678	0.498
reservation_status_date3/18/17	12.505	30.999	0.403	0.687
reservation_status_date3/19/16	-2.742	28.719	-0.095	0.924
reservation_status_date3/19/17	23.086	31.982	0.722	0.471
reservation_status_date3/2/16	-3.296	37.417	-0.088	0.930
reservation_status_date3/2/17	0.323	29.865	0.011	0.991
reservation_status_date3/20/16	-19.473	30.664	-0.635	0.526
reservation_status_date3/20/17	28.545	33.012	0.865	0.387
reservation_status_date3/21/17	24.526	31.082	0.789	0.430
reservation_status_date3/22/16	28.441	25.418	1.119	0.263
reservation_status_date3/22/17	24.262	30.650	0.792	0.429
reservation_status_date3/23/16	-6.159	27.476	-0.224	0.823
reservation_status_date3/23/17	18.706	29.112	0.643	0.521
reservation_status_date3/24/16	-0.073	28.353	-0.003	0.998
reservation_status_date3/24/17	8.607	34.209	0.252	0.801
reservation_status_date3/25/16	32.908	27.067	1.216	0.224
reservation_status_date3/25/17	12.394	32.032	0.387	0.699
reservation_status_date3/26/16	89.996	27.380	3.287	0.001
reservation_status_date3/26/17	33.964	39.480	0.860	0.390
reservation_status_date3/27/16	36.546	28.601	1.278	0.202
reservation_status_date3/27/17	16.506	31.730	0.520	0.603
reservation_status_date3/28/16	29.871	27.180	1.099	0.272
reservation_status_date3/28/17	35.823	32.521	1.102	0.271
reservation_status_date3/29/16	53.337	26.263	2.031	0.042
reservation_status_date3/29/17	37.243	31.047	1.200	0.231

term	estimate	std.error	statistic	p.value
reservation_status_date3/3/17	32.458	32.380	1.002	0.316
reservation_status_date3/30/17	38.974	40.030	0.974	0.330
reservation_status_date3/31/16	6.671	27.191	0.245	0.806
reservation_status_date3/31/17	16.641	39.625	0.420	0.675
reservation_status_date3/4/16	30.271	37.424	0.809	0.419
reservation_status_date3/4/17	47.116	34.318	1.373	0.170
reservation_status_date3/5/16	0.819	30.765	0.027	0.979
reservation_status_date3/5/17	21.791	34.288	0.636	0.525
reservation_status_date3/6/16	-4.014	36.953	-0.109	0.914
reservation_status_date3/6/17	15.922	31.981	0.498	0.619
reservation_status_date3/7/17	21.828	30.842	0.708	0.479
reservation_status_date3/8/16	55.757	37.598	1.483	0.138
reservation_status_date3/8/17	25.513	29.514	0.864	0.388
reservation_status_date3/9/17	25.644	29.614	0.866	0.387
reservation_status_date4/1/16	20.541	37.755	0.544	0.586
reservation_status_date4/1/17	16.901	34.943	0.484	0.629
reservation_status_date4/10/16	11.188	31.657	0.353	0.724
reservation_status_date4/10/17	11.682	34.031	0.343	0.731
reservation_status_date4/11/16	6.987	28.661	0.244	0.807
reservation_status_date4/11/17	35.608	32.052	1.111	0.267
reservation_status_date4/12/16	8.085	37.586	0.215	0.830
reservation_status_date4/12/17	31.910	29.434	1.084	0.278
reservation_status_date4/13/16	-2.930	28.573	-0.103	0.918
reservation_status_date4/13/17	20.993	40.608	0.517	0.605
reservation_status_date4/14/16	-4.204	25.451	-0.165	0.869
reservation_status_date4/14/17	35.664	30.089	1.185	0.236
reservation_status_date4/15/16	28.320	30.646	0.924	0.356
reservation_status_date4/16/17	35.027	30.802	1.137	0.256
reservation_status_date4/17/16	28.102	30.586	0.919	0.358
reservation_status_date4/17/17	10.889	31.942	0.341	0.733
reservation_status_date4/18/16	-18.328	30.705	-0.597	0.551
reservation_status_date4/18/17	-6.529	31.558	-0.207	0.836
reservation_status_date4/19/16	13.608	27.013	0.504	0.615
reservation_status_date4/19/17	8.105	31.908	0.254	0.800
reservation_status_date4/2/16	17.300	37.804	0.458	0.647
reservation_status_date4/20/16	6.048	30.909	0.196	0.845
reservation_status_date4/20/17	11.234	29.469	0.381	0.703
reservation_status_date4/21/16	12.445	30.761	0.405	0.686
reservation_status_date4/21/17	-10.575	29.874	-0.354	0.723
reservation_status_date4/22/17	-10.063	32.399	-0.311	0.756
reservation_status_date4/23/16	16.290	28.266	0.576	0.565
reservation_status_date4/24/17	13.292	29.834	0.446	0.656
reservation_status_date4/25/16	-3.444	26.971	-0.128	0.898
reservation_status_date4/26/16	10.791	30.087	0.359	0.720
reservation_status_date4/26/17	16.929	29.817	0.568	0.570
reservation_status_date4/27/16	-20.220	28.687	-0.705	0.481
reservation_status_date4/27/17	77.568	34.363	2.257	0.024
reservation_status_date4/28/16	13.080	28.414	0.460	0.645
reservation_status_date4/28/17	33.805	32.203	1.050	0.294
reservation_status_date4/29/16	-11.240	26.085	-0.431	0.667
reservation_status_date4/29/17	7.856	34.488	0.228	0.820
reservation_status_date4/3/16	11.162	28.120	0.397	0.691

