#Impoting libraries/

In [1]:

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

#loading the data set

In [5]:

```
df=pd.read_csv('hotel_bookings 2.csv')
```

#exploratory data analysis and data cleaning

In [6]:

```
df.head()
```

Out[6]:

	hotel	is_canceled	lead_time	arrival_date_year	arrival_date_month	arrival_date_week_number	arriva
0	Resort Hotel	0	342	2015	July	27	
1	Resort Hotel	0	737	2015	July	27	
2	Resort Hotel	0	7	2015	July	27	
3	Resort Hotel	0	13	2015	July	27	
4	Resort Hotel	0	14	2015	July	27	

5 rows × 32 columns

In [7]:

```
df.tail(10)
```

Out[7]:

	hotel	is_canceled	lead_time	arrival_date_year	arrival_date_month	arrival_date_week_number
119380	City Hotel	0	44	2017	August	35
119381	City Hotel	0	188	2017	August	35
119382	City Hotel	0	135	2017	August	35
119383	City Hotel	0	164	2017	August	35
119384	City Hotel	0	21	2017	August	35
119385	City Hotel	0	23	2017	August	35
119386	City Hotel	0	102	2017	August	35
119387	City Hotel	0	34	2017	August	35
119388	City Hotel	0	109	2017	August	35
119389	City Hotel	0	205	2017	August	35

10 rows × 32 columns

In [8]:

```
df.shape
```

Out[8]:

```
(119390, 32)
```

In [9]:

```
df.columns
```

Out[9]:

```
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'],
      dtype='object')
```

In [10]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119390 entries, 0 to 119389
Data columns (total 32 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 
dtypes: float64(4), int64(16), object(12)
memory usage: 29.1+ MB
```

In [11]:

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

In [12]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119390 entries, 0 to 119389
Data columns (total 32 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]
dtypes: datetime64[ns](1), float64(4), int64(16), object(11)
memory usage: 29.1+ MB
```

In [13]:

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

Out[13]:

	hotel	arrival_date_month	meal	country	market_segment	distribution_channel	reserved_ro
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 [14]:

```
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']
--------------------------------------------------
```

In [15]:

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

Out[15]:

```
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
dtype: int64
```

In [16]:

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

In [17]:

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

Out[17]:

```
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                          0
babies                            0
meal                              0
country                           0
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
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
dtype: int64
```

In [18]:

```
df.describe()
```

Out[18]:

	is_canceled	lead_time	arrival_date_year	arrival_date_week_number	arrival_date_day_of_m
count	118898.000000	118898.000000	118898.000000	118898.000000	118898.00
mean	0.371352	104.311435	2016.157656	27.166555	15.80
std	0.483168	106.903309	0.707459	13.589971	8.78
min	0.000000	0.000000	2015.000000	1.000000	1.00
25%	0.000000	18.000000	2016.000000	16.000000	8.00
50%	0.000000	69.000000	2016.000000	28.000000	16.00
75%	1.000000	161.000000	2017.000000	38.000000	23.00
max	1.000000	737.000000	2017.000000	53.000000	31.00

In [19]:

