CRAFT BEER IN NYC

HOW TO BUILD A SUCCESSFUL INVENTORY

r&d BEVERAGE CONSULTING

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// Flatiron — NYC Data Science

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Data

THE PURPOSE OF THIS ANALYSIS

To develop a beer program that will be well-received in your target market

- What styles of beer should we highlight?

- What price point does the local area support?

- Are there prices, types, producers, formats, etc. that should be avoided?

HOW DID WE GET THERE?

BeerMenus

- Real-time information
    - Digital menus & website update simultaneously
    - Keg is kicked, removed from the menu immediately (sensors can automate)
- Linked
    - Which other bars are serving this beer?
    - How much do they charge?
- Google Maps integration
    - Exact location and address (typo free)

DATA LIMITATIONS

- Non-random sampling
    - what kind of bars are using this website
    - Country-wide data? (origin NYS vs. country)
- Seasonality
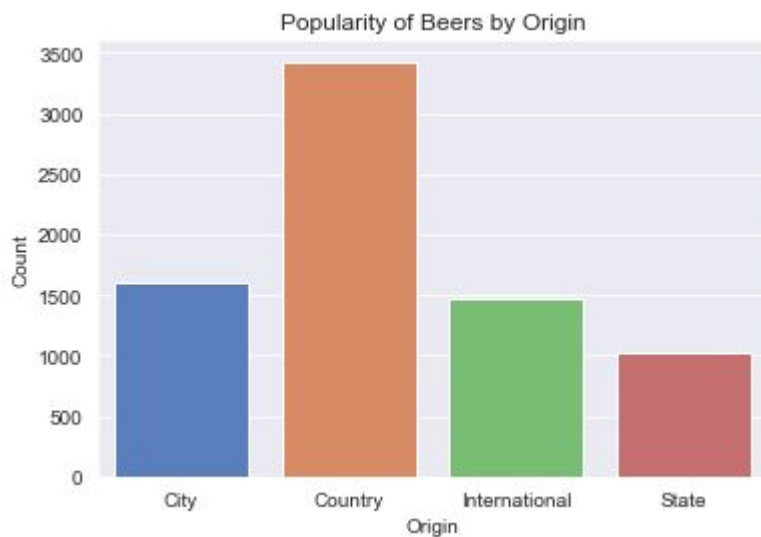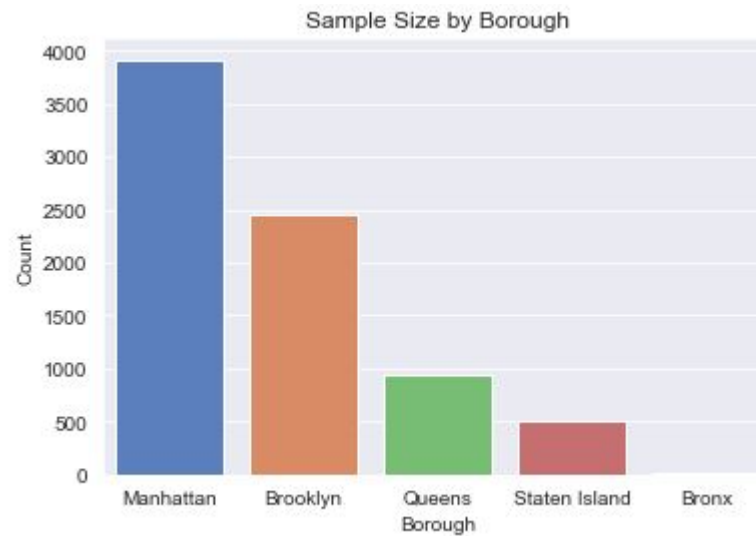   - data scraped on 11/13/19
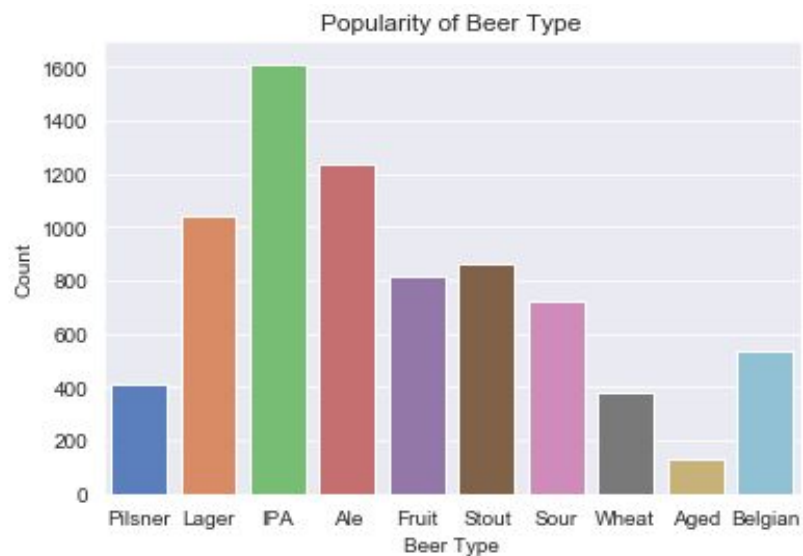
Data Collected