term	estimate	std.error	statistic	p.value
reservation_status_date4/3/17	10.095	34.115	0.296	0.767
reservation_status_date4/30/16	12.031	27.156	0.443	0.658
reservation_status_date4/30/17	-13.624	31.313	-0.435	0.664
reservation_status_date4/4/16	24.429	37.315	0.655	0.513
reservation_status_date4/4/17	17.677	31.520	0.561	0.575
reservation_status_date4/5/16	-2.855	30.915	-0.092	0.926
reservation_status_date4/5/17	20.411	39.718	0.514	0.607
reservation_status_date4/6/16	-15.157	37.429	-0.405	0.686
reservation_status_date4/6/17	17.375	31.311	0.555	0.579
reservation_status_date4/7/16	8.382	31.672	0.265	0.791
reservation_status_date4/7/17	4.951	29.495	0.168	0.867
reservation_status_date4/8/16	-9.988	31.540	-0.317	0.752
reservation_status_date4/8/17	-17.992	32.100	-0.561	0.575
reservation_status_date4/9/16	41.562	30.725	1.353	0.176
reservation_status_date4/9/17	5.996	29.289	0.205	0.838
reservation_status_date5/1/16	-27.848	37.436	-0.744	0.457
reservation_status_date5/1/17	73.993	32.676	2.264	0.024
reservation_status_date5/10/17	20.899	32.497	0.643	0.520
reservation_status_date5/11/16	25.437	28.585	0.890	0.374
reservation_status_date5/12/16	5.512	27.212	0.203	0.840
reservation_status_date5/12/17	-9.289	34.605	-0.268	0.788
reservation_status_date5/13/16	75.790	52.351	1.448	0.148
reservation_status_date5/13/17	52.694	29.795	1.769	0.077
reservation_status_date5/14/16	-21.588	28.556	-0.756	0.450
reservation_status_date5/14/17	5.271	32.664	0.161	0.872
reservation_status_date5/15/16	-33.615	29.650	-1.134	0.257
reservation_status_date5/15/17	58.008	40.664	1.427	0.154
reservation_status_date5/16/16	13.430	32.608	0.412	0.680
reservation_status_date5/16/17	15.633	30.012	0.521	0.603
reservation_status_date5/17/16	1.139	27.274	0.042	0.967
reservation_status_date5/17/17	-1.434	31.959	-0.045	0.964
reservation_status_date5/18/16	2.905	28.813	0.101	0.920
reservation_status_date5/18/17	16.687	30.626	0.545	0.586
reservation_status_date5/19/16	17.206	33.156	0.519	0.604
reservation_status_date5/19/17	11.497	30.471	0.377	0.706
reservation_status_date5/2/16	26.524	29.272	0.906	0.365
reservation_status_date5/2/17	6.377	29.425	0.217	0.828
reservation_status_date5/20/16	10.490	33.046	0.317	0.751
reservation_status_date5/20/17	3.984	29.990	0.133	0.894
reservation_status_date5/21/16	70.658	37.718	1.873	0.061
reservation_status_date5/21/17	14.670	31.483	0.466	0.641
reservation_status_date5/22/16	63.362	37.480	1.691	0.091
reservation_status_date5/22/17	34.216	32.978	1.038	0.300
reservation_status_date5/23/16	-10.818	31.267	-0.346	0.729
reservation_status_date5/23/17	19.998	31.943	0.626	0.531
reservation_status_date5/24/16	6.902	27.124	0.254	0.799
reservation_status_date5/24/17	-9.031	29.540	-0.306	0.760
reservation_status_date5/25/16	15.576	27.582	0.565	0.572
reservation_status_date5/25/17	17.693	31.127	0.568	0.570
reservation_status_date5/26/16	18.024	26.223	0.687	0.492
reservation_status_date5/26/17	22.677	30.630	0.740	0.459
reservation_status_date5/27/16	-24.126	37.996	-0.635	0.526

term	estimate	std.error	statistic	p.value
reservation_status_date5/27/17	22.687	30.463	0.745	0.457
reservation_status_date5/28/16	19.044	28.375	0.671	0.502
reservation_status_date5/28/17	9.635	52.187	0.185	0.854
reservation_status_date5/29/16	20.788	31.386	0.662	0.508
reservation_status_date5/29/17	2.764	31.029	0.089	0.929
reservation_status_date5/3/16	0.956	37.205	0.026	0.980
reservation_status_date5/3/17	29.295	28.835	1.016	0.310
reservation_status_date5/30/16	-7.198	27.256	-0.264	0.792
reservation_status_date5/30/17	19.380	28.897	0.671	0.503
reservation_status_date5/31/16	-14.209	29.054	-0.489	0.625
reservation_status_date5/31/17	-16.994	33.721	-0.504	0.614
reservation_status_date5/4/17	29.504	30.663	0.962	0.336
reservation_status_date5/5/16	22.163	27.005	0.821	0.412
reservation_status_date5/5/17	26.570	31.176	0.852	0.394
reservation_status_date5/6/17	50.281	29.259	1.718	0.086
reservation_status_date5/7/17	38.046	30.482	1.248	0.212
reservation_status_date5/8/16	33.298	37.420	0.890	0.374
reservation_status_date5/8/17	24.246	32.468	0.747	0.455
reservation_status_date5/9/16	5.759	27.011	0.213	0.831
reservation_status_date5/9/17	17.927	29.558	0.606	0.544
reservation_status_date6/1/16	4.429	28.876	0.153	0.878
reservation_status_date6/1/17	25.608	35.392	0.724	0.469
reservation_status_date6/10/16	-9.201	27.650	-0.333	0.739
reservation_status_date6/11/17	13.329	32.125	0.415	0.678
reservation_status_date6/12/16	17.407	30.334	0.574	0.566
reservation_status_date6/12/17	8.740	41.491	0.211	0.833
reservation_status_date6/13/16	7.319	27.562	0.266	0.791
reservation_status_date6/13/17	15.545	33.155	0.469	0.639
reservation_status_date6/14/16	18.655	27.943	0.668	0.504
reservation_status_date6/14/17	0.175	31.188	0.006	0.996
reservation_status_date6/15/16	8.169	25.388	0.322	0.748
reservation_status_date6/15/17	19.944	33.711	0.592	0.554
reservation_status_date6/16/17	6.472	31.079	0.208	0.835
reservation_status_date6/17/16	15.607	37.909	0.412	0.681
reservation_status_date6/17/17	19.263	30.704	0.627	0.531
reservation_status_date6/18/16	-2.293	29.221	-0.078	0.937
reservation_status_date6/18/17	18.617	35.632	0.522	0.601
reservation_status_date6/19/16	16.932	38.035	0.445	0.656
reservation_status_date6/19/17	-7.654	32.445	-0.236	0.814
reservation_status_date6/2/16	-6.322	37.759	-0.167	0.867
reservation_status_date6/2/17	13.020	29.711	0.438	0.661
reservation_status_date6/20/16	23.630	31.399	0.753	0.452
reservation_status_date6/20/17	29.192	33.747	0.865	0.387
reservation_status_date6/21/16	21.922	24.983	0.877	0.380
reservation_status_date6/21/17	18.354	35.856	0.512	0.609
reservation_status_date6/22/16	7.227	28.048	0.258	0.797
reservation_status_date6/22/17	29.045	32.548	0.892	0.372
reservation_status_date6/23/16	4.522	26.243	0.172	0.863
reservation_status_date6/23/17	24.214	30.802	0.786	0.432
reservation_status_date6/24/16	4.950	37.665	0.131	0.895
reservation_status_date6/24/17	20.755	33.591	0.618	0.537
reservation_status_date6/25/16	6.302	31.412	0.201	0.841

