In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import geopandas as gpd
import folium

from scipy import stats
#pd.set_option('display.max_rows', None)
#pd.reset_option('^display.', silent=True)
```

```
/opt/anaconda3/lib/python3.8/site-packages/pandas/core/computation/expressions.py:20: UserWarning:
Pandas requires version '2.7.3' or newer of 'numexpr' (version '2.7.1' currently installed).
  from pandas.core.computation.check import NUMEXPR_INSTALLED
```

In [2]:

```
df = pd.read_csv('Airbnb_NYC_2019.csv')
df
```

Out[2]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price
0	2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.97237	Private room	149
1	2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150
3	3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89
4	5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80
...	...	...	...	...	...	...	...	...	...	...
48890	36484665	Charming one bedroom - newly renovated rowhouse	8232441	Sabrina	Brooklyn	Bedford-Stuyvesant	40.67853	-73.94995	Private room	70
48891	36485057	Affordable room in Bushwick/East Williamsburg	6570630	Marisol	Brooklyn	Bushwick	40.70184	-73.93317	Private room	40
48892	36485431	Sunny Studio at Historical Neighborhood	23492952	Ilgar & Aysel	Manhattan	Harlem	40.81475	-73.94867	Entire home/apt	115
48893	36485609	43rd St. Time Square-cozy single bed	30985759	Taz	Manhattan	Hell's Kitchen	40.75751	-73.99112	Shared room	55
48894	36487245	Trendy duplex in the very heart of Hell's Kitchen	68119814	Christophe	Manhattan	Hell's Kitchen	40.76404	-73.98933	Private room	90

48895 rows × 16 columns

In [3]:

```
df_filter = df.dropna()
df_outlier = df_filter[['price','minimum_nights', 'availability_365', 'reviews_per_month',
              'number_of_reviews','calculated_host_listings_count']]
filtered = (np.abs(stats.zscore(df_outlier)) < 3).all(axis=1)
df_filter = df_filter[filtered]
```

In [4]:

```
# drop nas in terms of price
df_dp = df.dropna(subset = ['price'])
# filter the outlier of price
filtered1 = (np.abs(stats.zscore(df_dp.price)) < 3)
# get the filtered data
df_dp = df_dp[filtered1]
df_dp
```

Out[4]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price
0	2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.97237	Private room	149
1	2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150
3	3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89
4	5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80
...	...	...	...	...	...	...	...	...	...	...
48890	36484665	Charming one bedroom - newly renovated rowhouse	8232441	Sabrina	Brooklyn	Bedford-Stuyvesant	40.67853	-73.94995	Private room	70
48891	36485057	Affordable room in Bushwick/East Williamsburg	6570630	Marisol	Brooklyn	Bushwick	40.70184	-73.93317	Private room	40
48892	36485431	Sunny Studio at Historical Neighborhood	23492952	Ilgar & Aysel	Manhattan	Harlem	40.81475	-73.94867	Entire home/apt	115
48893	36485609	43rd St. Time Square-cozy single bed	30985759	Taz	Manhattan	Hell's Kitchen	40.75751	-73.99112	Shared room	55
48894	36487245	Trendy duplex in the very heart of Hell's Kitchen	68119814	Christophe	Manhattan	Hell's Kitchen	40.76404	-73.98933	Private room	90

48507 rows × 16 columns

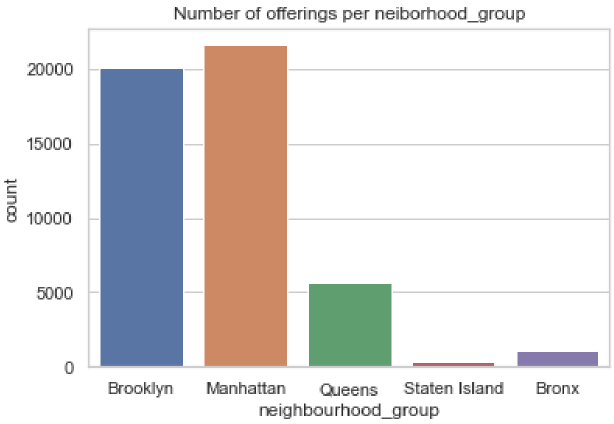
Counts for five neighborhood groups

In [5]:

```
# set theme
sns.set(style="whitegrid")
sns.countplot(x="neighbourhood_group", data=df).set(title='Number of offerings per neiborhood_group'
```

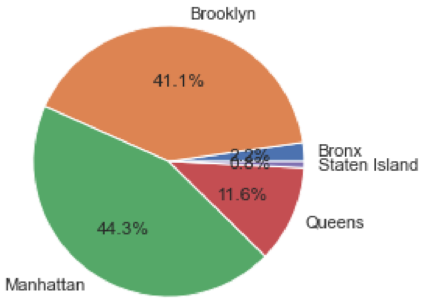
Out[5]:

```
[Text(0.5, 1.0, 'Number of offerings per neiborhood_group')]
```



In [6]:

```
count = df.groupby('neighbourhood_group').agg('count').reset_index()[['neighbourhood_group', 'neighbo
fig1, ax1 = plt.subplots()
ax1.pie(count.neighbourhood, labels=count.neighbourhood_group, autopct='%1.1f%%')
plt.show()
```



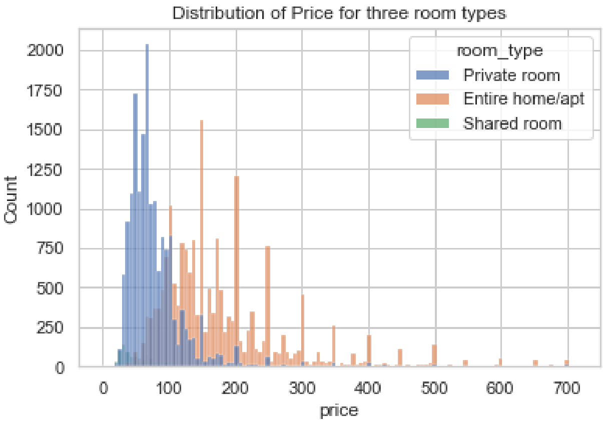
Price

In [7]:

```
# drop nas in terms of price
df_map = df.dropna(subset = ['price'])
# filter the outlier of price
filtered1 = (np.abs(stats.zscore(df_map.price)) < 3)
# get the filtered data
data = df_map[filtered1]


data = data.sample(2000)

# make map
m = folium.Map(location=[40.80902, -73.95976], zoom_start=1)

# Get longitude, latitude and price
for lat, lon, price in zip(data['latitude'], data['longitude'], data['price']):
    folium.Marker(
        location=[lat, lon],
        popup='Price: ' + str(price),
        icon=None
    ).add_child(folium.Popup('Price: ' + str(price))).add_to(m)

m.save('price_Map.html')
```

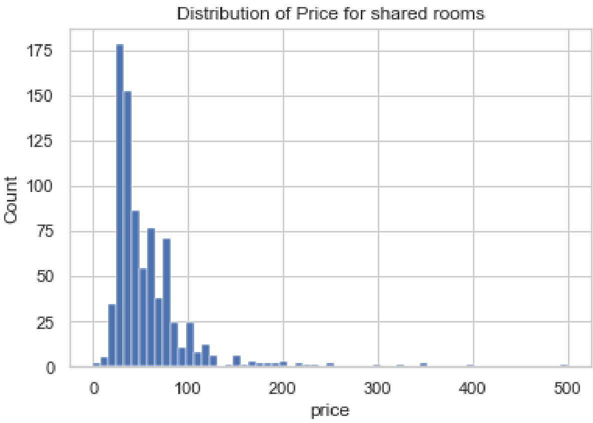
In [8]:
```
sns.histplot(data=df_filter, x="price", hue = "room_type",alpha = 0.7).set(
    title = "Distribution of Price for three room types")
```

Out[8]:
```
[Text(0.5, 1.0, 'Distribution of Price for three room types')]
```



In [9]:
```
# shared room
df_shared = df_filter[df_filter.room_type == 'Shared room']
sns.histplot(data=df_shared, x="price", alpha=1).set(title = "Distribution of Price for shared rooms
```

Out[9]:
```
[Text(0.5, 1.0, 'Distribution of Price for shared rooms')]
```



Number of host

In [10]:
```
# filter price
host = df.dropna(subset = ['calculated_host_listings_count', 'price'])
filtered_host = (np.abs(stats.zscore(host.price)) < 3)
host = host[filtered_host]
```

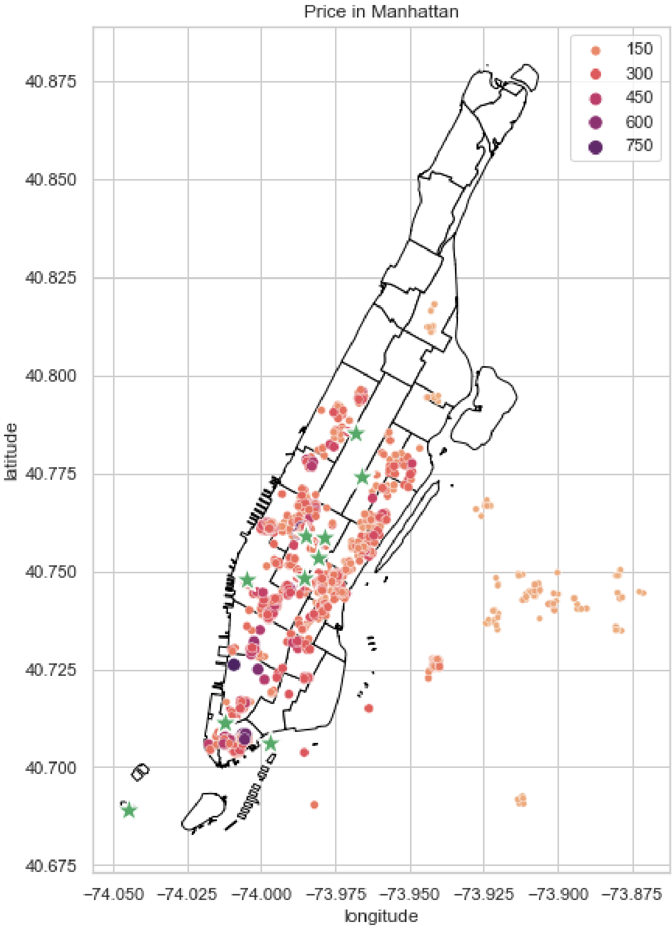
In [11]:
```
np.unique(host.calculated_host_listings_count)
```

Out[11]:
```
array([  1,   2,   3,   4,   5,   6,   7,   8,   9,  10,  11,  12,  13,
        14,  15,  16,  17,  18,  19,  20,  21,  23,  25,  26,  27,  28,
        29,  30,  31,  32,  33,  34,  37,  39,  43,  47,  49,  50,  52,
        65,  87,  91,  96, 103, 121, 232, 327])
```

In [12]:
```
# make a datast with latitude and longitutde of top tours
d = {'Name': ['Statue of Liberty','Empire State Building','Central Park','Time Square','Brooklyn Bri
              'Fifth Avenue', 'Rockefeller Center', 'Grand Central Terminal', 'High Line', 'September
     'Lat': [40.6892, 40.7484, 40.785091,40.758896, 40.7061,
              40.773998, 40.7587, 40.753479, 40.7480, 40.7115],
     'Long': [-74.0445, -73.9857, -73.968285, -73.985130, -73.9969,
               -73.966003, -73.9787, -73.980881, -74.0048, -74.0124]}
df_tour = pd.DataFrame(data=d)
```

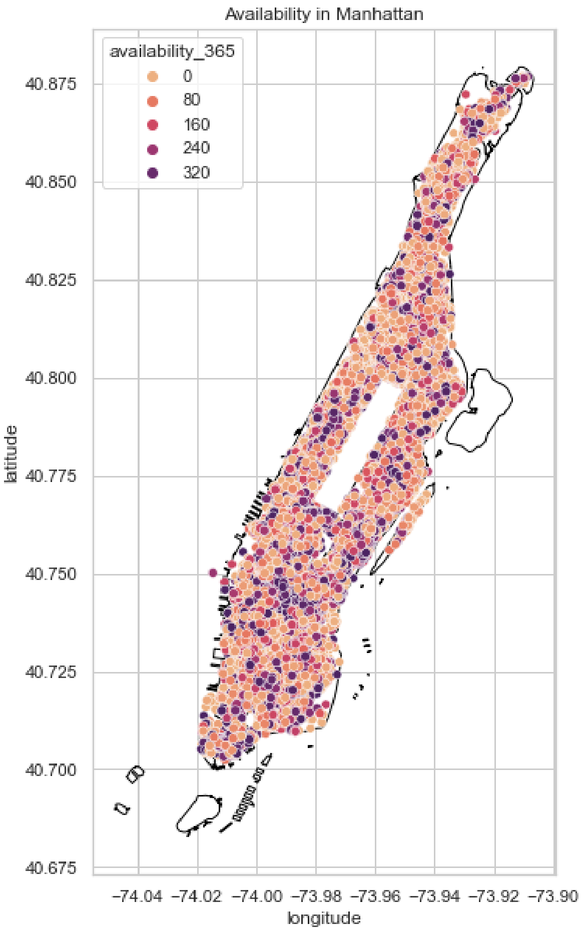
```
In [13]: a = gpd.read_file("nyc_neighborhoods.geojson")
         a = a[(a.boro_name == "Manhattan")]
         fig,ax = plt.subplots(1,1, figsize=(10,10))
         nyc_base = a.plot(color='w', edgecolor='black', ax=ax)