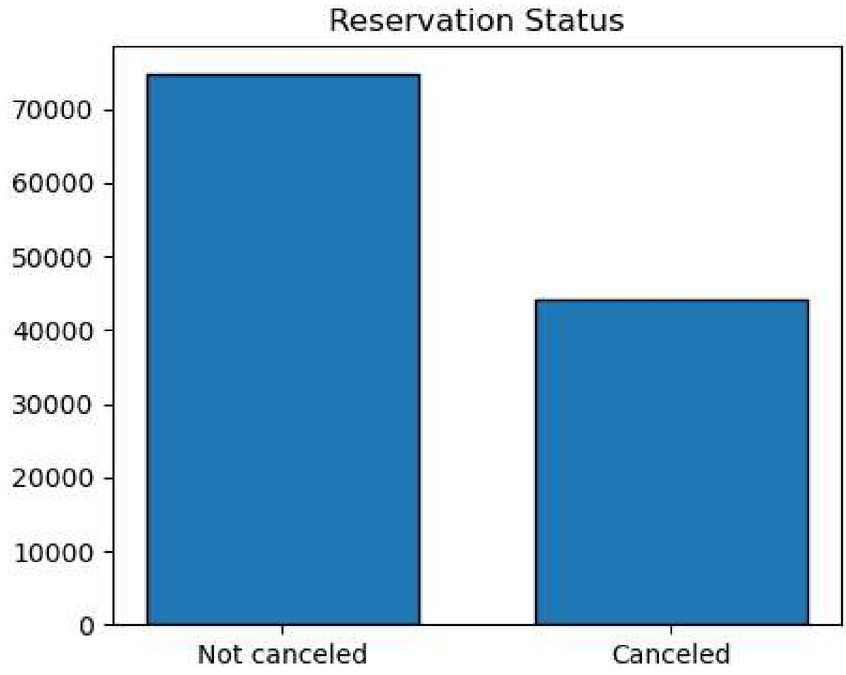
```
df=df[df['adr']<5000]
```

Data Analysis and Visualisation

In [20]:

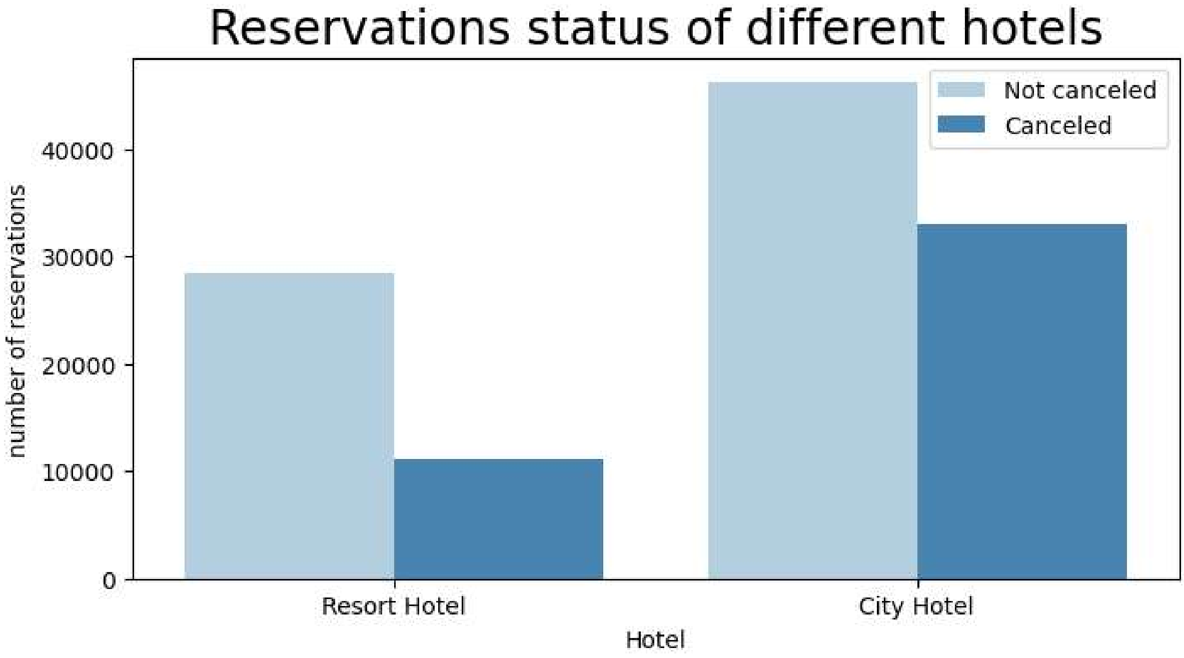
```
cancelled_perc = df['is_canceled'].value_counts(normalize = True)
print(cancelled_perc)

plt.figure(figsize= (5,4))
plt.title('Reservation Status')
plt.bar(['Not canceled','Canceled'],df['is_canceled'].value_counts(),edgecolor = 'k',width = 0.7
plt.show()
```

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



In [21]:

```
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('Reservations status of different hotels',size = 20)
plt.xlabel('Hotel')
plt.ylabel('number of reservations')
plt.legend(['Not canceled','Canceled'])
plt.show()
```



