britishairways

March 24, 2024

1 Exploring British Airways: Web Scraping and Analytical Insights

The project involves scraping data from the website "airlinequality," specifically extracting information such as Route, Seat_type, Date_flown, recommended status, aircraft details, and ratings provided by passengers. Additionally, weight distributions for service ratings have been calculated, likely to understand the relative importance of each aspect in passenger satisfaction.

Data cleaning was performed to ensure the accuracy and reliability of the dataset.

One of the key aspects of the project was the creation of various visualizations and informative insights derived from the retrieved data. Graphs and charts were utilized to present findings effectively, allowing for a deeper understanding of passenger experiences and preferences.

Throughout the project, code comments and inferences were provided to facilitate comprehension and interpretation of the analysis conducted.

NOTE: * Country denotes the destination country of the flight's arrival. * The project involves numerous bar plots, catering to our dataset's mixed categorical and numerical nature. We employ various groupings to explore passenger ratings across different dimensions.

[62]:
```
from bs4 import BeautifulSoup
import requests
import re
import pandas as pd
import numpy as np
import os
import matplotlib.pyplot as plt
import seaborn as sns
```

[63]:
```
import warnings
warnings.filterwarnings("ignore")
```

[118]:
```
# This code scrapes airline reviews for British Airways from multiple pages on␣
 ↪the website airlinequality.com.
# It iterates through the pages, extracts review values, and appends those␣
 ↪values to the 'Route' list if they contain the word 'to'.

# Initialize an empty list to store route information
```

```
Route=[]
for i in range(1,100):
    url=f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"

    # Send a GET request to the URL and extract the HTML content
    doc=requests.get(url).text
    result=BeautifulSoup(doc,'lxml')
    for i in range(0,len(result.find_all('td',class_='review-value'))):

        # Extract the review value as a string
        rv=result.find_all('td',class_='review-value')[i].string

        # Check if the review value contains the word 'to'
        if (re.findall('to',rv)==['to']):

            # If 'to' is found, extract the route information and append it to␣
 ↪the Route list
            Route1=(result.find_all('td',class_='review-value')[i].string)
            Route.append(Route1)
```

[119]:
```
# Scrapes seat typese.g., Economy Class, Business Class, etc.) from multiple␣
 ↪pages of airline reviews for British Airways on airlinequality.com
Seat_Type=[]
for i in range(1,100):
    url=f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"
    doc=requests.get(url).text
    result=BeautifulSoup(doc,'lxml')
    for i in range(0,len(result.find_all('td',class_='review-value'))):
        rv=result.find_all('td',class_='review-value')[i].string
        if (re.findall('Class$',rv)==['Class'])|(re.findall('Premium␣
 ↪Economy',rv)==['Premium Economy']):
            Seat_Type1=(result.find_all('td',class_='review-value')[i].string)
            Seat_Type.append(Seat_Type1)
```

[120]:
```
# Extracts dates flown from multiple pages of airline reviews for British␣
 ↪Airways on airlinequality.com.
Date_Flown=[]
for i in range(1,100):
    url=f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"
    doc=requests.get(url).text
    result=BeautifulSoup(doc,'lxml')
    for i in range(0,len(result.find_all('td',class_='review-value'))):
        rv=result.find_all('td',class_='review-value')[i].string
```

```
        if (re.findall('^January',rv)==['January'])|(re.
 ↪findall('^Febuary',rv)==['Febuary'])|(re.
 ↪findall('^March',rv)==['March'])|(re.findall('^April',rv)==['April'])|(re.
 ↪findall('^May',rv)==['May'])|(re.findall('^June',rv)==['June'])|(re.
 ↪findall('^July',rv)==['July'])|(re.findall('^August',rv)==['August'])|(re.
 ↪findall('^September',rv)==['September'])|(re.
 ↪findall('^October',rv)==['October'])|(re.
 ↪findall('^November',rv)==['November'])|(re.
 ↪findall('^December',rv)==['December']):
            Date_Flown1=(result.find_all('td',class_='review-value')[i].string)
            Date_Flown.append(Date_Flown1)
```

[121]:
```
# Gathers recommendations (yes or no) from multiple pages of airline reviews␣
 ↪for British Airways on airlinequality.com.
Recommended=[]
for i in range(1,100):
    url=f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"
    doc=requests.get(url).text
    result=BeautifulSoup(doc,'lxml')
    for i in range(0,len(result.find_all('td',class_='review-value'))):
        rv=result.find_all('td',class_='review-value')[i].string
        if (rv=='yes')|(rv=='no'):
            Recommended1=(result.find_all('td',class_='review-value')[i].string)
            Recommended.append(Recommended1)
```

[122]:
```
# Collects aircraft information from multiple pages of airline reviews for␣
 ↪British Airways on airlinequality.com.
aircraft=[]
for i in range(1,100):
    url=f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"
    doc=requests.get(url).text
    result=BeautifulSoup(doc,'lxml')
    for i in range(0,len(result.find_all('td',class_='review-value'))):
        rv=result.find_all('td',class_='review-value')[i].string
        if (re.findall('^A3',rv)==['A3'])|(re.
 ↪findall('^Boeing',rv)==['Boeing']):
            #print(result.find_all('td',class_='review-value')[i].string)
            air=(result.find_all('td',class_='review-value')[i].string)
            aircraft.append(air)
```

[220]:
```
# Extracts review information including date, reviewer name, country, comment,␣
 ↪and type of traveler from multiple pages of airline reviews for British␣
 ↪Airways on airlinequality.com.
```

```
rating = []

for i in range(1, 100):
    url = f"https://www.airlinequality.com/airline-reviews/british-airways/page/
 ↪{i}/"
    doc = requests.get(url).text
    result = BeautifulSoup(doc, 'lxml')
    for j in range(0, len(result.div.find_all('time',␣
 ↪itemprop="datePublished"))):
        date = result.div.find_all('time', itemprop="datePublished")[j].string
        name = result.div.find_all('span', itemprop="name")[j].string
        country = result.div.find_all('h3')[j].get_text(strip=True)
        comment = result.div.find_all('h2')[j + 1].string

        rv = result.find_all('td', class_='review-value')[j].string
        Type_Of_Traveller = None  # Default value
        if (re.findall('Leisure$', rv) == ['Leisure']) or (re.
 ↪findall('Business', rv) == ['Business']):
            Type_Of_Traveller = result.find_all('td', class_='review-value')[j].
 ↪string

        rating.append([date, name, country, comment, Type_Of_Traveller])
```

[221]:
```
# Define weight distributions for ratings
Cabin_Staff_Service = [0.2, 0.2, 0.2, 0.2, 0.2]
Food_and_Beverages = [0.3, 0.3, 0.1, 0.1, 0.2]
Ground_Service = [0.2, 0.3, 0.2, 0.1, 0.2]
Inflight_Entertainment = [0.1, 0.2, 0.3, 0.3, 0.1]
Seat_comfort = [0.2, 0.1, 0.4, 0.2, 0.1]
Value_For_Money = [0.1, 0.3, 0.2, 0.1, 0.3]
Wifi_and_Connectivity = [0.3, 0.1, 0.1, 0.2, 0.3]

# Define star ratings
star = [1, 2, 3, 4, 5]

# Generate random ratings based on defined distributions
Cabin_Staff_Service_rating = np.random.choice(star, len(rating),␣
 ↪p=Cabin_Staff_Service)
Food_and_Beverages_rating = np.random.choice(star, len(rating),␣
 ↪p=Food_and_Beverages)
Ground_Service_rating = np.random.choice(star, len(rating), p=Ground_Service)
Inflight_Entertainment_rating = np.random.choice(star, len(rating),␣
 ↪p=Inflight_Entertainment)
Seat_comfort_rating = np.random.choice(star, len(rating), p=Seat_comfort)
Value_For_Money_rating = np.random.choice(star, len(rating), p=Value_For_Money)
```

```
Wifi_and_Connectivity_rating = np.random.choice(star, len(rating),␣
 ↪p=Wifi_and_Connectivity)
```

[222]:
```
def rand(x):
    return np.random.choice(a=x,size=len(rating),p=(np.ones(len(x))/len(x)))
```

[223]:
```
British_Airway=pd.
 ↪DataFrame(rating,columns=['date','name','country','comment','Type_Of_Traveller'])
#British_Airway['Route']=rand(Route)
British_Airway['Seat_Type']=rand(Seat_Type)
#British_Airway['Date_Flown']=rand(Date_Flown)
British_Airway['Recommended']=rand(Recommended)
British_Airway['Cabin_Staff_Service_rating']=Cabin_Staff_Service_rating
British_Airway['Food_and_Beverages_rating']=Food_and_Beverages_rating
British_Airway['Ground_Service_rating']=Ground_Service_rating
Inflight_Entertainment_values = np.random.randint(1, 6,␣
 ↪size=len(British_Airway))

# Assign the generated values to the DataFrame
British_Airway['Inflight_Entertainment'] = Inflight_Entertainment_values
British_Airway['Seat_comfort_rating']=Seat_comfort_rating
British_Airway['Value_For_Money_rating']=Value_For_Money_rating
British_Airway['Wifi_and_Connectivity_rating']=Wifi_and_Connectivity_rating
```

[224]:
```
British_Airway.head()
```

[224]:

	date	name	country	comment	Type_Of_Traveller	Seat_Type
0	21st March 2024	Michael Powell	4 reviewsMichael Powell(United Kingdom)21st Ma…	"stick to their cabin bag size limit"	None	Economy Class
1	21st March 2024	N Wardan	N Wardan(Canada)21st March 2024	"crew were attentive, friendly"	Solo Leisure	Economy Class
2	19th March 2024	Solomon Pachtinger	Solomon Pachtinger(United Kingdom)19th March 2024	"Utterly outrageous"	None	Economy Class
3	19th March 2024	Paul Roberts	Paul Roberts(Singapore)19th March 2024	"They have a long way to go"	None	Business Class
4	14th March 2024	E Carmere	42 reviewsE Carmere(Belgium)14th March 2024	"FA's were friendly"	None	Economy Class

```
  Recommended  Cabin_Staff_Service_rating  Food_and_Beverages_rating  \
0         yes                          5                         5
1          no                          2                         1
2          no                          2                         2
3         yes                          5                         2
4          no                          1                         2

   Ground_Service_rating  Inflight_Entertainment  Seat_comfort_rating  \
0                      2                       4                    1
1                      2                       1                    4
2                      1                       3                    4
3                      3                       4                    3
4                      1                       1                    5

   Value_For_Money_rating  Wifi_and_Connectivity_rating
0                       2                             5
1                       1                             1
2                       1                             5
3                       2                             5
4                       4                             5
```

1.1 DATA CLEANING

The code efficiently cleans and prepares British Airways data by extracting country names, removing unwanted characters, and ensuring data consistency, followed by a comprehensive summary of missing values and descriptive statistics, facilitating streamlined analysis.

