



Analysis of Craft Beers

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Analyzing producers, alcoholic content, bitterness, and
other data of the industry

Introduction

- The craft beer Market in the U.S.

There is a surge in popularity of craft beers in the United States. According to the Brewers Association, the overall beer market size in the U.S. was USD 111.4 Billion in 2017, of which USD 26 Billion belong to "craft beers". Retail dollar sales of craft increased 8%, a much larger growth than the rest of the industry.

In volume terms, Overall U.S. beer volume sales were down 1% in 2017, whereas craft brewer sales continued to grow at a rate of 5% by volume, reaching 12.7% of the U.S. beer market by volume.

- Craft Breweries

The characteristics of American craft beer producers are: small, independent, and traditional.

There has been an explosive growth of craft breweries, the total number of breweries rose from 42 in 1978 to over 2,750 in 2012.

The primary objective of this work is to provide the Brewers Association with insights that can help to understand the craft beers industry, using sample data from producers in the United States.

Description of the Data

Beers Data Set:

2,410 different craft beers

Variables:

- Name: Name of the Beer
- Beer_ID: ID number for each beer
- ABV: Alcohol by volume
- ABU: International Bitterness Unit
- Brewery_id: ID number for each brewery
- Style: Style of Beer
- Ounces: Fluid ounces of each beer

Breweries data set:

558 craft beer producers

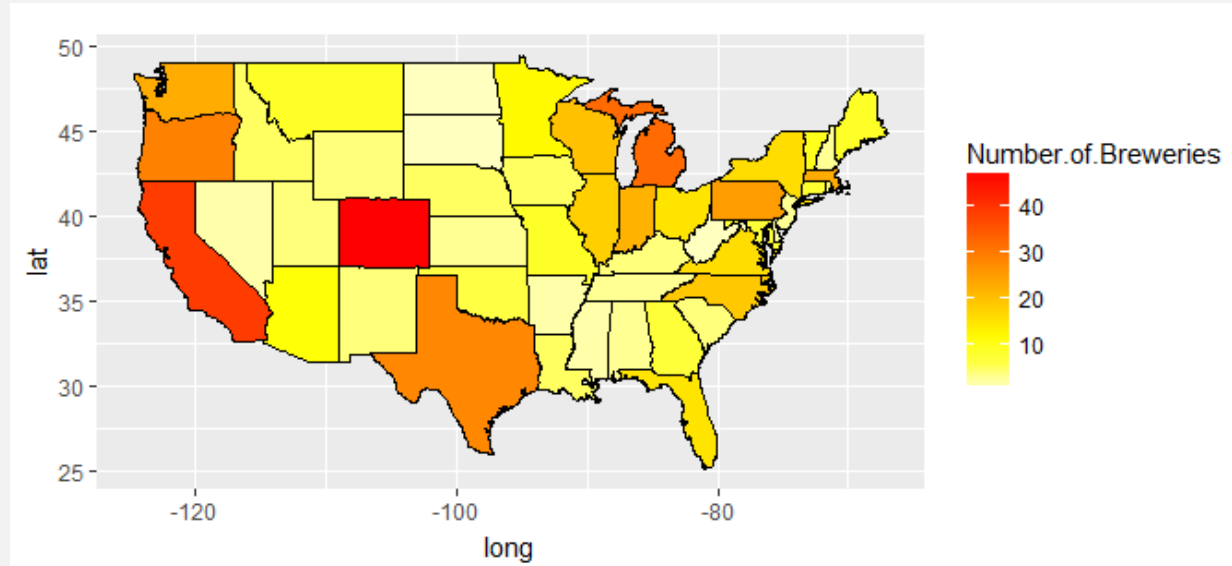
Variables:

- Brew_ID: ID number for each brewery
- Name: Brewery Name
- City: City each brewery is located
- State: State each brewery is located

We merged the data set by the ID of the brewery.