term	estimate	std.error	statistic	p.value
reservation_status_date6/25/17	4.973	31.823	0.156	0.876
reservation_status_date6/26/16	7.948	28.745	0.277	0.782
reservation_status_date6/26/17	13.402	30.799	0.435	0.664
reservation_status_date6/27/16	10.743	31.688	0.339	0.735
reservation_status_date6/27/17	11.447	31.004	0.369	0.712
reservation_status_date6/28/16	-4.184	31.451	-0.133	0.894
reservation_status_date6/28/17	14.881	30.736	0.484	0.628
reservation_status_date6/29/16	-24.543	38.506	-0.637	0.524
reservation_status_date6/29/17	-16.637	32.110	-0.518	0.604
reservation_status_date6/3/16	13.707	28.925	0.474	0.636
reservation_status_date6/3/17	33.715	34.887	0.966	0.334
reservation_status_date6/30/16	9.715	37.480	0.259	0.796
reservation_status_date6/4/16	31.466	27.544	1.142	0.253
reservation_status_date6/4/17	10.498	30.611	0.343	0.732
reservation_status_date6/5/16	6.632	26.084	0.254	0.799
reservation_status_date6/5/17	16.857	31.468	0.536	0.592
reservation_status_date6/6/16	6.723	37.832	0.178	0.859
reservation_status_date6/7/16	5.274	26.032	0.203	0.839
reservation_status_date6/7/17	1.738	41.382	0.042	0.967
reservation_status_date6/8/16	-2.958	27.024	-0.109	0.913
reservation_status_date6/8/17	15.395	33.238	0.463	0.643
reservation_status_date6/9/16	22.779	26.283	0.867	0.386
reservation_status_date6/9/17	15.219	30.497	0.499	0.618
reservation_status_date7/1/16	19.926	28.075	0.710	0.478
reservation_status_date7/1/17	-13.008	32.445	-0.401	0.689
reservation_status_date7/10/15	11.008	32.109	0.343	0.732
reservation_status_date7/10/16	58.958	37.766	1.561	0.119
reservation_status_date7/10/17	13.405	31.325	0.428	0.669
reservation_status_date7/11/15	-3.632	38.313	-0.095	0.924
reservation_status_date7/11/16	-11.662	31.023	-0.376	0.707
reservation_status_date7/11/17	52.982	31.332	1.691	0.091
reservation_status_date7/12/16	-9.636	37.743	-0.255	0.799
reservation_status_date7/12/17	0.226	29.253	0.008	0.994
reservation_status_date7/13/16	-15.078	37.602	-0.401	0.688
reservation_status_date7/13/17	24.593	32.066	0.767	0.443
reservation_status_date7/14/16	2.455	27.636	0.089	0.929
reservation_status_date7/14/17	-0.297	32.439	-0.009	0.993
reservation_status_date7/15/16	16.563	26.739	0.619	0.536
reservation_status_date7/15/17	40.075	33.605	1.193	0.233
reservation_status_date7/16/15	-4.343	38.248	-0.114	0.910
reservation_status_date7/16/16	17.090	27.420	0.623	0.533
reservation_status_date7/16/17	21.200	31.610	0.671	0.503
reservation_status_date7/17/15	-20.877	38.807	-0.538	0.591
reservation_status_date7/17/16	11.126	32.495	0.342	0.732
reservation_status_date7/17/17	28.412	42.001	0.676	0.499
reservation_status_date7/18/16	-19.788	38.036	-0.520	0.603
reservation_status_date7/18/17	38.175	31.893	1.197	0.232
reservation_status_date7/19/16	-5.994	27.095	-0.221	0.825
reservation_status_date7/19/17	32.886	30.908	1.064	0.288
reservation_status_date7/2/17	5.779	30.229	0.191	0.848
reservation_status_date7/20/15	35.741	38.613	0.926	0.355
reservation_status_date7/20/16	27.241	27.748	0.982	0.326