Bar:
- **Borough**

Beer:
- **ABV%**
- **Price**
- **Serving Size**
- **Type (IPA, Sour, etc)**
- **Origin**

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215 bars listing 7,837 beers

Popularity of Beer Type

Sample Size by Borough

Popularity of Beers by Origin

	alcohol_content	price
count	7460.000000	7500.000000
mean	0.874493	9.486372
std	0.394883	6.275985
min	0.000000	0.550000
25%	0.640000	7.000000
50%	0.800000	8.000000
75%	0.992000	10.000000
max	4.225000	85.000000

Descriptive Statistics

Analysis

QUESTION 1:

ARE CERTAIN BEER STYLES MORE POPULAR IN EACH BOROUGH OF NYC?

H_0: There is no difference in beer style popularity from borough to borough

H_A: There is a correlation between borough location and the style of beer preferred.

ARE CERTAIN BEER STYLES MORE POPULAR IN EACH BOROUGH OF NYC?

Beer Style

Borough	Aged	Ale	Belgian	Fruit	IPA	Lager	Pilsner	Sour	Stout	Wheat
Brooklyn	37	433	134	254	476	306	129	273	280	101
Manhattan	68	589	324	394	870	435	202	362	417	209
Queens	12	130	47	95	186	180	54	56	112	47
Staten Island	11	79	33	67	76	124	23	30	48	22

n	7725
df	27
χ^2	173.7
p	$2.3 \cdot 10^{-23}$

Counts in 4 rows, 10 columns

χ^2 Test of Independence for Beer Style versus Borough

We reject the null hypothesis of independence with $p \approx 2.3 \cdot 10^{-23}$

Z Scores for Beer Types in Each County
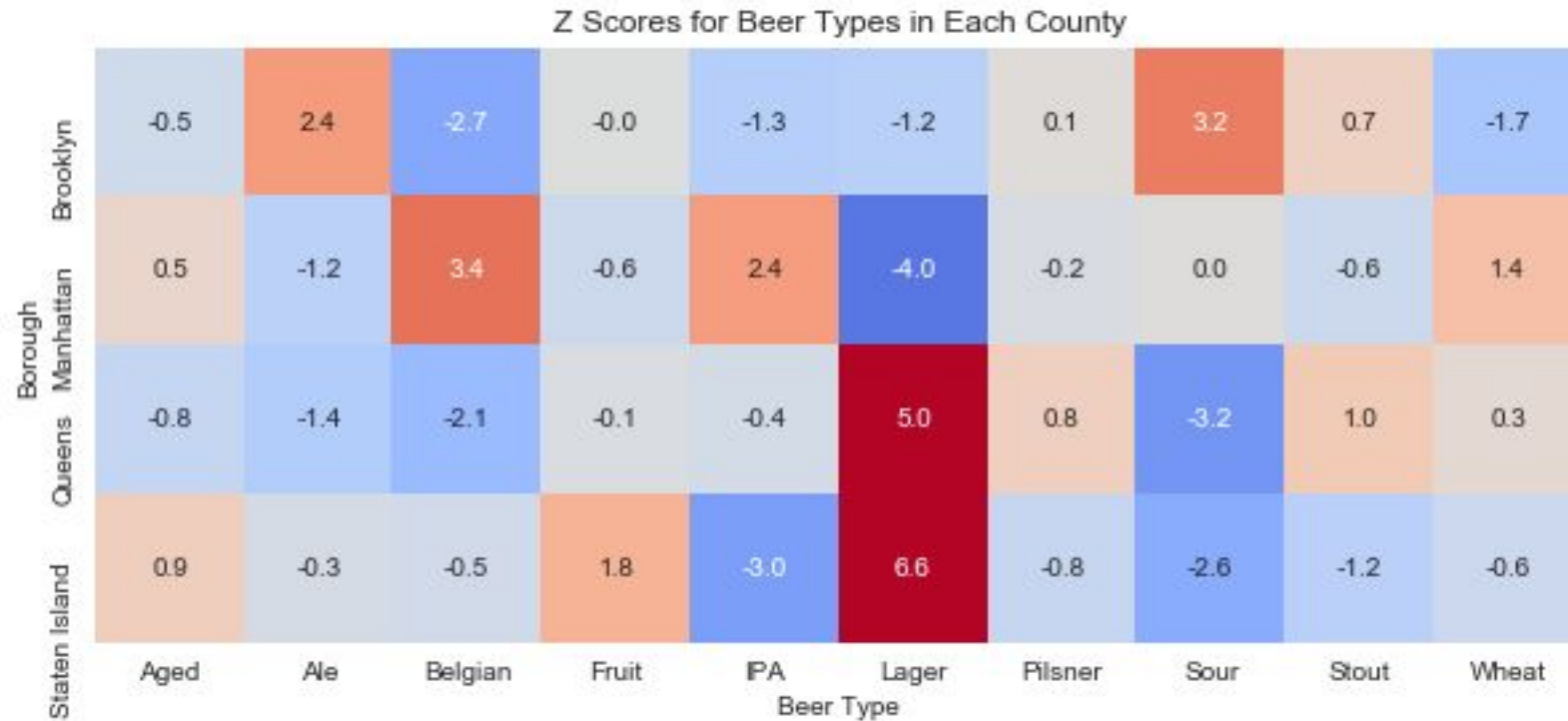
Post Estimation: Residuals, Effect Size, Power

