

D3M

Airbnb Project

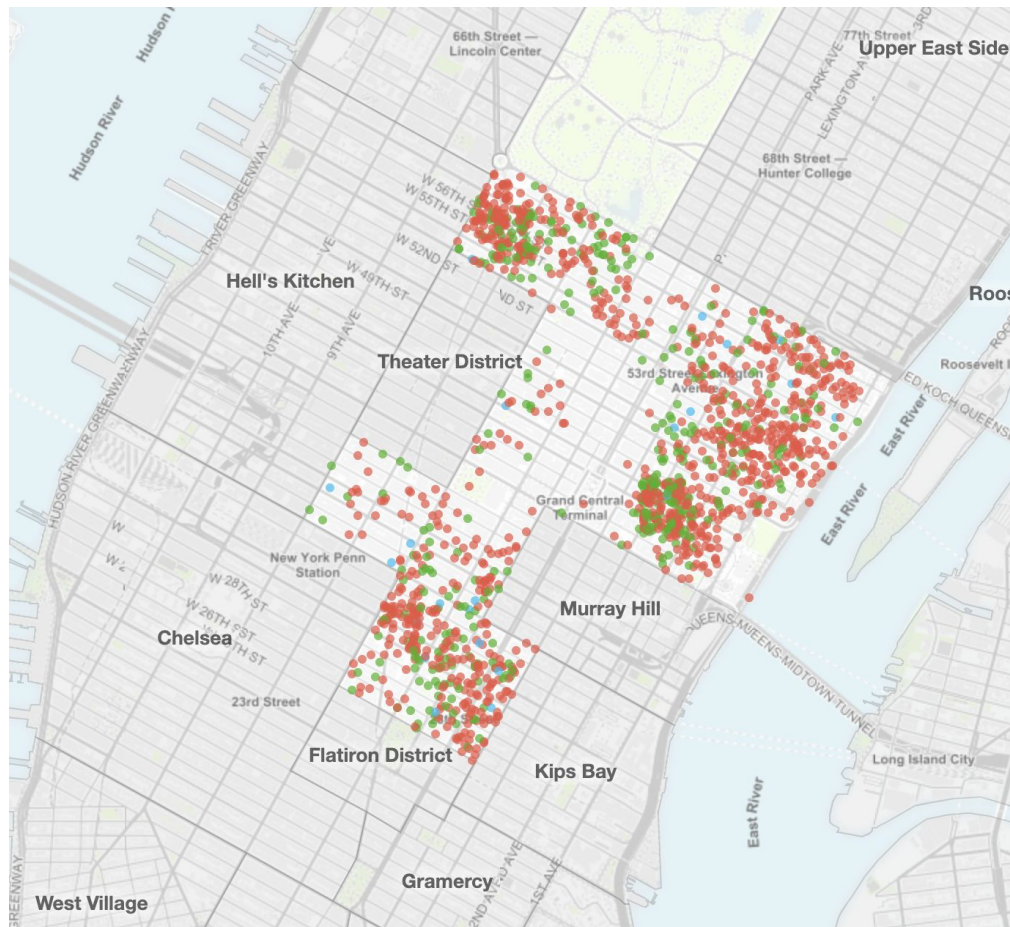
- Host Price

Group 1: Daniel Chin, Wendi Tang, Andrew Liu



Pt. 1: Identify the Problem

- **Decision Maker:** Host
- **Problem:** How to maximize profit when I have a house/room available for Airbnb?
- **Problem Breakdown:**
 - How can I find the optimal price?
 - How is demand affecting my pricing?
 - Should I consider seasonality in demand to do dynamic pricing?
 - Besides demand, what other factors affect my pricing?
- **Project Scope:**
 - Midtown, Manhattan (Private Room/Entire House)