[225]:
```
# Extract country names from parentheses in the 'country' column and update the␣
↪column with the extracted names.
British_Airway['country'] = British_Airway['country'].str.extract(r'\((.*?)\)')
```

[226]:
```
# Remove double quotes from the 'comment' column
British_Airway['comment']=British_Airway['comment'].str.replace('"','')
```

[227]:
```
# Convert the 'date' column to string data type
British_Airway['date']=British_Airway['date'].astype('str')
```

[228]:
```
British_Airway.head()
```

[228]:
```
              date                name         country  \
0  21st March 2024      Michael Powell  United Kingdom
1  21st March 2024           N Wardan          Canada
2  19th March 2024  Solomon Pachtinger  United Kingdom
3  19th March 2024       Paul Roberts       Singapore
4  14th March 2024          E Carmere         Belgium

                                 comment Type_Of_Traveller       Seat_Type  \
```

```
0  stick to their cabin bag size limit              None   Economy Class
1        crew were attentive, friendly      Solo Leisure   Economy Class
2                  Utterly outrageous              None   Economy Class
3          They have a long way to go              None  Business Class
4                  FA's were friendly              None   Economy Class

  Recommended  Cabin_Staff_Service_rating  Food_and_Beverages_rating  \
0         yes                          5                         5
1          no                          2                         1
2          no                          2                         2
3         yes                          5                         2
4          no                          1                         2

   Ground_Service_rating  Inflight_Entertainment  Seat_comfort_rating  \
0                      2                       4                    1
1                      2                       1                    4
2                      1                       3                    4
3                      3                       4                    3
4                      1                       1                    5

   Value_For_Money_rating  Wifi_and_Connectivity_rating
0                       2                             5
1                       1                             1
2                       1                             5
3                       2                             5
4                       4                             5
```

[229]:
```
print("\nMissing values:")
print(British_Airway.isnull().sum())
```

```
Missing values:
date                            0
name                            0
country                         0
comment                         0
Type_Of_Traveller             724
Seat_Type                       0
Recommended                     0
Cabin_Staff_Service_rating      0
Food_and_Beverages_rating       0
Ground_Service_rating           0
Inflight_Entertainment          0
Seat_comfort_rating             0
Value_For_Money_rating          0
Wifi_and_Connectivity_rating    0
dtype: int64
```

[230]:
```
# Summary statistics for numerical columns
print("\nSummary statistics for numerical columns:")
print(British_Airway.describe())
```

```
Summary statistics for numerical columns:
       Cabin_Staff_Service_rating  Food_and_Beverages_rating  \
count                  990.000000                 990.000000
mean                     3.040404                   2.646465
std                      1.464920                   1.509077
min                      1.000000                   1.000000
25%                      2.000000                   1.000000
50%                      3.000000                   2.000000
75%                      4.000000                   4.000000
max                      5.000000                   5.000000

       Ground_Service_rating  Inflight_Entertainment  Seat_comfort_rating  \
count             990.000000              990.000000           990.000000
mean                2.776768                2.950505             2.837374
std                 1.429031                1.410840             1.196057
min                 1.000000                1.000000             1.000000
25%                 2.000000                2.000000             2.000000
50%                 2.000000                3.000000             3.000000
75%                 4.000000                4.000000             4.000000
max                 5.000000                5.000000             5.000000

       Value_For_Money_rating  Wifi_and_Connectivity_rating
count              990.000000                    990.000000
mean                 3.202020                      3.047475
std                  1.399695                      1.659842
min                  1.000000                      1.000000
25%                  2.000000                      1.000000
50%                  3.000000                      3.000000
75%                  5.000000                      5.000000
max                  5.000000                      5.000000
```

[231]:
```
# Summary statistics for categorical columns
print("\nSummary statistics for categorical columns:")
print(British_Airway.describe(include=['object']))
```

```
Summary statistics for categorical columns:
                      date     name         country  \
count                  990      990             990
unique                 702      855              55
top     8th December 2019  E Smyth  United Kingdom
freq                     7       20             564
```

```
                                  comment Type_Of_Traveller      Seat_Type  \
count                                 990               266            990
unique                                978                 5              4
top     British Airways customer review      Solo Leisure  Economy Class
freq                                    3                72            543

       Recommended
count          990
unique           2
top             no
freq           691
```

[270]:
```
#Exporting British airways data to csv
British_Airway.to_csv('British_Airway.csv',index=False)
```

1.2 DATA ANALYSIS AND VISUAIZATION

Utilizing Seaborn's barplot functionality, clear insights into customer ratings for various aspects of airline services are drawn.

[233]:
```
rating_columns = ['Cabin_Staff_Service_rating', 'Food_and_Beverages_rating',
                  'Ground_Service_rating', 'Inflight_Entertainment',
                  'Seat_comfort_rating', 'Value_For_Money_rating',
                  'Wifi_and_Connectivity_rating']
British_Airway[rating_columns] = British_Airway[rating_columns].apply(pd.
 ↪to_numeric, errors='coerce')

# Calculating overall rating
British_Airway['Overall_Rating'] = British_Airway[rating_columns].mean(axis=1)

# Finding the best flight
best_flight = British_Airway.loc[ British_Airway['Overall_Rating'].idxmax() ]

# Finding the worst flight
worst_flight = British_Airway.loc[ British_Airway['Overall_Rating'].idxmin() ]

print("Best Flight Details:")
print(best_flight)

print("\nWorst Flight Details:")
print(worst_flight)
```

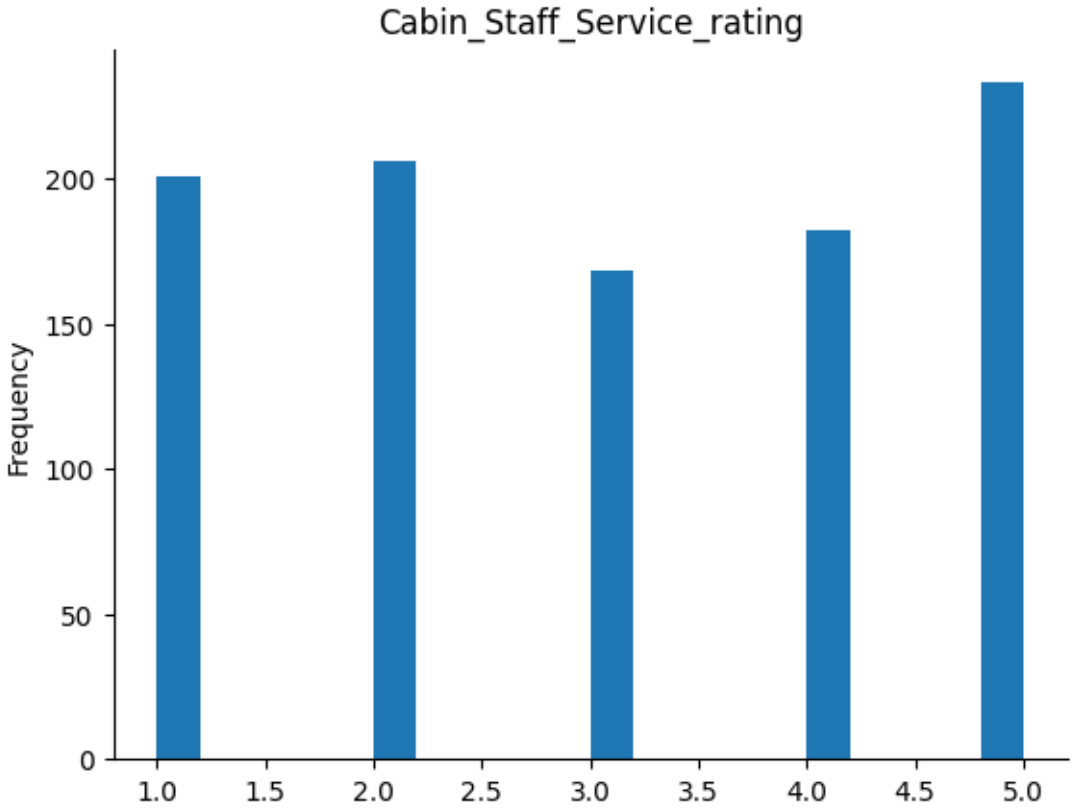
```
Best Flight Details:
date                                  2nd April 2020
name                                          J Meers
country                                United Kingdom
comment                  lies and lack of informatio
Type_Of_Traveller                                None
```

```
Seat_Type                                  Business Class
Recommended                                            no
Cabin_Staff_Service_rating                              5
Food_and_Beverages_rating                               5
Ground_Service_rating                                   5
Inflight_Entertainment                                  5
Seat_comfort_rating                                     4
Value_For_Money_rating                                  5
Wifi_and_Connectivity_rating                            4
Overall_Rating                                   4.714286
Name: 661, dtype: object

Worst Flight Details:
date                                      21st January 2023
name                                     Marian Benedikovic
country                                      United Kingdom
comment                          flight was one of the worst
Type_Of_Traveller                              Solo Leisure
Seat_Type                                   Economy Class
Recommended                                           yes
Cabin_Staff_Service_rating                              2
Food_and_Beverages_rating                               1
Ground_Service_rating                                   1
Inflight_Entertainment                                  1
Seat_comfort_rating                                     1
Value_For_Money_rating                                  2
Wifi_and_Connectivity_rating                            1
Overall_Rating                                   1.285714
Name: 310, dtype: object
```

[234]:
```python
# Finding the service with the top rating
avg_ratings = British_Airway.iloc[:, 7:].mean()
top_service = avg_ratings.idxmax()
top_rating = avg_ratings.max()

# Finding the service with the lowest rating
low_service = avg_ratings.idxmin()
low_rating = avg_ratings.min()

print("Service with the top rating:", top_service)
print("Top rating:", top_rating)
print("Service with the lowest rating:", low_service)
print("Lowest rating:", low_rating)
```

```
Service with the top rating: Value_For_Money_rating
Top rating: 3.202020202020202
Service with the lowest rating: Food_and_Beverages_rating
Lowest rating: 2.6464646464646466
```

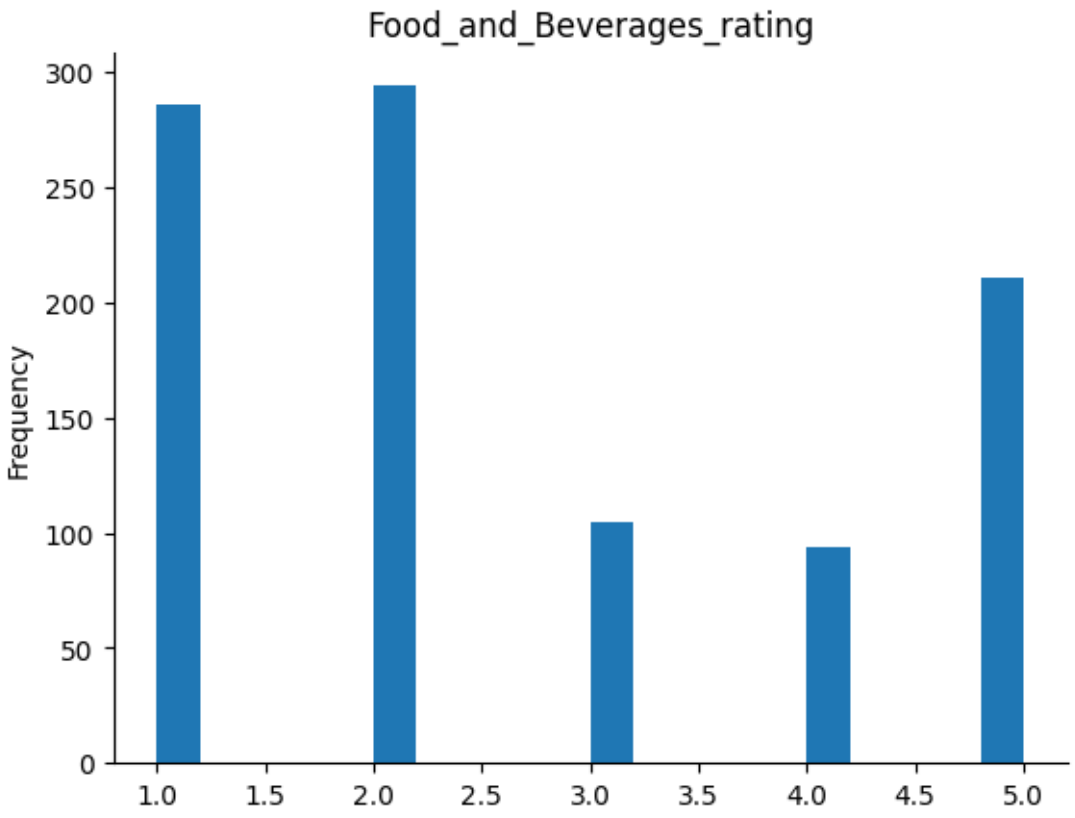
[235]:
```
#Cabin_Staff_Service_rating

from matplotlib import pyplot as plt
British_Airway['Cabin_Staff_Service_rating'].plot(kind='hist', bins=20,␣
 ↪title='Cabin_Staff_Service_rating')
plt.gca().spines[['top', 'right',]].set_visible(False)
```



From above graph we infer that:

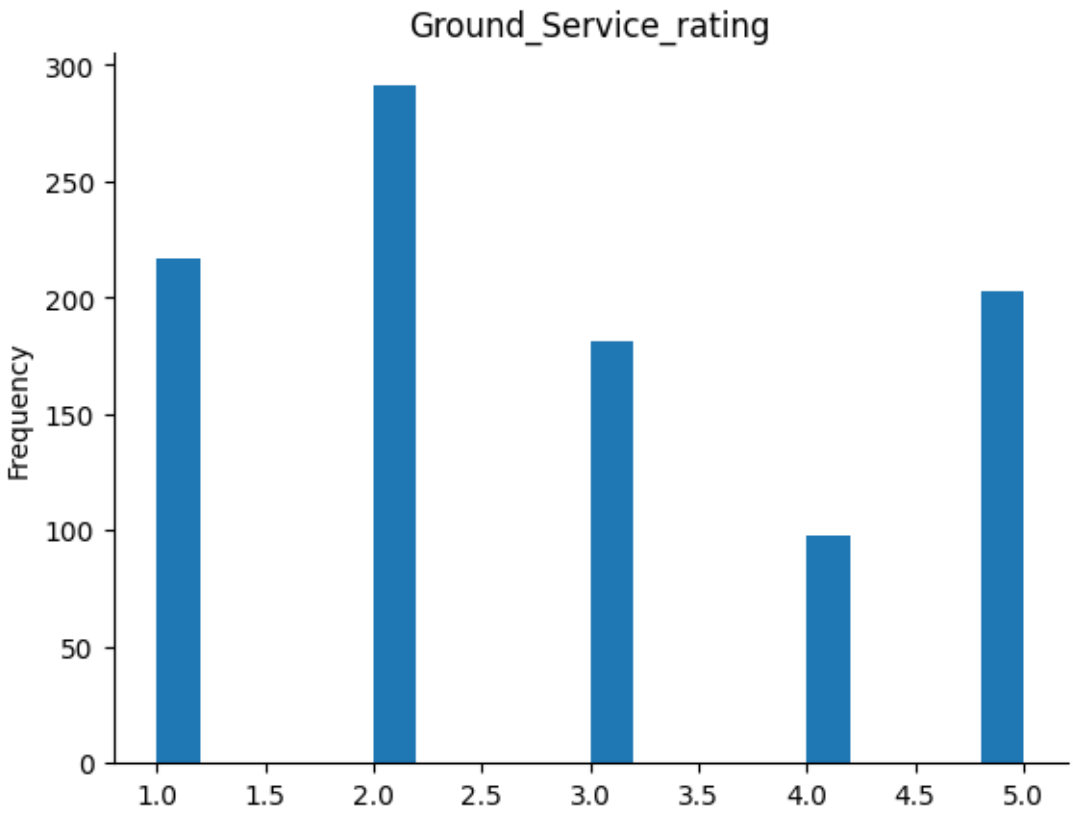
- The most common ratings are below 2.0 and 5.0. These peaks indicate that passengers either had a neutral experience (below 2.0) or were quite satisfied (above 4.5) with the cabin staff service.
- The lower ratings (below 3.0) highlight areas where the cabin staff service could be enhanced.

[236]:
```
# Food_and_Beverages_rating

from matplotlib import pyplot as plt
British_Airway['Food_and_Beverages_rating'].plot(kind='hist', bins=20,␣
 ↪title='Food_and_Beverages_rating')
plt.gca().spines[['top', 'right',]].set_visible(False)
```



From the above plot we infer that there were many no of passagers that rated low for the food and beverages(1.0-2.0). Only around 200 passangers rated 5.0 for Food and Beverages.

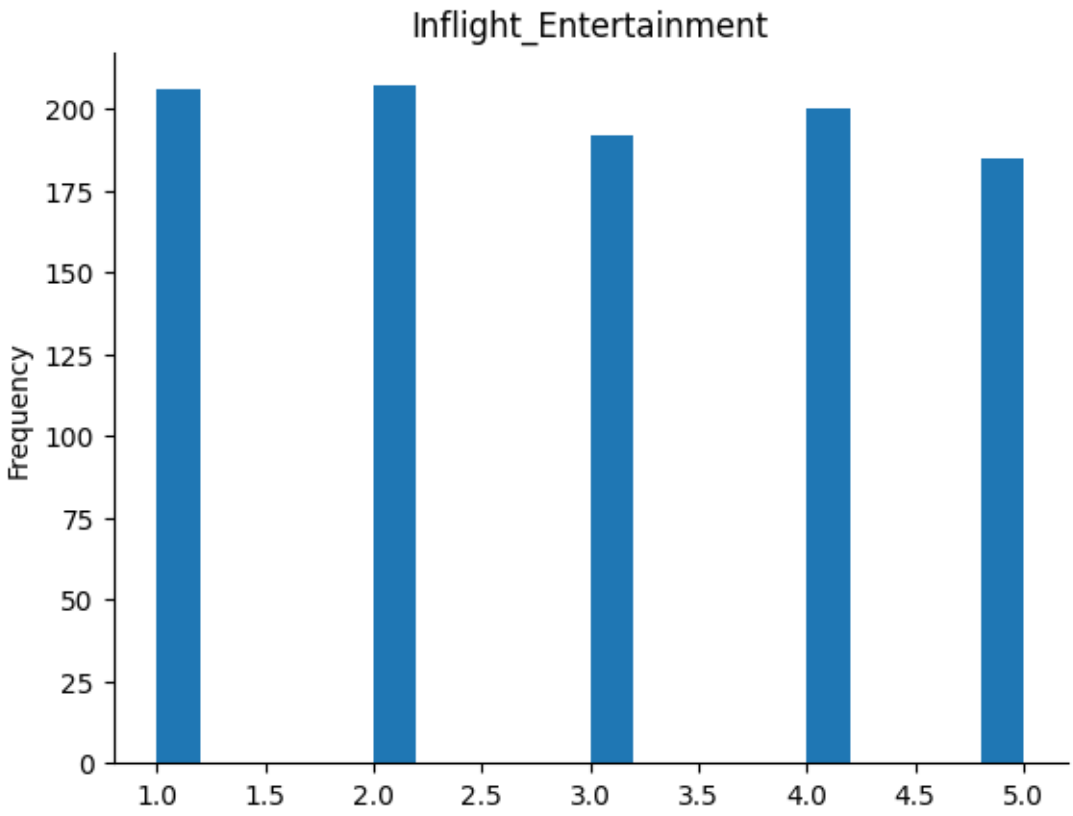
[237]:
```
#Ground_Service_rating

from matplotlib import pyplot as plt
British_Airway['Ground_Service_rating'].plot(kind='hist', bins=20,␣
 ↪title='Ground_Service_rating')
plt.gca().spines[['top', 'right',]].set_visible(False)
```



From the above plot we infer:

- Majority of passangers rated low to satisfactory for ground service(maintainence,cleaning,baggage handaling,etc)
- Only some passengers rated the service very positively.

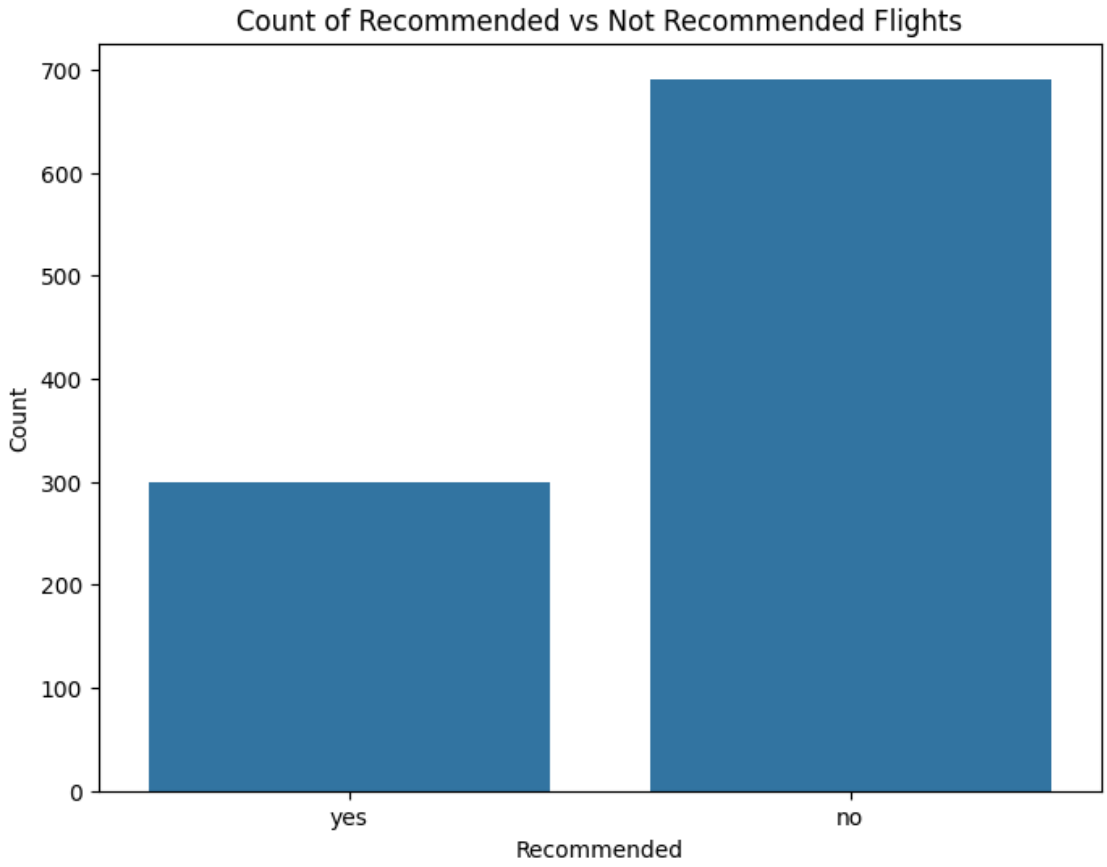
[266]:
```
#Inflight_Entertainment

from matplotlib import pyplot as plt
British_Airway['Inflight_Entertainment'].plot(kind='hist', bins=20,␣
 ↪title='Inflight_Entertainment')
plt.gca().spines[['top', 'right',]].set_visible(False)
```



From above plot we infer that:

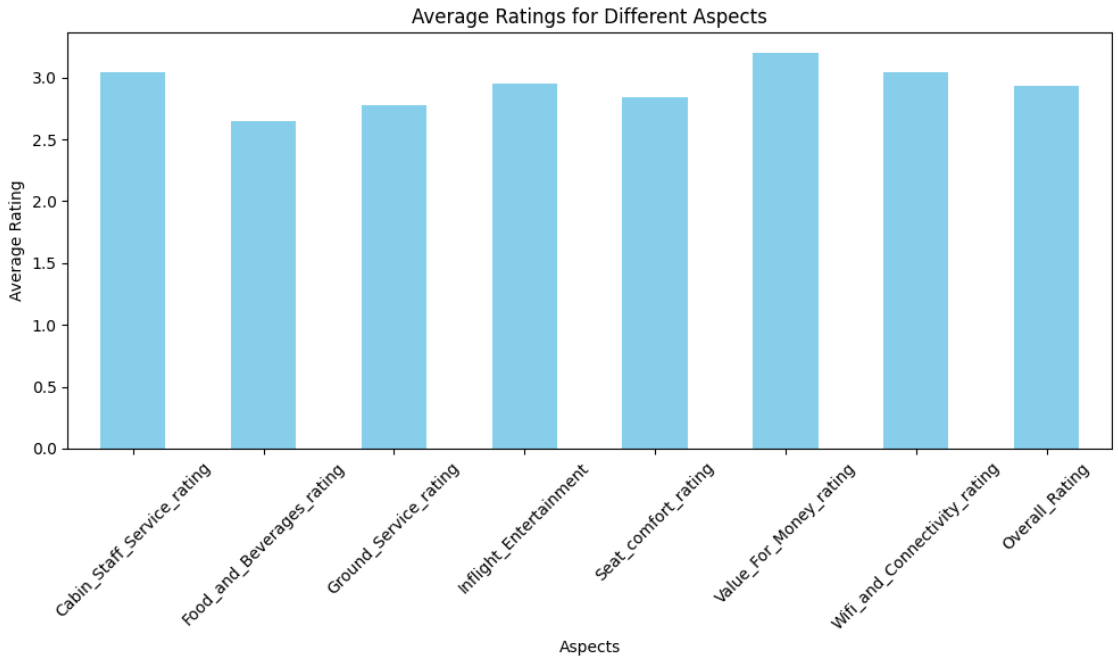
- Ratings below 3.0 (including 1.0 and 2.0) dominate the graph. This indicates that improvements are needed in the entertainment offerings.
- Ratings around 5 follow closely, suggesting that passengers were generally satisfied.

[239]:
```
plt.figure(figsize=(8, 6))
sns.countplot(x='Recommended', data=British_Airway)
plt.title('Count of Recommended vs Not Recommended Flights')
plt.xlabel('Recommended')
plt.ylabel('Count')
plt.show()
```



- British Airways has a higher number of not recommended flights compared to recommended ones.
- Passengers may have encountered issues or concerns with a significant portion of the flights.
- Improving the quality of the not recommended flights could enhance overall passenger satisfaction.

[240]:
```
# Plot Average Ratings for Different Aspects
plt.figure(figsize=(10, 6))
avg_ratings.plot(kind='bar', color='skyblue')
plt.title('Average Ratings for Different Aspects')
plt.xlabel('Aspects')
plt.ylabel('Average Rating')
plt.xticks(rotation=45)
plt.tight_layout()
plt.show()
```



All bars have similar heights, centered around the 3.0 mark, indicating moderate ratings for all the aspects.