         total = host[(host.calculated_host_listings_count > 50)]
         g = sns.color_palette("flare", as_cmap=True)
         sns.scatterplot(ax = nyc_base, x='longitude', y='latitude', hue='price', size = 'price',
                         palette = g, data=total, alpha = 1).set(title = 'Price in Manhattan')
         sns.scatterplot(ax = nyc_base, x='Long', y='Lat', data=df_tour, marker = '*', s=300, color="g")
```

```
Out[13]: <AxesSubplot:title={'center':'Price in Manhattan'}, xlabel='longitude', ylabel='latitude'>
```



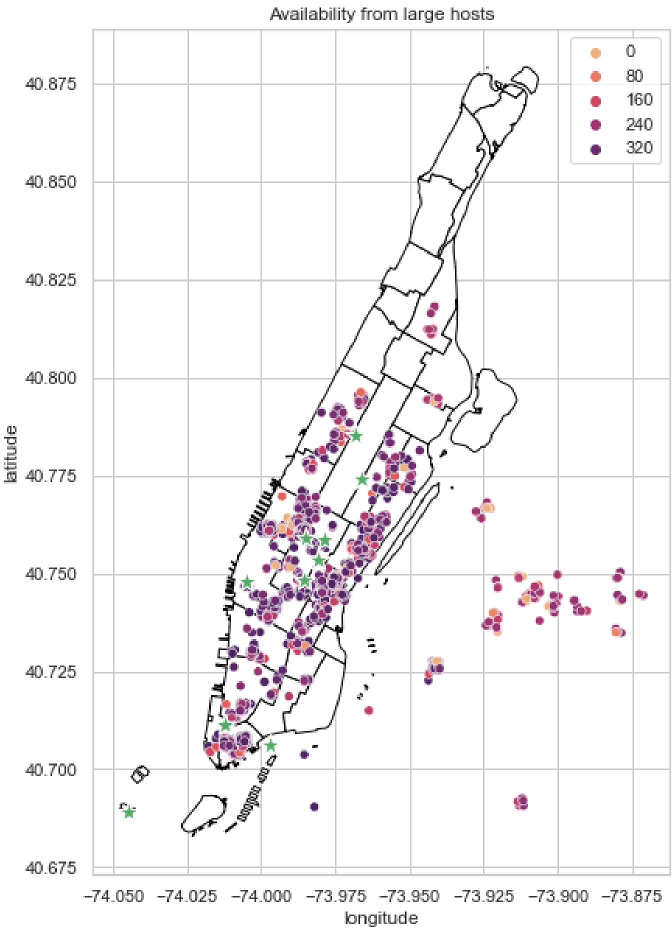
```
In [14]: a = gpd.read_file("nyc_neighborhoods.geojson")
         a = a[(a.boro_name == "Manhattan")]
         fig,ax = plt.subplots(1,1, figsize=(10,10))
         nyc_base = a.plot(color='w', edgecolor='black', ax=ax)

         df_man = df[df.neighbourhood_group == "Manhattan"]
         g = sns.color_palette("flare", as_cmap=True)
         sns.scatterplot(ax = nyc_base, x='longitude', y='latitude', hue='availability_365',
                         palette = g, data=df_man, alpha = 1).set(title = "Availability in Manhattan")
```