Cramer's V (Bias Corrected)	0.011
β	10^{-37}

QUESTION 2:

H_0: There is no relationship between a beer's alcohol content and its sale price.

H_A: Higher alcohol content beers are more expensive.

OLS Estimation:

Price vs Absolute Alcohol Amount

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.4122	0.135	3.064	0.002	0.149	0.676
alcohol_content	10.4288	0.140	74.438	0.000	10.154	10.703

	sum_sq	df	F	PR(>F)
alcohol_content	125912.621957	1.0	5541.006519	0.0
Residual	167656.060611	7378.0	NaN	NaN

F : 5541.0
p : 0.0
R^2 : 0.4289
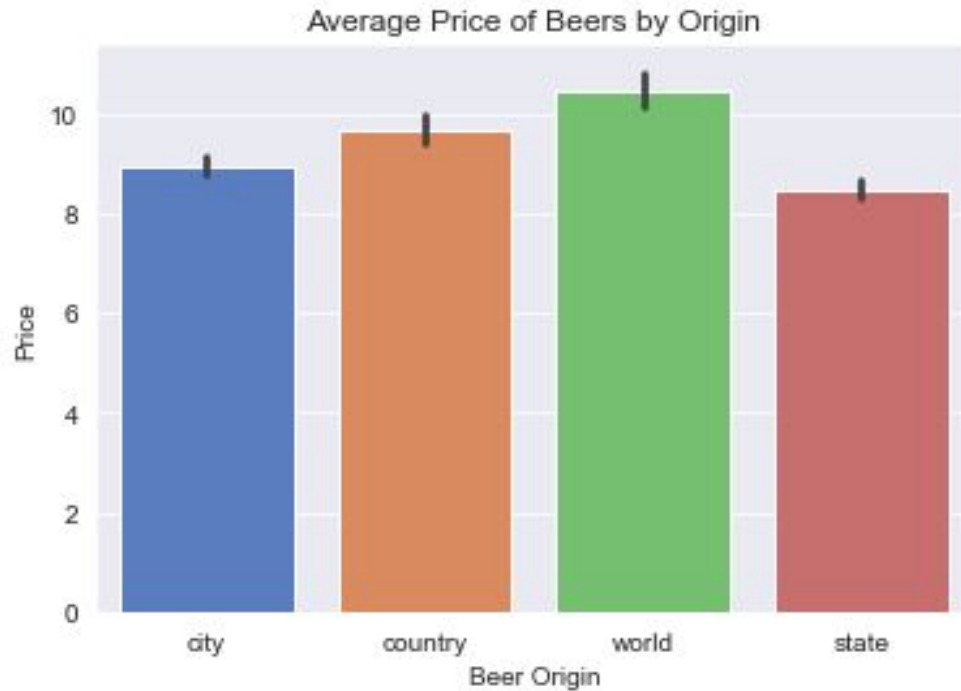
HYPOTHESIS TESTING₂

We reject the null hypothesis with p = 0 (to machine precision)

QUESTION 3:

ARE LOCAL BEERS CHEAPER?