[241]:
```
# Group the 'British_Airway' DataFrame by 'country' and calculate the mean␣
↪ratings for each rating category.
groupby_country=British_Airway.groupby('country')[['Cabin_Staff_Service_rating',
       'Food_and_Beverages_rating', 'Ground_Service_rating',
       'Inflight_Entertainment', 'Seat_comfort_rating',
       'Value_For_Money_rating', 'Wifi_and_Connectivity_rating']].mean()
groupby_country
```

[241]:

country	Cabin_Staff_Service_rating	Food_and_Beverages_rating	\
Argentina	3.333333	3.333333	
Australia	2.864865	2.540541	
Austria	4.000000	2.000000	
Belgium	2.666667	1.833333	
Bermuda	5.000000	5.000000	
Botswana	5.000000	2.000000	
Brazil	1.000000	2.000000	
Bulgaria	5.000000	2.000000	
Canada	2.942857	2.228571	
Chile	4.000000	3.000000	
China	2.000000	4.000000	
Cyprus	1.000000	2.000000	
Czech Republic	3.500000	3.500000	

Denmark	3.333333	4.333333
Ecuador	1.000000	1.000000
France	2.500000	1.833333
Germany	2.812500	2.937500
Ghana	3.500000	4.000000
Greece	2.750000	3.750000
Hong Kong	2.714286	2.714286
Iceland	4.000000	2.000000
India	2.285714	2.000000
Ireland	3.400000	2.800000
Israel	1.000000	1.000000
Italy	3.625000	2.875000
Japan	3.000000	5.000000
Jordan	2.000000	4.000000
Kuwait	3.500000	3.000000
Malaysia	3.400000	2.400000
Mexico	3.500000	3.500000
Netherlands	1.875000	2.625000
New Zealand	3.666667	1.333333
Nigeria	3.500000	3.000000
Norway	2.000000	5.000000
Panama	3.000000	5.000000
Philippines	2.000000	2.000000
Poland	3.200000	2.000000
Qatar	3.000000	2.333333
Romania	2.000000	2.333333
Russian Federation	5.000000	1.000000
Saint Kitts and Nevis	1.000000	2.000000
Senegal	4.000000	1.000000
Singapore	3.200000	2.400000
Slovakia	1.000000	5.000000
South Africa	3.176471	2.294118
Spain	3.142857	2.714286
Sweden	4.125000	3.125000
Switzerland	3.444444	2.111111
Taiwan	4.000000	1.000000
Thailand	4.000000	3.000000
Ukraine	2.000000	1.000000
United Arab Emirates	3.500000	2.600000
United Kingdom	3.001773	2.659574
United States	3.192547	2.745342
Vietnam	2.000000	1.000000

country	Ground_Service_rating	Inflight_Entertainment	\
Argentina	4.000000	4.000000	
Australia	2.702703	2.675676	

Austria	1.000000	4.000000
Belgium	3.666667	2.500000
Bermuda	3.000000	2.000000
Botswana	2.000000	2.000000
Brazil	1.000000	1.000000
Bulgaria	3.000000	1.000000
Canada	2.285714	2.742857
Chile	2.000000	1.000000
China	3.000000	3.500000
Cyprus	5.000000	2.000000
Czech Republic	3.500000	2.000000
Denmark	2.000000	3.333333
Ecuador	4.000000	1.000000
France	3.166667	2.666667
Germany	2.562500	3.062500
Ghana	1.500000	2.500000
Greece	2.750000	3.500000
Hong Kong	3.142857	3.285714
Iceland	2.500000	2.250000
India	2.000000	1.857143
Ireland	3.700000	2.400000
Israel	1.000000	3.000000
Italy	2.625000	2.750000
Japan	4.000000	3.000000
Jordan	1.000000	3.000000
Kuwait	3.000000	5.000000
Malaysia	1.800000	3.400000
Mexico	3.500000	2.000000
Netherlands	3.875000	3.000000
New Zealand	1.333333	3.000000
Nigeria	2.000000	4.500000
Norway	5.000000	2.000000
Panama	1.000000	5.000000
Philippines	1.000000	3.000000
Poland	2.600000	3.800000
Qatar	3.000000	4.000000
Romania	2.333333	4.333333
Russian Federation	3.000000	1.000000
Saint Kitts and Nevis	2.000000	1.000000
Senegal	3.000000	1.000000
Singapore	1.800000	3.200000
Slovakia	5.000000	1.000000
South Africa	3.294118	3.411765
Spain	3.142857	2.857143
Sweden	3.375000	3.250000
Switzerland	3.111111	3.222222
Taiwan	3.000000	3.000000

Thailand	2.000000	2.000000
Ukraine	4.000000	2.000000
United Arab Emirates	2.000000	3.000000
United Kingdom	2.804965	2.946809
United States	2.732919	3.049689
Vietnam	2.000000	5.000000

country	Seat_comfort_rating	Value_For_Money_rating	\
Argentina	2.333333	3.666667	
Australia	2.972973	3.675676	
Austria	1.000000	5.000000	
Belgium	2.833333	3.000000	
Bermuda	3.000000	5.000000	
Botswana	3.000000	5.000000	
Brazil	3.000000	2.000000	
Bulgaria	3.000000	2.000000	
Canada	2.828571	2.971429	
Chile	1.000000	2.000000	
China	2.000000	3.000000	
Cyprus	1.000000	2.000000	
Czech Republic	2.500000	3.000000	
Denmark	2.666667	3.333333	
Ecuador	4.000000	2.000000	
France	3.166667	2.833333	
Germany	3.062500	2.625000	
Ghana	2.500000	4.000000	
Greece	2.250000	2.250000	
Hong Kong	2.571429	3.000000	
Iceland	2.750000	3.500000	
India	2.428571	2.714286	
Ireland	2.900000	3.200000	
Israel	5.000000	5.000000	
Italy	2.375000	2.750000	
Japan	3.500000	4.500000	
Jordan	5.000000	4.000000	
Kuwait	2.000000	5.000000	
Malaysia	3.200000	2.200000	
Mexico	2.500000	5.000000	
Netherlands	3.625000	4.625000	
New Zealand	3.333333	3.000000	
Nigeria	4.500000	4.000000	
Norway	1.000000	2.000000	
Panama	4.000000	5.000000	
Philippines	3.000000	1.000000	
Poland	2.600000	3.000000	
Qatar	3.333333	3.666667	

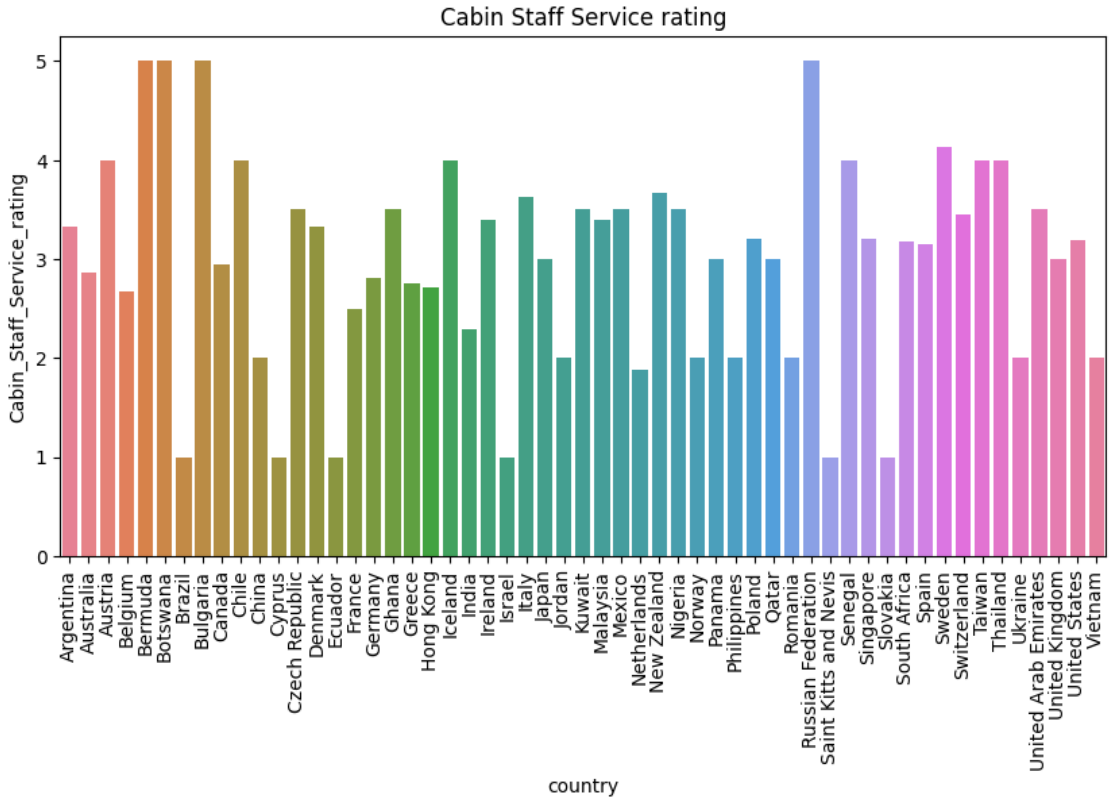
Romania	3.000000	4.000000
Russian Federation	3.000000	2.000000
Saint Kitts and Nevis	1.000000	2.000000
Senegal	1.000000	3.000000
Singapore	2.600000	3.000000
Slovakia	4.000000	3.000000
South Africa	3.000000	3.294118
Spain	2.714286	2.714286
Sweden	3.000000	3.125000
Switzerland	2.666667	3.000000
Taiwan	2.000000	3.000000
Thailand	2.000000	2.500000
Ukraine	3.000000	5.000000
United Arab Emirates	2.400000	3.300000
United Kingdom	2.806738	3.210993
United States	2.950311	3.155280
Vietnam	3.000000	4.000000

country	Wifi_and_Connectivity_rating
Argentina	2.333333
Australia	2.891892
Austria	4.000000
Belgium	3.500000
Bermuda	5.000000
Botswana	3.000000
Brazil	4.000000
Bulgaria	5.000000
Canada	3.114286
Chile	5.000000
China	3.000000
Cyprus	5.000000
Czech Republic	3.500000
Denmark	3.333333
Ecuador	5.000000
France	2.833333
Germany	2.937500
Ghana	5.000000
Greece	3.250000
Hong Kong	2.285714
Iceland	2.500000
India	3.714286
Ireland	3.500000
Israel	5.000000
Italy	2.750000
Japan	4.000000
Jordan	3.000000

```
Kuwait                          2.500000
Malaysia                        3.000000
Mexico                          1.000000
Netherlands                     3.125000
New Zealand                     2.333333
Nigeria                         3.000000
Norway                          1.000000
Panama                          4.000000
Philippines                     4.000000
Poland                          4.000000
Qatar                           3.333333
Romania                         3.333333
Russian Federation              1.000000
Saint Kitts and Nevis           1.000000
Senegal                         1.000000
Singapore                       3.200000
Slovakia                        2.000000
South Africa                    3.411765
Spain                           3.000000
Sweden                          4.250000
Switzerland                     2.222222
Taiwan                          4.000000
Thailand                        4.500000
Ukraine                         2.000000
United Arab Emirates            2.700000
United Kingdom                  2.989362
United States                   3.155280
Vietnam                         3.000000
```

[242]:
```python
# Define a function to plot average ratings by country using seaborn's barplot

def rating_by_country(v,c,title):
    plt.figure(figsize=(10, 5))
    colors = sns.color_palette("husl", len(v.index))
    sns.barplot(x=v.index, y=v, palette=colors)
    plt.xticks(rotation=90)
    plt.title(f'{title}')
    plt.show()
    return plt
```