```
Out[14]: [Text(0.5, 1.0, 'Availability in Manhattan')]
```

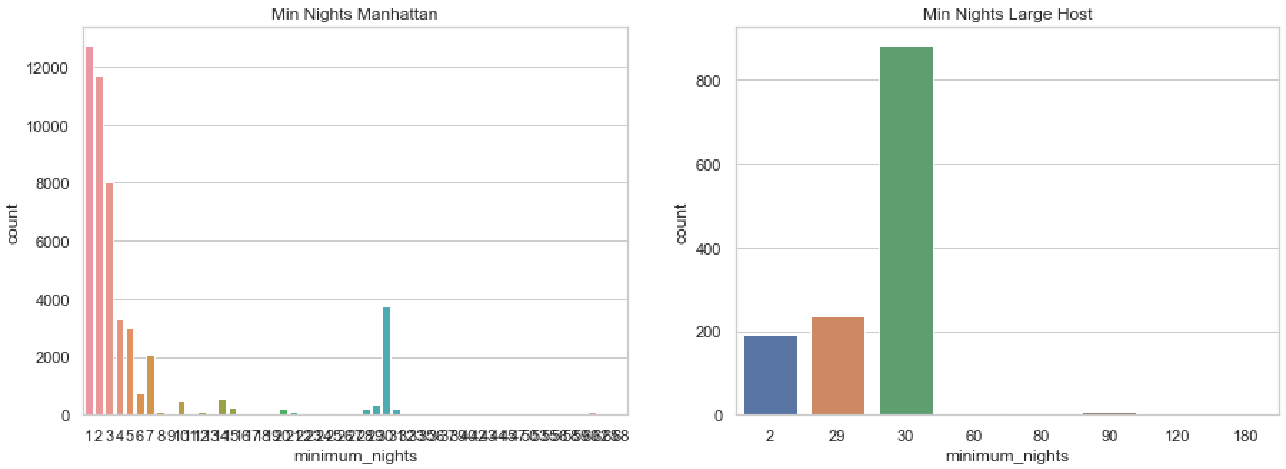


```
In [15]: a = gpd.read_file("nyc_neighborhoods.geojson")
         a = a[(a.boro_name == "Manhattan")]
         fig,ax = plt.subplots(1,1, figsize=(10,10))
         nyc_base = a.plot(color='w', edgecolor='black', ax=ax)

         total = df[(df.calculated_host_listings_count > 50)]
         g = sns.color_palette("flare", as_cmap=True)
         sns.scatterplot(ax = nyc_base, x='longitude', y='latitude', hue='availability_365',
                         palette = g, data=total, alpha = 1).set(title = "Availability from large hosts")
         sns.scatterplot(ax = nyc_base, x='Long', y='Lat', data=df_tour, marker = '*', s=200, color="g")
```

```
Out[15]: <AxesSubplot:title={'center':'Availability from large hosts'}, xlabel='longitude', ylabel='latitud
         e'>
```



In [16]:
```
# remove outlier of minimum_nights
df_man = df.dropna(subset = ['minimum_nights'])
filtered = (np.abs(stats.zscore(df_man.minimum_nights)) < 3)
df_man = df_man[filtered]

fig, (ax1, ax2) = plt.subplots(figsize=(15, 5), ncols=2)
sns.countplot(x="minimum_nights", data=df_man, ax = ax1).set(title = "Min Nights Manhattan")
sns.countplot(x="minimum_nights", data=total, ax = ax2).set(title = "Min Nights Large Host")
plt.show()
```



Analysis of the rent data

In [17]:
```
df_rent = pd.read_csv("medianAskingRent_All.csv")
```

In [18]:
```
sum19 = df_rent.iloc[:, 111:123]
sum20 = df_rent.iloc[:, 123:135]
df_rent['median19'] = sum19.median(axis = 1)
df_rent['median20'] = sum20.median(axis = 1)
```

In [19]:
```
price_median = pd.DataFrame(df.groupby('neighbourhood').median().price)
price_median = price_median.reset_index()
```

```
<ipython-input-19-c12a1da558aa>:1: FutureWarning: The default value of numeric_only in DataFrameGr
oupBy.median is deprecated. In a future version, numeric_only will default to False. Either specif
y numeric_only or select only columns which should be valid for the function.
  price_median = pd.DataFrame(df.groupby('neighbourhood').median().price)
```

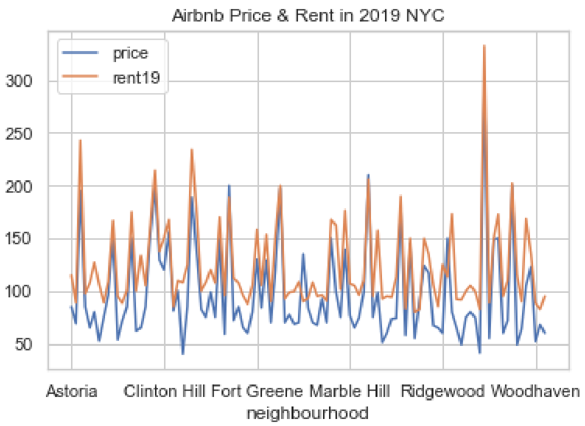
In [20]:
```
df_rent1 = df_rent.iloc[:,[0,138,139]]
df_rent1 = df_rent1.rename(columns={"areaName": "neighbourhood"})
```

In [21]:
```
price_median = price_median.merge(df_rent1, how='left', on='neighbourhood')
price_median1 = price_median.dropna(subset = ['median19','median20'])
price_median1['rent19'] = price_median1.median19 / 20
price_median1['rent20'] = price_median1.median20 / 20
```