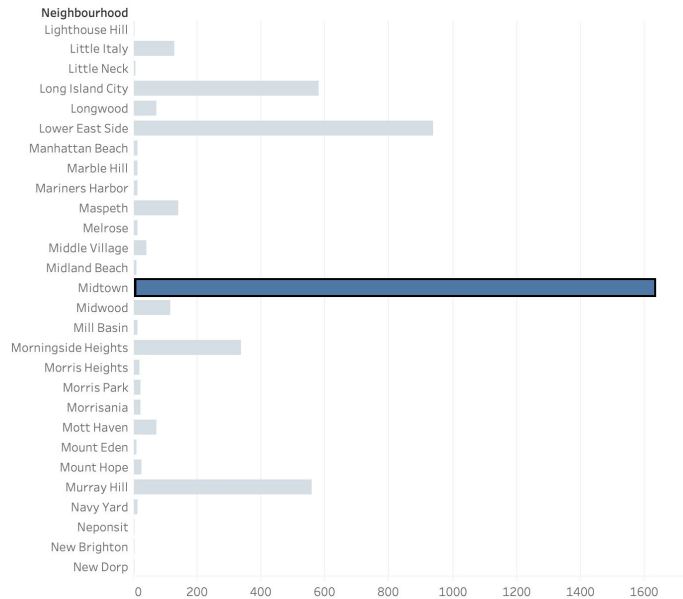
Inquiry Background

Our Host-centric question of "How to maximize profit when I have a house/room available for Airbnb", has many different factors that go into determining sales and optimal price such as: location, reviews, features, and etc.

Having explored different measurement options for our analysis, to explore what was feasible and limit other influences on sales, we decided to narrow our analysis scope by location, specifically by neighborhood.

After deciding to narrow down our analysis to the optimal pricing of a single neighborhood, we chose a neighborhood with a large number of listings: **Midtown, Manhattan** (1632 listings)

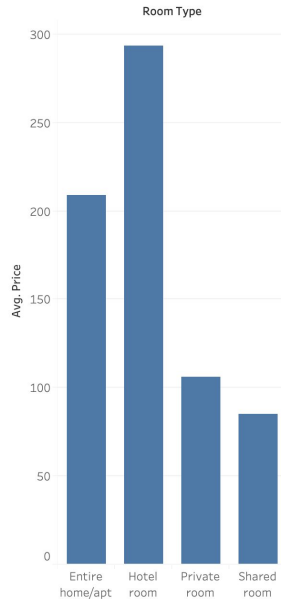
Data Visualization - Univariate Analysis



Distribution of listings in New York City

- Midtown has one of the highest counts

Data Visualization - Bivariate Analysis



Room Type vs. Avg Price

- Hotel Room charges the highest
- Shared Room is the cheapest



Pt. 2: Data-driven Analysis - Demand



Pt. 2: Data-driven Analysis - Demand

How to estimate Booking Volume?



Pt. 2: Data-driven Analysis - Demand

How to estimate Booking Volume?

of reviews



Pt. 2: Data-driven Analysis - Demand

How to estimate Booking Volume?

of reviews

Problems:

- biased towards really bad / nice listings



Pt. 2: Data-driven Analysis - Demand

How to estimate Booking Volume?

of reviews

Problems:

- biased towards really bad / nice listings
- Needs a parameter: Probability of leaving a review

Listing ID: 5178

Week of Date	Date						Available
	Sun..	Mon..	Tues..	Wed..	Thur..	Frid..	
February 9, 2020					13	14	15
February 16, 2020	16	17	18	19	20	21	22
February 23, 2020	23	24	25	26	27	28	29
March 1, 2020	1	2	3	4	5	6	7
March 8, 2020	8	9	10	11	12	13	14
March 15, 2020	15	16	17	18	19	20	21
March 22, 2020	22	23	24	25	26	27	28
March 29, 2020	29	30	31	1	2	3	4
April 5, 2020	5	6	7	8	9	10	11
April 12, 2020	12	13	14	15	16	17	18
April 19, 2020	19	20	21	22	23	24	25
April 26, 2020	26	27	28	29	30	1	2
May 3, 2020	3	4	5	6	7	8	9
May 10, 2020	10	11	12	13	14	15	16
May 17, 2020	17	18	19	20	21	22	23
May 24, 2020	24	25	26	27	28	29	30
May 31, 2020	31	1	2	3	4	5	6
June 7, 2020	7	8	9	10	11	12	13
June 14, 2020	14	15	16	17	18	19	20
June 21, 2020	21	22	23	24	25	26	27
June 28, 2020	28	29	30	1	2	3	4
July 5, 2020	5	6	7	8	9	10	11
July 12, 2020	12	13	14	15	16	17	18
July 19, 2020	19	20	21	22	23	24	25
July 26, 2020	26	27	28	29	30	31	1
August 2, 2020	2	3	4	5	6	7	8
August 9, 2020	9	10	11	12	13	14	15
August 16, 2020	16	17	18	19	20	21	22
August 23, 2020	23	24	25	26	27	28	29
August 30, 2020	30	31	1	2	3	4	5
September 6, 20..	6	7	8	9	10	11	12
September 13, 2..	13	14	15	16	17	18	19
September 20, 2..	20	21	22	23	24	25	26
September 27, 2..	27	28	29	30	1	2	3
October 4, 2020	4	5	6	7	8	9	10
October 11, 2020	11	12	13	14	15	16	17
October 18, 2020	18	19	20	21	22	23	24
October 25, 2020	25	26	27	28	29	30	31
November 1, 2020	1	2	3	4	5	6	7
November 8, 2020	8	9	10	11	12	13	14
November 15, 20..	15	16	17	18	19	20	21
November 22, 20..	22	23	24	25	26	27	28
November 29, 20..	29	30	1	2	3	4	5
December 6, 2020	6	7	8	9	10	11	12
December 13, 20..	13	14	15	16	17	18	19
December 20, 20..	20	21	22	23	24	25	26
December 27, 20..	27	28	29	30	31	1	2
January 3, 2021	3	4	5	6	7	8	9
January 10, 2021	10	11	12	13	14	15	16
January 17, 2021	17	18	19	20	21	22	23
January 24, 2021	24	25	26	27	28	29	30
January 31, 2021	31	1	2	3	4	5	6
February 7, 2021	7	8	9	10	11		