term	estimate	std.error	statistic	p.value
reservation_status_date7/20/17	26.892	31.366	0.857	0.391
reservation_status_date7/21/16	6.424	29.164	0.220	0.826
reservation_status_date7/21/17	16.720	31.173	0.536	0.592
reservation_status_date7/22/16	80.214	27.571	2.909	0.004
reservation_status_date7/22/17	3.747	30.972	0.121	0.904
reservation_status_date7/23/15	4.772	38.199	0.125	0.901
reservation_status_date7/23/16	47.800	29.072	1.644	0.100
reservation_status_date7/23/17	23.094	32.799	0.704	0.481
reservation_status_date7/24/16	21.121	30.953	0.682	0.495
reservation_status_date7/24/17	30.192	33.372	0.905	0.366
reservation_status_date7/26/16	111.857	38.083	2.937	0.003
reservation_status_date7/26/17	27.032	30.803	0.878	0.380
reservation_status_date7/27/16	25.997	38.111	0.682	0.495
reservation_status_date7/27/17	87.848	41.858	2.099	0.036
reservation_status_date7/28/16	56.230	31.715	1.773	0.076
reservation_status_date7/28/17	44.578	33.092	1.347	0.178
reservation_status_date7/29/15	9.151	38.482	0.238	0.812
reservation_status_date7/29/16	10.586	37.837	0.280	0.780
reservation_status_date7/29/17	33.599	35.809	0.938	0.348
reservation_status_date7/3/16	13.014	25.204	0.516	0.606
reservation_status_date7/3/17	23.643	33.497	0.706	0.480
reservation_status_date7/30/15	14.681	38.526	0.381	0.703
reservation_status_date7/30/16	52.426	26.795	1.957	0.051
reservation_status_date7/31/16	81.566	30.550	2.670	0.008
reservation_status_date7/31/17	23.074	32.843	0.703	0.482
reservation_status_date7/4/15	-12.545	32.020	-0.392	0.695
reservation_status_date7/4/16	-15.352	24.628	-0.623	0.533
reservation_status_date7/4/17	40.409	31.578	1.280	0.201
reservation_status_date7/5/15	-19.988	32.059	-0.623	0.533
reservation_status_date7/5/16	39.925	26.690	1.496	0.135
reservation_status_date7/5/17	13.118	32.118	0.408	0.683
reservation_status_date7/6/15	-17.856	39.888	-0.448	0.654
reservation_status_date7/6/16	27.560	27.477	1.003	0.316
reservation_status_date7/6/17	74.811	33.128	2.258	0.024
reservation_status_date7/7/16	46.098	26.950	1.710	0.087
reservation_status_date7/7/17	43.352	33.028	1.313	0.190
reservation_status_date7/8/15	-13.560	38.407	-0.353	0.724
reservation_status_date7/8/16	14.278	31.129	0.459	0.647
reservation_status_date7/8/17	83.295	41.334	2.015	0.044
reservation_status_date7/9/16	1.309	25.921	0.050	0.960
reservation_status_date7/9/17	-17.444	35.254	-0.495	0.621
reservation_status_date8/1/16	62.765	29.464	2.130	0.033
reservation_status_date8/1/17	4.593	33.690	0.136	0.892
reservation_status_date8/10/15	8.964	31.933	0.281	0.779
reservation_status_date8/10/16	95.667	38.339	2.495	0.013
reservation_status_date8/10/17	39.704	33.015	1.203	0.229
reservation_status_date8/11/15	8.134	33.053	0.246	0.806
reservation_status_date8/11/16	72.421	31.773	2.279	0.023
reservation_status_date8/11/17	14.723	36.277	0.406	0.685
reservation_status_date8/12/17	62.629	42.175	1.485	0.138
reservation_status_date8/13/15	84.673	31.715	2.670	0.008
reservation_status_date8/13/16	44.739	27.523	1.626	0.104

term	estimate	std.error	statistic	p.value
reservation_status_date8/13/17	14.801	32.597	0.454	0.650
reservation_status_date8/14/16	57.406	31.341	1.832	0.067
reservation_status_date8/14/17	29.966	36.263	0.826	0.409
reservation_status_date8/15/16	75.905	37.918	2.002	0.045
reservation_status_date8/15/17	27.716	32.894	0.843	0.400
reservation_status_date8/16/15	-14.167	42.801	-0.331	0.741
reservation_status_date8/16/16	4.731	31.345	0.151	0.880
reservation_status_date8/16/17	59.881	32.838	1.824	0.068
reservation_status_date8/17/16	8.138	37.963	0.214	0.830
reservation_status_date8/17/17	49.884	31.185	1.600	0.110
reservation_status_date8/18/16	29.017	28.146	1.031	0.303
reservation_status_date8/18/17	56.406	31.993	1.763	0.078
reservation_status_date8/19/15	43.777	38.262	1.144	0.253
reservation_status_date8/19/16	-0.730	31.912	-0.023	0.982
reservation_status_date8/19/17	62.179	31.782	1.956	0.051
reservation_status_date8/2/16	50.434	27.798	1.814	0.070
reservation_status_date8/2/17	8.894	32.558	0.273	0.785
reservation_status_date8/20/15	54.419	39.231	1.387	0.166
reservation_status_date8/20/16	42.381	42.590	0.995	0.320
reservation_status_date8/20/17	40.715	42.226	0.964	0.335
reservation_status_date8/21/15	82.341	31.900	2.581	0.010
reservation_status_date8/21/16	3.008	31.474	0.096	0.924
reservation_status_date8/22/16	-5.270	31.713	-0.166	0.868
reservation_status_date8/22/17	51.038	33.240	1.535	0.125
reservation_status_date8/23/16	4.157	31.621	0.131	0.895
reservation_status_date8/23/17	33.405	34.235	0.976	0.329
reservation_status_date8/24/16	20.595	28.096	0.733	0.464
reservation_status_date8/24/17	30.960	39.082	0.792	0.428
reservation_status_date8/25/15	9.289	33.618	0.276	0.782
reservation_status_date8/25/16	3.458	26.872	0.129	0.898
reservation_status_date8/25/17	13.762	30.827	0.446	0.655
reservation_status_date8/26/16	20.853	27.947	0.746	0.456
reservation_status_date8/26/17	-0.815	34.012	-0.024	0.981
reservation_status_date8/27/15	37.053	37.956	0.976	0.329
reservation_status_date8/27/16	15.927	31.808	0.501	0.617
reservation_status_date8/27/17	52.186	34.901	1.495	0.135
reservation_status_date8/28/15	25.128	32.243	0.779	0.436
reservation_status_date8/28/16	1.431	29.559	0.048	0.961
reservation_status_date8/28/17	-4.839	30.862	-0.157	0.875
reservation_status_date8/29/15	44.342	32.257	1.375	0.169
reservation_status_date8/29/16	18.943	29.256	0.647	0.517
reservation_status_date8/29/17	18.703	36.802	0.508	0.611
reservation_status_date8/3/16	-5.299	27.279	-0.194	0.846
reservation_status_date8/3/17	63.066	32.760	1.925	0.054
reservation_status_date8/30/15	-109.668	38.772	-2.828	0.005
reservation_status_date8/30/17	66.318	36.703	1.807	0.071
reservation_status_date8/31/16	-1.532	29.158	-0.053	0.958
reservation_status_date8/4/16	145.742	41.404	3.520	0.000
reservation_status_date8/4/17	20.594	31.190	0.660	0.509
reservation_status_date8/5/16	6.284	37.834	0.166	0.868
reservation_status_date8/5/17	19.684	31.957	0.616	0.538
reservation_status_date8/6/16	-15.761	39.684	-0.397	0.691