```
<ipython-input-21-2bdf1d06b9d8>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/inde
xing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/
indexing.html#returning-a-view-versus-a-copy)
  price_median1['rent19'] = price_median1.median19 / 20
<ipython-input-21-2bdf1d06b9d8>:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/inde
xing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/
indexing.html#returning-a-view-versus-a-copy)
  price_median1['rent20'] = price_median1.median20 / 20
```

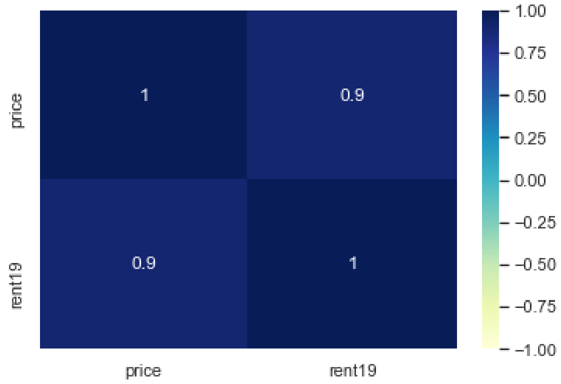
```
In [22]: price_median1.plot(x = "neighbourhood", y=["price", "rent19"]).set(title = "Airbnb Price & Rent in 2
```

```
Out[22]: [Text(0.5, 1.0, 'Airbnb Price & Rent in 2019 NYC')]
```



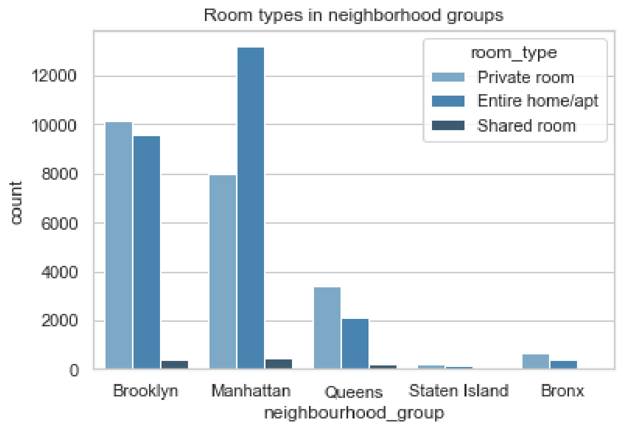
```
In [23]: price_median2 = price_median1[['price','rent19']]
         cor_mat = price_median2.corr()
         sns.heatmap(cor_mat,vmin = -1, vmax = 1, cmap="YlGnBu",annot=True)
```

```
Out[23]: <AxesSubplot:>
```



```
In [24]: sns.countplot(x="neighbourhood_group", hue = "room_type", data=df, palette="Blues_d").set(
             title = "Room types in neighborhood groups")
```

```
Out[24]: [Text(0.5, 1.0, 'Room types in neighborhood groups')]
```



```
In [25]: rents = pd.DataFrame(df_rent.groupby(['Borough']).median().median19).reset_index()
         rents
```

```
<ipython-input-25-45e8ef7beb63>:1: FutureWarning: The default value of numeric_only in DataFrameGr
oupBy.median is deprecated. In a future version, numeric_only will default to False. Either specif
y numeric_only or select only columns which should be valid for the function.
  rents = pd.DataFrame(df_rent.groupby(['Borough']).median().median19).reset_index()
```

Out[25]:

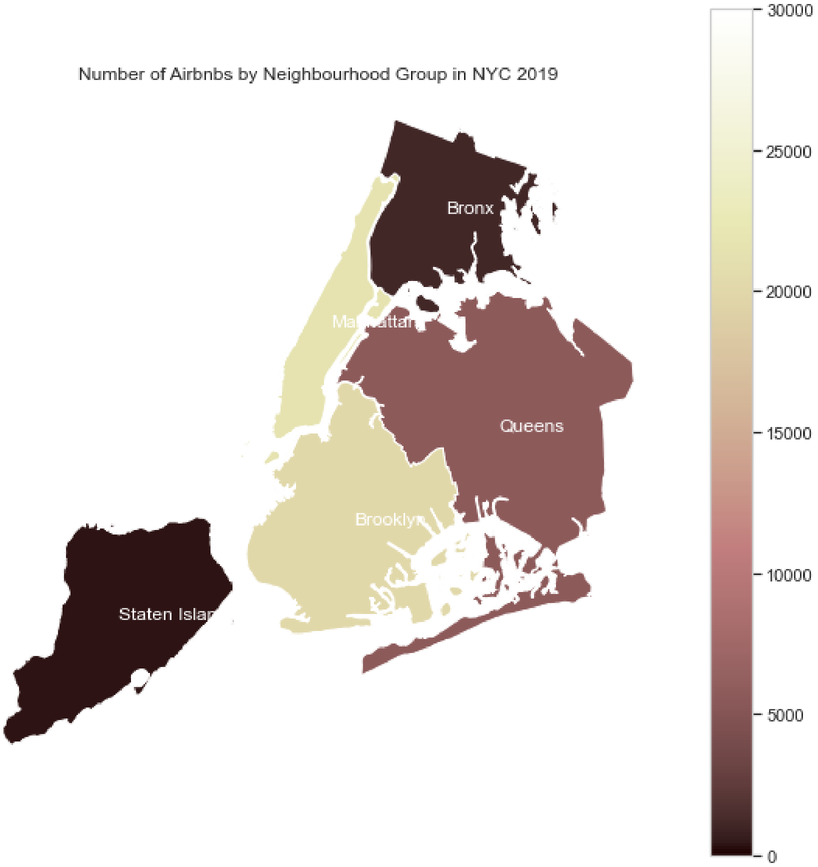
	Borough	median19
0	Bronx	1824.75
1	Brooklyn	2450.00
2	Manhattan	3500.00
3	Queens	1999.25
4	Staten Island	2022.50