Which States have the largest number of breweries?

| State | Number of Breweries | State | Number of Breweries |
|-------|---------------------|-------|---------------------|
| CO | 47 | MD | 7 |
| CA | 39 | OK | 6 |
| MI | 32 | IA | 5 |
| OR | 29 | ID | 5 |
| TX | 28 | LA | 5 |
| PA | 25 | NE | 5 |
| MA | 23 | RI | 5 |
| WA | 23 | HI | 4 |
| IN | 22 | KY | 4 |
| WI | 20 | NM | 4 |
| NC | 19 | SC | 4 |
| IL | 18 | UT | 4 |
| NY | 16 | WY | 4 |
| VA | 16 | AL | 3 |
| FL | 15 | KS | 3 |
| OH | 15 | NH | 3 |
| MN | 12 | NJ | 3 |
| AZ | 11 | TN | 3 |
| VT | 10 | AR | 2 |
| ME | 9 | DE | 2 |
| MO | 9 | MS | 2 |
| MT | 9 | NV | 2 |
| CT | 8 | DC | 1 |
| AK | 7 | ND | 1 |
| GA | 7 | SD | 1 |
| | | WV | 1 |



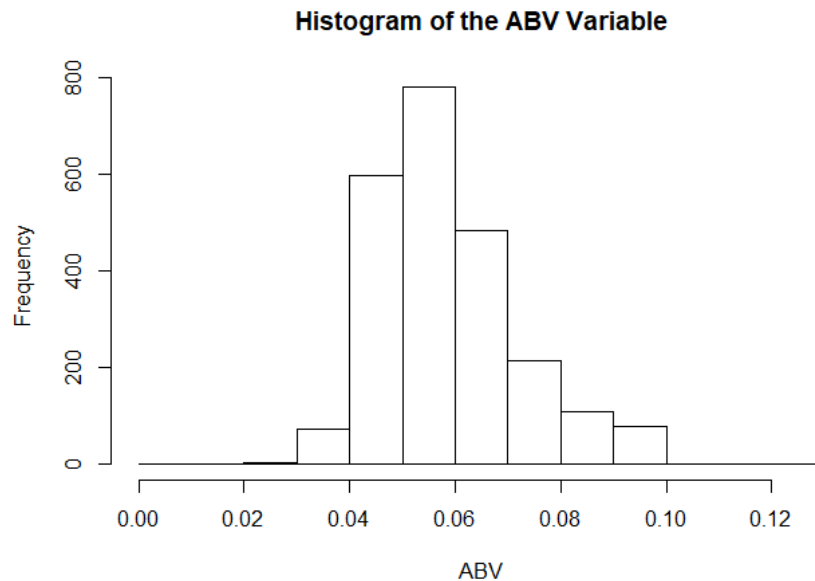
First and last observations of the merged data set

| First 6 Observations | | | | | | | | | |
|----------------------|------------------------------|---------|-------|-----|-------------------------------------|--------|-------------------------------|---------------|-------|
| Brewery_ID | Beer_Name | Beer_ID | ABV | IBU | Style | Ounces | Brewery_Name | City | State |
| 1 | 1Parapet ESB | 2687 | 0.056 | 47 | Extra Special / Strong Bitter (ESB) | 16 | NorthGate Brewing | Minneapolis | MN |
| 2 | 1Stronghold | 2688 | 0.06 | 25 | American Porter | 16 | NorthGate Brewing | Minneapolis | MN |
| 3 | 1Pumpion | 2689 | 0.06 | 38 | Pumpkin Ale | 16 | NorthGate Brewing | Minneapolis | MN |
| 4 | 1Wall's End | 2690 | 0.048 | 19 | English Brown Ale | 16 | NorthGate Brewing | Minneapolis | MN |
| 5 | 1Maggie's Leap | 2691 | 0.049 | 26 | Milk / Sweet Stout | 16 | NorthGate Brewing | Minneapolis | MN |
| 6 | 1Get Together | 2692 | 0.045 | 50 | American IPA | 16 | NorthGate Brewing | Minneapolis | MN |
| Last 6 Observations | | | | | | | | | |
| Brewery_ID | Beer_Name | Beer_ID | ABV | IBU | Style | Ounces | Brewery_Name | City | State |
| 2405 | 556Pilsner Ukiah | 98 | 0.055 | NA | German Pilsener | 12 | Ukiah Brewing Company | Ukiah | CA |
| 2406 | 557Porkslap Pale Ale | 49 | 0.043 | NA | American Pale Ale (APA) | 12 | Butternuts Beer and Ale | Garrattsville | NY |
| 2407 | 557Moo Thunder Stout | 50 | 0.049 | NA | Milk / Sweet Stout | 12 | Butternuts Beer and Ale | Garrattsville | NY |
| 2408 | 557Snapperhead IPA | 51 | 0.068 | NA | American IPA | 12 | Butternuts Beer and Ale | Garrattsville | NY |
| 2409 | 557Heinnieweisse Weissebier | 52 | 0.049 | NA | Hefeweizen | 12 | Butternuts Beer and Ale | Garrattsville | NY |
| 2410 | 558Urban Wilderness Pale Ale | 30 | 0.049 | NA | English Pale Ale | 12 | Sleeping Lady Brewing Company | Anchorage | AK |