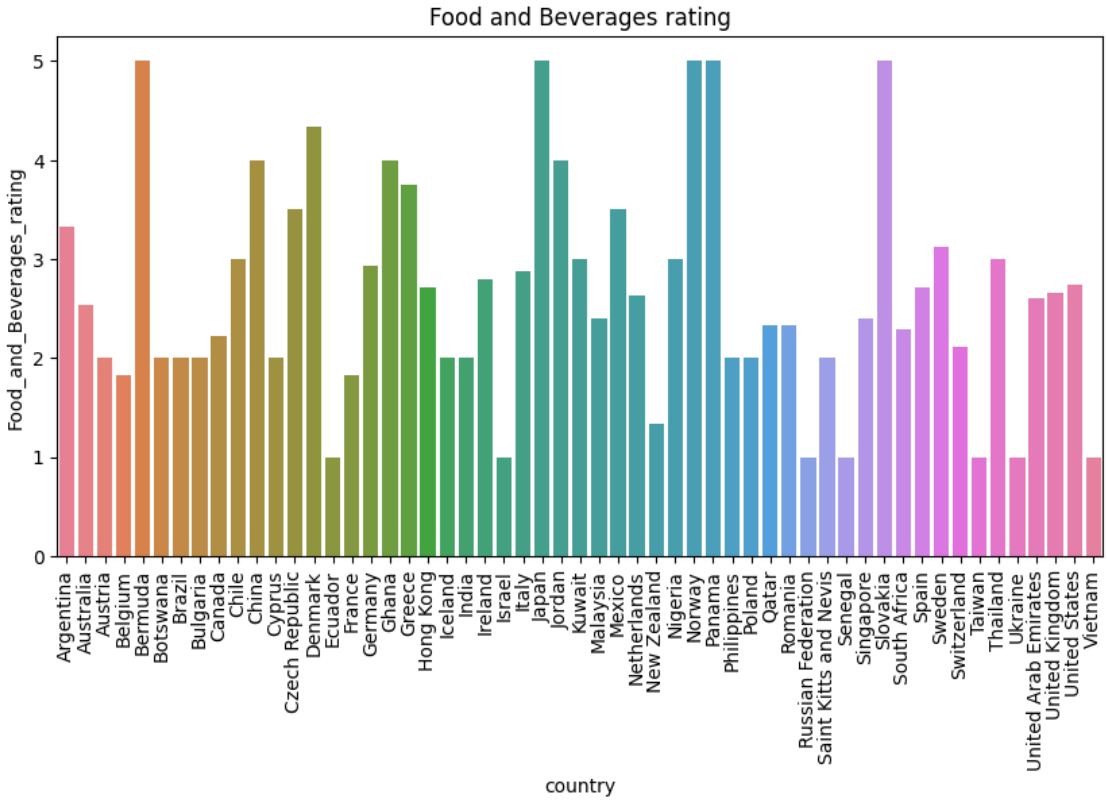
[243]:
```python
# Displays a bar plot of average cabin staff service ratings by country
display(rating_by_country(groupby_country['Cabin_Staff_Service_rating'],'Cabin_Staff_Service_r
 ↪Staff Service rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

- Countries like Belgium, Bulgaria, and Russian Federation have higher average ratings for cabin staff service.
- In contrast, countries like Brazil, Israel and Ecuador have lower average ratings.

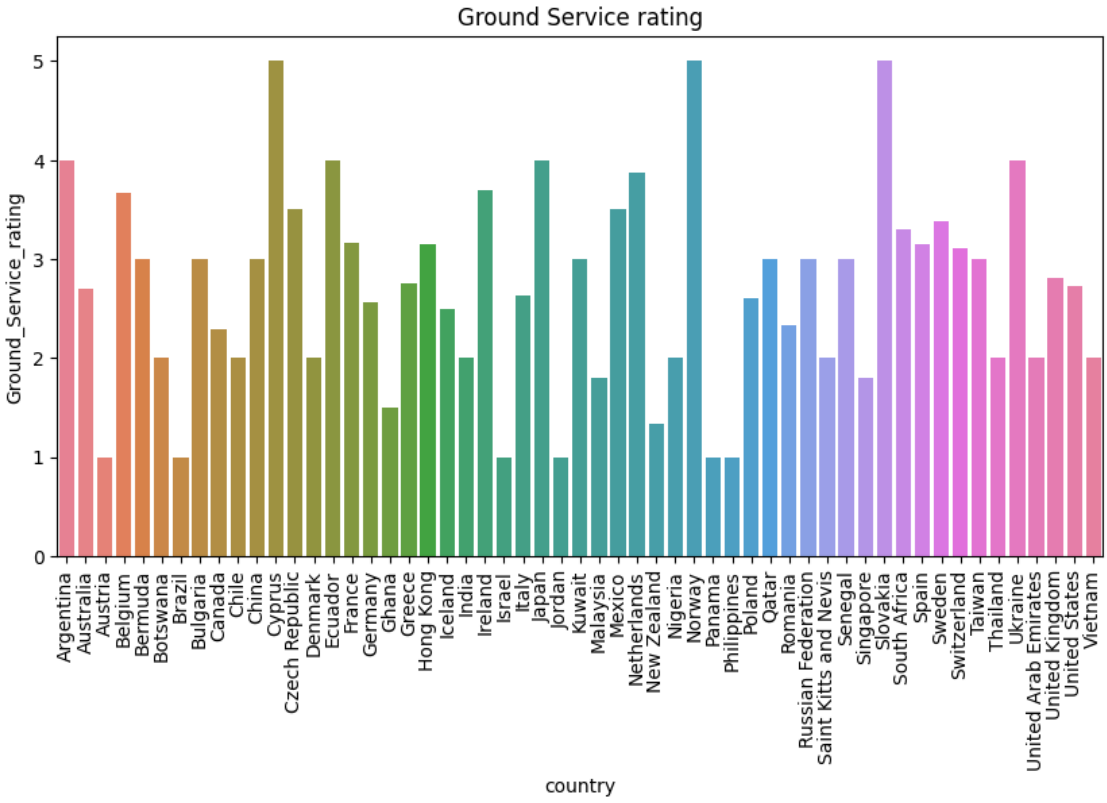
[244]:
```
# Display a bar plot of average food and beverages rating by country
display(rating_by_country(groupby_country['Food_and_Beverages_rating'],'Food_and_Beverages_rat
↪and Beverages rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

- Japan and Panama have 5.0 rating for food and beverage.
- There are almost 9 countries like Taiwan, Israel, Ukraine have lowest rating(1.0).

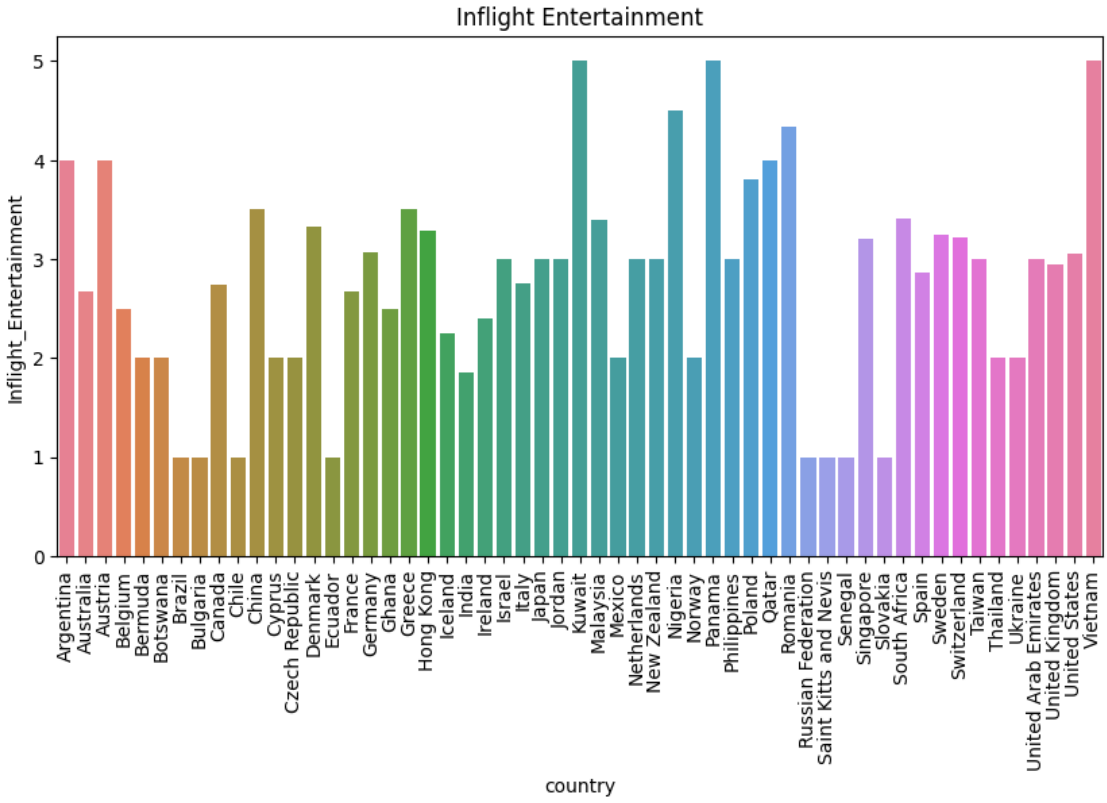
[245]:
```
# Displays a bar plot of average ground service ratings by country
display(rating_by_country(groupby_country['Ground_Service_rating'],'Ground_Service_rating','Gr
↪Service rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

- Countries like Norway, Nigeria and Slovakia appear to have high average ground service ratings.
- In contrast, countries like Jordan and the Austria have lower average ratings.

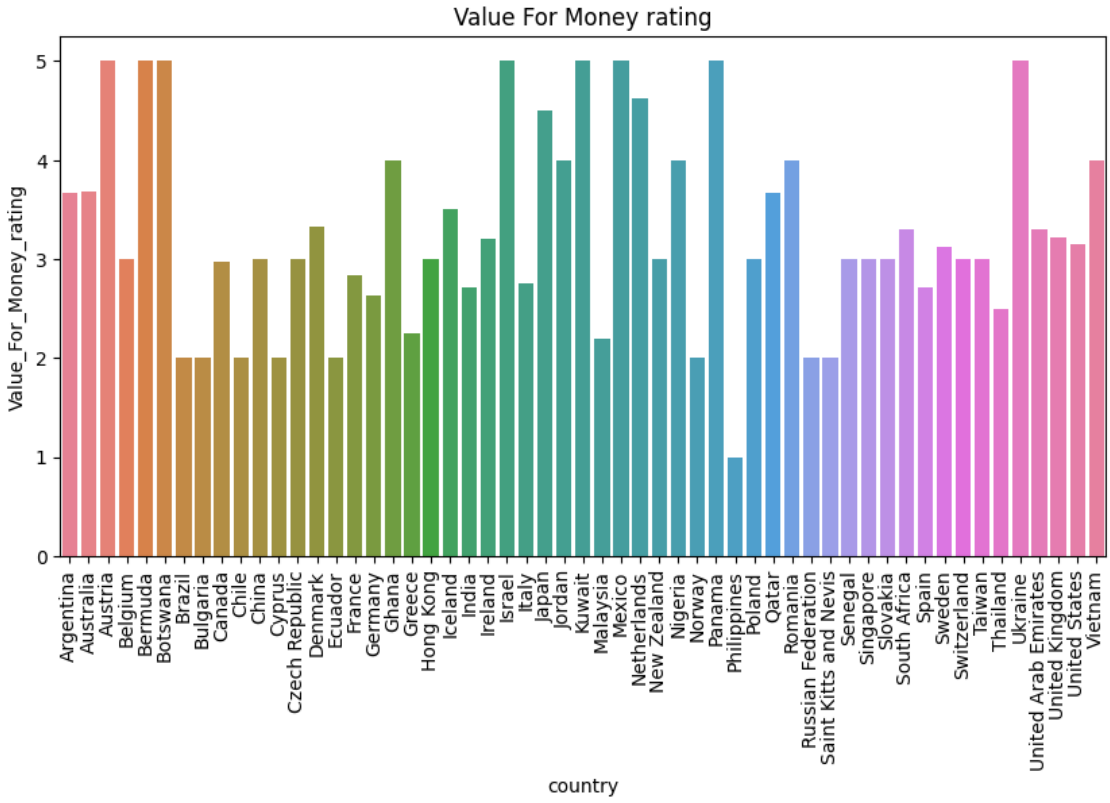
[246]:
```
# Display a bar plot of average inflight_entertainment ratings by country
display(rating_by_country(groupby_country['Inflight_Entertainment'],'Inflight_Entertainment','
↪Entertainment'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

- Countries like Vietnam, Panama, and Kuwait have higher average ratings.
- Countries like Chile and the Brazil have lower average ratings.

[247]:
```
# Display a bar plot of average value for money ratings by country
display(rating_by_country(groupby_country['Value_For_Money_rating'],'Value_For_Money_rating','
↪For Money rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
 ↪matplotlib/pyplot.py'>
```

There are only few low value for money ratings for countries like Philippines, Brazil and Chile.