```
In [26]: df = pd.read_csv('Airbnb_NYC_2019.csv')
         df21 = pd.read_csv('listings_Jan2021.csv')
```

In [27]:
```
###B: Analysis with Airbnb Data in January 2021
# Number of Airbnbs by Neighbourhood Group in NYC 2019
nyc_map = gpd.read_file(gpd.datasets.get_path('nybb'))
neighbourhood_group_count = df.groupby('neighbourhood_group').agg('count').reset_index()
neighbourhood_group_count = neighbourhood_group_count[["neighbourhood_group", "id"]]
nyc_map.rename(columns={'BoroName':'neighbourhood_group'}, inplace=True)
nyc_merged = nyc_map.merge(neighbourhood_group_count, on='neighbourhood_group')
fig,ax = plt.subplots(1,1, figsize=(10,10))
nyc_merged.plot(column='id',cmap='pink', vmin=0, vmax=30000, ax=ax, legend=True)

nyc_merged.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.centroi
plt.title("Number of Airbnbs by Neighbourhood Group in NYC 2019")
plt.axis('off')
```

```
<ipython-input-27-52b22fe80ebc>:11: MatplotlibDeprecationWarning: The 's' parameter of annotate()
has been renamed 'text' since Matplotlib 3.3; support for the old name will be dropped two minor r
eleases later.
  nyc_merged.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.cen
troid.coords[0]), axis=1)
```

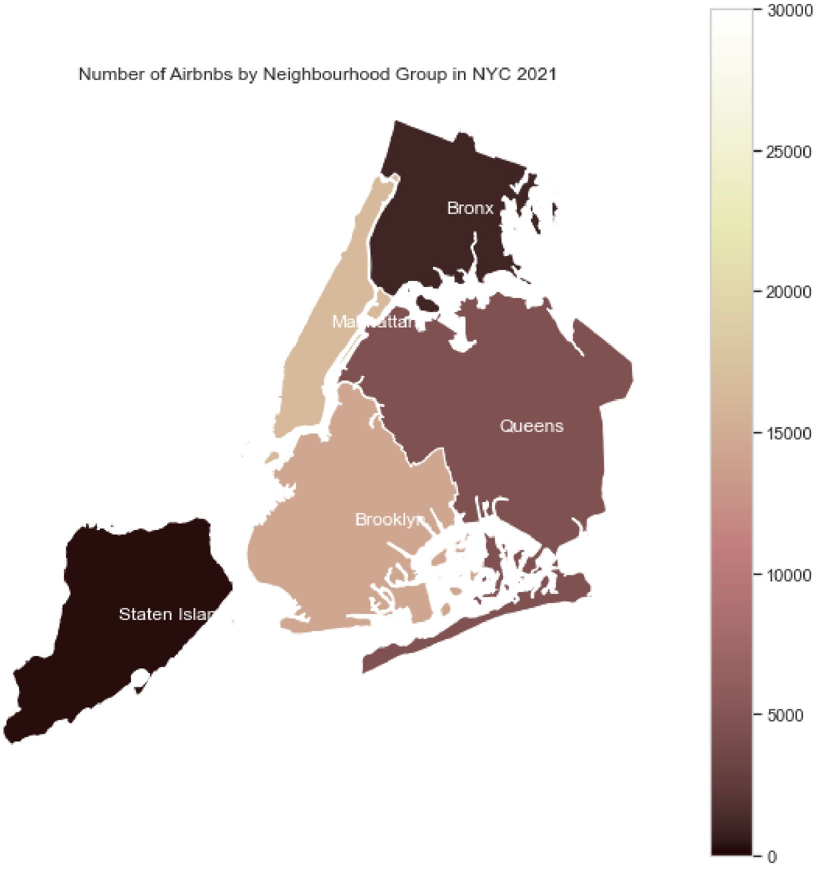
Out[27]:
```
(905464.7390380859, 1075092.8783935546, 112485.76063504723, 280480.4142594267)
```



In [28]:
```
# 2021
nyc_map = gpd.read_file(gpd.datasets.get_path('nybb'))
neighbourhood_group_count21 = df21.groupby('neighbourhood_group').agg('count').reset_index()
neighbourhood_group_count21 = neighbourhood_group_count21[["neighbourhood_group", "id"]]
nyc_map.rename(columns={'BoroName':'neighbourhood_group'}, inplace=True)
nyc_merged21 = nyc_map.merge(neighbourhood_group_count21, on='neighbourhood_group')
fig,ax = plt.subplots(1,1, figsize=(10,10))
nyc_merged21.plot(column='id',  cmap='pink',vmin=0, vmax=30000,ax=ax, legend=True)

nyc_merged21.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.centr
plt.title("Number of Airbnbs by Neighbourhood Group in NYC 2021")
plt.axis('off')
```