H_0: A beer producer's proximity to the bar at which it is sold does not effect price.

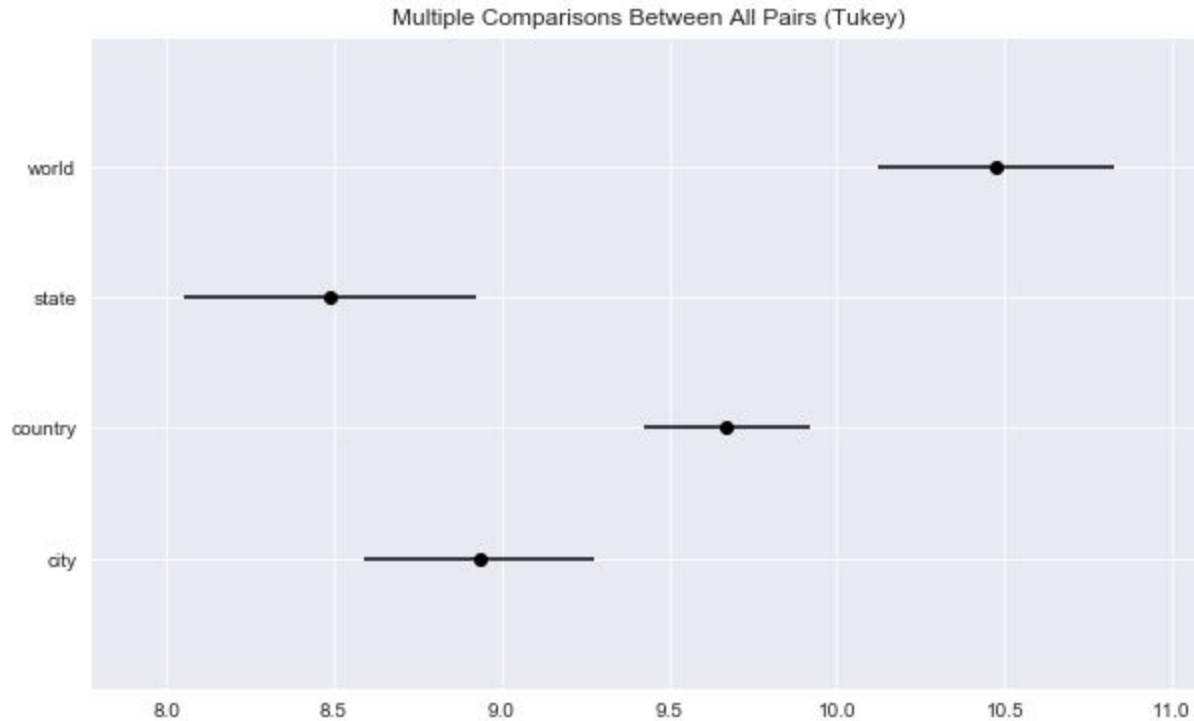H_A: Beer price is different based on the brewer's locality.

Average Price of Beers by Origin

One-Way ANOVA

F   : 18.0
p   : 1.2e-11
η^2 : 0.0074

	sum_sq	df	F	PR(>F)
origin_zone	2960.653596	3.0	18.012789	1.212483e-11
Residual	398199.129356	7268.0	NaN	NaN

HYPOTHESIS TESTING$_3$

We reject the null hypothesis with $p \approx 1.2 \cdot 10^{-11}$

Multiple Comparisons Between All Pairs (Tukey)

Multiple Comparison of Means - Tukey HSD, FWER=0.05

group1	group2	meandiff	p-adj	lower	upper	reject
city	country	0.7376	0.0069	0.1501	1.3251	True
city	state	-0.4446	0.4572	-1.2217	0.3326	False
city	world	1.54	0.001	0.8425	2.2375	True
country	state	-1.1822	0.001	-1.873	-0.4913	True
country	world	0.8024	0.0033	0.2026	1.4022	True
state	world	1.9846	0.001	1.1981	2.7711	True

Post Estimation: Tukey's HSD

Conclusion

BEER PROGRAM RECOMMENDATIONS

- Manhattan bars should follow trends
  - IPAs still wildly popular

- Brooklyn bars can be a little bit more adventurous
  - Sours
  - IPAs, not so much
  - Willing to pay more (high ABV stouts, low ABV sours)
  - ** **Craft beer bars**

- Queens/Staten Island are still behind beer trends
  - Lagers and Pilsners are still king
  - Fruit beers popularity (cider)
  - ** **Sports bars, family bars/restaurants**