[248]:
```
# Group the 'British_Airway' DataFrame by 'Type_Of_Traveller' and calculate the␣
 ↪sum of ratings for each rating category
British_Airway['Type_Of_Traveller'] = British_Airway['Type_Of_Traveller'].
 ↪replace('Business', 'Business Class')
groupby_Type_Of_Traveller=British_Airway.
 ↪groupby('Type_Of_Traveller')[['Cabin_Staff_Service_rating',
       'Food_and_Beverages_rating', 'Ground_Service_rating',
       'Inflight_Entertainment', 'Seat_comfort_rating',
       'Value_For_Money_rating', 'Wifi_and_Connectivity_rating']].sum()
groupby_Type_Of_Traveller
```

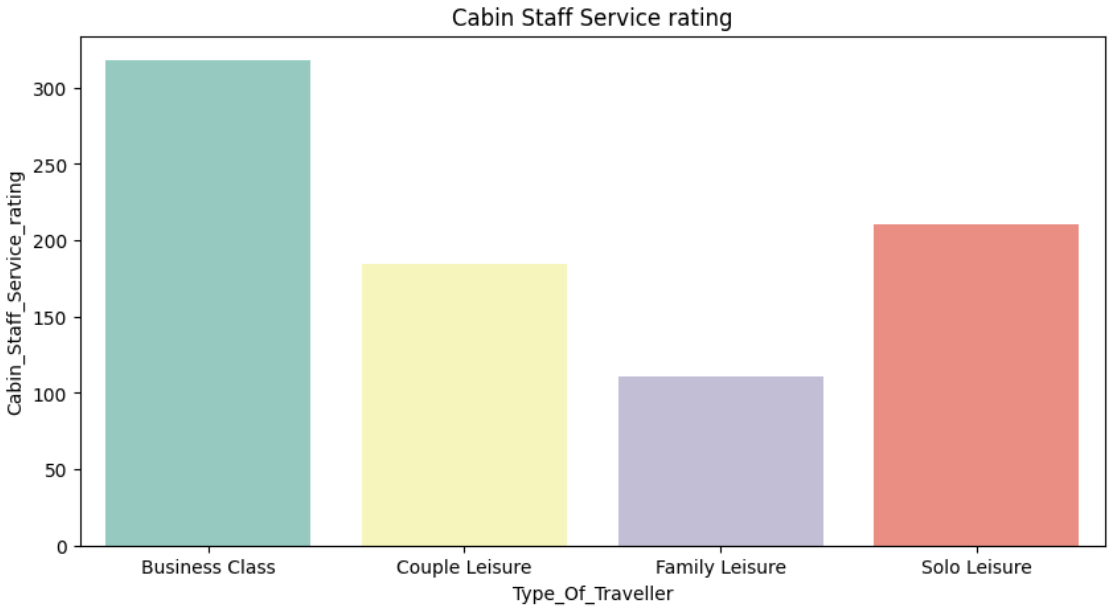
[248]:

Type_Of_Traveller	Cabin_Staff_Service_rating	Food_and_Beverages_rating	\
Business Class	318	257	
Couple Leisure	184	159	
Family Leisure	111	78	
Solo Leisure	210	195	

```
                    Ground_Service_rating  Inflight_Entertainment  \
Type_Of_Traveller
Business Class                        292                     287
Couple Leisure                        194                     177
Family Leisure                         97                      97
Solo Leisure                          211                     193

                    Seat_comfort_rating  Value_For_Money_rating  \
Type_Of_Traveller
Business Class                      300                     333
Couple Leisure                      165                     191
Family Leisure                       87                      95
Solo Leisure                        222                     217

                    Wifi_and_Connectivity_rating
Type_Of_Traveller
Business Class                               314
Couple Leisure                               188
Family Leisure                                89
Solo Leisure                                 234
```

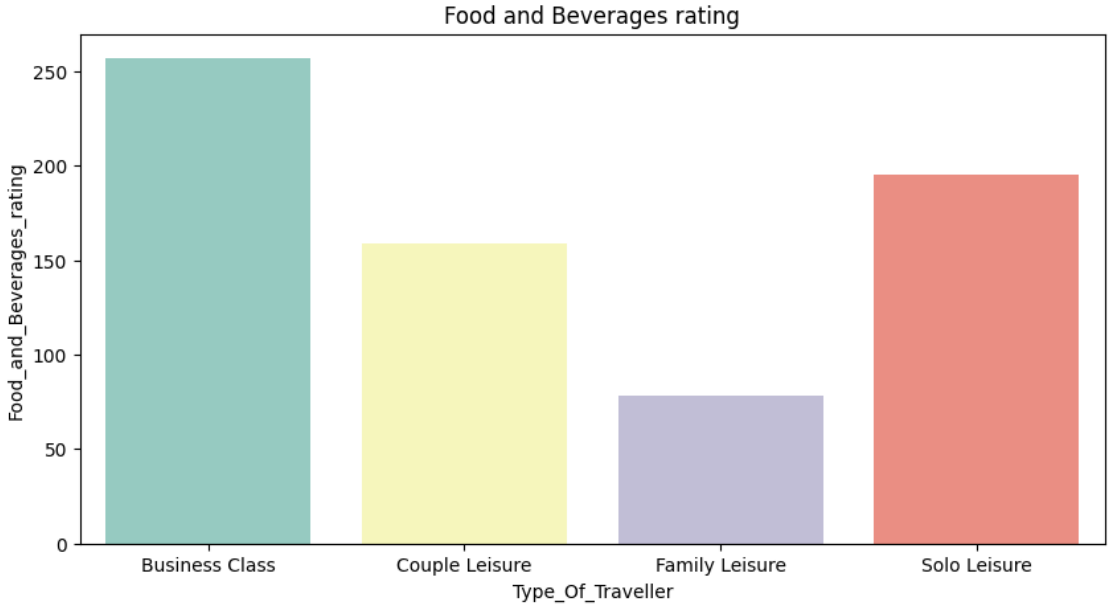
[249]:
```
# Define a function to plot average ratings by type of traveller using␣
 ↪seaborn's barplot
def rating_by_type_of_traveller(v,c,title):
    plt.figure(figsize=(10, 5))
    sns.barplot(x=v.index,y=v,palette='Set3')
    #plt.xticks(rotation=90)
    plt.title(f'{title}')
    plt.show()
    return plt
```

[250]:
```
# Display a bar plot of total cabin staff service ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Cabin_Staff_Service_rating'],'C
 ↪Staff Service rating'))
```



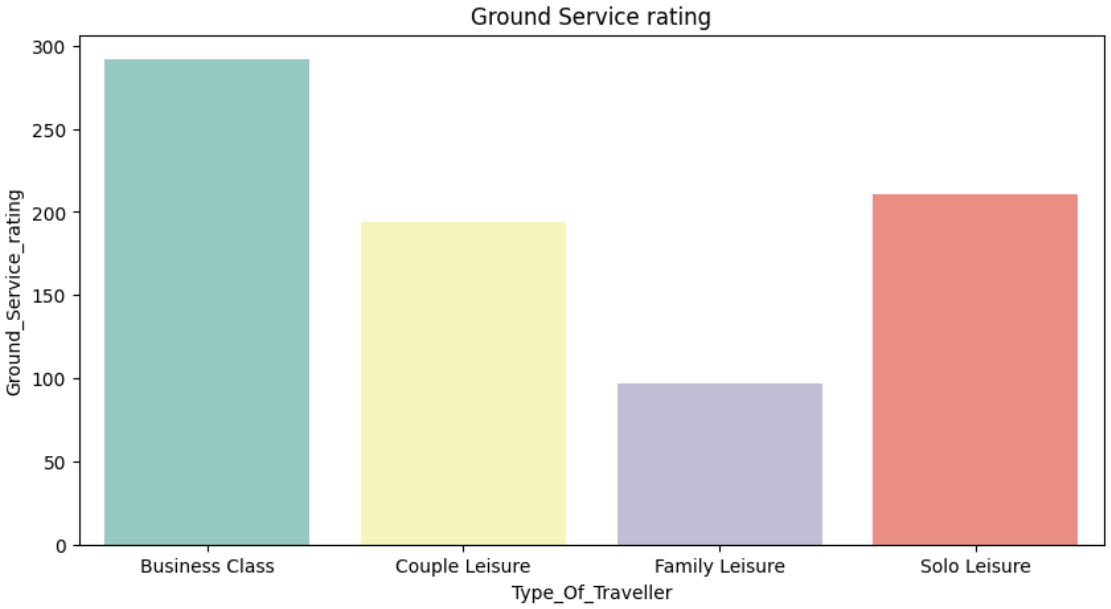

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
  ↪matplotlib/pyplot.py'>
```

[251]:
```
# Display a bar plot of total food and beverages ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Food_and_Beverages_rating'],'Fo
  ↪and Beverages rating'))
```



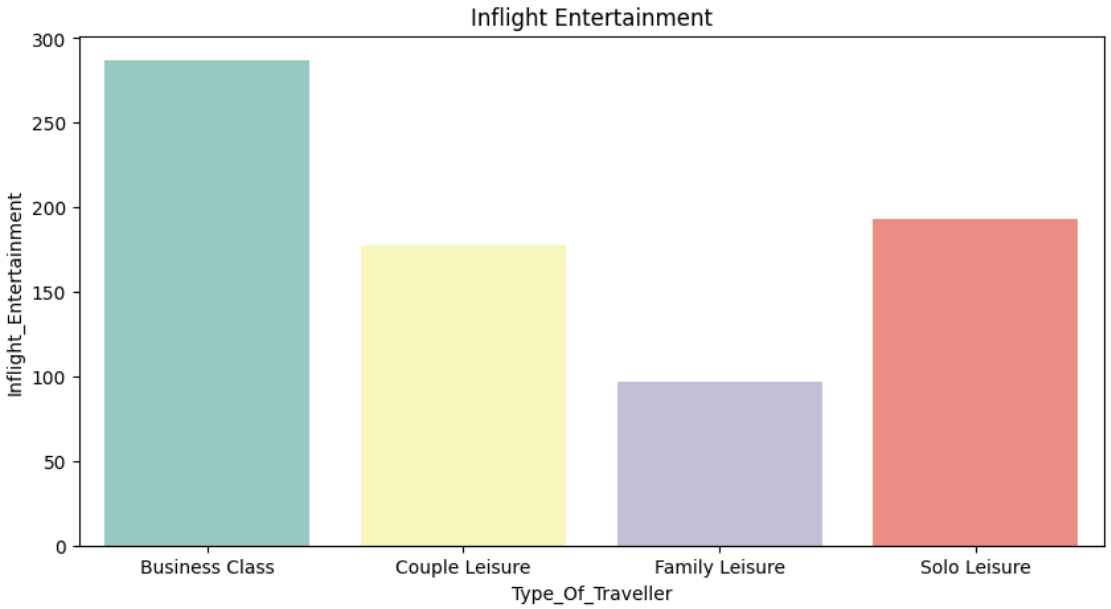
```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[252]:
```
# Display a bar plot of total ground service ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Ground_Service_rating'],'Ground
↪Service rating'))
```



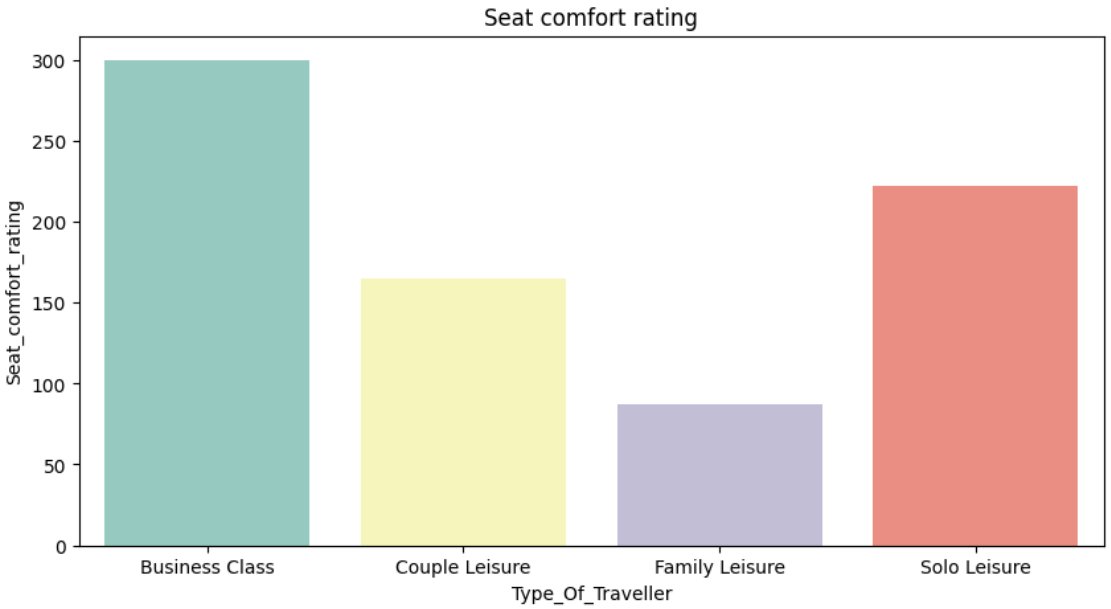

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[253]:
```
# Display a bar plot of total inflight entertainment ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Inflight_Entertainment'],'Infli
↪Entertainment'))
```