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5178.



Listing ID: 5178

Week of Date	Date						Available
	Sun..	Mon..	Tues..	Thur..	Frid..	Satu..	
February 9, 2020				13	14	15	False
February 16, 2020	16	17	18	19	20	21	
February 23, 2020	23	24	25	26	27	28	True
March 1, 2020	1	2	3	4	5	6	
March 8, 2020	8	9	10	11	12	13	False
March 15, 2020	15	16	17	18	19	20	
March 22, 2020	22	23	24	25	26	27	True
March 29, 2020	29	30	31	1	2	3	
April 5, 2020	5	6	7	8	9	10	False
April 12, 2020	12	13	14	15	16	17	
April 19, 2020	19	20	21	22	23	24	True
April 26, 2020	26	27	28	29	30	1	
May 3, 2020	3	4	5	6	7	8	False
May 10, 2020	10	11	12	13	14	15	
May 17, 2020	17	18	19	20	21	22	True
May 24, 2020	24	25	26	27	28	29	
May 31, 2020	31	1	2	3	4	5	False
June 7, 2020							
June 14, 2020	14	15	16	17	18	19	True
June 21, 2020	21	22	23	24	25	26	
June 28, 2020	28	29	30	1	2	3	False
July 5, 2020	5	6	7	8	9	10	
July 12, 2020	12	13	14	15	16	17	True
July 19, 2020	19	20	21	22	23	24	
July 26, 2020	26	27	28	29	30	31	False
August 2, 2020							
August 9, 2020		10	11	12	13	14	True
August 16, 2020	16	17	18	19	20	21	
August 23, 2020	23	24	25	26	27	28	False
August 30, 2020	30	31	1	2	3	4	
September 6, 20..	6	7	8	9	10	11	True
September 13, 2..	13	14	15	16	17	18	
September 20, 2..	20	21	22	23	24	25	False
September 27, 2..	27	28	29	30	1	2	
October 4, 2020	4	5	6	7	8	9	True
October 11, 2020	11	12	13	14	15	16	
October 18, 2020	18	19	20	21	22	23	False
October 25, 2020	25	26	27	28	29	30	
November 1, 2020	1	2	3	4	5	6	True
November 8, 2020	8	9	10	11	12	13	
November 15, 20..	15	16	17	18	19	20	False
November 22, 20..	22	23	24	25	26	27	
November 29, 20..	29	30	1	2	3	4	True
December 6, 2020	6	7	8	9	10	11	
December 13, 20..	13	14	15	16	17	18	False
December 20, 20..	20	21	22	23	24	25	
December 27, 20..	27	28	29	30	31	1	True
January 3, 2021	3	4	5	6	7	8	
January 10, 2021	10	11	12	13	14	15	False
January 17, 2021	17	18	19	20	21	22	
January 24, 2021	24	25	26	27	28	29	True
January 31, 2021	31	1	2	3	4	5	
February 7, 2021	7	8	9	10	11	12	False

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5178.