term	estimate	std.error	statistic	p.value
reservation_status_date8/6/17	26.137	36.210	0.722	0.471
reservation_status_date8/7/15	36.217	41.872	0.865	0.387
reservation_status_date8/7/16	24.695	38.087	0.648	0.517
reservation_status_date8/7/17	-0.059	41.992	-0.001	0.999
reservation_status_date8/8/17	4.678	34.361	0.136	0.892
reservation_status_date8/9/16	8.724	38.205	0.228	0.819
reservation_status_date9/1/16	18.779	28.153	0.667	0.505
reservation_status_date9/1/17	7.826	35.180	0.222	0.824
reservation_status_date9/10/15	-14.624	31.346	-0.467	0.641
reservation_status_date9/10/16	2.247	28.107	0.080	0.936
reservation_status_date9/11/16	30.928	30.210	1.024	0.306
reservation_status_date9/12/15	5.818	30.093	0.193	0.847
reservation_status_date9/12/16	25.015	27.948	0.895	0.371
reservation_status_date9/13/15	11.595	39.797	0.291	0.771
reservation_status_date9/13/16	17.990	27.410	0.656	0.512
reservation_status_date9/14/16	34.614	29.788	1.162	0.245
reservation_status_date9/15/16	36.416	26.693	1.364	0.173
reservation_status_date9/16/15	-1.354	39.491	-0.034	0.973
reservation_status_date9/16/16	28.690	27.324	1.050	0.294
reservation_status_date9/17/15	-53.530	39.478	-1.356	0.175
reservation_status_date9/17/16	19.202	27.186	0.706	0.480
reservation_status_date9/18/15	-4.219	32.024	-0.132	0.895
reservation_status_date9/18/16	13.102	27.033	0.485	0.628
reservation_status_date9/19/16	15.162	27.692	0.548	0.584
reservation_status_date9/2/15	2.231	44.212	0.050	0.960
reservation_status_date9/2/16	18.785	27.349	0.687	0.492
reservation_status_date9/2/17	56.721	42.443	1.336	0.182
reservation_status_date9/20/16	5.765	28.029	0.206	0.837
reservation_status_date9/21/15	17.427	30.075	0.579	0.562
reservation_status_date9/21/16	NA	NA	NA	NA
reservation_status_date9/22/15	20.720	30.669	0.676	0.499
reservation_status_date9/22/16	9.619	32.506	0.296	0.767
reservation_status_date9/23/15	-5.050	27.581	-0.183	0.855
reservation_status_date9/23/16	33.776	33.902	0.996	0.319
reservation_status_date9/24/15	18.312	28.908	0.633	0.527
reservation_status_date9/24/16	-42.901	43.939	-0.976	0.329
reservation_status_date9/25/15	-44.558	31.529	-1.413	0.158
reservation_status_date9/25/16	7.897	32.443	0.243	0.808
reservation_status_date9/26/15	-22.018	38.393	-0.574	0.566
reservation_status_date9/26/16	-11.026	27.449	-0.402	0.688
reservation_status_date9/27/15	47.173	27.849	1.694	0.091
reservation_status_date9/27/16	-7.403	32.688	-0.226	0.821
reservation_status_date9/28/15	68.155	31.590	2.157	0.031
reservation_status_date9/28/16	22.292	32.681	0.682	0.495
reservation_status_date9/29/15	78.663	33.153	2.373	0.018
reservation_status_date9/29/16	12.865	29.284	0.439	0.660
reservation_status_date9/3/16	6.093	26.755	0.228	0.820
reservation_status_date9/3/17	16.351	36.466	0.448	0.654
reservation_status_date9/30/15	77.656	27.529	2.821	0.005
reservation_status_date9/30/16	35.489	32.516	1.091	0.275
reservation_status_date9/4/15	-10.136	38.247	-0.265	0.791
reservation_status_date9/4/16	20.287	27.125	0.748	0.455

term	estimate	std.error	statistic	p.value
reservation_status_date9/4/17	-9.661	42.095	-0.230	0.819
reservation_status_date9/5/15	-21.294	37.785	-0.564	0.573
reservation_status_date9/5/16	55.114	27.630	1.995	0.046
reservation_status_date9/6/15	6.758	29.247	0.231	0.817
reservation_status_date9/6/16	-3.149	28.403	-0.111	0.912
reservation_status_date9/7/15	19.374	38.065	0.509	0.611
reservation_status_date9/7/16	2.922	32.498	0.090	0.928
reservation_status_date9/8/15	-15.338	37.929	-0.404	0.686
reservation_status_date9/8/16	16.346	29.828	0.548	0.584
reservation_status_date9/9/15	-9.977	31.962	-0.312	0.755
reservation_status_date9/9/16	24.640	27.769	0.887	0.375
total_stay_length	NA	NA	NA	NA
only_adults_presentTRUE	96.818	22.808	4.245	0.000
kids_presentTRUE	67.244	24.166	2.783	0.005

```
selected_model <- step(full_model, scope=formula(full_model), direction="backward", k = log(nrow(hotels)))
```

```
tidy(selected_model) %>%  
  kable()
```