In [22]:

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

Out[22]:

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

In [23]:

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

Out[23]:

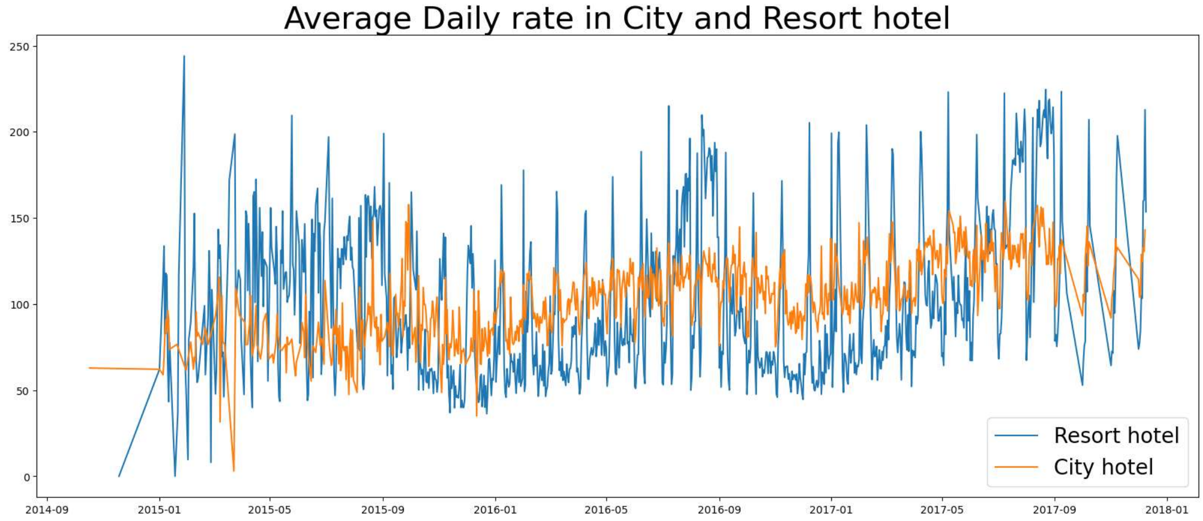
```
0    0.582918
1    0.417082
Name: is_canceled, dtype: float64
```

In [24]:

```
resort_hotel=resort_hotel.groupby('reservation_status_date')[['adr']].mean()
City_hotel=City_hotel.groupby('reservation_status_date')[['adr']].mean()
```

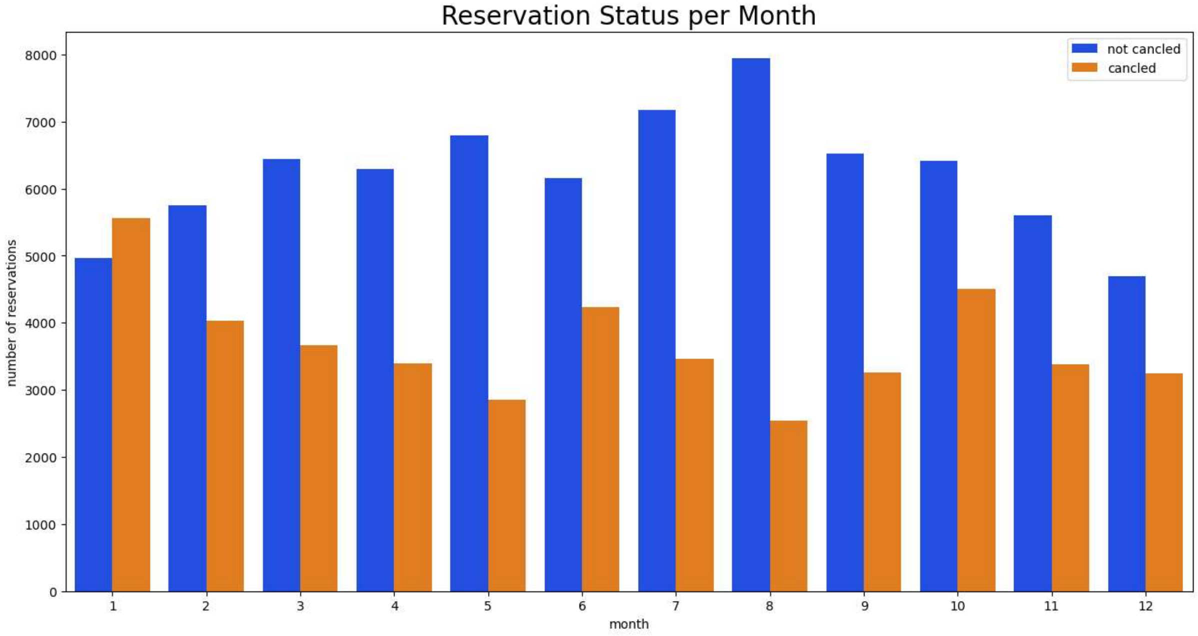
In [25]:

```
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()
```



