Importing Libraries

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

Loading the dataset

In [2]:

```
df=pd.read_csv(r'C:\Users\ritesh.g\Downloads\Hotel Booking Project\hotel_booking.csv',enc
```

Exploratory Data Analysis and Data Cleaning

In [3]:

```
df.head()
```

Out[3]:

	hotel	is_canceled	lead_time	arrival_date_year	arrival_date_month	arrival_date_week_nur
0	Resort Hotel	0	342	2015	July	
1	Resort Hotel	0	737	2015	July	
2	Resort Hotel	0	7	2015	July	
3	Resort Hotel	0	13	2015	July	
4	Resort Hotel	0	14	2015	July	

5 rows × 36 columns

In [4]:

```
df.tail()
```

Out[4]:

	hotel	is_canceled	lead_time	arrival_date_year	arrival_date_month	arrival_date_week
119385	City Hotel	0	23	2017	August	
119386	City Hotel	0	102	2017	August	
119387	City Hotel	0	34	2017	August	
119388	City Hotel	0	109	2017	August	
119389	City Hotel	0	205	2017	August	

5 rows × 36 columns

In [5]:

```
df.shape
```

Out[5]:

```
(119390, 36)
```

In [6]:

```
df.shape
```

Out[6]:

```
(119390, 36)
```

In [7]:

```
df.columns
```

Out[7]:

```
Index(['hotel', 'is_canceled', 'lead_time', 'arrival_date_year',
       'arrival_date_month', 'arrival_date_week_number',
       'arrival_date_day_of_month', 'stays_in_weekend_nights',
       'stays_in_week_nights', 'adults', 'children', 'babies', 'meal',
       'country', 'market_segment', 'distribution_channel',
       'is_repeated_guest', 'previous_cancellations',
       'previous_bookings_not_canceled', 'reserved_room_type',
       'assigned_room_type', 'booking_changes', 'deposit_type', 'agent',
       'company', 'days_in_waiting_list', 'customer_type', 'adr',
       'required_car_parking_spaces', 'total_of_special_requests',
       'reservation_status', 'reservation_status_date', 'name', 'email',
       'phone-number', 'credit_card'],
      dtype='object')
```

In [8]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119390 entries, 0 to 119389
Data columns (total 36 columns):
 #   Column                          Non-Null Count   Dtype  
---  ------                          --------------   -----  
 0   hotel                           119390 non-null  object 
 1   is_canceled                     119390 non-null  int64  
 2   lead_time                       119390 non-null  int64  
 3   arrival_date_year               119390 non-null  int64  
 4   arrival_date_month              119390 non-null  object 
 5   arrival_date_week_number        119390 non-null  int64  
 6   arrival_date_day_of_month       119390 non-null  int64  
 7   stays_in_weekend_nights         119390 non-null  int64  
 8   stays_in_week_nights            119390 non-null  int64  
 9   adults                          119390 non-null  int64  
 10  children                        119386 non-null  float64
 11  babies                          119390 non-null  int64  
 12  meal                            119390 non-null  object 
 13  country                         118902 non-null  object 
 14  market_segment                  119390 non-null  object 
 15  distribution_channel            119390 non-null  object 
 16  is_repeated_guest               119390 non-null  int64  
 17  previous_cancellations          119390 non-null  int64  
 18  previous_bookings_not_canceled  119390 non-null  int64  
 19  reserved_room_type              119390 non-null  object 
 20  assigned_room_type              119390 non-null  object 
 21  booking_changes                 119390 non-null  int64  
 22  deposit_type                    119390 non-null  object 
 23  agent                           103050 non-null  float64
 24  company                         6797 non-null    float64
 25  days_in_waiting_list            119390 non-null  int64  
 26  customer_type                   119390 non-null  object 
 27  adr                             119390 non-null  float64
 28  required_car_parking_spaces     119390 non-null  int64  
 29  total_of_special_requests       119390 non-null  int64  
 30  reservation_status              119390 non-null  object 
 31  reservation_status_date         119390 non-null  object 
 32  name                            119390 non-null  object 
 33  email                           119390 non-null  object 
 34  phone-number                    119390 non-null  object 
 35  credit_card                     119390 non-null  object 
dtypes: float64(4), int64(16), object(16)
memory usage: 32.8+ MB
```

In [9]:

```
df['reservation_status_date']= pd.to_datetime(df['reservation_status_date']) # Convering
```

In [10]:

```
df.info()#checking whether it is done or not
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119390 entries, 0 to 119389
Data columns (total 36 columns):
 #   Column                          Non-Null Count   Dtype         
---  ------                          --------------   -----         
 0   hotel                           119390 non-null  object        
 1   is_canceled                     119390 non-null  int64         
 2   lead_time                       119390 non-null  int64         
 3   arrival_date_year               119390 non-null  int64         
 4   arrival_date_month              119390 non-null  object        
 5   arrival_date_week_number        119390 non-null  int64         
 6   arrival_date_day_of_month       119390 non-null  int64         
 7   stays_in_weekend_nights         119390 non-null  int64         
 8   stays_in_week_nights            119390 non-null  int64         
 9   adults                          119390 non-null  int64         
 10  children                        119386 non-null  float64       
 11  babies                          119390 non-null  int64         
 12  meal                            119390 non-null  object        
 13  country                         118902 non-null  object        
 14  market_segment                  119390 non-null  object        
 15  distribution_channel            119390 non-null  object        
 16  is_repeated_guest               119390 non-null  int64         
 17  previous_cancellations          119390 non-null  int64         
 18  previous_bookings_not_canceled  119390 non-null  int64         
 19  reserved_room_type              119390 non-null  object        
 20  assigned_room_type              119390 non-null  object        
 21  booking_changes                 119390 non-null  int64         
 22  deposit_type                    119390 non-null  object        
 23  agent                           103050 non-null  float64       
 24  company                         6797 non-null    float64       
 25  days_in_waiting_list            119390 non-null  int64         
 26  customer_type                   119390 non-null  object        
 27  adr                             119390 non-null  float64       
 28  required_car_parking_spaces     119390 non-null  int64         
 29  total_of_special_requests       119390 non-null  int64         
 30  reservation_status              119390 non-null  object        
 31  reservation_status_date         119390 non-null  datetime64[ns]
 32  name                            119390 non-null  object        
 33  email                           119390 non-null  object        
 34  phone-number                    119390 non-null  object        
 35  credit_card                     119390 non-null  object        
dtypes: datetime64[ns](1), float64(4), int64(16), object(15)
memory usage: 32.8+ MB
```

In [11]:

```
df.describe()# shows all details- numerical columns
```

Out[11]:

	is_canceled	lead_time	arrival_date_year	arrival_date_week_number	arrival_dat
count	119390.000000	119390.000000	119390.000000	119390.000000	
mean	0.370416	104.011416	2016.156554	27.165173	
std	0.482918	106.863097	0.707476	13.605138	
min	0.000000	0.000000	2015.000000	1.000000	
25%	0.000000	18.000000	2016.000000	16.000000	
50%	0.000000	69.000000	2016.000000	28.000000	
75%	1.000000	160.000000	2017.000000	38.000000	
max	1.000000	737.000000	2017.000000	53.000000	

In [12]:

```
df.describe(include='object')
```

Out[12]:

	hotel	arrival_date_month	meal	country	market_segment	distribution_channel	r
count	119390	119390	119390	118902	119390	119390	
unique	2	12	5	177	8	5	
top	City Hotel	August	BB	PRT	Online TA	TA/TO	
freq	79330	13877	92310	48590	56477	97870	

In [13]:

```
for col in df.describe(include='object').columns:
    print(col)
    print(df[col].unique())
    print('-'*50)
```