Listing ID: 5121

Week of Date	Date						Available
	Sun..	Mon..	Tues..	Thur..	Frid..	Satu..	
February 9, 2020				13	14	15	False
February 16, 2020	16	17	18	19	20	21	
February 23, 2020	23	24	25	26	27	28	True
March 1, 2020	1	2	3	4	5	6	
March 8, 2020	8	9	10	11	12	13	False
March 15, 2020	15	16	17	18	19	20	
March 22, 2020	22	23	24	25	26	27	True
March 29, 2020	29	30	31	1	2	3	
April 5, 2020	5	6	7	8	9	10	False
April 12, 2020	12	13	14	15	16	17	
April 19, 2020	19	20	21	22	23	24	True
April 26, 2020	26	27	28	29	30	1	
May 3, 2020	3	4	5	6	7	8	False
May 10, 2020	10	11	12	13	14	15	
May 17, 2020	17	18	19	20	21	22	True
May 24, 2020	24	25	26	27	28	29	
May 31, 2020	31	1	2	3	4	5	False
June 7, 2020							
June 14, 2020	14	15	16	17	18	19	True
June 21, 2020	21	22	23	24	25	26	
June 28, 2020	28	29	30	1	2	3	False
July 5, 2020	5	6	7	8	9	10	
July 12, 2020	12	13	14	15	16	17	True
July 19, 2020	19	20	21	22	23	24	
July 26, 2020	26	27	28	29	30	31	False
August 2, 2020							
August 9, 2020		10	11	12	13	14	True
August 16, 2020	16	17	18	19	20	21	
August 23, 2020	23	24	25	26	27	28	False
August 30, 2020	30	31	1	2	3	4	
September 6, 20..	6	7	8	9	10	11	True
September 13, 2..	13	14	15	16	17	18	
September 20, 2..	20	21	22	23	24	25	False
September 27, 2..	27	28	29	30	1	2	
October 4, 2020	4	5	6	7	8	9	True
October 11, 2020	11	12	13	14	15	16	
October 18, 2020	18	19	20	21	22	23	False
October 25, 2020	25	26	27	28	29	30	
November 1, 2020	1	2	3	4	5	6	True
November 8, 2020	8	9	10	11	12	13	
November 15, 20..	15	16	17	18	19	20	False
November 22, 20..	22	23	24	25	26	27	
November 29, 20..	29	30	1	2	3	4	True
December 6, 2020	6	7	8	9	10	11	
December 13, 20..	13	14	15	16	17	18	False
December 20, 20..	20	21	22	23	24	25	
December 27, 20..	27	28	29	30	31	1	True
January 3, 2021	3	4	5	6	7	8	
January 10, 2021	10	11	12	13	14	15	False
January 17, 2021	17	18	19	20	21	22	
January 24, 2021	24	25	26	27	28	29	True
January 31, 2021	31	1	2	3	4	5	
February 7, 2021	7	8	9	10	11	12	False

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5121.

Listing ID: 5099

Week of Date	Sun..	Mon..	Tues..	Date Wed..	Thur..	Frid..	Satu..	Available
February 9, 2020				1	2	3	4	False
February 16, 2020	16	17	18	19	20	21	22	False
February 23, 2020	23	24	25	26	27	28	29	False
March 1, 2020				1	2	3	4	False
March 8, 2020			1	2	3	4	5	False
March 15, 2020	1	2	3	4	5	6	7	False
March 22, 2020	8	9	10	11	12	13	14	False
March 29, 2020	15	16	17	18	19	20	21	False
April 5, 2020	22	23	24	25	26	27	28	False
April 12, 2020				1	2	3	4	False
April 19, 2020	5	6	7	8	9	10	11	False
April 26, 2020	12	13	14	15	16	17	18	False
May 3, 2020	19	20	21	22	23	24	25	False
May 10, 2020				1	2	3	4	False
May 17, 2020	5	6	7	8	9	10	11	False
May 24, 2020	12	13	14	15	16	17	18	False
May 31, 2020	19	20	21	22	23	24	25	False
June 7, 2020				1	2	3	4	False
June 14, 2020	5	6	7	8	9	10	11	False
June 21, 2020	12	13	14	15	16	17	18	False
June 28, 2020	19	20	21	22	23	24	25	False
July 5, 2020				1	2	3	4	False
July 12, 2020	5	6	7	8	9	10	11	False
July 19, 2020	12	13	14	15	16	17	18	False
July 26, 2020	19	20	21	22	23	24	25	False
August 2, 2020				1	2	3	4	False
August 9, 2020	5	6	7	8	9	10	11	False
August 16, 2020	12	13	14	15	16	17	18	False
August 23, 2020	19	20	21	22	23	24	25	False
August 30, 2020				1	2	3	4	False
September 6, 20..	5	6	7	8	9	10	11	False
September 13, 2..	12	13	14	15	16	17	18	False
September 20, 2..	19	20	21	22	23	24	25	False
September 27, 2..				1	2	3	4	False
October 4, 2020	5	6	7	8	9	10	11	False
October 11, 2020	12	13	14	15	16	17	18	False
October 18, 2020	19	20	21	22	23	24	25	False
October 25, 2020				1	2	3	4	False
November 1, 2020	5	6	7	8	9	10	11	False
November 8, 2020	12	13	14	15	16	17	18	False
November 15, 20..	19	20	21	22	23	24	25	False
November 22, 20..				1	2	3	4	False
November 29, 20..	5	6	7	8	9	10	11	False
December 6, 2020	12	13	14	15	16	17	18	False
December 13, 20..	19	20	21	22	23	24	25	False
December 20, 20..				1	2	3	4	False
December 27, 20..	5	6	7	8	9	10	11	False
January 3, 2021	12	13	14	15	16	17	18	False
January 10, 2021	19	20	21	22	23	24	25	False
January 17, 2021				1	2	3	4	False
January 24, 2021	5	6	7	8	9	10	11	False
January 31, 2021	12	13	14	15	16	17	18	False
February 7, 2021	19	20	21	22	23	24	25	False