```
<ipython-input-28-501b2ebe3369>:10: MatplotlibDeprecationWarning: The 's' parameter of annotate()
has been renamed 'text' since Matplotlib 3.3; support for the old name will be dropped two minor r
eleases later.
  nyc_merged21.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.c
entroid.coords[0]), axis=1)
```

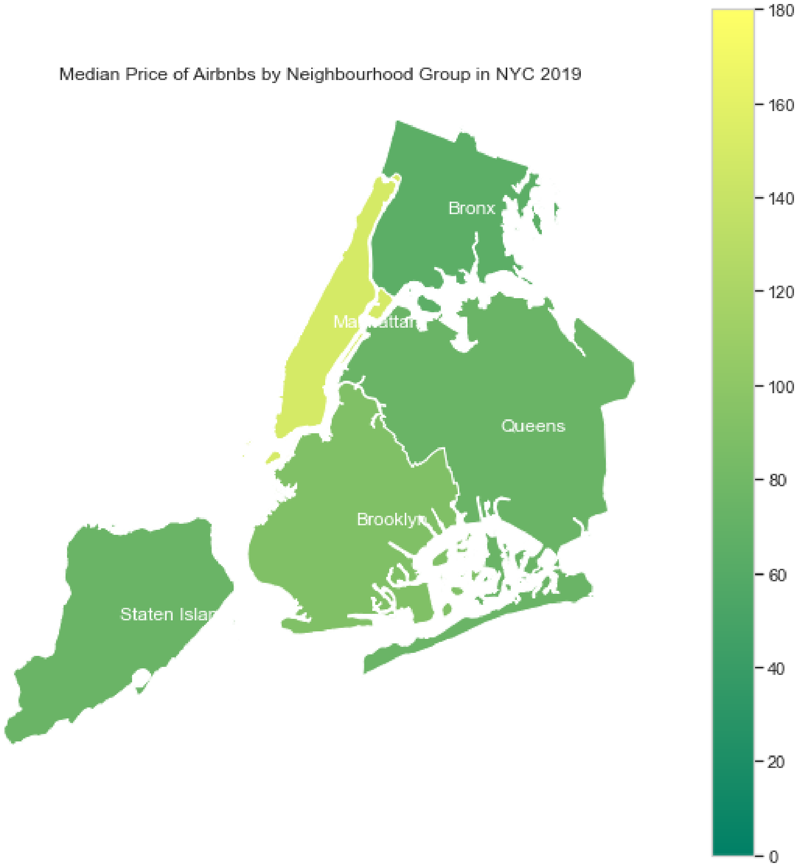
Out[28]:
```
(905464.7390380859, 1075092.8783935546, 112485.76063504723, 280480.4142594267)
```



In [29]:
```
# Median Price of Airbnbs by Neighbourhood Group in NYC 2019
neighbourhood_group_median = df.groupby('neighbourhood_group').agg({'price': 'median'}).reset_index(
nyc_map.rename(columns={'BoroName':'neighbourhood_group'}, inplace=True)
nyc_merged = nyc_map.merge(neighbourhood_group_median, on='neighbourhood_group')
fig,ax = plt.subplots(1,1, figsize=(10,10))
nyc_merged.plot(column='price',  cmap='summer',vmin=0, vmax=180, ax=ax, legend=True)

nyc_merged.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.centroi
plt.title("Median Price of Airbnbs by Neighbourhood Group in NYC 2019")
plt.axis('off')
```

```
<ipython-input-29-2839fee0f812>:8: MatplotlibDeprecationWarning: The 's' parameter of annotate() h
as been renamed 'text' since Matplotlib 3.3; support for the old name will be dropped two minor re
leases later.
  nyc_merged.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.cen
troid.coords[0]), axis=1)
```

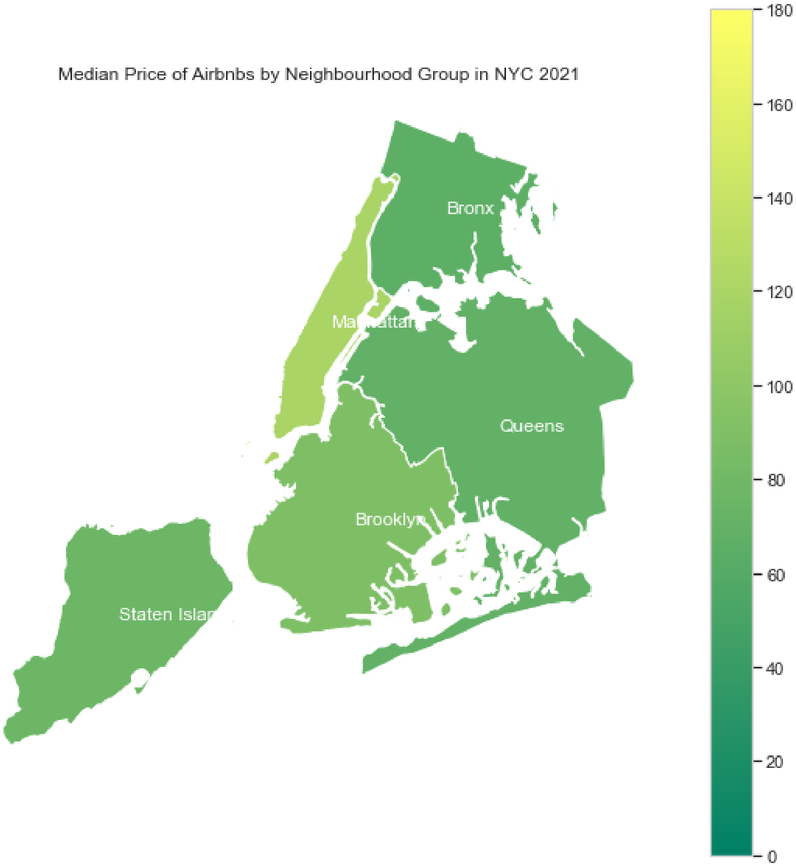
Out[29]:
```
(905464.7390380859, 1075092.8783935546, 112485.76063504723, 280480.4142594267)
```



In [30]:
```
)21
hbourhood_group_median21 = df21.groupby('neighbourhood_group').agg({'price': 'median'}).reset_index()
merged21 = nyc_map.merge(neighbourhood_group_median21, on='neighbourhood_group')
ax = plt.subplots(1,1, figsize=(10,10))
merged21.plot(column='price',  cmap='summer',vmin=0, vmax=180,ax=ax, legend=True)

merged21.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.centroid.c
title("Median Price of Airbnbs by Neighbourhood Group in NYC 2021")
axis('off')
```