Number of NA's in each column

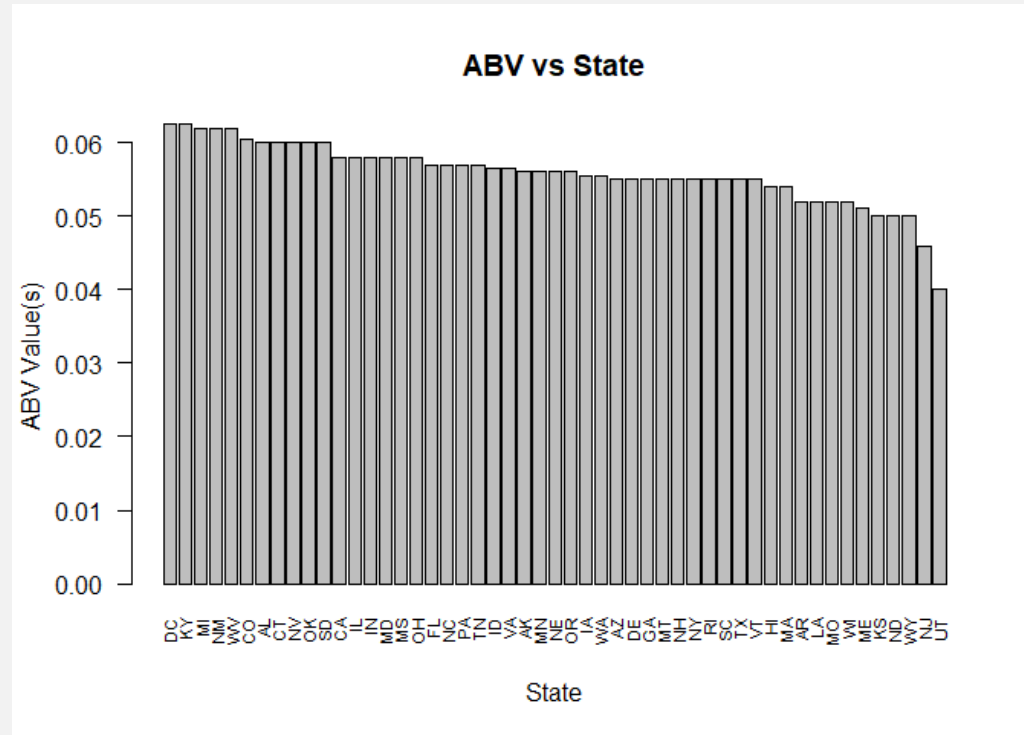
| Column | Number of NA's |
|--------------|----------------|
| Brewery_ID | 0 |
| Beer_Name | 0 |
| Beer_ID | 0 |
| ABV | 62 |
| IBU | 1,005 |
| Style | 0 |
| Ounces | 0 |
| Brewery_Name | 0 |
| City | 0 |
| State | 0 |