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5099.

Listing ID: 5178

Week of Date	Sun..	Mon..	Tues..	Date Wed..	Thur..	Frid..	Satu..	Available
February 9, 2020				1	2	3	4	False
February 16, 2020	16	17	18	19	20	21	22	False
February 23, 2020	23	24	25	26	27	28	29	False
March 1, 2020				1	2	3	4	False
March 8, 2020			1	2	3	4	5	False
March 15, 2020	1	2	3	4	5	6	7	False
March 22, 2020	8	9	10	11	12	13	14	False
March 29, 2020	15	16	17	18	19	20	21	False
April 5, 2020	22	23	24	25	26	27	28	False
April 12, 2020				1	2	3	4	False
April 19, 2020	5	6	7	8	9	10	11	False
April 26, 2020	12	13	14	15	16	17	18	False
May 3, 2020	19	20	21	22	23	24	25	False
May 10, 2020				1	2	3	4	False
May 17, 2020	5	6	7	8	9	10	11	False
May 24, 2020	12	13	14	15	16	17	18	False
May 31, 2020	19	20	21	22	23	24	25	False
June 7, 2020				1	2	3	4	False
June 14, 2020	5	6	7	8	9	10	11	False
June 21, 2020	12	13	14	15	16	17	18	False
June 28, 2020	19	20	21	22	23	24	25	False
July 5, 2020				1	2	3	4	False
July 12, 2020	5	6	7	8	9	10	11	False
July 19, 2020	12	13	14	15	16	17	18	False
July 26, 2020	19	20	21	22	23	24	25	False
August 2, 2020				1	2	3	4	False
August 9, 2020	5	6	7	8	9	10	11	False
August 16, 2020	12	13	14	15	16	17	18	False
August 23, 2020	19	20	21	22	23	24	25	False
August 30, 2020				1	2	3	4	False
September 6, 20..	5	6	7	8	9	10	11	False
September 13, 2..	12	13	14	15	16	17	18	False
September 20, 2..	19	20	21	22	23	24	25	False
September 27, 2..				1	2	3	4	False
October 4, 2020	5	6	7	8	9	10	11	False
October 11, 2020	12	13	14	15	16	17	18	False
October 18, 2020	19	20	21	22	23	24	25	False
October 25, 2020				1	2	3	4	False
November 1, 2020	5	6	7	8	9	10	11	False
November 8, 2020	12	13	14	15	16	17	18	False
November 15, 20..	19	20	21	22	23	24	25	False
November 22, 20..				1	2	3	4	False
November 29, 20..	5	6	7	8	9	10	11	False
December 6, 2020	12	13	14	15	16	17	18	False
December 13, 20..	19	20	21	22	23	24	25	False
December 20, 20..				1	2	3	4	False
December 27, 20..	5	6	7	8	9	10	11	False
January 3, 2021	12	13	14	15	16	17	18	False
January 10, 2021	19	20	21	22	23	24	25	False
January 17, 2021				1	2	3	4	False
January 24, 2021	5	6	7	8	9	10	11	False
January 31, 2021	12	13	14	15	16	17	18	False
February 7, 2021	19	20	21	22	23	24	25	False

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5178.