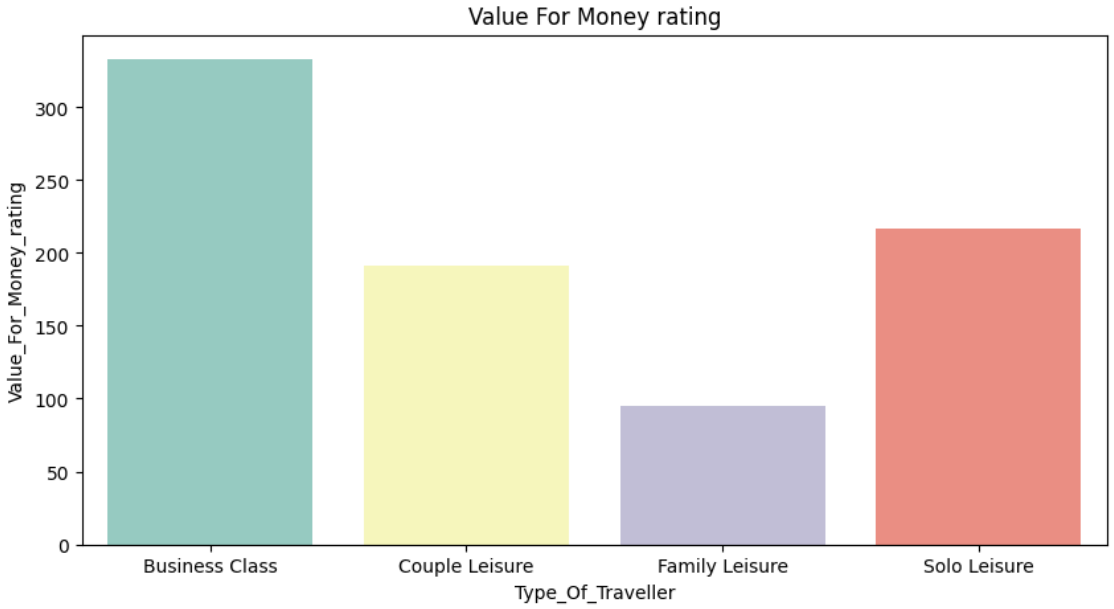

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
  ↪matplotlib/pyplot.py'>
```

[254]:
```
# Display a bar plot of total seat comfort service ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Seat_comfort_rating'],'Seat_com
  ↪comfort rating'))
```



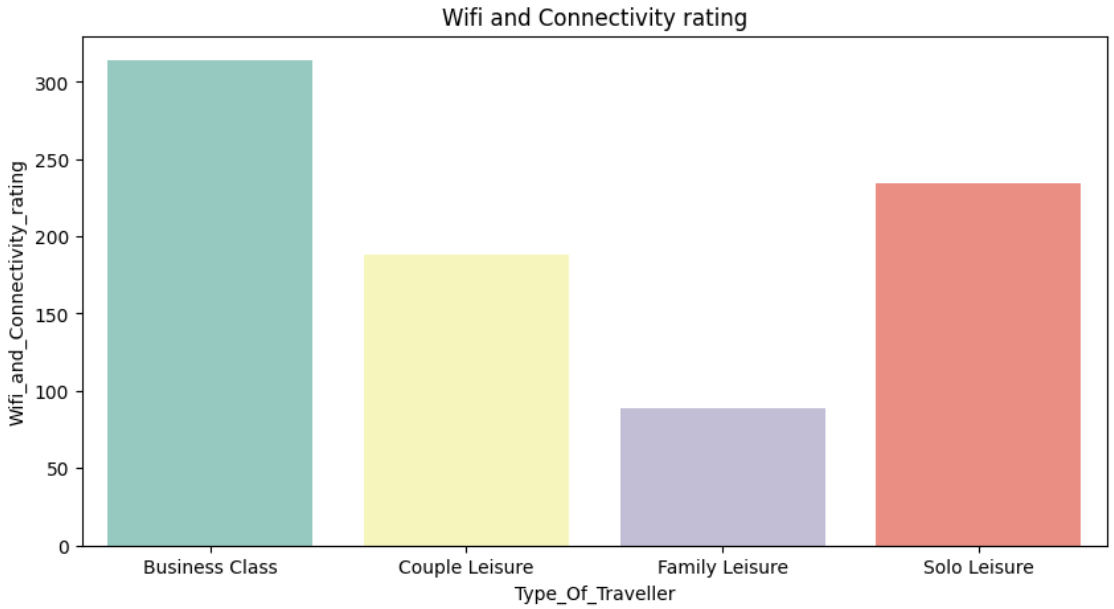
```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[255]:
```
# Display a bar plot of total value for money ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Value_For_Money_rating'],'Value
↪For Money rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[256]:
```
# Display a bar plot of total wifi and connectivity ratings by type of traveler
display(rating_by_type_of_traveller(groupby_Type_Of_Traveller['Wifi_and_Connectivity_rating'],
↪and Connectivity rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
 ↪matplotlib/pyplot.py'>
```

From the plots above that as grouped by type of travelers:

- Business Class travelers seem to have the highest service ratings, indicating that all the services cabin staff and the airlines provides were excellent service to business passengers.
- Couple Leisure travelers ratings fall in the middle range. It appears that all the services cabin staff and the airlines provides satisfactory service to couples traveling for leisure.
- The ratings for family leisure travelers are lowest among all traveler types. Perhaps all the services cabin staff and the airlines faces more challenges when dealing with families.
- Solo Leisure travelers have the almost satisfatory service ratings. It's possible that solo leisure travelers have specific expectations or preferences that aren't always met.

[267]:
```
# Group the 'British_Airway' DataFrame by 'Seat_Type' and calculate the mean␣
 ↪ratings for each rating category
groupby_Seat_Type=British_Airway.
 ↪groupby('Seat_Type')[['Cabin_Staff_Service_rating',
       'Food_and_Beverages_rating', 'Ground_Service_rating',
       'Inflight_Entertainment', 'Seat_comfort_rating',
       'Value_For_Money_rating', 'Wifi_and_Connectivity_rating']].mean()
groupby_Seat_Type
```

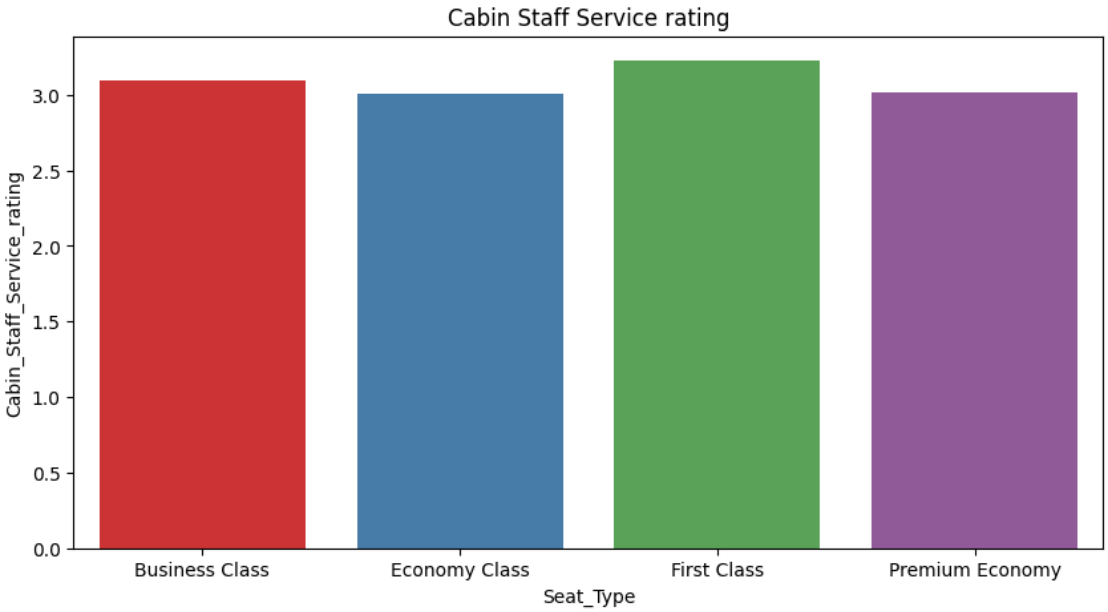
[267]:

Seat_Type	Cabin_Staff_Service_rating	Food_and_Beverages_rating	\
Business Class	3.091429	2.617143	

```
Economy Class                    3.003683                  2.690608
First Class                      3.227273                  2.500000
Premium Economy                  3.013333                  2.506667

                Ground_Service_rating  Inflight_Entertainment  \
Seat_Type
Business Class               2.851429                2.928571
Economy Class                2.701657                2.950276
First Class                  3.500000                2.909091
Premium Economy              2.760000                3.066667

                Seat_comfort_rating  Value_For_Money_rating  \
Seat_Type
Business Class             2.834286                3.311429
Economy Class              2.847145                3.139963
First Class                2.636364                2.954545
Premium Economy            2.840000                3.213333

                Wifi_and_Connectivity_rating
Seat_Type
Business Class                      3.148571
Economy Class                       2.983425
First Class                         2.818182
Premium Economy                     3.106667
```

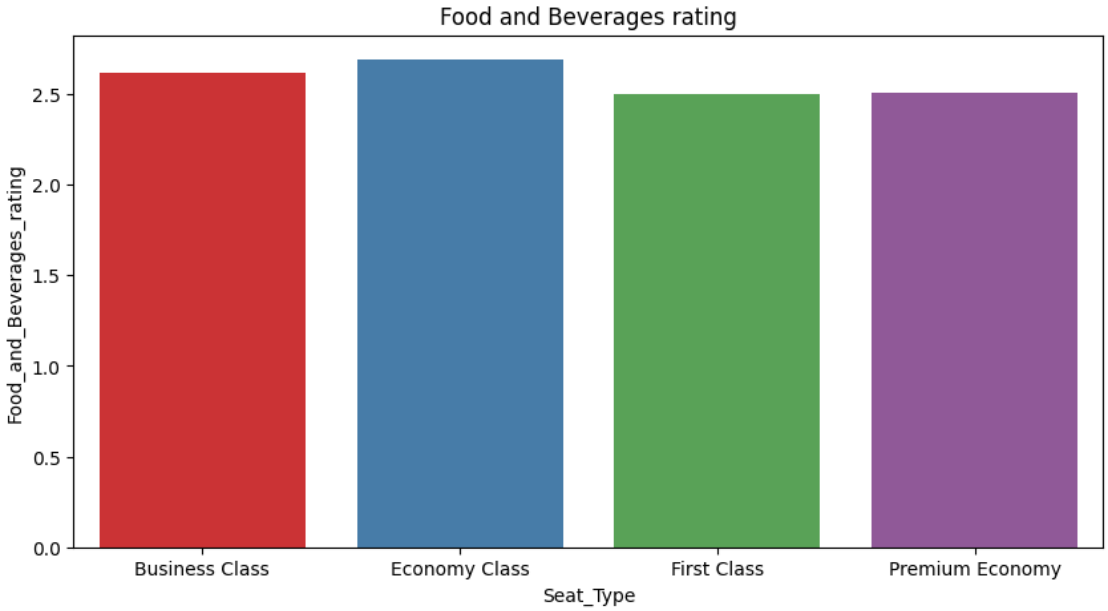
[268]:
```python
# Define a function to plot average ratings by seat type using seaborn's barplot
def rating_by_Seat_Type(v,c,title):
    plt.figure(figsize=(10, 5))
    sns.barplot(x=v.index,y=v,palette='Set1')
    #plt.xticks(rotation=90)
    plt.title(f'{title}')
    plt.show()
    return plt
```

[259]:
```python
# Display a bar plot of average cabin staff service ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Cabin_Staff_Service_rating'],'Cabin_Staff_Servi
 ↪Staff Service rating'))
```



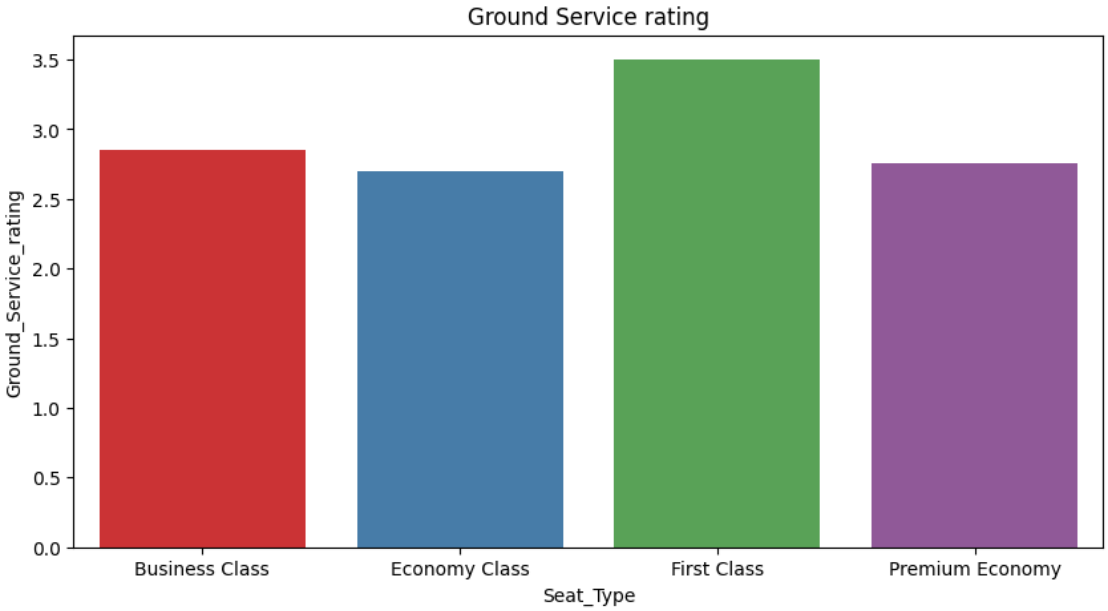

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
  ↪matplotlib/pyplot.py'>
```