Summary Statistics of the ABV variable

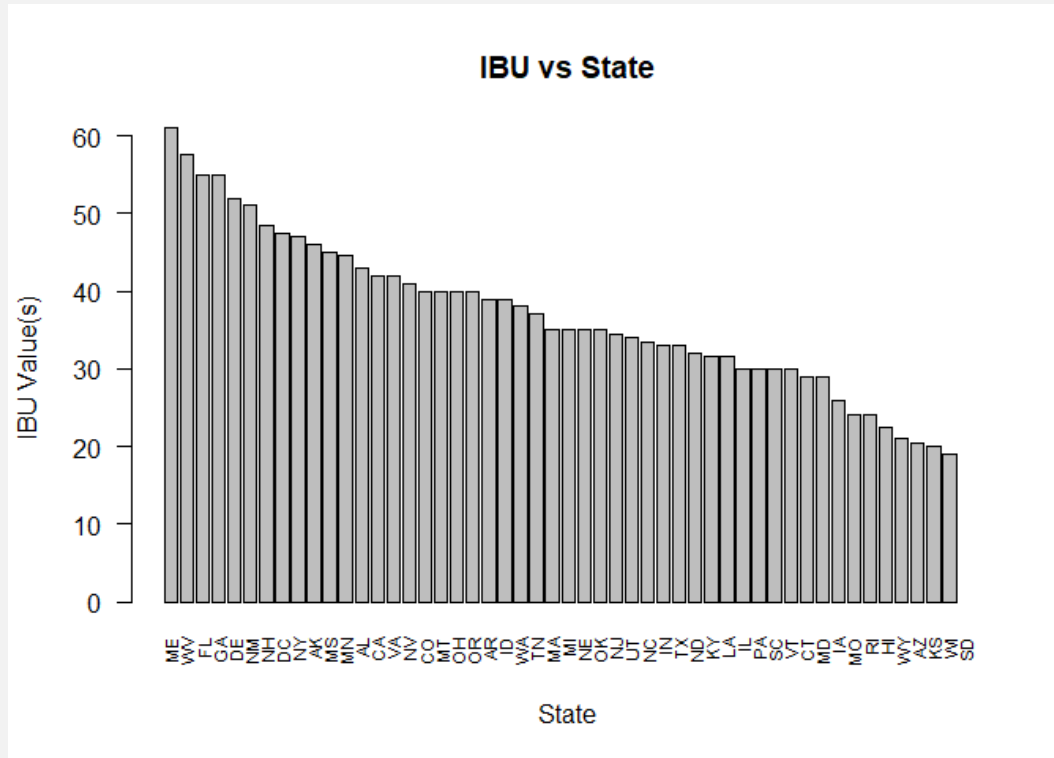


| | | | | | | |
|---------|---------|---------|---------|---------|---------|------|
| Min. | 1st Qu. | Median | Mean | 3rd Qu. | Max. | NA's |
| 0.00100 | 0.05000 | 0.05600 | 0.05977 | 0.06700 | 0.12800 | 62 |

Median alcohol content for beers produced in each State



Median Bitterness Units for beers produced in each State



Maximum alcoholic content and maximum bitterness

The State that has maximum alcoholic beer is **Colorado**, and it's the "Lee Hill Series Vol. 5", a Quadrupel Ale with 0.128 ABV

Belgian Style Quadrupel Ale available Aug. 13

Boulder, Colo. (Aug. 7, 2015) – **Upslope Brewing Company** announces Volume 5 of its quarterly Lee Hill Series– Belgian Style Quadrupel Ale.