term	estimate	std.error	statistic	p.value
(Intercept)	-2.994815e+04	3748.1945161	-7.9900211	0.0000000
hotelResort Hotel	-6.493968e+00	1.9487085	-3.3324470	0.0008761
lead_time	-1.790694e-01	0.0100978	-17.7334336	0.0000000
arrival_date_year	1.488448e+01	1.8505618	8.0432210	0.0000000
arrival_date_monthAugust	1.451792e+02	35.0383801	4.1434332	0.0000356
arrival_date_monthDecember	1.927779e+02	70.2694459	2.7434106	0.0061331
arrival_date_monthFebruary	-9.373908e+01	17.9461129	-5.2233643	0.0000002
arrival_date_monthJanuary	-1.193587e+02	26.4551521	-4.5117379	0.0000068
arrival_date_monthJuly	1.038712e+02	26.2516580	3.9567492	0.0000785
arrival_date_monthJune	6.310017e+01	17.7830126	3.5483397	0.0003963
arrival_date_monthMarch	-4.717985e+01	9.8443092	-4.7926009	0.0000018
arrival_date_monthMay	3.934141e+01	9.2349692	4.2600474	0.0000214
arrival_date_monthNovember	1.808707e+02	61.6396614	2.9343238	0.0033797
arrival_date_monthOctober	1.659941e+02	52.7074316	3.1493485	0.0016598
arrival_date_monthSeptember	1.558476e+02	43.9826051	3.5433915	0.0004038
arrival_date_week_number	-5.958839e+00	2.0138510	-2.9589274	0.0031223
arrival_date_day_of_month	1.092474e+00	0.2987952	3.6562633	0.0002623
stays_in_week_nights	1.489819e+00	0.4951391	3.0088903	0.0026538
adults	2.183618e+01	1.5336021	14.2384948	0.0000000
children	4.148004e+01	3.9380871	10.5330420	0.0000000
mealHB	2.863563e+01	4.7702754	6.0029297	0.0000000
mealSC	-2.271245e+01	1.9972409	-11.3719145	0.0000000
mealUndefined	8.147189e+01	34.3654282	2.3707516	0.0178434
distribution_channelDirect	1.724340e+01	6.2064155	2.7783185	0.0055136
distribution_channelGDS	3.857297e+01	9.5144431	4.0541493	0.0000522
distribution_channelTA/TO	4.509317e+00	6.0555927	0.7446533	0.4565661
is_repeated_guest	-5.305326e+01	9.5214805	-5.5719545	0.0000000
previous_bookings_not_canceled	4.846473e+01	11.1674573	4.3398177	0.0000149
days_in_waiting_list	-2.959721e-01	0.0757224	-3.9086453	0.0000958

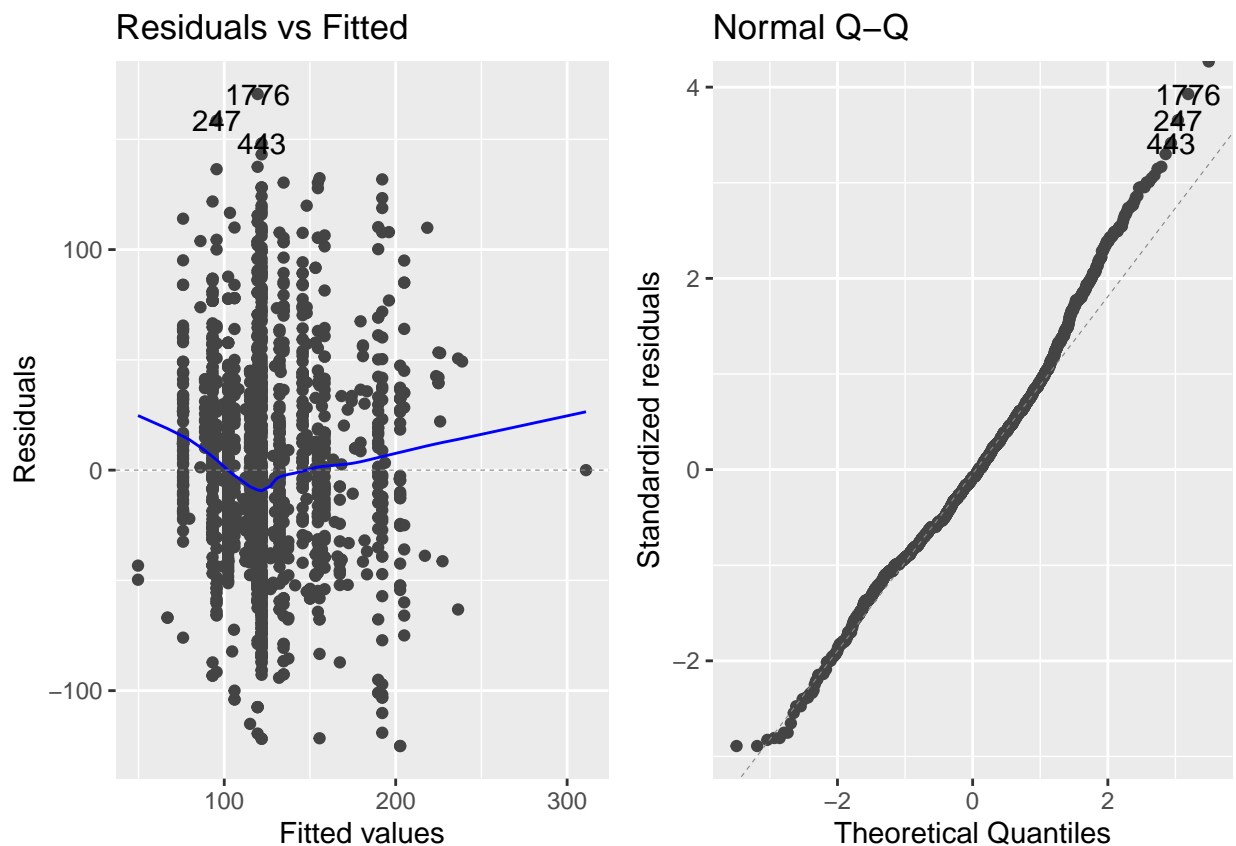
term	estimate	std.error	statistic	p.value
total_of_special_requests	4.844110e+00	0.9561201	5.0664238	0.0000004
reservation_statusCheck-Out	-9.468762e+00	1.9624042	-4.8250826	0.0000015
reservation_statusNo-Show	-1.384646e+00	6.6392745	-0.2085538	0.8348172
only_adults_presentTRUE	9.419506e+01	18.7177801	5.0323842	0.0000005
kids_presentTRUE	7.629983e+01	19.9264423	3.8290746	0.0001325