```
hotel
['Resort Hotel' 'City Hotel']
--------------------------------------------------
arrival_date_month
['July' 'August' 'September' 'October' 'November' 'December' 'January'
 'February' 'March' 'April' 'May' 'June']
--------------------------------------------------
meal
['BB' 'FB' 'HB' 'SC' 'Undefined']
--------------------------------------------------
country
['PRT' 'GBR' 'USA' 'ESP' 'IRL' 'FRA' nan 'ROU' 'NOR' 'OMN' 'ARG' 'POL'
 'DEU' 'BEL' 'CHE' 'CN' 'GRC' 'ITA' 'NLD' 'DNK' 'RUS' 'SWE' 'AUS' 'EST'
 'CZE' 'BRA' 'FIN' 'MOZ' 'BWA' 'LUX' 'SVN' 'ALB' 'IND' 'CHN' 'MEX' 'MAR'
 'UKR' 'SMR' 'LVA' 'PRI' 'SRB' 'CHL' 'AUT' 'BLR' 'LTU' 'TUR' 'ZAF' 'AGO'
 'ISR' 'CYM' 'ZMB' 'CPV' 'ZWE' 'DZA' 'KOR' 'CRI' 'HUN' 'ARE' 'TUN' 'JAM'
 'HRV' 'HKG' 'IRN' 'GEO' 'AND' 'GIB' 'URY' 'JEY' 'CAF' 'CYP' 'COL' 'GGY'
 'KWT' 'NGA' 'MDV' 'VEN' 'SVK' 'FJI' 'KAZ' 'PAK' 'IDN' 'LBN' 'PHL' 'SEN'
 'SYC' 'AZE' 'BHR' 'NZL' 'THA' 'DOM' 'MKD' 'MYS' 'ARM' 'JPN' 'LKA' 'CUB'
 'CMR' 'BIH' 'MUS' 'COM' 'SUR' 'UGA' 'BGR' 'CIV' 'JOR' 'SYR' 'SGP' 'BDI'
 'SAU' 'VNM' 'PLW' 'QAT' 'EGY' 'PER' 'MLT' 'MWI' 'ECU' 'MDG' 'ISL' 'UZB'
 'NPL' 'BHS' 'MAC' 'TGO' 'TWN' 'DJI' 'STP' 'KNA' 'ETH' 'IRQ' 'HND' 'RWA'
 'KHM' 'MCO' 'BGD' 'IMN' 'TJK' 'NIC' 'BEN' 'VGB' 'TZA' 'GAB' 'GHA' 'TMP'
 'GLP' 'KEN' 'LIE' 'GNB' 'MNE' 'UMI' 'MYT' 'FRO' 'MMR' 'PAN' 'BFA' 'LBY'
 'MLI' 'NAM' 'BOL' 'PRY' 'BRB' 'ABW' 'AIA' 'SLV' 'DMA' 'PYF' 'GUY' 'LCA'
 'ATA' 'GTM' 'ASM' 'MRT' 'NCL' 'KIR' 'SDN' 'ATF' 'SLE' 'LAO']
--------------------------------------------------
market_segment
['Direct' 'Corporate' 'Online TA' 'Offline TA/TO' 'Complementary' 'Groups'
 'Undefined' 'Aviation']
--------------------------------------------------
distribution_channel
['Direct' 'Corporate' 'TA/TO' 'Undefined' 'GDS']
--------------------------------------------------
reserved_room_type
['C' 'A' 'D' 'E' 'G' 'F' 'H' 'L' 'P' 'B']
--------------------------------------------------
assigned_room_type
['C' 'A' 'D' 'E' 'G' 'F' 'I' 'B' 'H' 'P' 'L' 'K']
--------------------------------------------------
deposit_type
['No Deposit' 'Refundable' 'Non Refund']
--------------------------------------------------
customer_type
['Transient' 'Contract' 'Transient-Party' 'Group']
--------------------------------------------------
reservation_status
['Check-Out' 'Canceled' 'No-Show']
--------------------------------------------------
name
['Ernest Barnes' 'Andrea Baker' 'Rebecca Parker' ... 'Wesley Aguilar'
 'Caroline Conley MD' 'Ariana Michael']
--------------------------------------------------
email
['Ernest.Barnes31@outlook.com' 'Andrea_Baker94@aol.com'
 'Rebecca_Parker@comcast.net' ... 'Mary_Morales@hotmail.com'
 'MD_Caroline@comcast.net' 'Ariana_M@xfinity.com']
--------------------------------------------------
phone-number
['669-792-1661' '858-637-6955' '652-885-2745' ... '395-518-4100'
 '531-528-1017' '422-804-6403']
```

```
--------------------------------------------------
credit_card
['************4322' '************9157' '************3734' ...
 '************9170' '************6349' '************7959']
--------------------------------------------------
```

In [14]:

```
df.isnull().sum()
```

Out[14]:

```
hotel                               0
is_canceled                         0
lead_time                           0
arrival_date_year                   0
arrival_date_month                  0
arrival_date_week_number            0
arrival_date_day_of_month           0
stays_in_weekend_nights             0
stays_in_week_nights                0
adults                              0
children                            4
babies                              0
meal                                0
country                           488
market_segment                      0
distribution_channel                0
is_repeated_guest                   0
previous_cancellations              0
previous_bookings_not_canceled      0
reserved_room_type                  0
assigned_room_type                  0
booking_changes                     0
deposit_type                        0
agent                           16340
company                        112593
days_in_waiting_list                0
customer_type                       0
adr                                 0
required_car_parking_spaces         0
total_of_special_requests           0
reservation_status                  0
reservation_status_date             0
name                                0
email                               0
phone-number                        0
credit_card                         0
dtype: int64
```

In [15]:

```
df.drop(['company','agent'],axis=1,inplace=True)#delete columns
df.dropna(inplace=True)# delete rows
```

In [16]:

```
df.describe()
```

Out[16]:

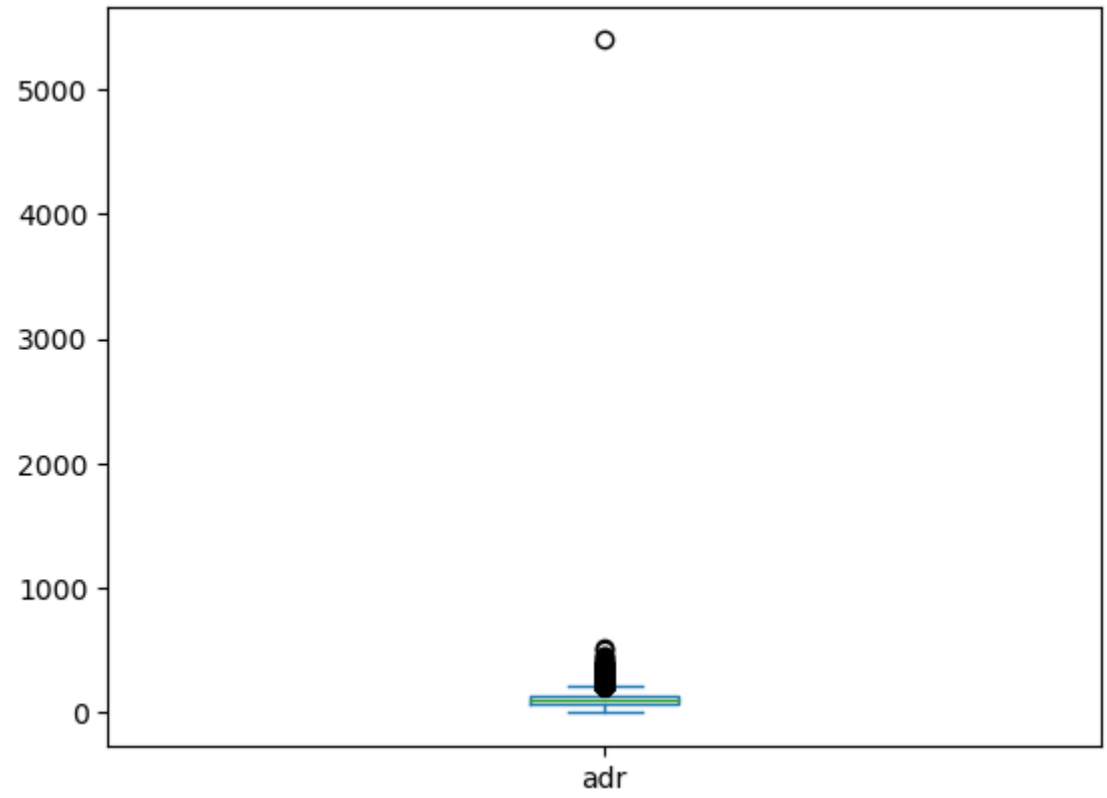
	is_canceled	lead_time	arrival_date_year	arrival_date_week_number	arrival_dat
count	118898.000000	118898.000000	118898.000000	118898.000000	
mean	0.371352	104.311435	2016.157656	27.166555	
std	0.483168	106.903309	0.707459	13.589971	
min	0.000000	0.000000	2015.000000	1.000000	
25%	0.000000	18.000000	2016.000000	16.000000	
50%	0.000000	69.000000	2016.000000	28.000000	
75%	1.000000	161.000000	2017.000000	38.000000	
max	1.000000	737.000000	2017.000000	53.000000	

In [17]:

```
df['adr'].plot(kind='box') # checking outlyers 5400 only one value is there
```

Out[17]:

```
<AxesSubplot:>
```



In [18]:

```
df= df[df['adr']<5000]
```

In [19]:

```
df.describe()
```

Out[19]:

	is_canceled	lead_time	arrival_date_year	arrival_date_week_number	arrival_dat
count	118897.000000	118897.000000	118897.000000	118897.000000	
mean	0.371347	104.312018	2016.157657	27.166674	
std	0.483167	106.903570	0.707462	13.589966	
min	0.000000	0.000000	2015.000000	1.000000	
25%	0.000000	18.000000	2016.000000	16.000000	
50%	0.000000	69.000000	2016.000000	28.000000	
75%	1.000000	161.000000	2017.000000	38.000000	
max	1.000000	737.000000	2017.000000	53.000000	

Data Analysis and visulizations

In [22]:

```
cancelled_perc=df['is_canceled'].value_counts(normalize=True)
cancelled_perc
```

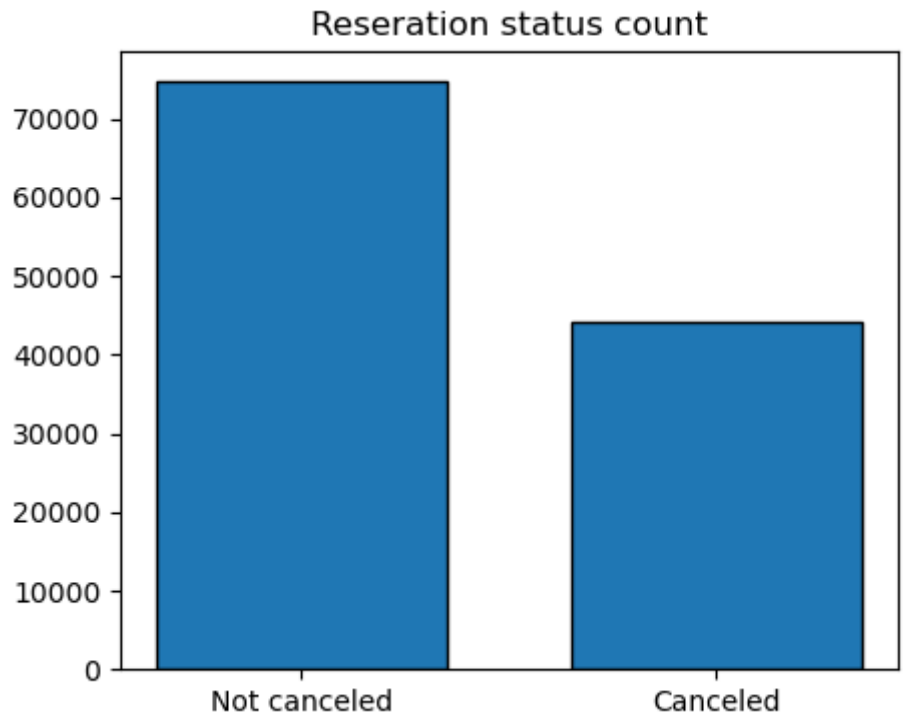
Out[22]:

```
0    0.628653
1    0.371347
Name: is_canceled, dtype: float64
```

In [32]:

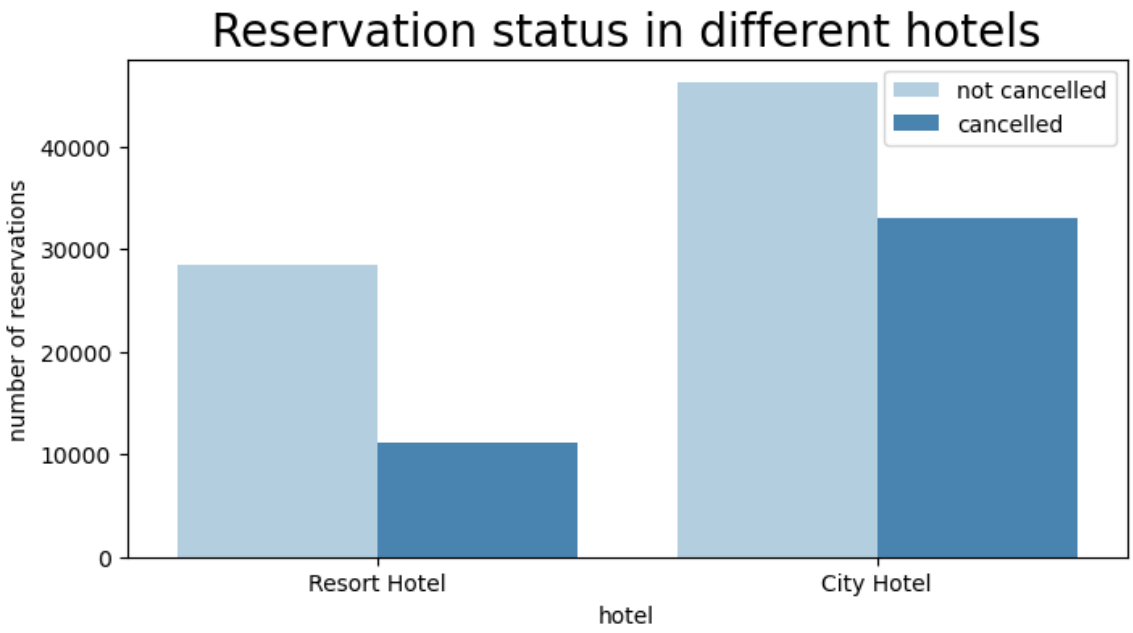
```
#1. Percentage of Cancellation

cancelled_perc=df['is_canceled'].value_counts(normalize=True)
print(cancelled_perc)

plt.figure(figsize=(5,4))
plt.title('Reseration status count')
plt.bar(['Not canceled','Canceled'],df['is_canceled'].value_counts(),edgecolor ='k', widt
plt.show()
```

```
0    0.628653
1    0.371347
Name: is_canceled, dtype: float64
```



In [45]:

```
#2. Identify in which hotel cancellation is happening
plt.figure(figsize=(8,4))
ax1=sns.countplot(x='hotel',hue='is_canceled',data=df, palette='Blues')
legend_labels,_=ax1.get_legend_handles_labels()
ax1.legend(bbox_to_anchor=(1,1))
plt.title('Reservation status in different hotels',size=20)
plt.xlabel('hotel')
plt.ylabel('number of reservations')
plt.legend(['not cancelled','cancelled'])
plt.show()
```



In [37]:

```
# 3 Percentage of cancellation in both hotels

resort_hotel=df[df['hotel']=='Resort Hotel']
resort_hotel['is_canceled'].value_counts(normalize=True)
```

Out[37]:

```
0    0.72025
1    0.27975
Name: is_canceled, dtype: float64
```

In [39]:

```
#3  Percentage of cancellation in both hotels

city_hotel=df[df['hotel']=='City Hotel']
city_hotel['is_canceled'].value_counts(normalize=True)
```

Out[39]:

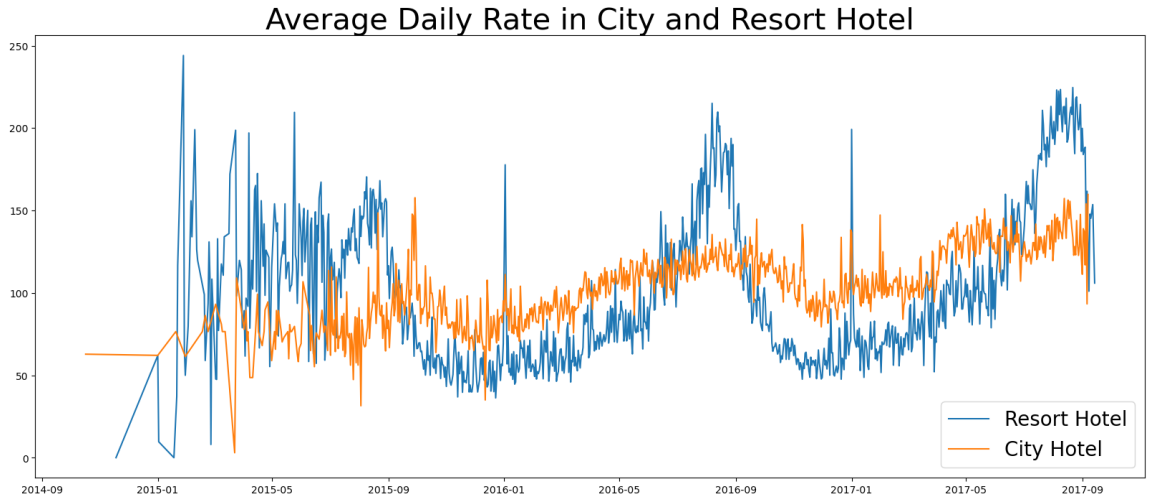
```
0    0.582918
1    0.417082
Name: is_canceled, dtype: float64
```

In [40]:

```
# 4 Visualising avearge daily rate (ADR)
resort_hotel = resort_hotel.groupby('reservation_status_date')[['adr']].mean()
city_hotel = city_hotel.groupby('reservation_status_date')[['adr']].mean()
```

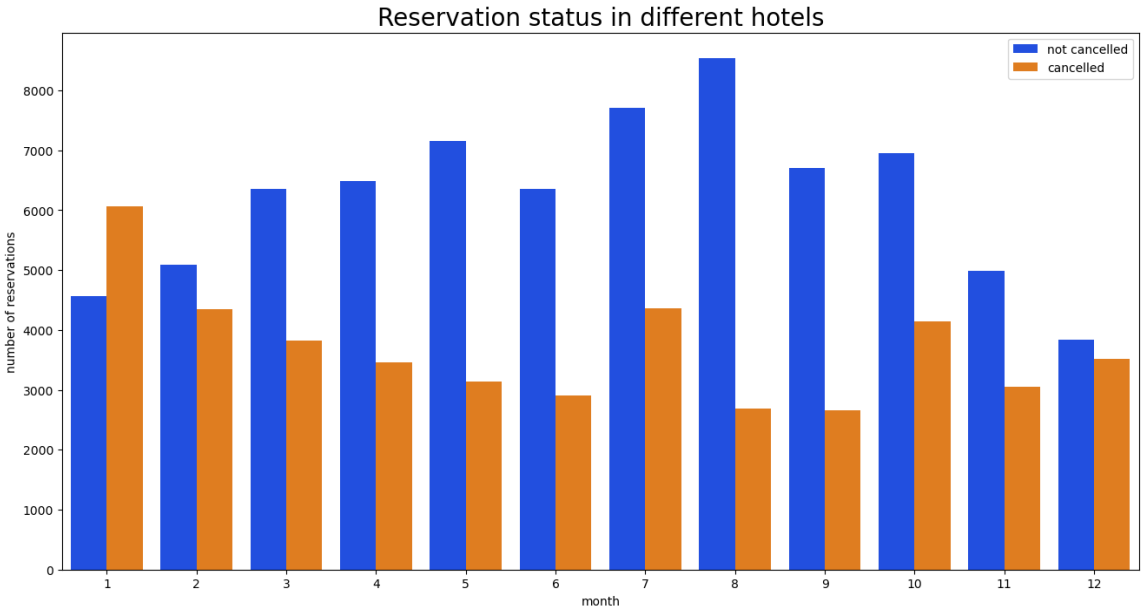
In [41]:

```
# 5 checking price of City hotel and Resort Hotel
plt.figure(figsize=(20,8))
plt.title('Average Daily Rate in City and Resort Hotel',fontsize=30)
plt.plot(resort_hotel.index,resort_hotel['adr'],label='Resort Hotel')
plt.plot(city_hotel.index,city_hotel['adr'],label='City Hotel')
plt.legend(fontsize=20)
plt.show()
```



In [50]:

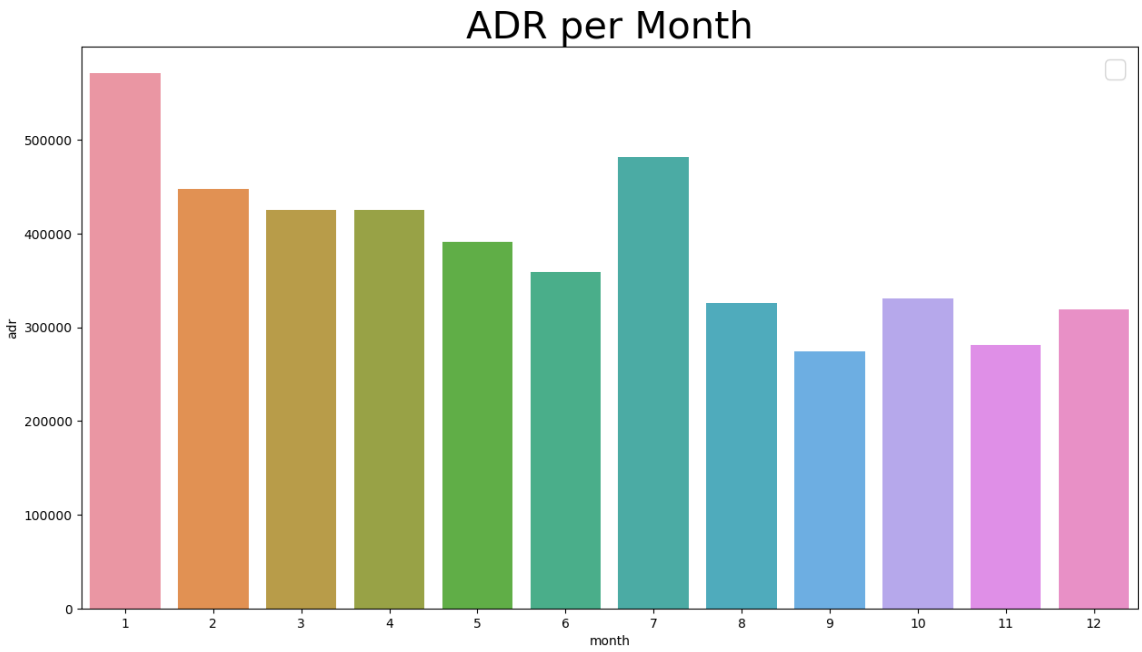
```
# 6. Reservation status (cancelled and not cancelled) month wise
df['month']=df['reservation_status_date'].dt.month
plt.figure(figsize=(16,8))
ax1=sns.countplot(x='month',hue='is_canceled',data=df,palette='bright')
legend_labels,_=ax1.get_legend_handles_labels()
ax1.legend(bbox_to_anchor=(1,1))
plt.title('Reservation status in different hotels',size=20)
plt.xlabel('month')
plt.ylabel('number of reservations')
plt.legend(['not cancelled','cancelled'])
plt.show()
```



In [51]:

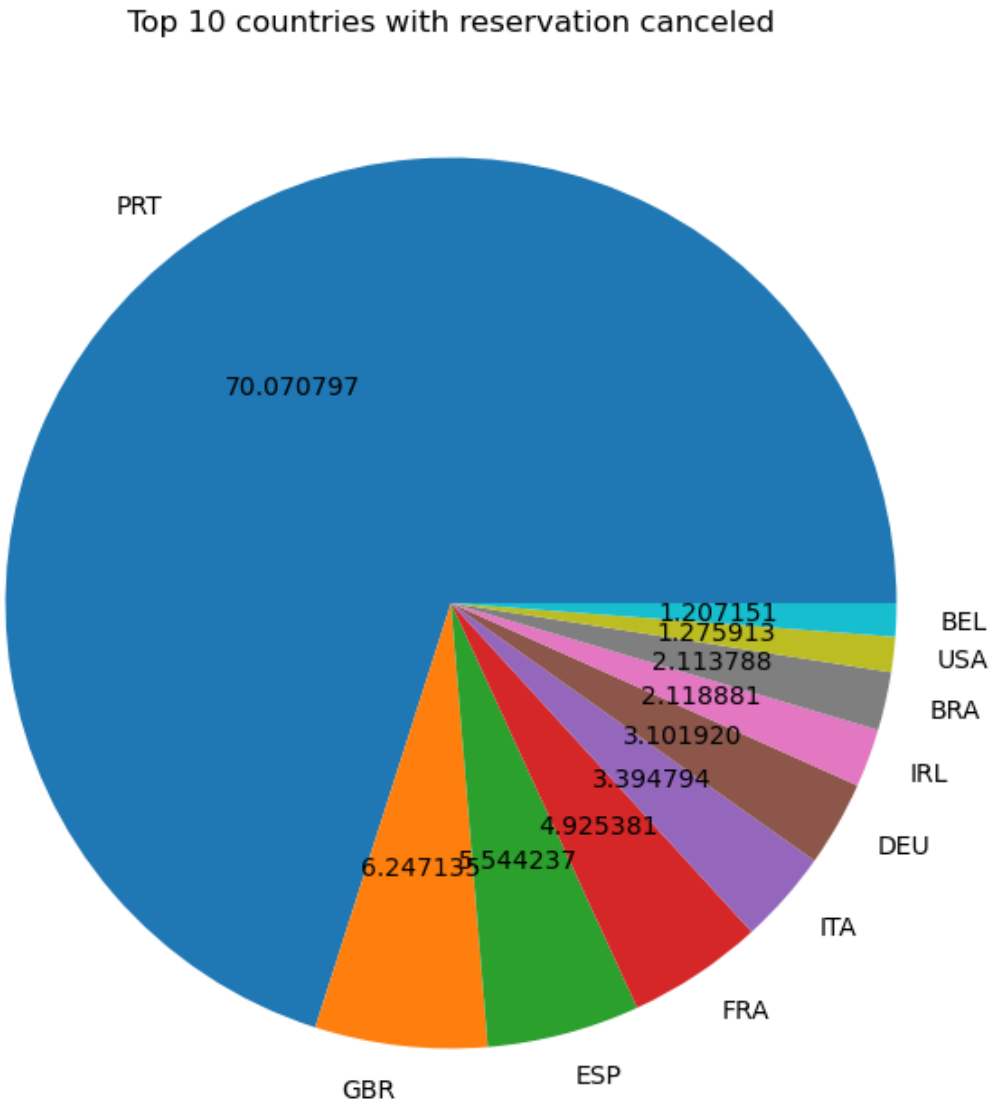
```
# 7 Plot the avrage daily rate for each month
plt.figure(figsize=(15,8))
plt.title('ADR per Month',fontsize=30)
sns.barplot('month','adr',data=df[df['is_canceled']==1].groupby('month')[['adr']].sum().r
plt.legend(fontsize=20)
plt.show()
```