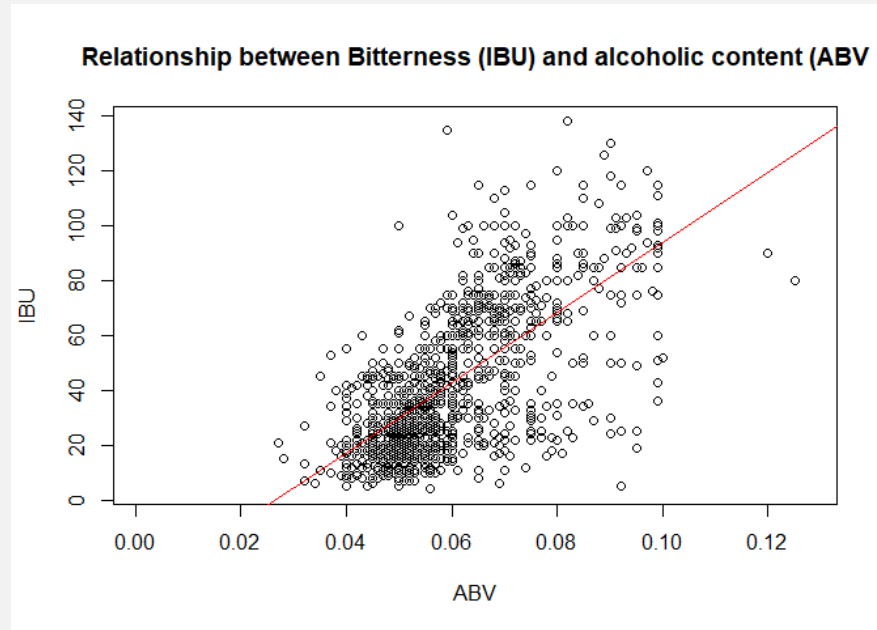
Inspired by traditional monastic brewing, Upslope's brewers set out to create a hefty and intricate Quadrupel to celebrate the craftsmanship of Belgian brewing. Brewed with a select strain of Belgian yeast and traditional Belgian candi syrup, the 12.8% abv beer matured over six months to mellow and soften its character. With layered notes of flambéd bananas foster, black currants and hints of clove, this fine ale will continue to develop and transform over time.

"This fifth installment falls near the first anniversary of releasing our Lee Hill Series. We launched the Series with a Barrel Aged Brown Ale last summer as a tribute to our original Lee Hill tap room in North Boulder," said Upslope Head Brewer Sam Scruby. "The Lee Hill brewing facility is where we revel in and explore small batch experimentation

The State that has most bitter (IBU) beer is **Oregon**, and it's the "Bitter Bitch", an Imperial IPA with 138 IBU, produced by Astoria Brewing Co.