Modeling

```
model <- lm(adr ~ adults + children + babies + hotel + meal + reservation_status, data = hotels)
```

Conditions Check For Linear Model

```
# Residual + QQ Plots
autoplot(model, which = c(1,2))
```



- **Linearity** The residuals are randomly scattered in the plot of residuals vs fitted, so the linearity condition is satisfied.
- **Constant variance:** The spread of the residuals is approximately equal in the plot of residuals vs. fitted as the fitted value increases. There are a few outliers, but overall the spread of the residuals is equal. Therefore constant variance is satisfied.
- **Normality:** The QQ-plot shows that the distribution of the residuals is skewed right, so this condition is not satisfied. However, the model is robust to deviations from normality for sample sizes greater than 30. Our sample size of 1447 is greater than 30, so we can

proceed. • Independence: This condition is not met since there are multiple observations for most lemurs. These observations would be correlated

From this analysis, we conclude that the conditions are met for performing linear regression.

Results

```
tidy(model, conf.int = TRUE) %>%
kable(digits = 3)
```

term	estimate	std.error	statistic	p.value	conf.low	conf.high
(Intercept)	79.723	4.256	18.734	0.000	71.377	88.069
adults	26.277	1.825	14.398	0.000	22.698	29.856
children	35.169	1.825	19.274	0.000	31.590	38.747
babies	-22.637	17.815	-1.271	0.204	-57.574	12.300
hotelResort Hotel	2.353	2.391	0.984	0.325	-2.336	7.042
mealHB	33.779	5.982	5.647	0.000	22.048	45.511
mealSC	-17.205	2.409	-7.141	0.000	-21.930	-12.480
mealUndefined	106.033	43.632	2.430	0.015	20.466	191.600
reservation_statusCheck-Out	-12.809	2.323	-5.515	0.000	-17.364	-8.254
reservation_statusNo-Show	-2.662	8.327	-0.320	0.749	-18.991	13.668

$$\begin{aligned}
\text{Average}\hat{\text{DailyRate}} = & 79.723 + 26.277(\text{adults}) + 35.169(\text{children}) \\
& -22.637(\text{babies}) + 2.353(\text{hotelResortHotel}) + 33.779(\text{mealHB}) - 17.205(\text{mealSC}) \\
& + 106.033(\text{mealUndefined}) - 12.809(\text{reservationstatusCheck-Out}) - 2.662(\text{reservationstatusNo-Show})
\end{aligned}$$

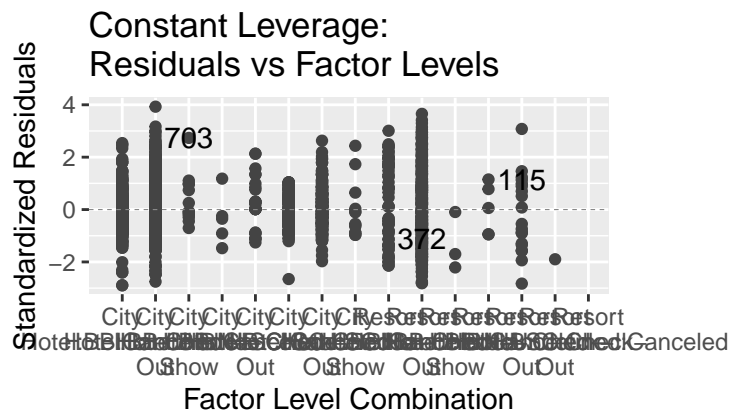
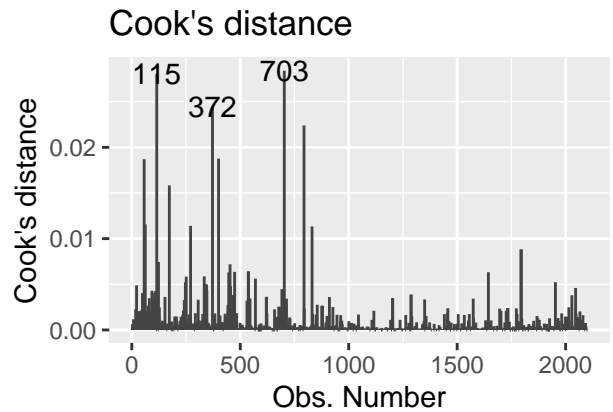
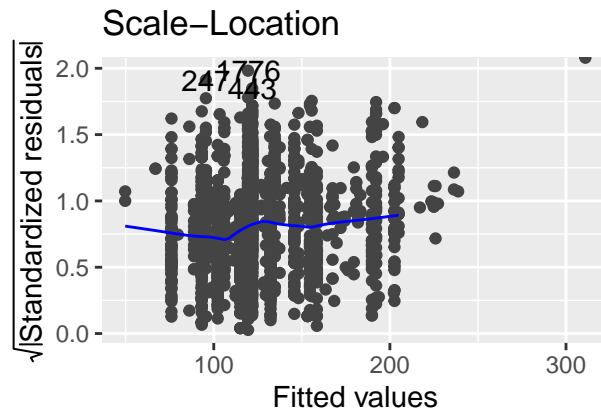
Diagnostics

```
autoplot(model, which = c(3, 4, 5))
```

```
## Warning: Removed 14 row(s) containing missing values (geom_path).
```

```
## Warning: Removed 1 rows containing missing values (geom_segment).
```

```
## Warning: Removed 1 rows containing missing values (geom_point).
```



```
#Leverage
lev_threshold <- 2 * 2 / nrow(hotels)
hotel_aug <- augment(model)

hotel_aug %>%
  filter(.hat > lev_threshold) %>% nrow()
```

```
## [1] 1604
```

```
# High Magnitude Residual
hotel_aug %>%
  filter(.std.resid < -3 | .std.resid > 3) %>% nrow()
```

```
## [1] 10
```

```
# Influential Point
hotel_aug %>%
  filter(.cooks > 1.0) %>% nrow()
```

```
## [1] 0
```