```
No artists with labels found to put in legend.  Note that artists whose la
bel start with an underscore are ignored when legend() is called with no a
rgument.
```



In [57]:

```
# 8. Country Basis Cancellation Rates
cancelled_data=df[df['is_canceled']==1]
top_10_country=cancelled_data['country'].value_counts()[:10]
plt.figure(figsize=(8,8))
plt.title('Top 10 countries with reservation canceled')
plt.pie(top_10_country,autopct='%2f',labels=top_10_country.index)
plt.show()
```



In [58]:

```
# 9. See the clients from where online or offline- market segments

df['market_segment'].value_counts()
```

Out[58]:

```
Online TA        56402
Offline TA/TO    24159
Groups           19806
Direct           12448
Corporate         5111
Complementary      734
Aviation           237
Name: market_segment, dtype: int64
```

In [59]:

```
df['market_segment'].value_counts(normalize=True) # Percentage checking datas- online res
```

Out[59]:

```
Online TA        0.474377
Offline TA/TO    0.203193
Groups           0.166581
Direct           0.104696
Corporate        0.042987
Complementary    0.006173
Aviation         0.001993
Name: market_segment, dtype: float64
```

In [60]:

```
cancelled_data['market_segment'].value_counts(normalize=True)# Cancellation is more in or
```

Out[60]:

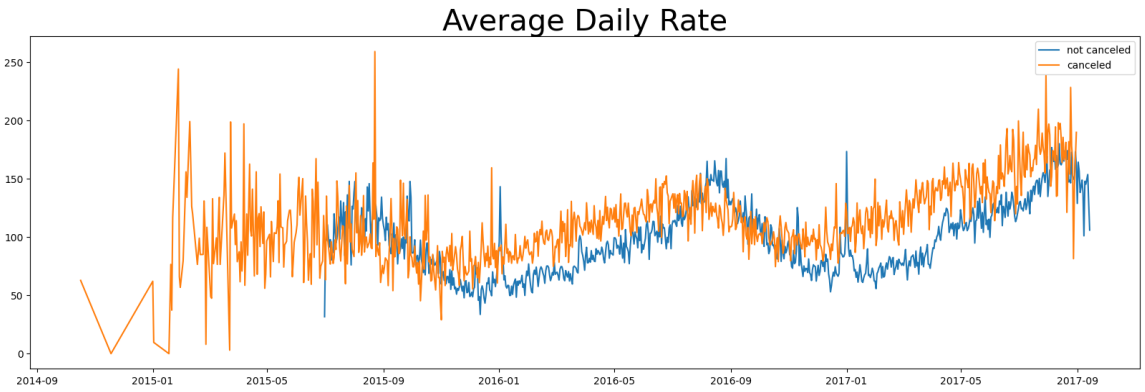
```
Online TA        0.469696
Groups           0.273985
Offline TA/TO    0.187466
Direct           0.043486
Corporate        0.022151
Complementary    0.002038
Aviation         0.001178
Name: market_segment, dtype: float64
```

In [63]:

```
cancelled_df_adr=cancelled_data.groupby('reservation_status_date')[['adr']].mean()
cancelled_df_adr.reset_index(inplace=True)
cancelled_df_adr.sort_values('reservation_status_date',inplace=True)

not_cancelled_data=df[df['is_canceled']==0]

not_cancelled_df_adr=not_cancelled_data.groupby('reservation_status_date')[['adr']].mean(
not_cancelled_df_adr.reset_index(inplace=True)
not_cancelled_df_adr.sort_values('reservation_status_date',inplace=True)

plt.figure(figsize=(20,6))
plt.title('Average Daily Rate',fontsize=30)
plt.plot(not_cancelled_df_adr['reservation_status_date'],not_cancelled_df_adr['adr'],labe
plt.plot(cancelled_df_adr['reservation_status_date'],cancelled_df_adr['adr'],label='cance
plt.legend()
```

Out[63]:

```
<matplotlib.legend.Legend at 0x2bde3beabe0>
```



In [ ]:

```
```