Listing ID: 5121

Week of Date	Sun..	Mon..	Tues..	Date Wed..	Thur..	Frid..	Satu..	Available
February 9, 2020				1	2	3	4	True
February 16, 2020	16	17	18	19	20	21	22	True
February 23, 2020	23	24	25	26	27	28	29	True
March 1, 2020				1	2	3	4	True
March 8, 2020			1	2	3	4	5	True
March 15, 2020	1	2	3	4	5	6	7	True
March 22, 2020	8	9	10	11	12	13	14	True
March 29, 2020	15	16	17	18	19	20	21	True
April 5, 2020	22	23	24	25	26	27	28	True
April 12, 2020				1	2	3	4	True
April 19, 2020	5	6	7	8	9	10	11	True
April 26, 2020	12	13	14	15	16	17	18	True
May 3, 2020	19	20	21	22	23	24	25	True
May 10, 2020				1	2	3	4	True
May 17, 2020	5	6	7	8	9	10	11	True
May 24, 2020	12	13	14	15	16	17	18	True
May 31, 2020	19	20	21	22	23	24	25	True
June 7, 2020				1	2	3	4	True
June 14, 2020	5	6	7	8	9	10	11	True
June 21, 2020	12	13	14	15	16	17	18	True
June 28, 2020	19	20	21	22	23	24	25	True
July 5, 2020				1	2	3	4	True
July 12, 2020	5	6	7	8	9	10	11	True
July 19, 2020	12	13	14	15	16	17	18	True
July 26, 2020	19	20	21	22	23	24	25	True
August 2, 2020				1	2	3	4	True
August 9, 2020	5	6	7	8	9	10	11	True
August 16, 2020	12	13	14	15	16	17	18	True
August 23, 2020	19	20	21	22	23	24	25	True
August 30, 2020				1	2	3	4	True
September 6, 20..	5	6	7	8	9	10	11	True
September 13, 2..	12	13	14	15	16	17	18	True
September 20, 2..	19	20	21	22	23	24	25	True
September 27, 2..				1	2	3	4	True
October 4, 2020	5	6	7	8	9	10	11	True
October 11, 2020	12	13	14	15	16	17	18	True
October 18, 2020	19	20	21	22	23	24	25	True
October 25, 2020				1	2	3	4	True
November 1, 2020	5	6	7	8	9	10	11	True
November 8, 2020	12	13	14	15	16	17	18	True
November 15, 20..	19	20	21	22	23	24	25	True
November 22, 20..				1	2	3	4	True
November 29, 20..	5	6	7	8	9	10	11	True
December 6, 2020	12	13	14	15	16	17	18	True
December 13, 20..	19	20	21	22	23	24	25	True
December 20, 20..				1	2	3	4	True
December 27, 20..	5	6	7	8	9	10	11	True
January 3, 2021	12	13	14	15	16	17	18	True
January 10, 2021	19	20	21	22	23	24	25	True
January 17, 2021				1	2	3	4	True
January 24, 2021	5	6	7	8	9	10	11	True
January 31, 2021	12	13	14	15	16	17	18	True
February 7, 2021	19	20	21	22	23	24	25	True

Date Day broken down by Date Weekday vs. Date Week. Color shows details about Available. The data is filtered on Listing Id, which keeps 5121.



Pt. 2: Data-driven Analysis - Demand

Summary:

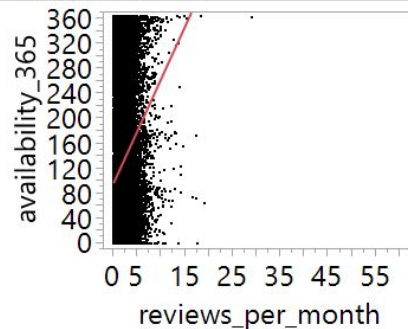
- Use # of reviews + availability trend

A quick check

Regression between
reviews_per_month and 365_availability

Response availability_365

Regression Plot



Summary of Fit

RSquare	0.042233
RSquare Adj	0.042209
Root Mean Square Error	129.8591
Mean of Response	118.3047
Observations (or Sum Wgts)	40749

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	30299136	30299136	1796.740
Error	40747	687132677	16863.393	Prob > F
C. Total	40748	717431813		<.0001*

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t
Intercept	96.173567	0.828513	116.08	<.0001*
reviews_per_month	16.772086	0.39568	42.39	<.0001*



Next Steps:

- Work on the algorithm to fit demand
- Predict demand and optimize pricing
- Conclusion and recommendations for optimal pricing strategies



Thank you!



Pt. 2: Data-driven Analysis - Seasonality