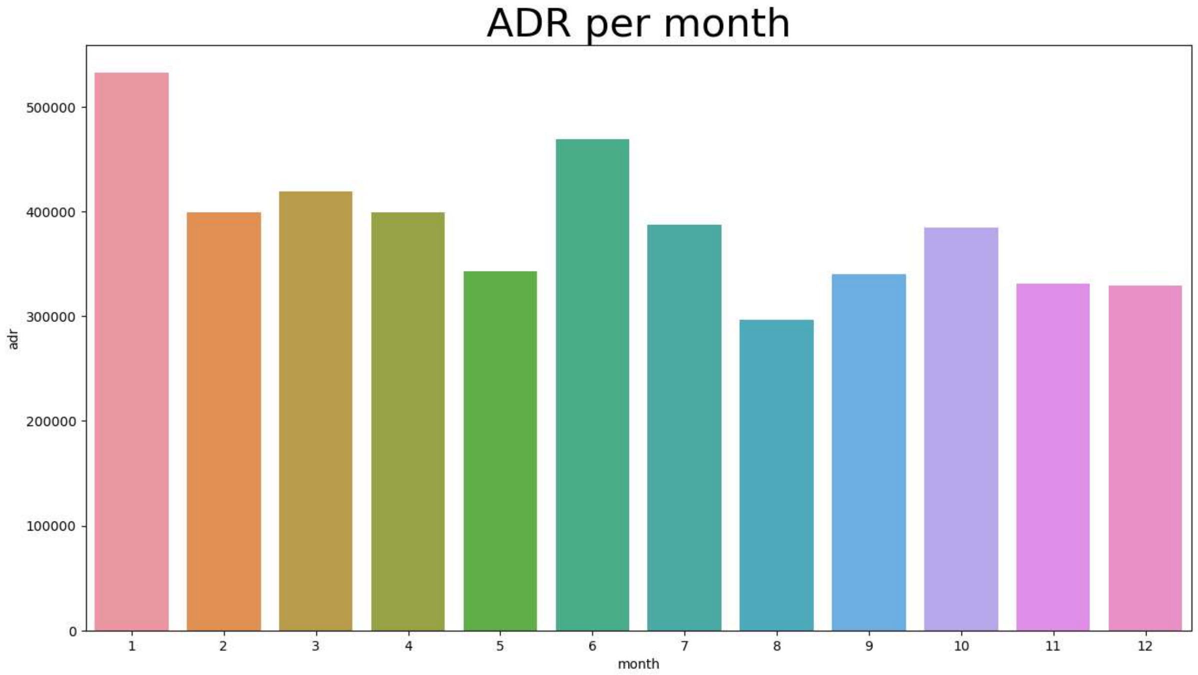
In [26]:

```
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_lables,_= ax1. get_legend_handles_labels()
ax1.legend(bbox_to_anchor=(1,1))
plt.title('Reservation Status per Month',size=20)
plt.xlabel('month')
plt.ylabel('number of reservations')
plt.legend(['not cancled','cancled'])
plt.show()
```