```
<ipython-input-30-84d77a1d395d>:7: MatplotlibDeprecationWarning: The 's' parameter of annotate() h
as been renamed 'text' since Matplotlib 3.3; support for the old name will be dropped two minor re
leases later.
  nyc_merged21.apply(lambda x: ax.annotate(s=x.neighbourhood_group, color='white', xy=x.geometry.c
entroid.coords[0]), axis=1)
```

Out[30]:
```
(905464.7390380859, 1075092.8783935546, 112485.76063504723, 280480.4142594267)
```


Median Price of Airbnbs by Neighbourhood Group in NYC 2021

In [31]:

```
# for tables  to find the median and count
def find_price_combine(df, df21):
    price_21 = df21.groupby('neighbourhood_group').agg({'price': ['median', 'sum']})
    price_21.rename(columns = {"neighbourhood_group": "neighbourhood_group",
                           "price": "", "median": "median_2021", "sum": "sum_2021"}, inplace=Tru

    price_19 = df.groupby('neighbourhood_group').agg({'price': ['median', 'sum']})
    price_19.rename(columns = {"neighbourhood_group": "neighbourhood_group",
                           "price": "", "median": "median_2019", "sum": "sum_2019"}, inplace=Tru

    number_21 = df21.groupby('neighbourhood_group').agg("count").reset_index()
    number_21 = number_21[["neighbourhood_group", "id"]]
    number_21.rename(columns = {"id": "number_of_housing_2021"}, inplace=True)

    number_19 = df.groupby('neighbourhood_group').agg("count").reset_index()
    number_19 = number_19[["neighbourhood_group", "id"]]
    number_19.rename(columns = {"id": "number_of_housing_2019"}, inplace=True)

    price_combine = price_19.merge(price_21, on='neighbourhood_group')
    price_combine.columns = price_combine.columns.droplevel()
    price_combine = price_combine.merge(number_19, on='neighbourhood_group')
    price_combine = price_combine.merge(number_21, on='neighbourhood_group')
    return price_combine
```

In [32]:

```
# for tables to find the differene between 2021 and 2019
def find_price_different(price_combine):
    diff_combine = pd.DataFrame(data = price_combine.neighbourhood_group)
    diff_combine["median"] = price_combine.median_2021 - price_combine.median_2019
    diff_combine["total_price"] = price_combine.sum_2021 - price_combine.sum_2019
    diff_combine["total_price_percentage"] = diff_combine.total_price/price_combine.sum_2021
    diff_combine["number_of_housing"] = price_combine.number_of_housing_2021 - price_combine.number_
    diff_combine["number_of_housing_percentage"] = diff_combine.number_of_housing/price_combine.numbe
    diff_combine.loc['Average_of_all']= diff_combine.mean()
    return diff_combine
```

In [33]:

```
price_combine = find_price_combine(df, df21)
diff_combine = find_price_different(price_combine)
diff_combine
```

```
<ipython-input-32-96519e15be69>:9: FutureWarning: The default value of numeric_only in DataFrame.m
ean is deprecated. In a future version, it will default to False. In addition, specifying 'numeric
_only=None' is deprecated. Select only valid columns or specify the value of numeric_only to silen
ce this warning.
  diff_combine.loc['Average_of_all']= diff_combine.mean()
```

Out[33]:

	neighbourhood_group	median	total_price	total_price_percentage	number_of_housing	number_of_housing_percentage
0	Bronx	1.5	-3847.0	-0.041992	-119.0	-0.122428
1	Brooklyn	-1.0	-765185.0	-0.440923	-5500.0	-0.376609
2	Manhattan	-30.0	-1257087.0	-0.417992	-5061.0	-0.304880
3	Queens	-6.0	-92417.0	-0.196027	-990.0	-0.211719
4	Staten Island	1.0	-10888.0	-0.340921	-82.0	-0.281787
Average_of_all	NaN	-6.9	-425884.8	-0.287571	-2350.4	-0.259485

In [34]:

```
def remove_outliers_price(df):
    df_dp = df.dropna(subset = ['price'])
    # filter the outlier of price
    filtered1 = (np.abs(stats.zscore(df_dp.price)) < 3)
    # get the filtered data
    df_filter1 = df_dp[filtered1]

    return df_filter1

price_combine_no_outliers = find_price_combine(remove_outliers_price(df), remove_outliers_price(df21
diff_combine_no_outliers = find_price_different(price_combine_no_outliers)
diff_combine_no_outliers
```

```
<ipython-input-32-96519e15be69>:9: FutureWarning: The default value of numeric_only in DataFrame.m
ean is deprecated. In a future version, it will default to False. In addition, specifying 'numeric
_only=None' is deprecated. Select only valid columns or specify the value of numeric_only to silen
ce this warning.
  diff_combine.loc['Average_of_all']= diff_combine.mean()
```

Out[34]:

	neighbourhood_group	median	total_price	total_price_percentage	number_of_housing	number_of_housing_percentage
0	Bronx	1.0	-3751.0	-0.042524	-119.0	-0.122680
1	Brooklyn	-1.0	-713587.0	-0.440695	-5483.0	-0.377175
2	Manhattan	-29.0	-1217898.0	-0.483244	-5000.0	-0.305288
3	Queens	-6.0	-116792.0	-0.281494	-994.0	-0.213488
4	Staten Island	1.0	-4838.0	-0.157400	-80.0	-0.275862
Average_of_all	NaN	-6.8	-411373.2	-0.281072	-2335.2	-0.258899

In [35]:

```
# calculate the true revenue in NYC
true_diff = price_combine_no_outliers.sum_2021 * 0.55 - price_combine_no_outliers.sum_2019 * 0.7072
sum(true_diff)
```

Out[35]:

```
-2189263.1112
```