[260]:
```
# Display a bar plot of average food and beverages ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Food_and_Beverages_rating'],'Food_and_Beverages
  ↪and Beverages rating'))
```



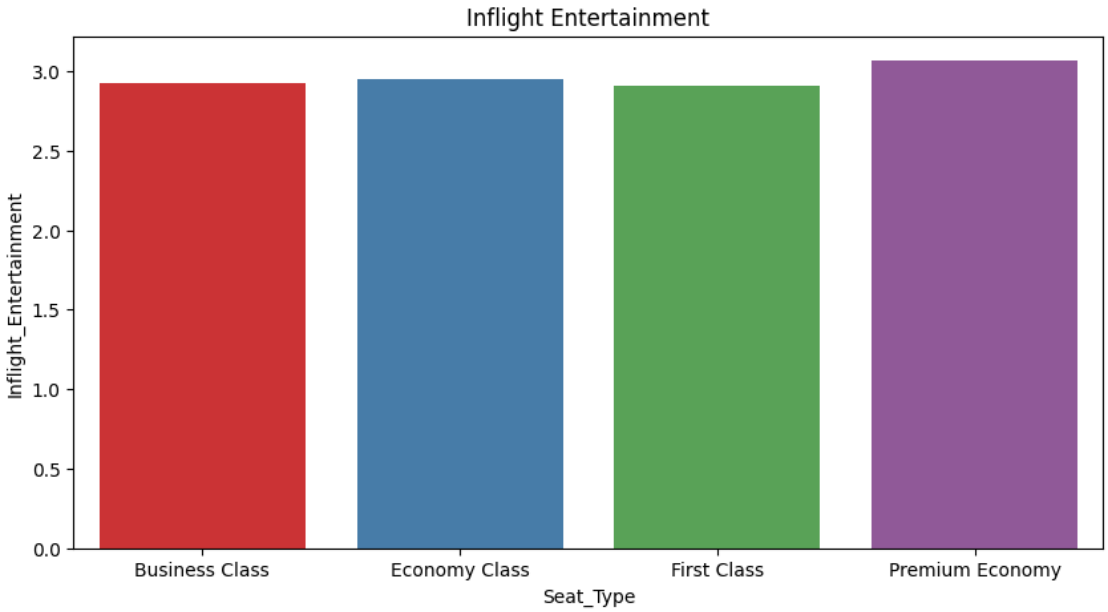
```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[261]:
```
# Display a bar plot of average ground service ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Ground_Service_rating'],'Ground_Service_rating'
↪Service rating'))
```



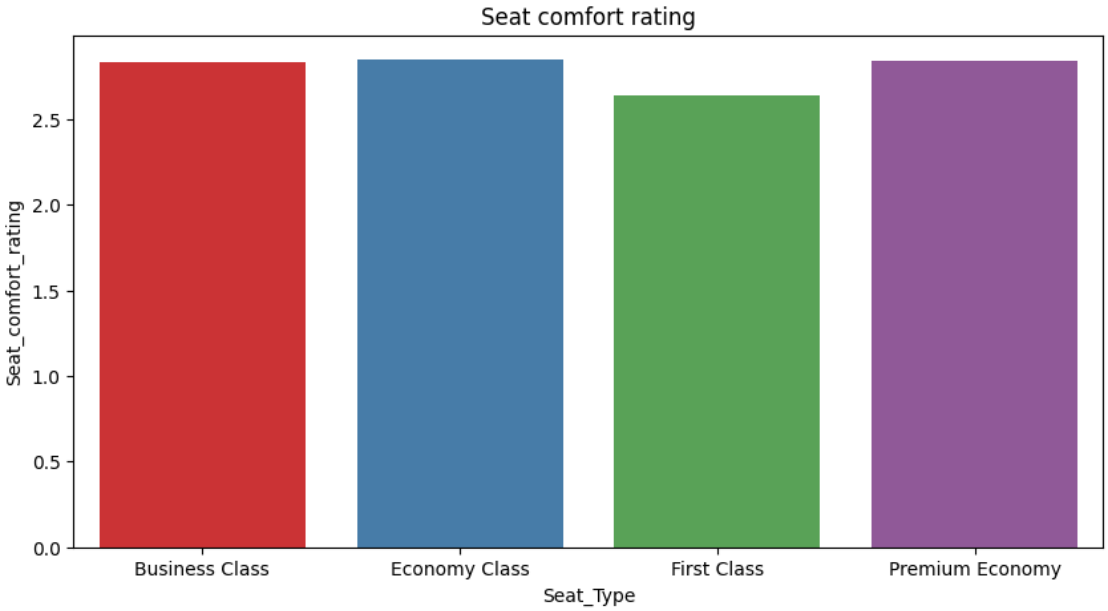

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[262]:
```
# Display a bar plot of average inflight entertainment ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Inflight_Entertainment'],'Inflight_Entertainmen
↪Entertainment'))
```



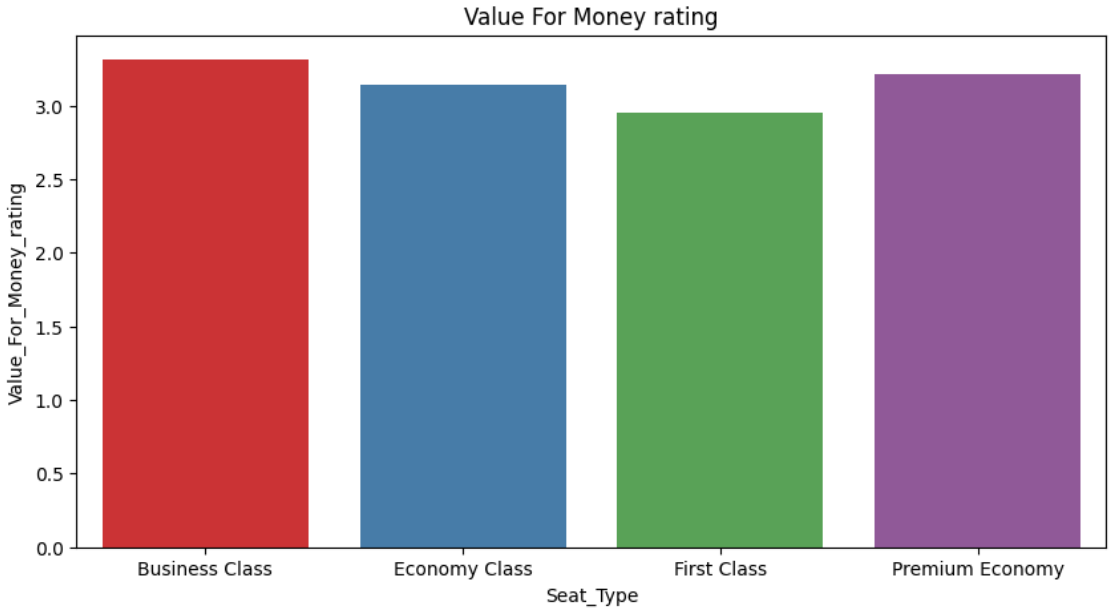

```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
  ↪matplotlib/pyplot.py'>
```

[263]:
```
# Display a bar plot of average seat comfort ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Seat_comfort_rating'],'Seat_comfort_rating','Se
  ↪comfort rating'))
```



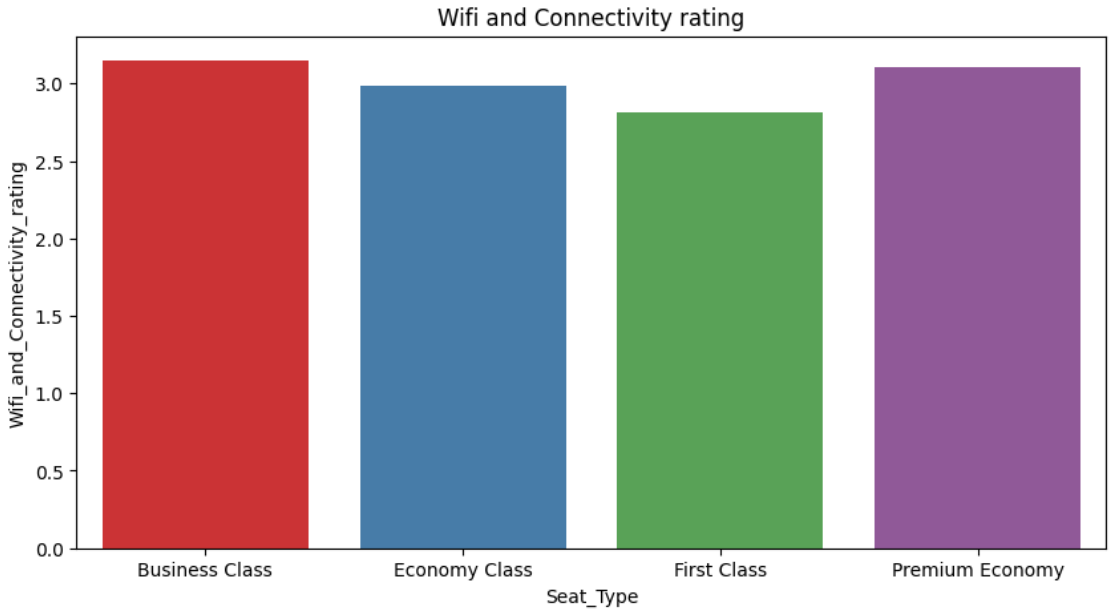
```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[264]:
```
# Display a bar plot of average value for money ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Value_For_Money_rating'],'Value_For_Money_ratin
↪For Money rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

[265]:
```
# Display a bar plot of average wifi and connectivity ratings by seat type
display(rating_by_Seat_Type(groupby_Seat_Type['Wifi_and_Connectivity_rating'],'Wifi_and_Connec
↪and Connectivity rating'))
```




```
<module 'matplotlib.pyplot' from '/usr/local/lib/python3.10/dist-packages/
↪matplotlib/pyplot.py'>
```

- Food and beverages: Interestingly, all seat types have received the same high rating. This suggests that regardless of the seat class, passengers generally have a positive experience with the food and beverage services on these airlines.
- Cabin Staff Service: All seat classes receive high ratings above 2.5. This suggests that passengers generally have a satisfactory experience with the cabin staff service, regardless of the seat class they choose.
- Ground Service: First Class has the highest rating, indicating that passengers in this class experience superior ground service,followed by Business Class, Premium Economy, and Economy Class.
- The bar chart indicates that First Class seats have the highest comfort rating, followed by Business Class, Premium Economy, and Economy Class.
- From the bar chart, it appears that Business Class has the highest Value for Money rating among different seat types on an airline. Other seat types, such as Premium Economy and Economy Class, have satisfactory ratings in comparison.
- Interestingly, Wifi and Connectivity shows that all classes have the same rating(satisfactory).