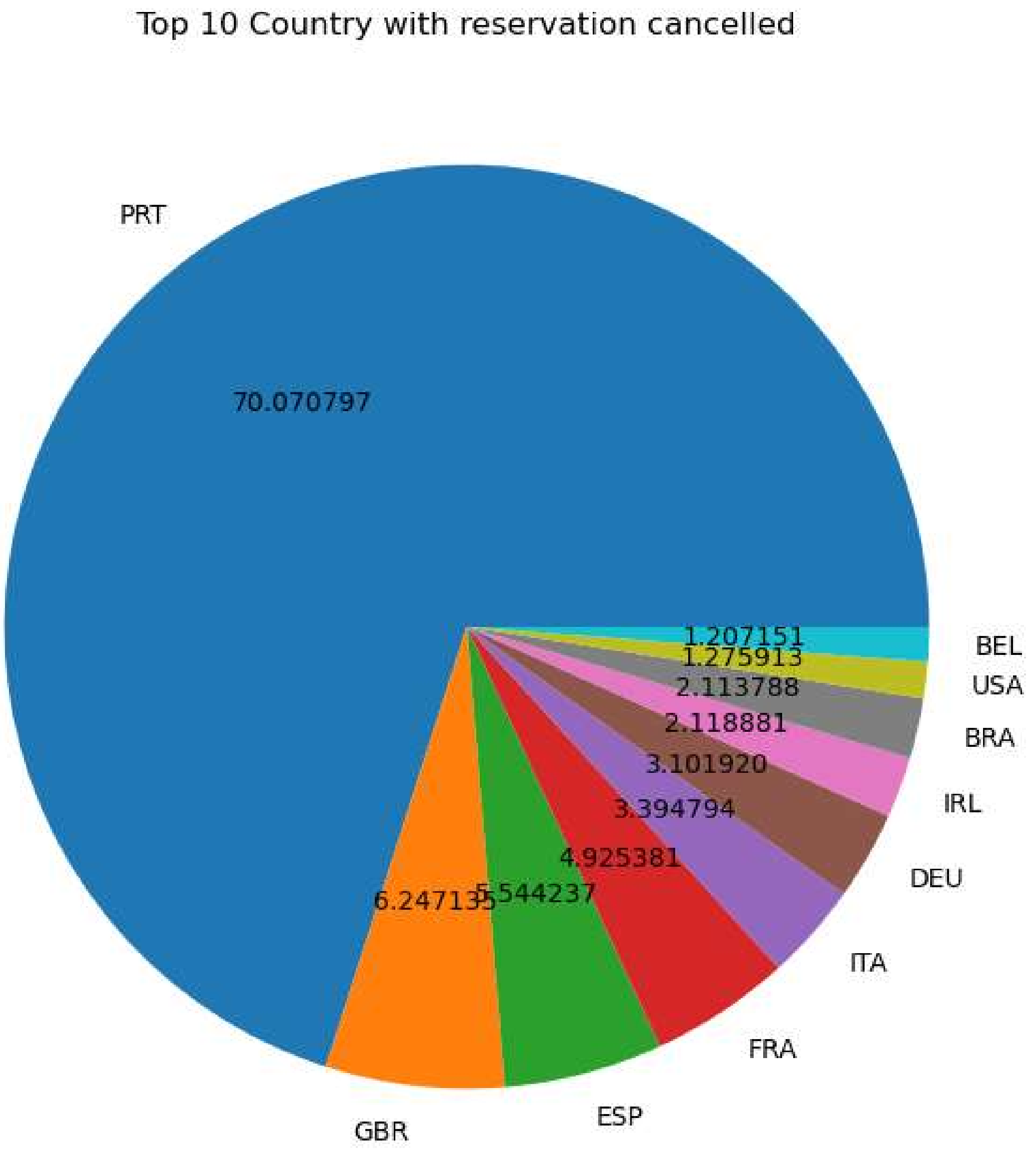
In [27]:

```
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().reset_i
plt.show()
```



In [28]:

```
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 Country with reservation cancelled')
plt.pie(top_10_country,autopct = '%2f',labels=top_10_country.index)
plt.show()
```



In [29]:

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

Out[29]:

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

In [30]:

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

Out[30]:

```
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 [31]:

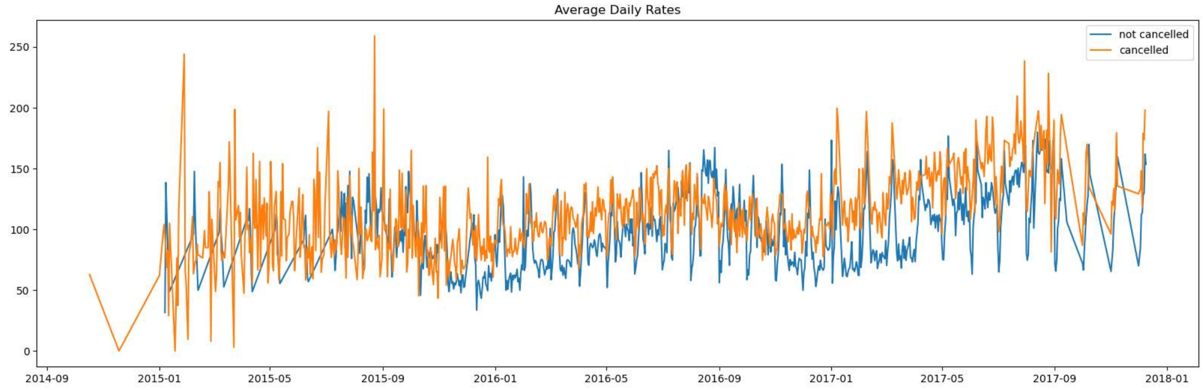
```
cancelled_data['market_segment'].value_counts(normalize=True)
```

Out[31]:

```
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 [46]:

```
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 Rates')
plt.plot(not_cancelled_df_adr['reservation_status_date'],not_cancelled_df_adr['adr'],label='not c
plt.plot(cancelled_df_adr['reservation_status_date'],cancelled_df_adr['adr'],label='cancelled')
plt.legend()
plt.show()
```

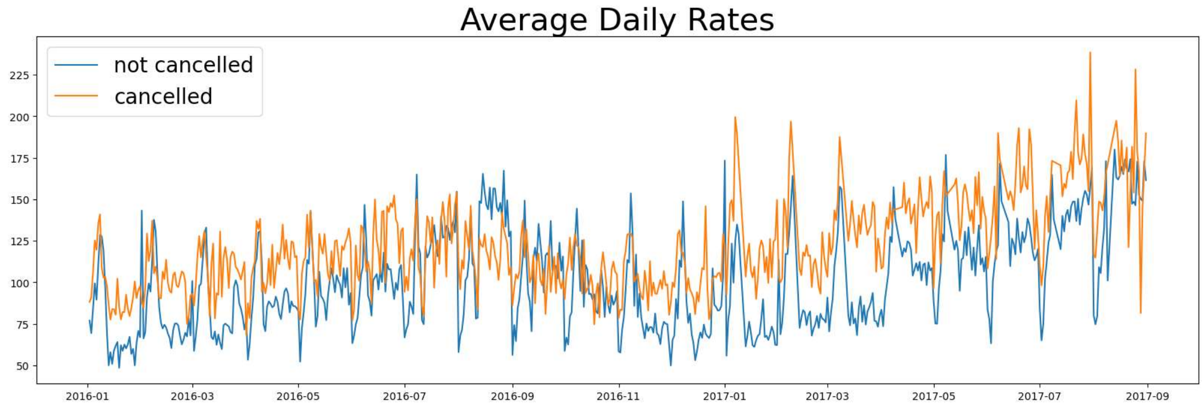


In [47]:

```
dr[(cancelled_df_adr['reservation_status_date']>'2016') & (cancelled_df_adr['reservation_status_da
led_df_adr[(not_cancelled_df_adr['reservation_status_date']>'2016') & (not_cancelled_df_adr['reser
```

In [50]:

```
plt.figure(figsize=(20,6))
plt.title('Average Daily Rates', fontsize = 30)
plt.plot(not_cancelled_df_adr_1['reservation_status_date'],not_cancelled_df_adr_1['adr'],label='n
plt.plot(cancelled_df_adr_1['reservation_status_date'],cancelled_df_adr_1['adr'],label='cancelled
plt.legend(fontsize = 20)
plt.show()
```


Average Daily Rates
not cancelled
cancelled