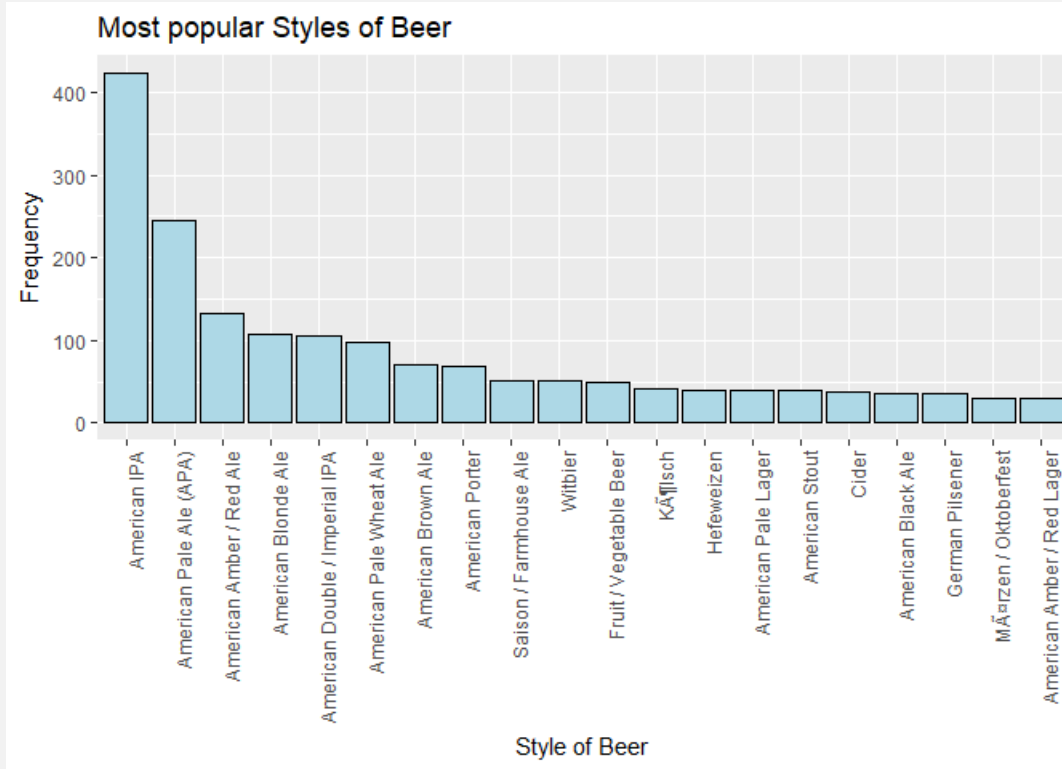


Relationship between Bitterness and alcoholic content

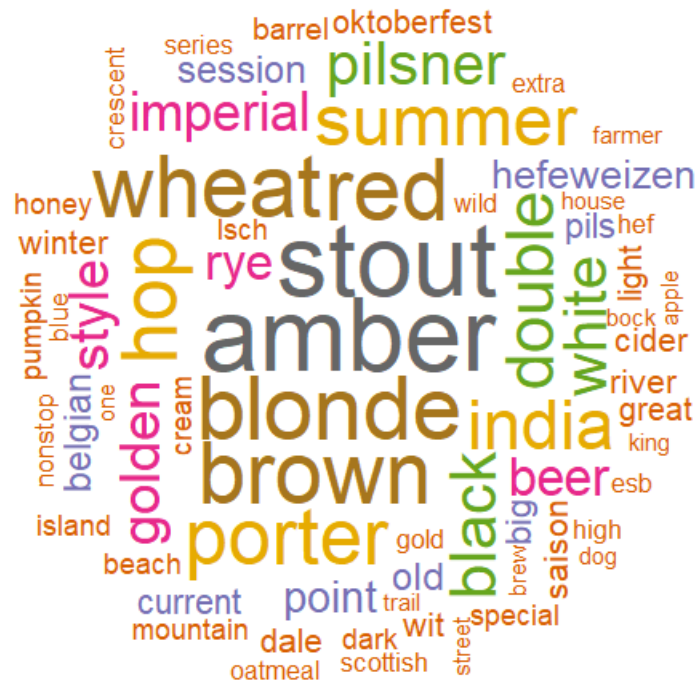


There is a noticeable positive relationship between bitterness and alcoholic content. The correlation coefficient between the variables is 0.67

Additional analysis: Most popular beer styles



Additional analysis: Common words in beer names



Presented to the Brewers Association | Boulder, CO

Conclusions

Based on the analysis, California and Colorado are the top two States. When we order all the data by Brewery and Beer IDs, . The first six observations include beer names: Parapet ESB, Stronghold, Pumpkin, Wall's End, Maggie's Leap and Get Together. The last 6 observations include beer names: Pilsner Ukiah, Porkslap Pale Ale, Moo Thunder Stout, Snapperhead IPA, Heinnieweisse Weissebier and Urban Wilderness Pale Ale; Out of 2410 total rows of the data, there are two columns having NA's: ABV has 62 and IBU has 1005.

After computing the median alcohol content and international bitterness unit for each state. DC has the highest median ABV, MS has the highest median IBV; UT has the lowest median ABV, SD has the lowest median IBV. The State of Colorado has the maximum alcoholic (ABV) beer and Oregon has the most bitter (IBU) beer. After running the summary statistics to ABV variable, the min ABV is 0.001 and the max ABV is 0.128. The Mean is 0.05977 and the median is 0.056. It has a little bit skewness here. Based on the scatter plot, we can see that there is a noticeable positive, linear relationship between the bitterness of the beer and the alcoholic content.