We use leverage and Cook's Distance to identify influential observations in our dataset, and use standardized residuals to identify outliers.

Leverage is a measure of the distance between an observation's values of the predictor variables and the average values of the predictor variables for the entire data set. We define a high leverage point as having a leverage greater than $\frac{2(p+1)}{n}$, where p is the number of predictors and n is the number of observations. We find X observations to be high leverage, and consider them to be potential influential points.

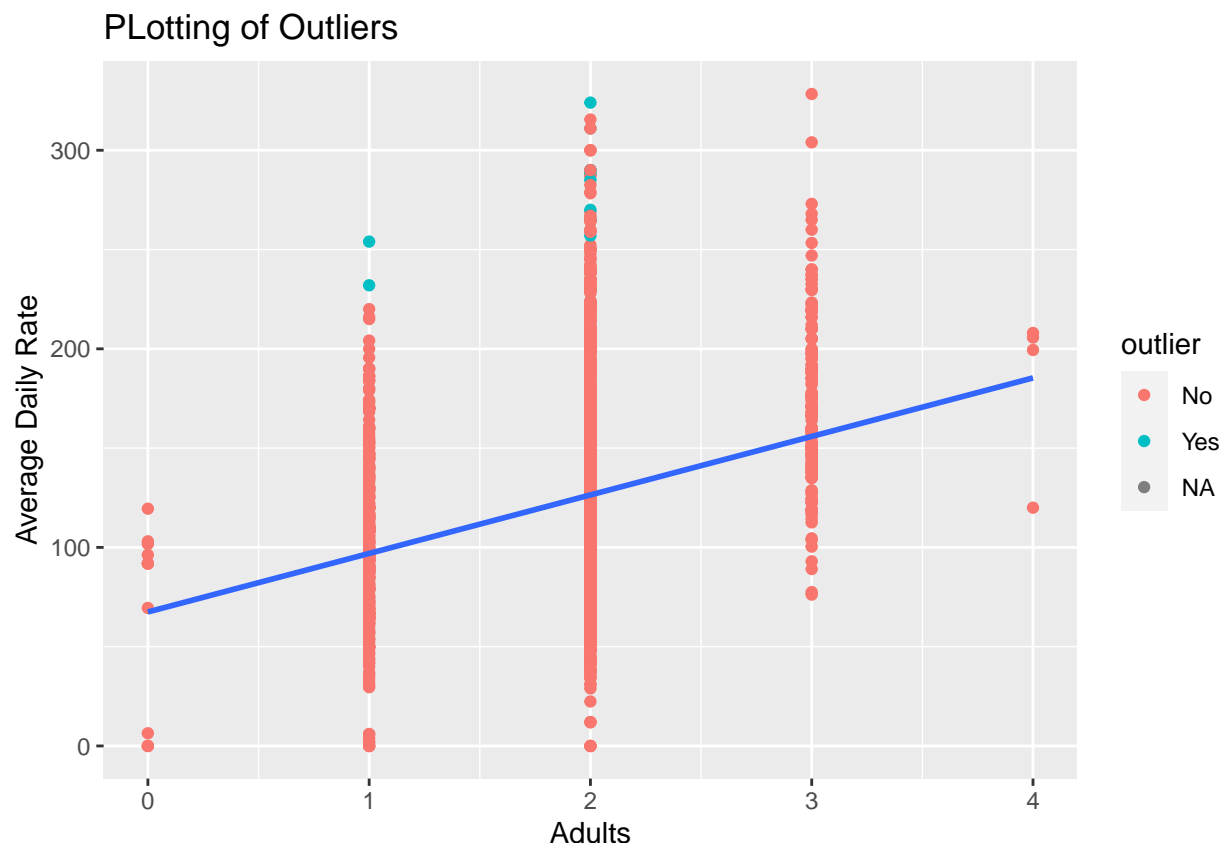
Cook's distance is a composite measure of an observation's leverage and standardized residual, and is used to identify influential points. An observation is considered an influential point if its Cook's distance is greater than 1.0. We find X observations with a Cook's distance greater than 1.0, and conclude that they are influential points.

Standardized residuals can be used to identify outliers, as observations that have standardized residuals of large magnitude don't fit the pattern determined by the regression model. We identify outliers as observations with standardized residuals with a magnitude greater than or equal to 3. We find X observations to be outliers.

```
hotel_aug <- hotel_aug %>%
  mutate(outlier = if_else(.std.resid < -3 | .std.resid > 3, "Yes", "No"))

ggplot(hotel_aug, aes(x = adults, y = adr)) + geom_point(aes(color = outlier)) +
  geom_smooth(method = "lm", se = FALSE) + labs(title = "Plotting of Outliers",
    y = "Average Daily Rate",
    x = "Adults")
```

'geom_smooth()' using formula 'y ~ x'



Model Assumptions, Limitations

Interpretations and Conclusions