AIRLINE EDA

Workflow

Importing required Modules

1. Importing Required Modules
2. importing numpy for mathematical operation on arrays and dataframe.
3. importing pandas for reading data and data manipulation.
4. importing matplotlib and seaborn to show the insights and visualization from the dataset.
5. importing warnings for Warning messages that are typically issued in dataframe where it is useful to alert the user of some condition in a program, where that condition (normally) doesn't warrant raising an exception and terminating the program.

- Importing required libraries
- loading the data set
- Basic understanding of data

  -- checking shape

  -- checking info

  -- fetching columns names

  --- checking unique values

Importing Libraries

In [256]:

```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings("ignore")
```

Loading the Data

In [143]:

```
df = pd.read_excel("Data_Train.xlsx")
df
```

Out[143]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Dura
0	IndiGo	24/03/2019	Banglore	New Delhi	BLR → DEL	22:20	01:10 22 Mar	2h
1	Air India	1/05/2019	Kolkata	Banglore	CCU → IXR → BBI → BLR	05:50	13:15	7h
2	Jet Airways	9/06/2019	Delhi	Cochin	DEL → LKO → BOM → COK	09:25	04:25 10 Jun	
3	IndiGo	12/05/2019	Kolkata	Banglore	CCU → NAG → BLR	18:05	23:30	5h
4	IndiGo	01/03/2019	Banglore	New Delhi	BLR → NAG → DEL	16:50	21:35	4h
...	...	...	...	...	...	...	...	
10678	Air Asia	9/04/2019	Kolkata	Banglore	CCU → BLR	19:55	22:25	2h
10679	Air India	27/04/2019	Kolkata	Banglore	CCU → BLR	20:45	23:20	2h
10680	Jet Airways	27/04/2019	Banglore	Delhi	BLR → DEL	08:20	11:20	
10681	Vistara	01/03/2019	Banglore	New Delhi	BLR → DEL	11:30	14:10	2h
10682	Air India	9/05/2019	Delhi	Cochin	DEL → GOI → BOM → COK	10:55	19:15	8h

10683 rows × 11 columns

Preview of data

In [144]:

```
df.sample(5)
```

Out[144]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratic
9384	Multiple carriers	21/05/2019	Delhi	Cochin	DEL → BOM → COK	10:00	01:30 22 May	15h 30
3360	IndiGo	9/06/2019	Delhi	Cochin	DEL → HYD → COK	07:35	12:10	4h 35
4244	Jet Airways	24/05/2019	Kolkata	Banglore	CCU → BOM → BLR	08:25	18:15	9h 50
9186	Jet Airways	1/05/2019	Kolkata	Banglore	CCU → DEL → BLR	17:00	21:05 02 May	28h 5
838	Jet Airways	18/05/2019	Delhi	Cochin	DEL → BOM → COK	22:50	19:00 19 May	20h 10

Basic Understanding of Data

How big is the data ?

In [145]:

```
df.shape
```

Out[145]:

```
(10683, 11)
```

-Observation:

- There are total **11 Attributes/columns** available in the dataset.
- There are total **10683 Records/Rows** available in the dataset.

Fetching Column Names

In [146]:

```
df.columns
```

Out[146]:

```
Index(['Airline', 'Date_of_Journey', 'Source', 'Destination', 'Route',
       'Dep_Time', 'Arrival_Time', 'Duration', 'Total_Stops',
       'Additional_Info', 'Price'],
      dtype='object')
```

Checking the column names

In [147]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10683 entries, 0 to 10682
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   Airline          10683 non-null  object
 1   Date_of_Journey  10683 non-null  object
 2   Source           10683 non-null  object
 3   Destination      10683 non-null  object
 4   Route            10682 non-null  object
 5   Dep_Time         10683 non-null  object
 6   Arrival_Time     10683 non-null  object
 7   Duration         10683 non-null  object
 8   Total_Stops      10682 non-null  object
 9   Additional_Info  10683 non-null  object
 10  Price            10683 non-null  int64 
dtypes: int64(1), object(10)
memory usage: 918.2+ KB
```

-Observation:

- In this data all the columns are of object type except Price , and we can see here the column names Date_of_Journey,Dep_Time,Arrival_Time need to be converted into datetime
- there is a duration column which should be in numeric

Checking the unique values

In [148]:

```
for i  in df.columns:
    print(i,"-------------",df[i].unique())
```

```
OM → COK'
 'CCU → NAG → BLR' 'BLR → NAG → DEL' 'CCU → BLR' 'BLR → BOM → DEL'
 'DEL → BOM → COK' 'DEL → BLR → COK' 'MAA → CCU' 'CCU → BOM → BLR'
 'DEL → AMD → BOM → COK' 'DEL → PNQ → COK' 'DEL → CCU → BOM → COK'
 'BLR → COK → DEL' 'DEL → IDR → BOM → COK' 'DEL → LKO → COK'
 'CCU → GAU → DEL → BLR' 'DEL → NAG → BOM → COK' 'CCU → MAA → BLR'
 'DEL → HYD → COK' 'CCU → HYD → BLR' 'DEL → COK' 'CCU → DEL → BLR'
 'BLR → BOM → AMD → DEL' 'BOM → DEL → HYD' 'DEL → MAA → COK' 'BOM → HY
D'
 'DEL → BHO → BOM → COK' 'DEL → JAI → BOM → COK' 'DEL → ATQ → BOM → CO
K'
 'DEL → JDH → BOM → COK' 'CCU → BBI → BOM → BLR' 'BLR → MAA → DEL'
 'DEL → GOI → BOM → COK' 'DEL → BDQ → BOM → COK' 'CCU → JAI → BOM → BL
R'
 'CCU → BBI → BLR' 'BLR → HYD → DEL' 'DEL → TRV → COK'
 'CCU → IXR → DEL → BLR' 'DEL → IXU → BOM → COK' 'CCU → IXB → BLR'
 'BLR → BOM → JDH → DEL' 'DEL → UDR → BOM → COK' 'DEL → HYD → MAA → CO
K'
 'CCU → BOM → COK → BLR' 'BLR → CCU → DEL' 'CCU → BOM → GOI → BLR'
 'DEL → RPR → NAG → BOM → COK' 'DEL → HYD → BOM → COK'
```

-Observation:

- From this output we can see there is anomly in airline names : vistara premimum economy with vistara multiple carriers with multiple carriers premium economy jet airways with jet airways business
- From this output we can see there is anomly in destination: new Delhi with Delhi

We need to resolve this above mentioned inconsistency

Preprocessing

Cleaning

Checking the Missing Values

In [149]:

```
df.isnull().sum().to_frame().rename(columns={0:"missing_values_count"}).T
```

Out[149]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arriv
missing_values_count	0	0	0	0	1	0	

In [150]:

```
# to frame () is used to represent the data without the index
```

In [151]:

```
df["Route"].mode()
```

Out[151]:

```
0    DEL → BOM → COK
Name: Route, dtype: object
```

In [152]:

```
df["Total_Stops"].mode()
```

Out[152]:

```
0    1 stop
Name: Total_Stops, dtype: object
```

In [153]:

```
df[df["Route"].isnull()]
# means route and total stops has none values
```

Out[153]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratio
9039	Air India	6/05/2019	Delhi	Cochin	NaN	09:45	09:25 07 May	23h 40r

Handling Missing Values

In [154]:

```
df[["Route","Total_Stops"]].dtypes
```

Out[154]:

```
Route          object
Total_Stops    object
dtype: object
```

In [155]:

```
df["Route"].mode()
```

Out[155]:

```
0    DEL → BOM → COK
Name: Route, dtype: object
```

In [156]:

```
df[df["Route"].isnull()]
```

Out[156]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratio
9039	Air India	6/05/2019	Delhi	Cochin	NaN	09:45	09:25 07 May	23h 40r

In [157]:

```
df["Route"]=df["Route"].fillna(df["Route"].mode()[0])
df["Total_Stops"]=df["Total_Stops"].fillna(df["Total_Stops"].mode()[0])
```

In [158]:

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

Out[158]:

```
0
```

In [159]:

```
df.dtypes
```

Out[159]:

```
Airline            object
Date_of_Journey    object
Source             object
Destination        object
Route              object
Dep_Time           object
Arrival_Time       object
Duration           object
Total_Stops        object
Additional_Info    object
Price               int64
dtype: object
```

In [160]:

```
df["Duration"].unique()
```

```
Out[160]:
```

```
array(['2h 50m', '7h 25m', '19h', '5h 25m', '4h 45m', '2h 25m', '15h 30m',
       '21h 5m', '25h 30m', '7h 50m', '13h 15m', '2h 35m', '2h 15m',
       '12h 10m', '26h 35m', '4h 30m', '22h 35m', '23h', '20h 35m',
       '5h 10m', '15h 20m', '2h 55m', '13h 20m', '15h 10m', '5h 45m',
       '5h 55m', '13h 25m', '22h', '5h 30m', '10h 25m', '5h 15m',
       '2h 30m', '6h 15m', '11h 55m', '11h 5m', '8h 30m', '22h 5m',
       '2h 45m', '12h', '16h 5m', '19h 55m', '3h 15m', '25h 20m', '3h',
       '16h 15m', '15h 5m', '6h 30m', '25h 5m', '12h 25m', '27h 20m',
       '10h 15m', '10h 30m', '1h 30m', '1h 25m', '26h 30m', '7h 20m',
       '13h 30m', '5h', '19h 5m', '14h 50m', '2h 40m', '22h 10m',
       '9h 35m', '10h', '21h 20m', '18h 45m', '12h 20m', '18h', '9h 15m',
       '17h 30m', '16h 35m', '12h 15m', '7h 30m', '24h', '8h 55m',
       '7h 10m', '14h 30m', '30h 20m', '15h', '12h 45m', '10h 10m',
       '15h 25m', '14h 5m', '20h 15m', '23h 10m', '18h 10m', '16h',
       '2h 20m', '8h', '16h 55m', '3h 10m', '14h', '23h 50m', '21h 40m',
       '21h 15m', '10h 50m', '8h 15m', '8h 35m', '11h 50m', '27h 35m',
       '8h 25m', '20h 55m', '4h 50m', '8h 10m', '24h 25m', '23h 35m',
       '25h 45m', '26h 10m', '28h 50m', '25h 15m', '9h 20m', '9h 10m',
       '3h 5m', '11h 30m', '9h 30m', '17h 35m', '5h 5m', '25h 50m', '20h',
       '13h', '18h 25m', '24h 10m', '4h 55m', '25h 35m', '6h 20m',
       '18h 40m', '19h 25m', '29h 20m', '9h 5m', '10h 45m', '11h 40m',
       '22h 55m', '37h 25m', '25h 40m', '13h 55m', '8h 40m', '23h 30m',
       '12h 35m', '24h 15m', '1h 20m', '11h', '11h 15m', '14h 35m',
       '12h 55m', '9h', '7h 40m', '11h 45m', '24h 55m', '17h 5m',
       '29h 55m', '22h 15m', '14h 40m', '7h 15m', '20h 10m', '20h 45m',
       '27h', '24h 30m', '20h 25m', '5h 35m', '14h 45m', '5h 40m',
       '4h 5m', '15h 55m', '7h 45m', '28h 20m', '4h 20m', '3h 40m',
       '8h 50m', '23h 45m', '24h 45m', '21h 35m', '8h 5m', '6h 25m',
       '15h 50m', '26h 25m', '24h 50m', '26h', '23h 5m', '7h 55m',
       '26h 20m', '23h 15m', '5h 20m', '4h', '9h 45m', '8h 20m',
       '17h 25m', '7h 5m', '34h 5m', '6h 5m', '5h 50m', '7h', '4h 25m',
       '13h 45m', '19h 15m', '22h 30m', '16h 25m', '13h 50m', '27h 5m',
       '28h 10m', '4h 40m', '15h 40m', '4h 35m', '18h 30m', '38h 15m',
       [illegible]
       [illegible]
       '20h 40m', '30h', '13h 10m', '8h 45m', '6h 10m', '17h 45m',
       '21h 45m', '3h 55m', '17h 20m', '30h 30m', '21h 25m', '12h 40m',
       '24h 35m', '19h 10m', '22h 40m', '14h 55m', '21h', '6h 45m',
       '28h 40m', '9h 40m', '16h 40m', '16h 20m', '16h 45m', '1h 15m',
       '6h 55m', '11h 25m', '14h 20m', '12h 5m', '24h 5m', '28h 15m',
       '17h 50m', '20h 20m', '28h 5m', '10h 20m', '14h 15m', '35h 15m',
       '35h 35m', '26h 40m', '28h', '14h 25m', '13h 5m', '37h 20m',
       '36h 10m', '25h 55m', '35h 5m', '19h 45m', '27h 55m', '47h',
       '10h 35m', '1h 35m', '16h 10m', '38h 20m', '6h', '16h 50m',
       '14h 10m', '23h 20m', '17h 40m', '11h 35m', '18h 20m', '6h 40m',
       '30h 55m', '24h 40m', '29h 50m', '28h 25m', '17h 15m', '22h 45m',
       '25h 25m', '21h 50m', '33h 15m', '30h 15m', '3h 35m', '27h 40m',
       '30h 25m', '18h 50m', '27h 45m', '15h 15m', '10h 40m', '26h 15m',
       '36h 25m', '26h 50m', '15h 45m', '19h 40m', '22h 25m', '19h 35m',
       '25h', '26h 45m', '38h', '4h 15m', '25h 10m', '18h 15m', '6h 50m',
       '23h 55m', '17h 55m', '23h 25m', '17h 10m', '24h 20m', '28h 30m',
       '27h 10m', '19h 20m', '15h 35m', '9h 25m', '21h 30m', '34h 25m',
       '18h 35m', '29h 40m', '26h 5m', '29h 5m', '27h 25m', '16h 30m',
       '11h 10m', '28h 55m', '29h 10m', '34h', '30h 40m', '30h 45m',
       '32h 55m', '10h 5m', '35h 20m', '32h 5m', '31h 40m', '19h 50m',
       '33h 45m', '30h 10m', '13h 40m', '19h 30m', '31h 30m', '34h 30m',
       '27h 50m', '38h 35m', '42h 5m', '4h 10m', '39h 5m', '3h 50m', '5m',
       '32h 30m', '31h 55m', '33h 20m', '27h 30m', '18h 55m', '9h 55m',
       '41h 20m', '20h 5m', '31h 50m', '42h 45m', '3h 25m', '37h 10m',
```

In [161]:

```
s='2h 50m'
s=s.replace("h",'*h').replace("m","*1").replace(" ","+")
print(s)
h=60
```

```
2*h+50*1
```

In [162]:

```
eval(s)
```

Out[162]:

```
170
```

In [163]:

```
df[df['Duration']=='5m']
```

Out[163]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	Duratio
6474	Air India	6/03/2019	Mumbai	Hyderabad	BOM → GOI → PNQ → HYD	16:50	16:55	5r

In [164]:

```
for i in df["Duration"].unique():
    if (len(i)==3 and "m" in i) or (len(i)==2 and "m" in i):
        print(i)
```

```
5m
```

In [165]:

```
eval("3+8*2")
```

Out[165]:

```
19
```

In [166]:

```
df["Duration"]=df["Duration"].str.replace("h","*60").str.replace(" ","+").str.replace("m
       '29h 30m', '32h 20m', '20h 50m', '40h 20m', '13h 35m', '47h 40m'],
      dtype=object)
```

In [167]:

```
df["Duration"]
```

Out[167]:

```
0         170
1         445
2        1140
3         325
4         285
         ...
10678     150
10679     155
10680     180
10681     160
10682     500
Name: Duration, Length: 10683, dtype: int64
```

Feature Engineering

In [168]:

```
## change the types of arrival time,departure time, date in datetime and extarct the day
```

In [169]:

```
df['Date_of_Journey']=pd.to_datetime(df['Date_of_Journey'])
df["Dep_Time"]=pd.to_datetime(df['Dep_Time'])
df["Arrival_Time"]=pd.to_datetime(df['Arrival_Time'])
```

Checking Dtypes of above columns

In [170]:

```
df.dtypes.to_frame().rename(columns={0:"dtypes"}).T
```

Out[170]:

	Airline	Date_of_Journey	Source	Destination	Route	Dep_Time	Arrival_Time	I
dtypes	object	datetime64[ns]	object	object	object	datetime64[ns]	datetime64[ns]	

In [171]:

```
# Extracting  day
df["day_of_journey"] = df["Date_of_Journey"].dt.day

# Extracting month
df["month_of_journey"] = df["Date_of_Journey"].dt.month

## Extracting  departure Hours
df["Dep_hour"] = df["Dep_Time"].dt.hour

# Extracting departure Minutes
df["Dep_min"] = df["Dep_Time"].dt.minute

## Extracting  arrival Hours
df["arrival_hour"] = df["Arrival_Time"].dt.hour

# Extracting arrival Minutes
df["arrival_min"] = df["Arrival_Time"].dt.minute
```

In [172]:

```
df.drop(columns=["Date_of_Journey","Dep_Time","Arrival_Time"],inplace=True)
df.shape
```

Out[172]:

```
(10683, 14)
```

Handling Inconsistency

In [173]:

```
df["Airline"].unique()
```

Out[173]:

```
array(['IndiGo', 'Air India', 'Jet Airways', 'SpiceJet',
       'Multiple carriers', 'GoAir', 'Vistara', 'Air Asia',
       'Vistara Premium economy', 'Jet Airways Business',
       'Multiple carriers Premium economy', 'Trujet'], dtype=object)
```

In [174]:

```
df["Airline"]=df["Airline"].str.replace("Vistara Premium economy","Vistara")
df["Airline"]=df["Airline"].str.replace("Jet Airways Business","Jet Airways")
df["Airline"]=df["Airline"].str.replace("Multiple carriers Premium economy","Multiple ca
```

In [175]:

```
df["Airline"].unique()
```

Out[175]:

```
array(['IndiGo', 'Air India', 'Jet Airways', 'SpiceJet',
       'Multiple carriers', 'GoAir', 'Vistara', 'Air Asia', 'Trujet'],
      dtype=object)
```

In [176]:

```
df["Destination"].unique()
```

Out[176]:

```
array(['New Delhi', 'Banglore', 'Cochin', 'Kolkata', 'Delhi', 'Hyderaba
d'],
      dtype=object)
```

In [177]:

```
df["Destination"]=df["Destination"].replace("New Delhi","Delhi")
```

In [178]:

```
df["Destination"].unique()
```

Out[178]:

```
array(['Delhi', 'Banglore', 'Cochin', 'Kolkata', 'Hyderabad'],
      dtype=object)
```

In [179]:

```
df["Total_Stops"].unique()
```

Out[179]:

```
array(['non-stop', '2 stops', '1 stop', '3 stops', '4 stops'],
      dtype=object)
```

In [180]:

```
df["Total_Stops"]=df["Total_Stops"].map({"non-stop":0,"2 stops":2,"1 stop":1,"3 stops":3
```

In [181]:

```
df["Total_Stops"].unique()
```

Out[181]:

```
array([0, 2, 1, 3, 4], dtype=int64)
```

In [182]:

```
df.head()
```

Out[182]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	day_
0	IndiGo	Banglore	Delhi	BLR → DEL	170	0	No info	3897	
1	Air India	Kolkata	Banglore	CCU → IXR → BBI → BLR	445	2	No info	7662	
2	Jet Airways	Delhi	Cochin	DEL → LKO → BOM → COK	1140	2	No info	13882	
3	IndiGo	Kolkata	Banglore	CCU → NAG → BLR	325	1	No info	6218	
4	IndiGo	Banglore	Delhi	BLR → NAG → DEL	285	1	No info	13302	

INSIGHTS

Descriptive Statistics

In [183]:

```
df.describe().T
```

Out[183]:

	count	mean	std	min	25%	50%	75%	ma
Duration	10683.0	643.093232	507.862001	5.0	170.0	520.0	930.0	2860
Total_Stops	10683.0	0.824207	0.675199	0.0	0.0	1.0	1.0	4
Price	10683.0	9087.064121	4611.359167	1759.0	5277.0	8372.0	12373.0	79512
day_of_journey	10683.0	12.682205	8.803701	3.0	5.0	6.0	21.0	27
month_of_journey	10683.0	5.534775	2.987489	1.0	3.0	5.0	6.0	12
Dep_hour	10683.0	12.490686	5.748650	0.0	8.0	11.0	18.0	23
Dep_min	10683.0	24.411214	18.767980	0.0	5.0	25.0	40.0	55
arrival_hour	10683.0	13.348778	6.859125	0.0	8.0	14.0	19.0	23
arrival_min	10683.0	24.690630	16.506036	0.0	10.0	25.0	35.0	55

In [184]:

```
df[df["Duration"]==5.0]
```

Out[184]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	day
6474	Air India	Mumbai	Hyderabad	BOM → GOI → PNQ → HYD	5	2	No info	17327	

In [185]:

```
x=df[(df["Airline"]=="Air India")&(df["Source"]=="Mumbai")&(df["Destination"]=="Hyderaba
```

In [186]:

```
x
```

Out[186]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	day_of_journey
597	Air India	Mumbai	Hyderabad	BOM → JDH → DEL → HYD	1775	2	No info	25139	3
1417	Air India	Mumbai	Hyderabad	BOM → AMD → ISK → HYD	795	2	No info	9977	3
				BOM →					

In [187]:

```
x["Duration"].mean()
```

Out[187]:

```
1070.6521739130435
```

In [188]:

```
1070.65/60       # 84-60min(1hr) =24 min = 17+1 = 18h 24 min
```

Out[188]:

```
17.844166666666667
```

In [189]:

```
round(x["Duration"].mean(),2)
```

Out[189]:

```
1070.65
```

In [190]:

```
18*60   # 18H 24 m
```

Out[190]:

```
1080
```

In [191]:

```
df.loc[6474,"Duration"]=round(x["Duration"].mean(),2)
df.iloc[6474]
```

Out[191]:

```
Airline                           Air India
Source                               Mumbai
Destination                       Hyderabad
Route                 BOM → GOI → PNQ → HYD
Duration                            1070.65
Total_Stops                               2
Additional_Info                     No info
Price                                 17327
day_of_journey                            3
month_of_journey                          6
Dep_hour                                 16
Dep_min                                  50
arrival_hour                             16
arrival_min                              55
Name: 6474, dtype: object
```

In [192]:

```
df.loc[6474,"arrival_hour"]=18
df.loc[6474,"arrival_min"]=24
df.iloc[6474]
```

Out[192]:

```
Airline                           Air India
Source                               Mumbai
Destination                       Hyderabad
Route                 BOM → GOI → PNQ → HYD
Duration                            1070.65
Total_Stops                               2
Additional_Info                     No info
Price                                 17327
day_of_journey                            3
month_of_journey                          6
Dep_hour                                 16
Dep_min                                  50
arrival_hour                             18
arrival_min                              24
Name: 6474, dtype: object
```

Correlation

In [193]:

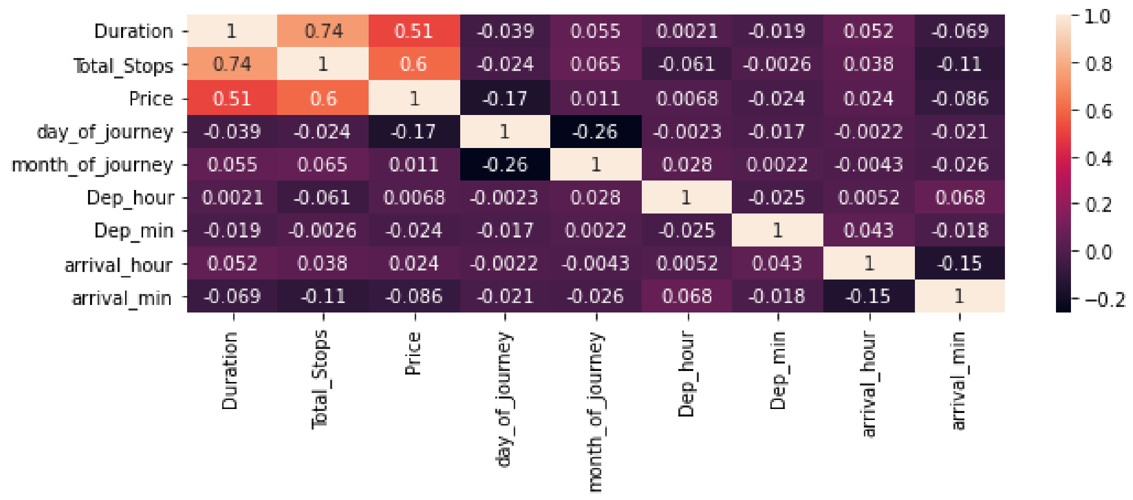
```
df.corr()
```

Out[193]:

	Duration	Total_Stops	Price	day_of_journey	month_of_journey	Dep_
Duration	1.000000	0.738397	0.506743	-0.038697	0.055185	0.0
Total_Stops	0.738397	1.000000	0.603883	-0.024156	0.065498	-0.0
Price	0.506743	0.603883	1.000000	-0.165412	0.010700	0.0
day_of_journey	-0.038697	-0.024156	-0.165412	1.000000	-0.264899	-0.0
month_of_journey	0.055185	0.065498	0.010700	-0.264899	1.000000	0.0
Dep_hour	0.002121	-0.061490	0.006819	-0.002251	0.028180	1.0
Dep_min	-0.018671	-0.002591	-0.024492	-0.016521	0.002152	-0.0
arrival_hour	0.051534	0.038170	0.024312	-0.002154	-0.004334	0.0
arrival_min	-0.069454	-0.107262	-0.086483	-0.021234	-0.025817	0.0

In [194]:

```
plt.figure(figsize=(10,3))
sns.heatmap(df.corr(),cmap=None,annot=True);
# near to the one shows it is highly correlated i.e, duration and total stops are highly
# with increase of total_stops there is an increase in duration and vice-versa
```



-Observation:

- From this output we can see there is strong positive correlation between total stops and duration and it is also valid as total stops increases the duration also increase
-
  - also positive correlation found between price and total stops, and Duration and Price

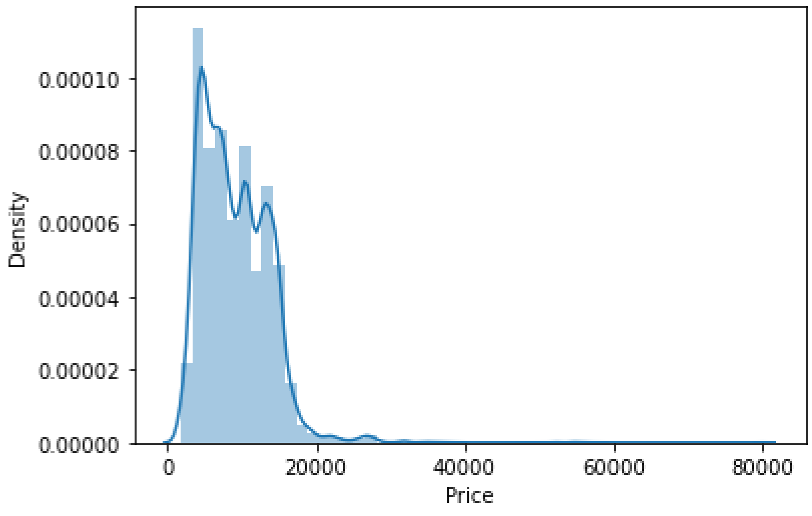
Since Price is the Main aspect so we do EDA w.r.t price column

In [195]:

```
sns.distplot(df["Price"])
```

Out[195]:

```
<AxesSubplot:xlabel='Price', ylabel='Density'>
```

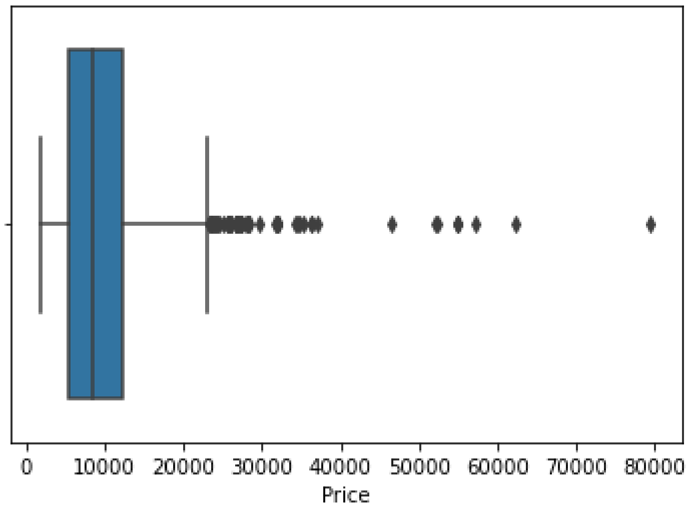


-Observation:

- the distribution of price is right skewed so it has outliers and most of the flights price is foundm around 8k to 10k and there are some flights which are extremely expensive

In [196]:

```
sns.boxplot(x="Price",data=df);
```



FIND THE DETAIL OF EXPENSIVE FLIGHT.

In [197]:

```
df[df["Price"]==df["Price"].max()]
```

Out[197]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	d
2924	Jet Airways	Banglore	Delhi	BLR → BOM → DEL	340.0	1	Business class	79512	

FIND OUT THE MIN , MAX AND THE AVERAGE PRICE OF FLIGHTS

In [198]:

```
df["Price"].agg(["max","min","mean"])
```

Out[198]:

```
max      79512.000000
min       1759.000000
mean      9087.064121
Name: Price, dtype: float64
```

DETAILS OF THE CHEAPEST FLIGHT

In [199]:

```
df[df["Price"]==df["Price"].min()]
```

Out[199]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	d
4066	SpiceJet	Mumbai	Hyderabad	BOM → HYD	85.0	0	No info	1759	
4274	SpiceJet	Mumbai	Hyderabad	BOM → HYD	85.0	0	No info	1759	
4839	SpiceJet	Mumbai	Hyderabad	BOM → HYD	90.0	0	No info	1759	
10513	SpiceJet	Mumbai	Hyderabad	BOM → HYD	80.0	0	No info	1759	

since there are outliers in the data so mean has been highly effected by outliers so we are taking the data excluding high extreme price' flights

In [200]:

```
x_mean=df[df["Price"]<45000]["Price"].mean()
x_mean
```

Out[200]:

```
9046.512647554806
```

TOTAL NO. OF FLIGHTS WHOSE PRICE IS LESS THAN THE AVERAGE PRICE

In [201]:

```
len(df[df["Price"]<x_mean])
```

Out[201]:

```
5793
```

In [202]:

```
len(df[df["Price"]>=x_mean])
```

Out[202]:

```
4890
```

FIND OUT THE TOTAL NO. OF FLIGHTS OF EACH COMPANY or THE MOST DEMANDING FLIGHT COMPANY

In [203]:

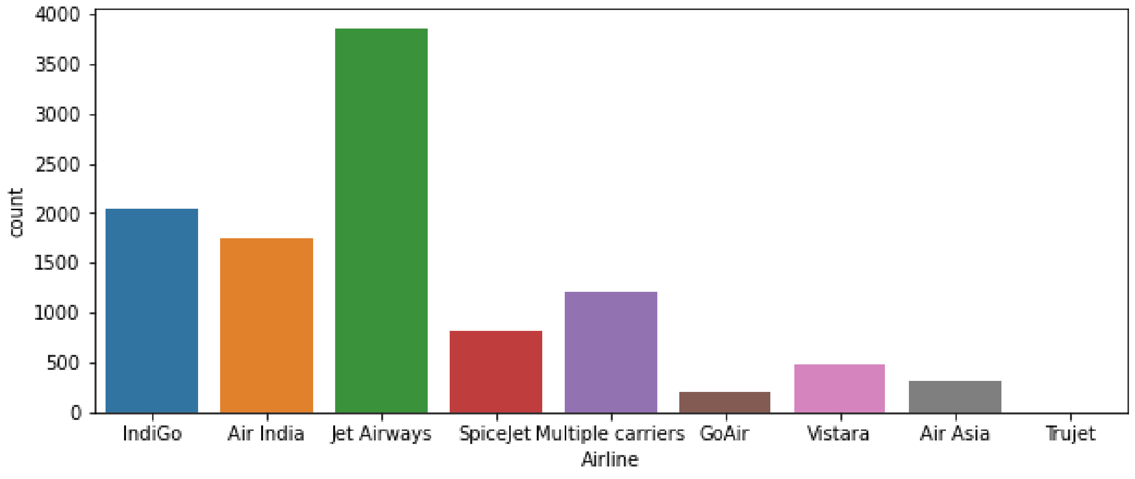
```
df['Airline'].value_counts()
```

Out[203]:

```
Jet Airways          3855
IndiGo               2053
Air India            1752
Multiple carriers    1209
SpiceJet              818
Vistara               482
Air Asia              319
GoAir                 194
Trujet                  1
Name: Airline, dtype: int64
```

In [204]:

```
plt.figure(figsize=(10,4))
sns.countplot(x="Airline",data=df);
```



THE MOST EXPENSIVE FLIGHT W.R.T THE COMPANY

In [205]:

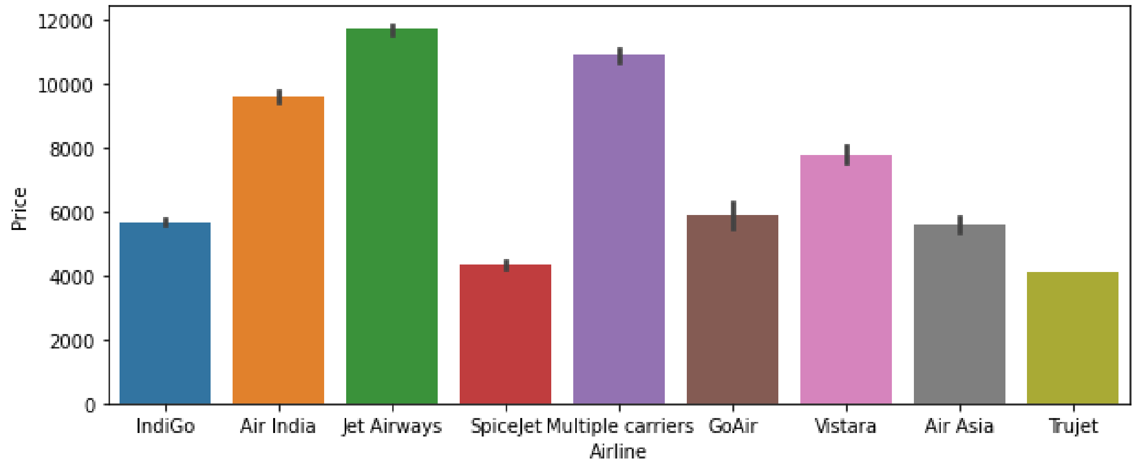
```
df.groupby('Airline')['Price'].agg(['mean']).sort_values(by='mean',ascending=False)
```

Out[205]:

	mean
Airline	
Jet Airways	11716.631128
Multiple carriers	10908.228288
Air India	9611.210616
Vistara	7803.605809
GoAir	5861.056701
IndiGo	5673.682903
Air Asia	5590.260188
SpiceJet	4338.284841
Trujet	4140.000000

In [206]:

```
plt.figure(figsize=(10,4))
sns.barplot(x="Airline",y="Price",data=df);
```

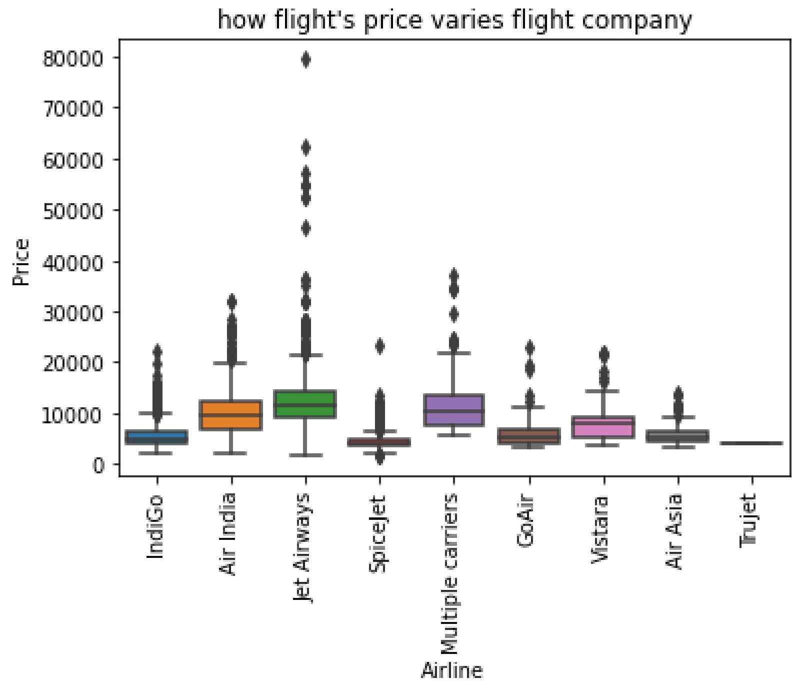


From "customer" point of view expensive flight is "jet airways" From "business" point of "jet airways" is found to be most selling company

HOW PRICE VARIES W.R.T EACH FLIGHTS' COMPANY

In [207]:

```
sns.boxplot(x="Airline",y="Price",data=df);
plt.xticks(rotation=90)
plt.title("how flight's price varies flight company");
```



The expensive flight is "jet-airways business" The cheapest flight is "Trujet company"

FIND OUT THE PRICE OF THE EXPENSIVE FLIGHTS' AND THE CHEAPEST FLIGHTS' COMPANY

In [208]:

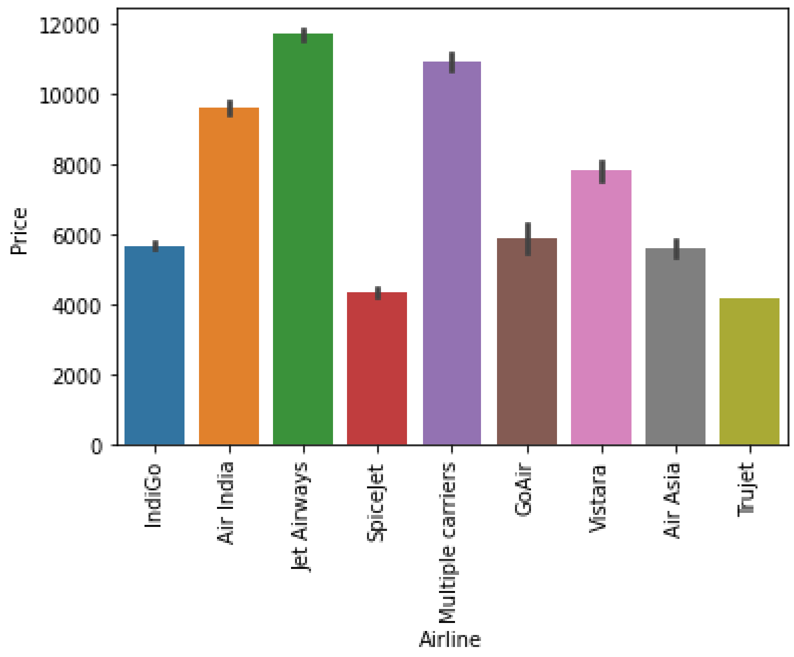
```
df.groupby('Airline')['Price'].agg(['min','max'])
```

Out[208]:

	min	max
Airline		
Air Asia	3383	13774
Air India	2050	31945
GoAir	3398	22794
IndiGo	2227	22153
Jet Airways	1840	79512
Multiple carriers	5797	36983
SpiceJet	1759	23267
Trujet	4140	4140
Vistara	3687	21730

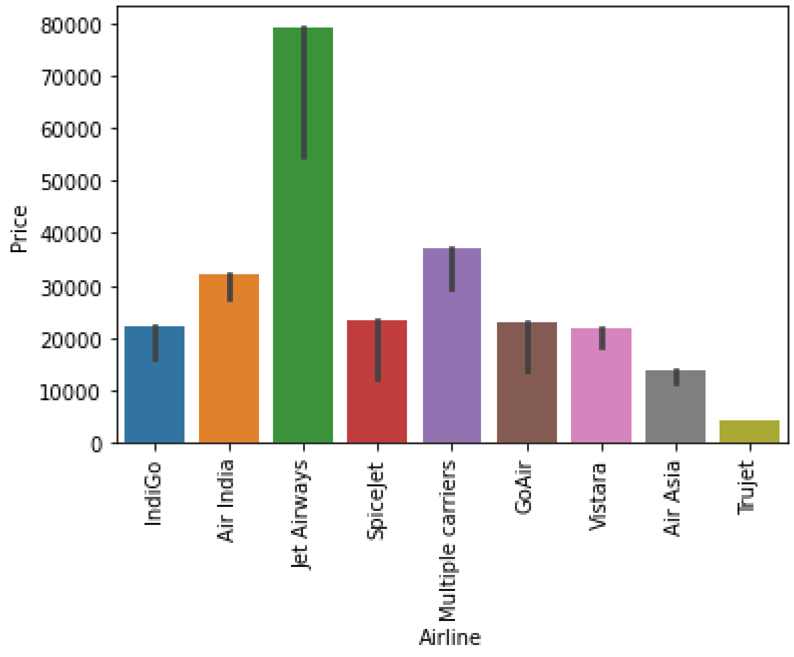
In [209]:

```
sns.barplot(x="Airline",y="Price",data=df);
plt.xticks(rotation=90);
# by default it takes avg
```



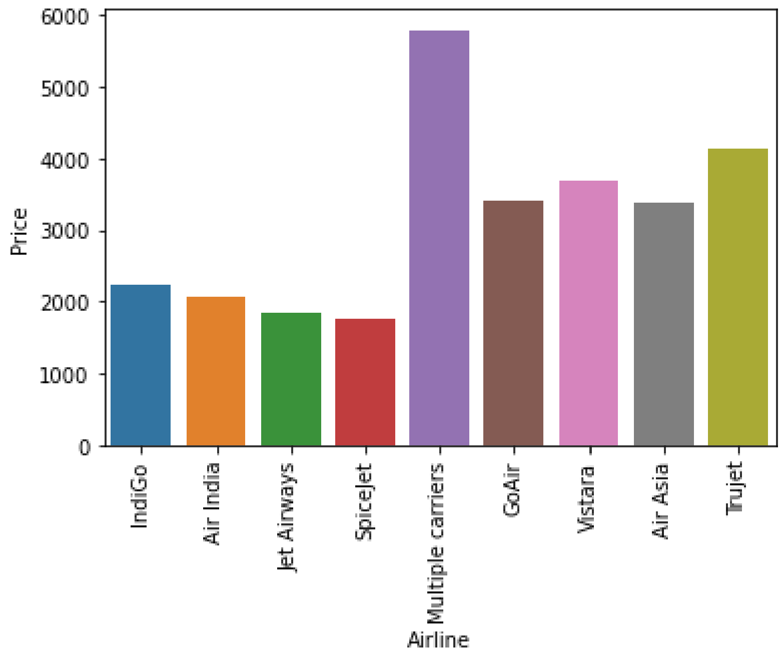
In [210]:

```
sns.barplot(x="Airline",y="Price",estimator=max,data=df);
plt.xticks(rotation=90);
```



In [211]:

```
sns.barplot(x="Airline",y="Price",estimator=min,data=df,ci=None);
plt.xticks(rotation=90);
```



NO.OF FLIGHTS W.R.T THEIR STOPPAGES

In [212]:

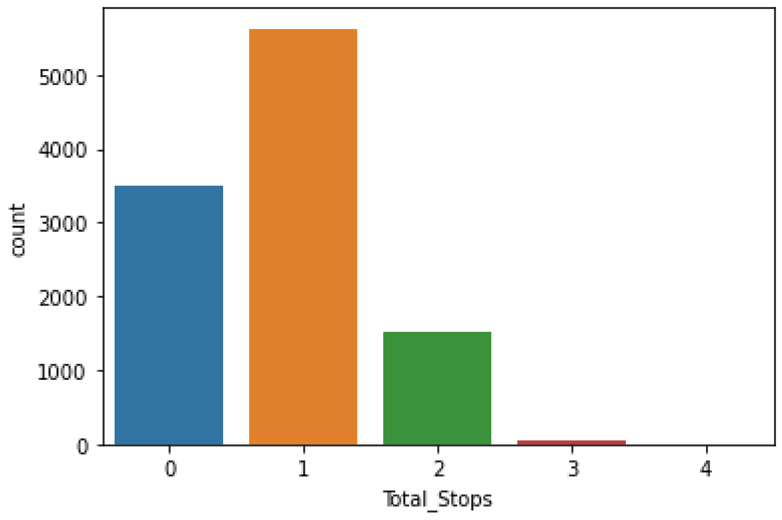
```
df['Total_Stops'].value_counts()
```

Out[212]:

```
1    5626
0    3491
2    1520
3      45
4       1
Name: Total_Stops, dtype: int64
```

In [213]:

```
sns.countplot(x='Total_Stops',data=df);
```



In [214]:

```
df[df["Total_Stops"]==4]
```

Out[214]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	da
9182	Air India	Banglore	Delhi	BLR → CCU → BBI → HYD → VGA → DEL	1770.0	4	Change airports	17686	

We can see that no. of flights and their stoppages, In this data maximum flights have 1 stoppages and there are few flights which have 3 to 4 stoppages

FIND THE FLIGHTS AVAILABILITY W.R.T NO. OF STOPPAGES

In [215]:

```
df.groupby(["Total_Stops"])["Airline"].value_counts()
```

Out[215]:

```
Total_Stops  Airline
0            IndiGo               1241
             SpiceJet              670
             Jet Airways           623
             Air India             417
             Vistara               267
             Air Asia              181
             GoAir                  92
1            Jet Airways          2539
             Multiple carriers    1158
             IndiGo                793
             Air India             541
             Vistara               215
             SpiceJet              148
             Air Asia              129
             GoAir                 102
             Trujet                  1
2            Air India             756
             Jet Airways           693
             Multiple carriers      43
             IndiGo                 19
             Air Asia                9
3            Air India              37
             Multiple carriers       8
4            Air India               1
Name: Airline, dtype: int64
```

In [216]:

```
df.groupby('Airline')['Total_Stops'].agg(['min','max'])
```

Out[216]:

	min	max
Airline		
Air Asia	0	2
Air India	0	4
GoAir	0	1
IndiGo	0	2
Jet Airways	0	2
Multiple carriers	1	3
SpiceJet	0	1
Trujet	1	1
Vistara	0	1

"Indigo" has highest number of flights available with 0 stoppages, Jet Airways highest number of flights available with 1 stoppages, Air india highest number of flights available with 2 stoppages, Air india highest number of flights available with 3 stoppages, Air india is the only flight available with 4 stoppages.

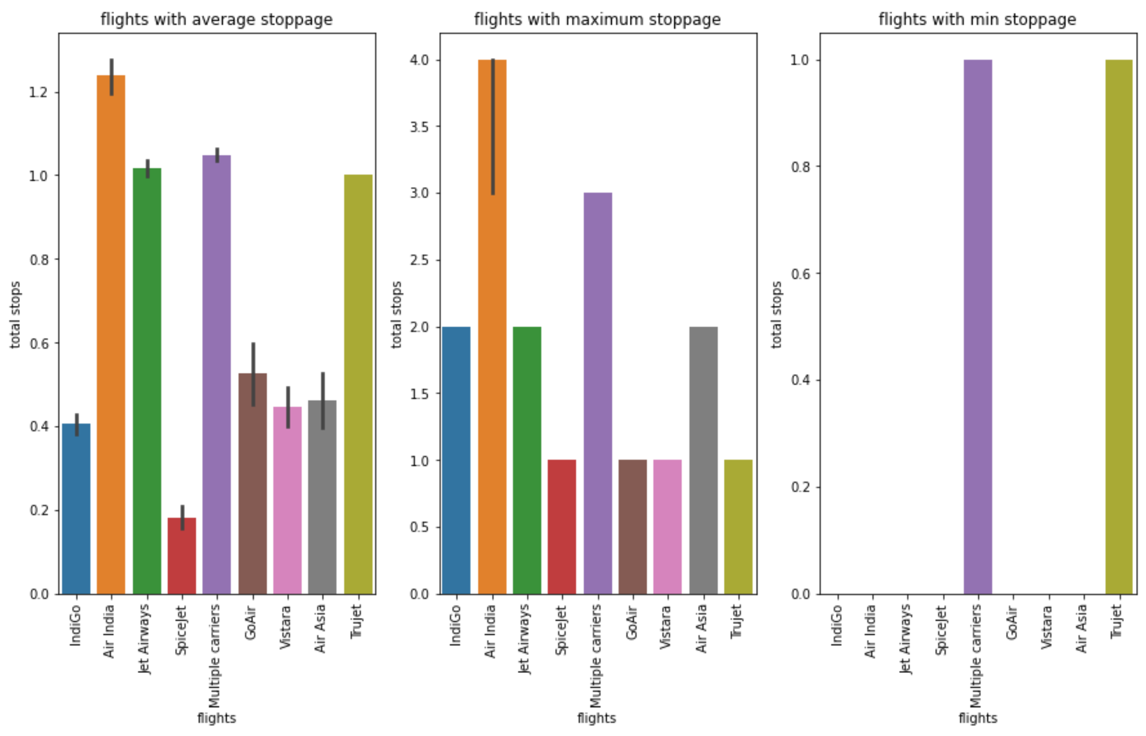
FIND THE MIN, MAX AND AVERAGE STOPPAGE OF EACH FLIGHT

In [217]:

```
plt.figure(figsize=(15,8))
plt.subplot(1,3,1)
sns.barplot(x="Airline",y="Total_Stops",data=df)
plt.title("flights with average stoppage")
plt.xlabel("flights")
plt.ylabel("total stops")
plt.xticks(rotation=90)


plt.subplot(1,3,2)
sns.barplot(x="Airline",y="Total_Stops",data=df,estimator=max)
plt.title("flights with maximum stoppage")
plt.xlabel("flights")
plt.ylabel("total stops")
plt.xticks(rotation=90)


plt.subplot(1,3,3)
sns.barplot(x="Airline",y="Total_Stops",data=df,estimator=min)
plt.title("flights with min stoppage")
plt.xlabel("flights")
plt.ylabel("total stops")
plt.xticks(rotation=90);
```



There is only one flight named "Vistara Premium economy" having "0" stoppage and "Air India" is the flight which has "maximum" stoppages

FIND THE DETAILS OF VISTARA PREMIUM ECONOMY FLIGHT

In [218]:

```
df[df['Airline']=='Vistara']
```

Out[218]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	d
28	Vistara	Banglore	Delhi	BLR → DEL	170.0	0	No info	4668	
29	Vistara	Chennai	Kolkata	MAA → CCU	135.0	0	No info	3687	
30	Vistara	Chennai	Kolkata	MAA → CCU	135.0	0	No info	3687	
57	Vistara	Chennai	Kolkata	MAA → CCU	135.0	0	No info	7414	
59	Vistara	Mumbai	Hyderabad	BOM → DEL → HYD	1505.0	1	No info	12395	
...	...	...	...	...	...	...	...	...	
10624	Vistara	Kolkata	Banglore	CCU → DEL → BLR	1580.0	1	No info	8662	
10656	Vistara	Banglore	Delhi	BLR → DEL	160.0	0	No info	5613	
10659	Vistara	Banglore	Delhi	BLR → DEL	170.0	0	No info	4668	
10660	Vistara	Banglore	Delhi	BLR → DEL	175.0	0	No info	4878	
10681	Vistara	Banglore	Delhi	BLR → DEL	160.0	0	No info	12648	

482 rows × 14 columns

HOW DOES THE NO. OF STOPPAGES AND DURATION VARIES WITH THE PRICE?

In [219]:

```
print(df.corr()["Total_Stops"]["Price"])
print(df.corr()["Duration"]["Price"])
```

```
0.6038830640858682
0.5067431283617874
```

WHICH FLIGHT IS AVAILABLE FROM SOURCE TO DESTINATION or CHECKING THE AVAILABILITY OF FLIGHT W.R.T THE SOURCE AND DESTINATION

In [220]:

```
df.groupby(["Source","Destination"])["Airline"].value_counts()
```

Out[220]:

```
Source    Destination  Airline
Banglore  Delhi        Jet Airways           792
                       IndiGo                523
                       Air India             332
                       Vistara               187
                       SpiceJet              181
                       GoAir                  93
                       Air Asia               89
Chennai   Kolkata      IndiGo                184
                       SpiceJet              128
                       Vistara                44
                       Air India              25
Delhi     Cochin       Jet Airways          1588
                       Multiple carriers    1209
                       Air India             747
                       IndiGo                705
                       SpiceJet               87
                       Air Asia               80
                       GoAir                  76
                       Vistara                45
Kolkata   Banglore     Jet Airways          1256
                       Air India             512
                       IndiGo                445
                       SpiceJet              300
                       Vistara               183
                       Air Asia              150
                       GoAir                  25
Mumbai    Hyderabad    Jet Airways           219
                       IndiGo                196
                       Air India             136
                       SpiceJet              122
                       Vistara                23
                       Trujet                  1
Name: Airline, dtype: int64
```

FIND THE MAX , MIN AND THE AVERAGE PRICE OF DIFFERENT FLIGHT FROM SOURCE TO DESTINATION

In [221]:

```
k=df.groupby(["Source","Destination","Airline"])["Price"].agg(["mean","max","min"])
k.reset_index(inplace=True)
k
```

Out[221]:

	Source	Destination	Airline	mean	max	min
0	Banglore	Delhi	Air Asia	4574.280899	10873	3383
1	Banglore	Delhi	Air India	9238.198795	31783	3758
2	Banglore	Delhi	GoAir	4948.881720	18558	3398
3	Banglore	Delhi	IndiGo	5274.112811	22153	3359
4	Banglore	Delhi	Jet Airways	11283.462121	79512	3359
5	Banglore	Delhi	SpiceJet	4550.292818	23267	3257
6	Banglore	Delhi	Vistara	6211.037433	21730	4353
7	Chennai	Kolkata	Air India	5895.640000	19630	3145
8	Chennai	Kolkata	IndiGo	4538.766304	8580	3384
9	Chennai	Kolkata	SpiceJet	3993.523438	7718	3332
10	Chennai	Kolkata	Vistara	7528.500000	11982	3687
11	Delhi	Cochin	Air Asia	7804.175000	13774	6151
12	Delhi	Cochin	Air India	10000.068273	28322	4487
13	Delhi	Cochin	GoAir	6587.157895	22794	3876
14	Delhi	Cochin	IndiGo	7203.933333	16162	4729
15	Delhi	Cochin	Jet Airways	12688.871537	52285	4256
16	Delhi	Cochin	Multiple carriers	10908.228288	36983	5797
17	Delhi	Cochin	SpiceJet	5916.356322	11726	4098
18	Delhi	Cochin	Vistara	6465.644444	12411	4851
19	Kolkata	Banglore	Air Asia	5012.320000	11323	3782
20	Kolkata	Banglore	Air India	10357.324219	31945	4145
21	Kolkata	Banglore	GoAir	7047.000000	10586	3514
22	Kolkata	Banglore	IndiGo	5075.235955	12198	3480
23	Kolkata	Banglore	Jet Airways	11717.565287	15149	5608
24	Kolkata	Banglore	SpiceJet	4642.883333	12287	3815
25	Kolkata	Banglore	Vistara	9257.683060	16932	7770
26	Mumbai	Hyderabad	Air India	6260.051471	25139	2050
27	Mumbai	Hyderabad	IndiGo	3659.816327	17501	2227
28	Mumbai	Hyderabad	Jet Airways	6227.949772	24210	1840
29	Mumbai	Hyderabad	SpiceJet	2511.106557	13552	1759
30	Mumbai	Hyderabad	Trujet	4140.000000	4140	4140
31	Mumbai	Hyderabad	Vistara	12326.521739	12395	12080

In [222]:

```
k.set_index(["Source","Destination"])
```

Out[222]:

		Airline	mean	max	min
Source	**Destination**				
Banglore	**Delhi**	Air Asia	4574.280899	10873	3383
	Delhi	Air India	9238.198795	31783	3758
	Delhi	GoAir	4948.881720	18558	3398
	Delhi	IndiGo	5274.112811	22153	3359
	Delhi	Jet Airways	11283.462121	79512	3359
	Delhi	SpiceJet	4550.292818	23267	3257
	Delhi	Vistara	6211.037433	21730	4353
Chennai	**Kolkata**	Air India	5895.640000	19630	3145
	Kolkata	IndiGo	4538.766304	8580	3384
	Kolkata	SpiceJet	3993.523438	7718	3332
	Kolkata	Vistara	7528.500000	11982	3687
Delhi	**Cochin**	Air Asia	7804.175000	13774	6151
	Cochin	Air India	10000.068273	28322	4487
	Cochin	GoAir	6587.157895	22794	3876
	Cochin	IndiGo	7203.933333	16162	4729
	Cochin	Jet Airways	12688.871537	52285	4256
	Cochin	Multiple carriers	10908.228288	36983	5797
	Cochin	SpiceJet	5916.356322	11726	4098
	Cochin	Vistara	6465.644444	12411	4851
Kolkata	**Banglore**	Air Asia	5012.320000	11323	3782
	Banglore	Air India	10357.324219	31945	4145
	Banglore	GoAir	7047.000000	10586	3514
	Banglore	IndiGo	5075.235955	12198	3480
	Banglore	Jet Airways	11717.565287	15149	5608
	Banglore	SpiceJet	4642.883333	12287	3815
	Banglore	Vistara	9257.683060	16932	7770
Mumbai	**Hyderabad**	Air India	6260.051471	25139	2050
	Hyderabad	IndiGo	3659.816327	17501	2227
	Hyderabad	Jet Airways	6227.949772	24210	1840
	Hyderabad	SpiceJet	2511.106557	13552	1759
	Hyderabad	Trujet	4140.000000	4140	4140
	Hyderabad	Vistara	12326.521739	12395	12080

In [223]:

```
df
```

Out[223]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price
0	IndiGo	Banglore	Delhi	BLR → DEL	170.0	0	No info	3897
1	Air India	Kolkata	Banglore	CCU → IXR → BBI → BLR	445.0	2	No info	7662
2	Jet Airways	Delhi	Cochin	DEL → LKO → BOM → COK	1140.0	2	No info	13882
3	IndiGo	Kolkata	Banglore	CCU → NAG → BLR	325.0	1	No info	6218
4	IndiGo	Banglore	Delhi	BLR → NAG → DEL	285.0	1	No info	13302
...	...	...	...	...	...	...	...	...
10678	Air Asia	Kolkata	Banglore	CCU → BLR	150.0	0	No info	4107
10679	Air India	Kolkata	Banglore	CCU → BLR	155.0	0	No info	4145
10680	Jet Airways	Banglore	Delhi	BLR → DEL	180.0	0	No info	7229
10681	Vistara	Banglore	Delhi	BLR → DEL	160.0	0	No info	12648
10682	Air India	Delhi	Cochin	DEL → GOI → BOM → COK	500.0	2	No info	11753

10683 rows × 14 columns

VARIATION OF FLIGHT PRICE FROM SOURCE

In [224]:

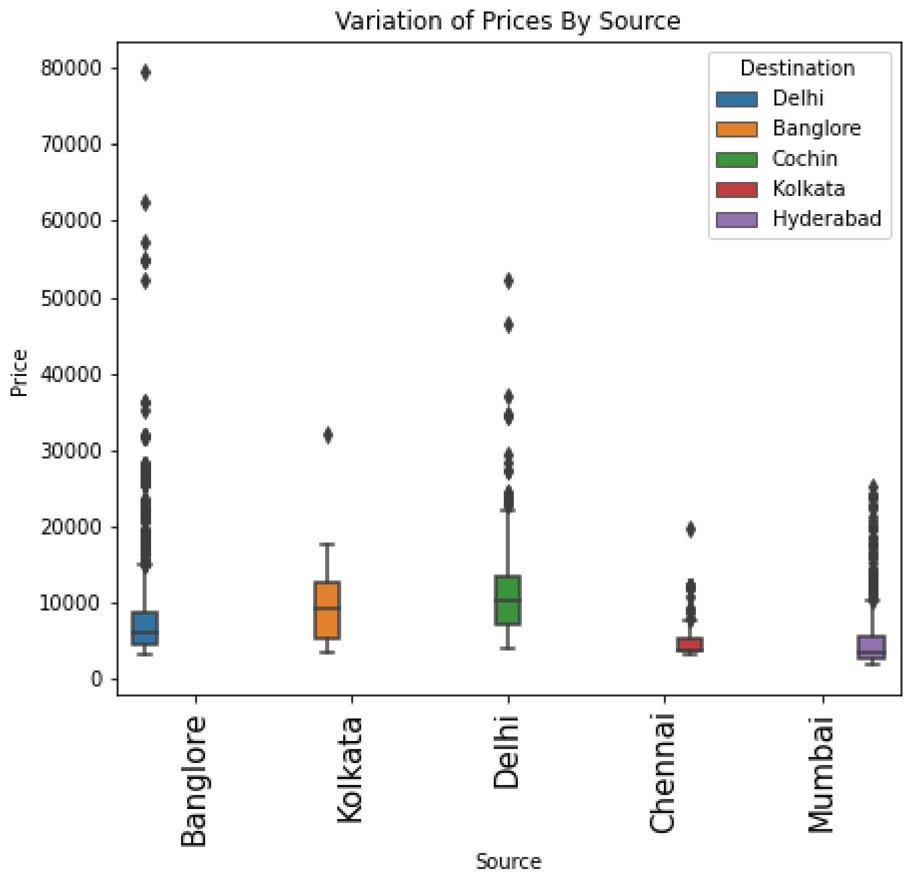
```
df.groupby(['Source','Destination'])['Price'].agg(['mean','sum'])
```

Out[224]:

		mean	sum
Source	**Destination**		
Banglore	**Delhi**	8017.464269	17614369
Chennai	**Kolkata**	4789.892388	1824949
Delhi	**Cochin**	10539.439057	47817435
Kolkata	**Banglore**	9158.389411	26293736
Mumbai	**Hyderabad**	5059.708752	3526617

In [225]:

```
plt.figure(figsize=(7,6))
sns.boxplot(x='Source',y='Price',hue='Destination',data=df)
plt.xticks(rotation=90,size=15)
plt.title('Variation of Prices By Source')
plt.show()
```



The Expensive Flight is taken off from "Bangalore" and The Cheapest flight is taken off from "Chennai"

FIND THE DAY ON WHICH FLIGHTS TAKEN OFF WAS ON THE PEAK

Since date column have so many unique values that is why we extracted day and month from it

ON WHICH DAY AS WELL AS THE MONTH, THE FLIGHTS WERE AVAILABLE

In [226]:

```
df.head()
```

Out[226]:

	Airline	Source	Destination	Route	Duration	Total_Stops	Additional_Info	Price	day_
0	IndiGo	Banglore	Delhi	BLR → DEL	170.0	0	No info	3897	
1	Air India	Kolkata	Banglore	CCU → IXR → BBI → BLR	445.0	2	No info	7662	
2	Jet Airways	Delhi	Cochin	DEL → LKO → BOM → COK	1140.0	2	No info	13882	
3	IndiGo	Kolkata	Banglore	CCU → NAG → BLR	325.0	1	No info	6218	
4	IndiGo	Banglore	Delhi	BLR → NAG → DEL	285.0	1	No info	13302	

In [227]:

```
df['day_of_journey'].unique()
```

Out[227]:

```
array([24,  5,  6,  3, 27, 18, 15, 21,  4], dtype=int64)
```

In [228]:

```
df['month_of_journey'].unique()
```

Out[228]:

```
array([ 3,  1,  9, 12,  6,  5,  4], dtype=int64)
```

There was no flight take off in month feb,july,aug,oct,nov

FIND THE MONTH WITH MAXIMUM FLIGHTS TAKE OFF

In [229]:

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

Out[229]:

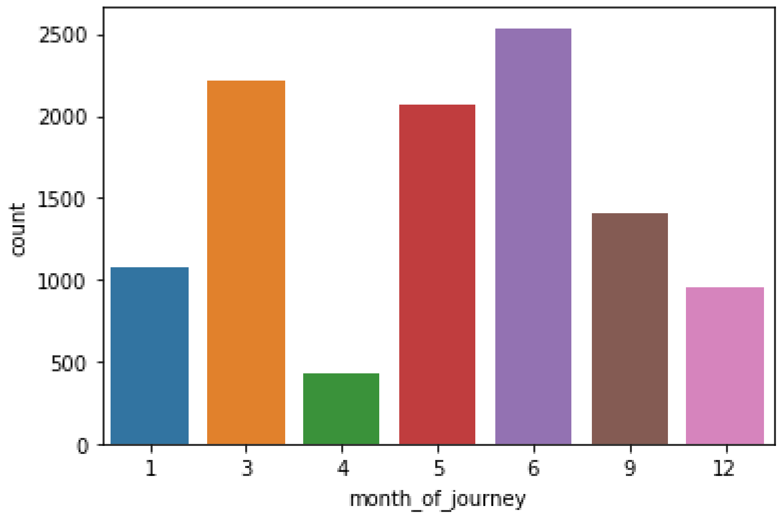
```
6     2536
3     2211
5     2074
9     1406
1     1075
12     957
4      424
Name: month_of_journey, dtype: int64
```

In [230]:

```
# using countplot
sns.countplot(x="month_of_journey",data=df)
```

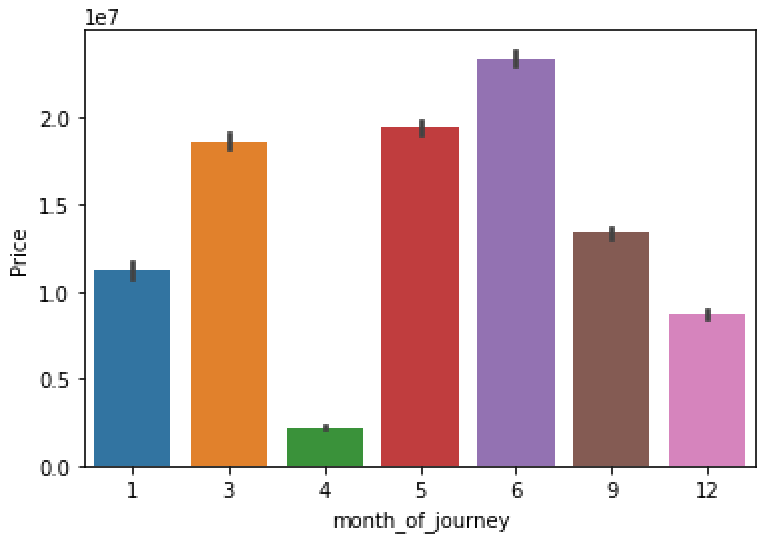
Out[230]:

```
<AxesSubplot:xlabel='month_of_journey', ylabel='count'>
```



In [231]:

```
# using barplot
sns.barplot(x="month_of_journey",y="Price",data=df,estimator=sum);
```

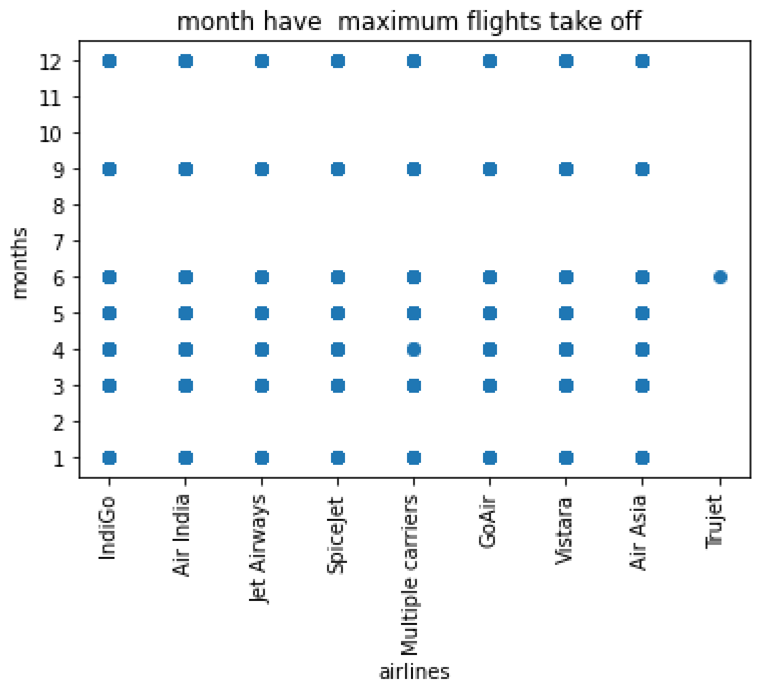


"June" was on the peak , where "maximum" flights taken off and "April" was the off season

WHICH FLIGHT ARE BEING TAKEN OFF IN WHICH MONTH?

In [232]:

```
plt.scatter(df["Airline"],df["month_of_journey"])
plt.xticks(rotation=90);
plt.ylabel("months")
plt.xlabel("airlines")
plt.yticks([1,2,3,4,5,6,7,8,9,10,11,12])
plt.title("month have  maximum flights take off ");
```



HOW MANY FLIGHTS ARE TAKEN OFF IN EACH MONTH?

In [233]:

```
df.groupby(["month_of_journey"])["Airline"].value_counts()
```

Out[233]:

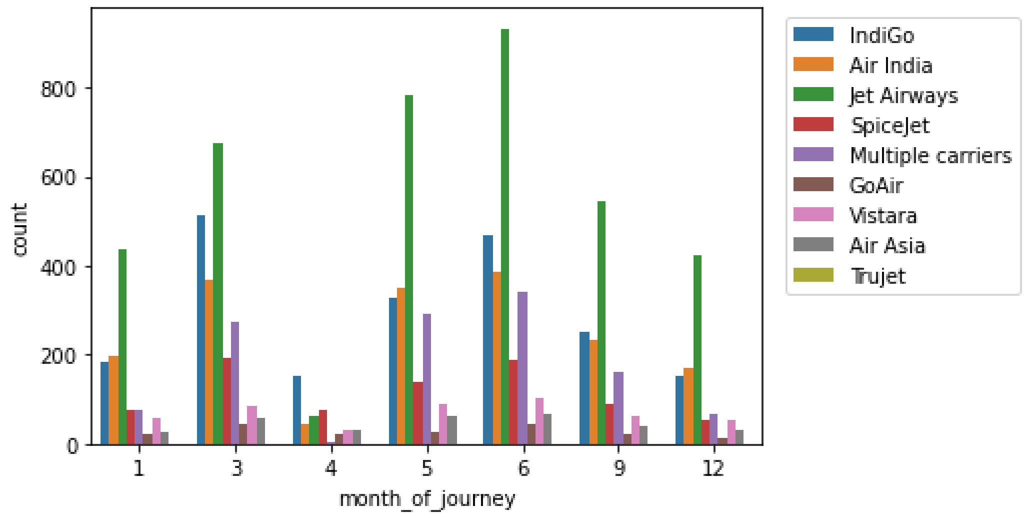
```
month_of_journey  Airline          
1                 Jet Airways          434
                  Air India            197
                  IndiGo               184
                  SpiceJet              76
                  Multiple carriers     75
                  Vistara               60
                  Air Asia              28
                  GoAir                 21
3                 Jet Airways          675
                  IndiGo               513
                  Air India            369
                  Multiple carriers    274
                  SpiceJet             193
                  Vistara               85
                  Air Asia              59
                  GoAir                 43
4                 IndiGo               153
                  SpiceJet              76
                  Jet Airways           63
                  Air India             45
                  Air Asia              32
                  Vistara               31
                  GoAir                 22
                  Multiple carriers      2
5                 Jet Airways          783
                  Air India            352
                  IndiGo               329
                  Multiple carriers    292
                  SpiceJet             139
                  Vistara               90
                  Air Asia              61
                  GoAir                 28
6                 Jet Airways          932
                  IndiGo               469
                  Air India            386
                  Multiple carriers    341
                  SpiceJet             190
                  Vistara              103
                  Air Asia              69
                  GoAir                 45
                  Trujet                 1
9                 Jet Airways          544
                  IndiGo               253
                  Air India            234
                  Multiple carriers    160
                  SpiceJet              90
                  Vistara               61
                  Air Asia              41
                  GoAir                 23
12                Jet Airways          424
                  Air India            169
                  IndiGo               152
                  Multiple carriers     65
                  SpiceJet              54
                  Vistara               52
                  Air Asia              29
                  GoAir                 12
Name: Airline, dtype: int64
```

In [234]:

```
sns.countplot(x="month_of_journey",hue="Airline",data=df)
plt.legend(bbox_to_anchor= (1.4,1))
```

Out[234]:

```
<matplotlib.legend.Legend at 0x24eec47cb50>
```



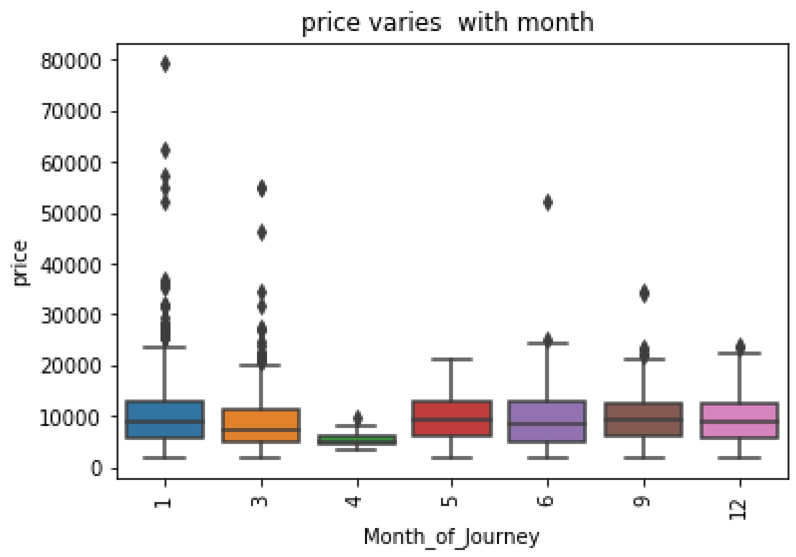
HOW MONTH OF JOURNEY VARIES WITH THE PRICE?

In [235]:

```
sns.boxplot(x="month_of_journey",y="Price",data=df)
plt.xticks(rotation=90);
plt.ylabel("price")
plt.xlabel("Month_of_Journey")
plt.title("price varies  with month ")
```

Out[235]:

```
Text(0.5, 1.0, 'price varies  with month ')
```



WHICH DAY OF JOURNEY WAS ON THE PEAK?

In [236]:

```
df["day_of_journey"].value_counts()
```

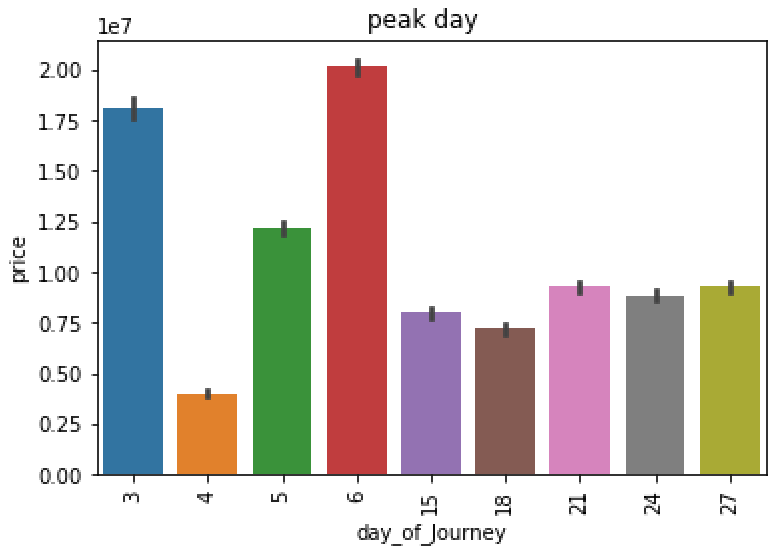
Out[236]:

```
6     2166
5     1392
3     1361
27    1130
21    1111
24    1052
15     984
18     832
4      655
Name: day_of_journey, dtype: int64
```

6th was the day when passengers travelled the most

In [237]:

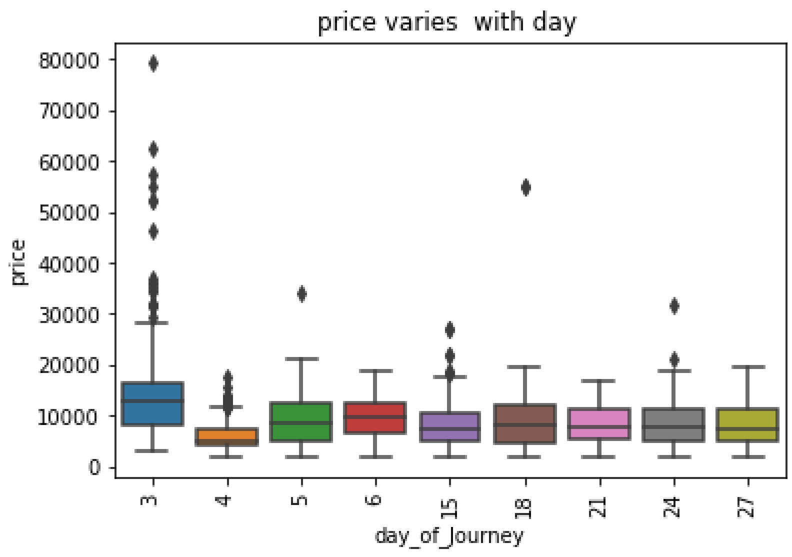
```
sns.barplot(x="day_of_journey",y="Price",estimator=sum,data=df)
plt.xticks(rotation=90);
plt.ylabel("price")
plt.xlabel("day_of_Journey")
plt.title("peak day  ");
```



HOW DAY VARIES WITH THE PRICE?

In [238]:

```
sns.boxplot(x="day_of_journey",y="Price",data=df)
plt.xticks(rotation=90);
plt.ylabel("price")
plt.xlabel("day_of_Journey")
plt.title("price varies  with day ");
```



WHICH DEPARTURE HOUR WAS ON THE PEAK?

In [239]:

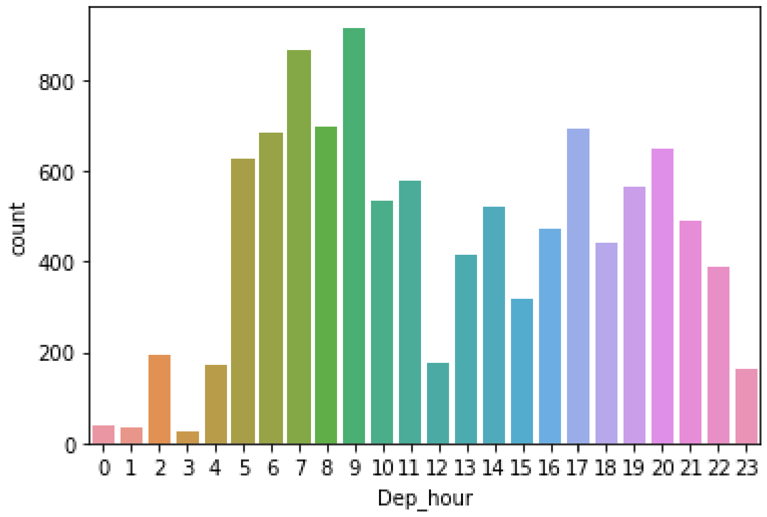
```
df["Dep_hour"].value_counts()
```

Out[239]:

```
9     916
7     867
8     697
17    695
6     687
20    651
5     629
11    580
19    567
10    536
14    523
21    492
16    472
18    444
13    417
22    387
15    319
2     194
12    178
4     170
23    161
0      40
1      37
3      24
Name: Dep_hour, dtype: int64
```

In [240]:

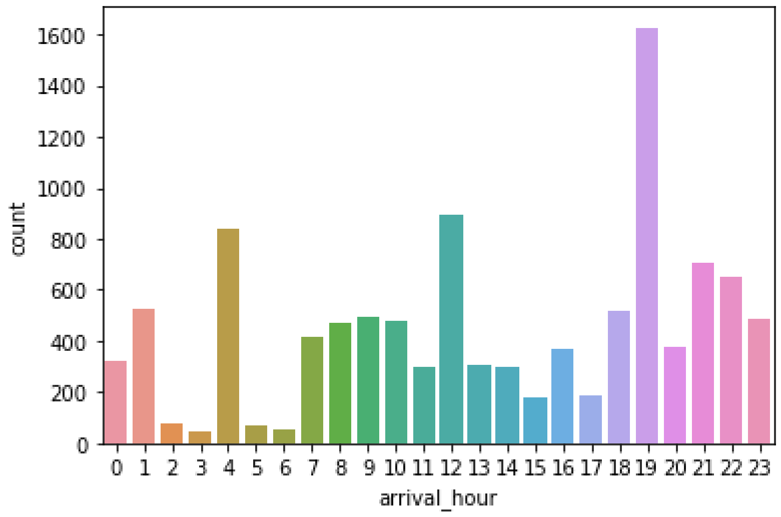
```
sns.countplot(x="Dep_hour",data=df);
```



WHICH ARRIVAL HOUR WAS ON THE PEAK?

In [241]:

```
sns.countplot(x="arrival_hour",data=df);
```



FIND THE PEAK ARRIVAL HOUR FOR DIFFERENT FLIGHTS

In [242]:

```
df.groupby(["Airline"])["arrival_hour"].value_counts()
```

Out[242]:

```
Airline    arrival_hour
Air Asia   22              63
           7               52
           13              36
           2               33
           1               30
                           ..
Vistara    19              28
           17              23
           0                8
           16               5
           21               3
Name: arrival_hour, Length: 129, dtype: int64
```

FIND THE PEAK ARRIVAL HOUR FOE THE DIFFERENT FLIGHT W.R.T DESTINATION ALSO

In [243]:

```
df.groupby(["Destination","Airline"])["arrival_hour"].value_counts()
```

Out[243]:

```
Destination  Airline   arrival_hour
Banglore     Air Asia  22              34
                       1               30
                       12              30
                       23              24
                       10              21
                                       ..
Kolkata      SpiceJet  12              41
                       20              41
             Vistara   9               25
                       20              18
                       10               1
Name: arrival_hour, Length: 265, dtype: int64
```

In [244]:

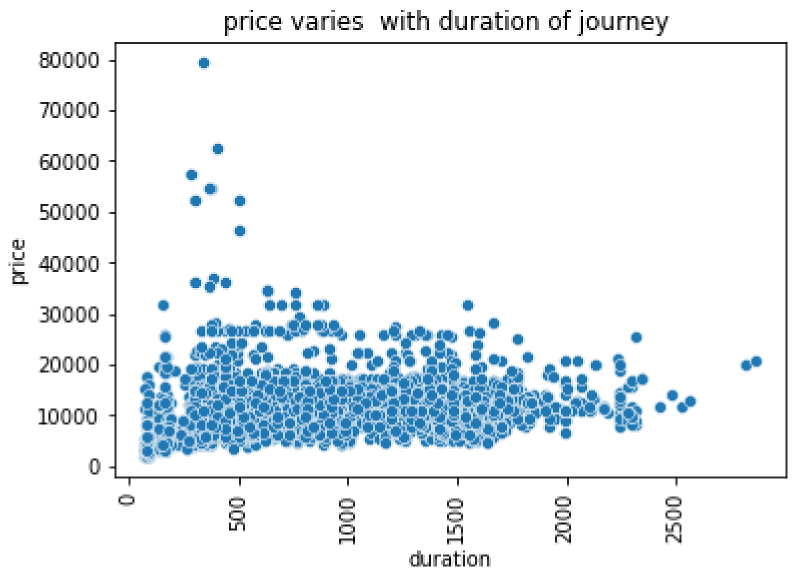
```
df.select_dtypes(["int","float"]).columns
```

Out[244]:

```
Index(['Duration', 'Total_Stops', 'Price', 'day_of_journey',
       'month_of_journey', 'Dep_hour', 'Dep_min', 'arrival_hour',
       'arrival_min'],
      dtype='object')
```

In [245]:

```
sns.scatterplot(x="Duration",y="Price",data=df)
plt.xticks(rotation=90);
plt.ylabel("price")
plt.xlabel("duration")
plt.title("price varies  with duration of journey ");
# which shows it is sort of linear
```



In [246]:

```
df.corr()["Price"]
```

Out[246]:

```
Duration              0.506743
Total_Stops           0.603883
Price                 1.000000
day_of_journey       -0.165412
month_of_journey      0.010700
Dep_hour              0.006819
Dep_min              -0.024492
arrival_hour          0.024312
arrival_min          -0.086483
Name: Price, dtype: float64
```

WHICH AIRLINE HAS THE MAXIMUM PROFIT?

In [247]:

```
df.groupby('Airline')['Price'].agg(['max','sum','count']).sort_values(by='max',ascending
# jetairways is the airline which has the expensive flight and has the maximum profits a
```

Out[247]:

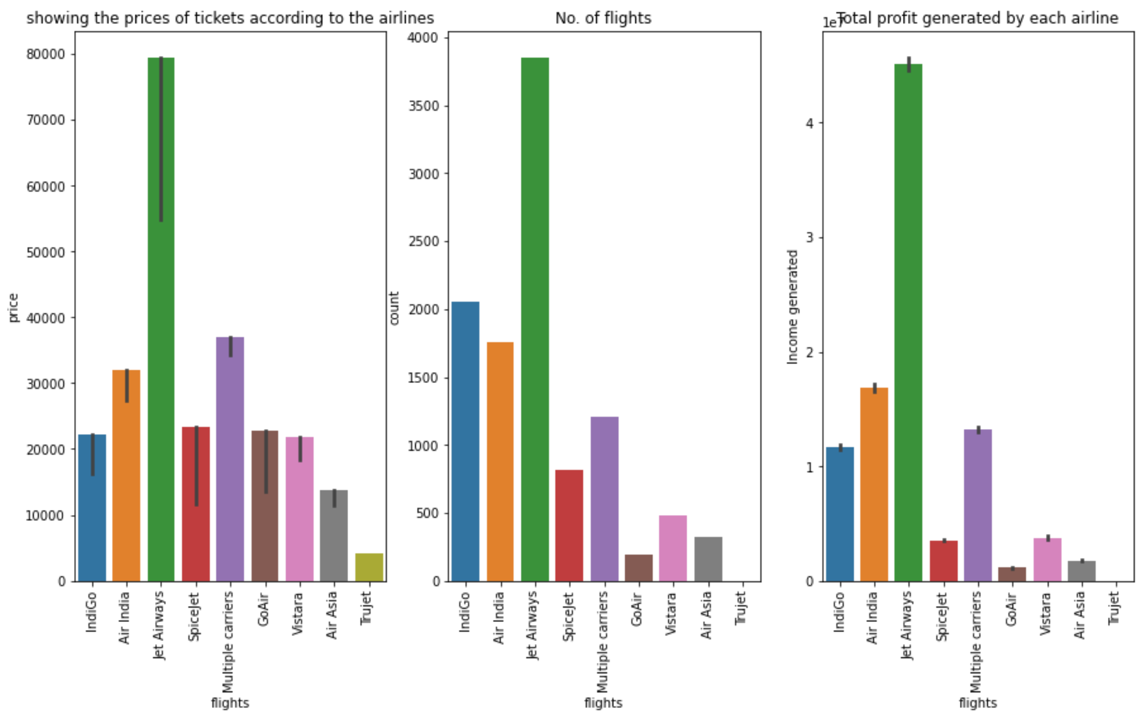
Airline	max	sum	count
Jet Airways	79512	45167613	3855
Multiple carriers	36983	13188048	1209
Air India	31945	16838841	1752
SpiceJet	23267	3548717	818
GoAir	22794	1137045	194
IndiGo	22153	11648071	2053
Vistara	21730	3761338	482
Air Asia	13774	1783293	319
Trujet	4140	4140	1

In [248]:

```
plt.figure(figsize=(15,8))
plt.subplot(1,3,1)
sns.barplot(x="Airline",y="Price",data=df,estimator = max)
plt.title("showing the prices of tickets according to the airlines")
plt.xlabel("flights")
plt.ylabel("price")
plt.xticks(rotation=90)


plt.subplot(1,3,2)
sns.countplot(x="Airline",data=df)
plt.title("No. of flights")
plt.xlabel("flights")
plt.ylabel("count")
plt.xticks(rotation=90)


plt.subplot(1,3,3)
sns.barplot(x="Airline",y="Price",data=df,estimator=sum)
plt.title("Total profit generated by each airline")
plt.xlabel("flights")
plt.ylabel("Income generated")
plt.xticks(rotation=90);
```



WHICH MONTH HAS THE MAXIMUM PROFIT W.R.T AIRLINES?

In [249]:

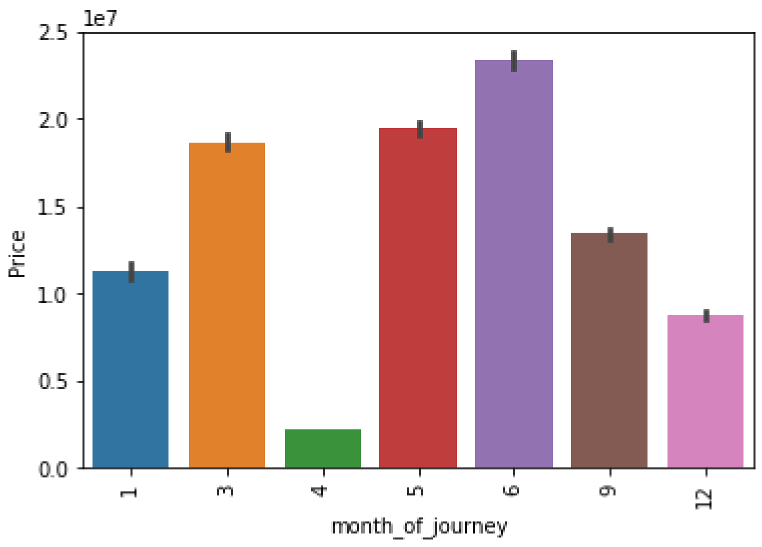
```
df.groupby('month_of_journey')['Price'].sum().sort_values(ascending=False)
```

Out[249]:

```
month_of_journey
6     23369151
5     19414875
3     18647220
9     13429373
1     11279591
12     8719011
4     2217885
Name: Price, dtype: int64
```

In [250]:

```
sns.barplot(x="month_of_journey",y="Price",estimator=sum,data=df);
plt.xticks(rotation=90);
```



In [251]:

```
df.groupby(['month_of_journey','Airline'])['Price'].agg(['sum','count']).sort_values(by=
```

Out[251]:

		sum	count
month_of_journey	**Airline**		
6	**Jet Airways**	11100376	932
5	**Jet Airways**	9435176	783
3	**Jet Airways**	7087418	675
9	**Jet Airways**	6523683	544
1	**Jet Airways**	5853653	434
12	**Jet Airways**	4777168	424
6	**Multiple carriers**	3803704	341
	Air India	3752045	386
5	**Air India**	3508354	352
	IndiGo	3174457	513
3	**Air India**	3169391	369
	Multiple carriers	3054577	274
5	**Multiple carriers**	2922266	292
6	**IndiGo**	2553771	469
9	**Air India**	2295491	234
1	**Air India**	2198523	197
9	**Multiple carriers**	1809841	160
5	**IndiGo**	1788186	329
12	**Air India**	1655980	169
9	**IndiGo**	1504417	253
1	**IndiGo**	1123298	184
	Multiple carriers	900258	75
3	**SpiceJet**	844230	193
6	**Vistara**	799380	103
4	**IndiGo**	761519	153
6	**SpiceJet**	757501	190
12	**IndiGo**	742423	152
5	**Vistara**	703455	90
3	**Vistara**	697134	85
12	**Multiple carriers**	685216	65
5	**SpiceJet**	568285	139
1	**Vistara**	505994	60
9	**Vistara**	470700	61
	SpiceJet	415805	90
12	**Vistara**	406085	52
4	**Jet Airways**	390139	63

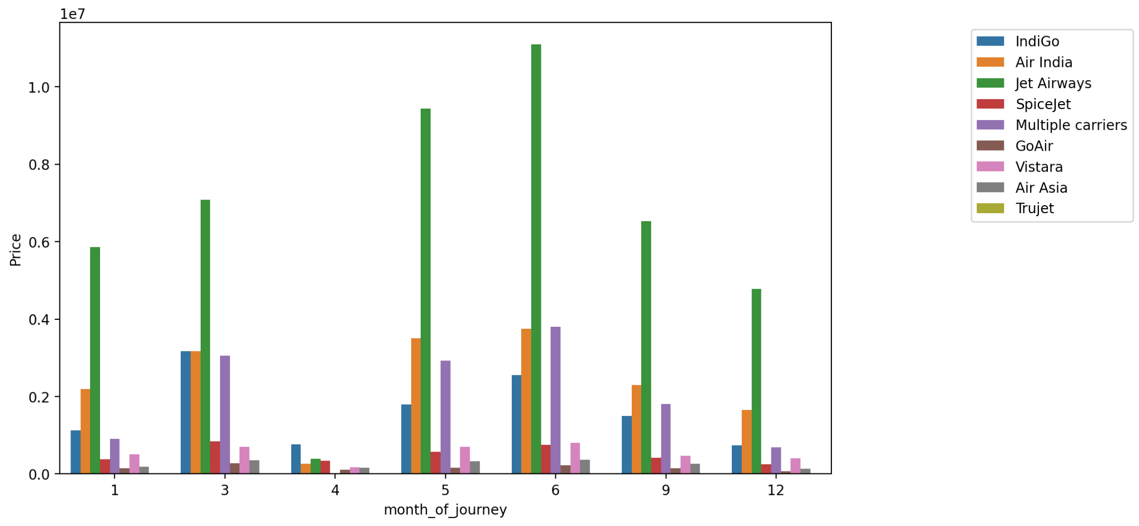
		sum	count
month_of_journey	**Airline**		
1	**SpiceJet**	372574	76
6	**Air Asia**	368888	69
3	**Air Asia**	349853	59
4	**SpiceJet**	343718	76
5	**Air Asia**	323056	61
3	**GoAir**	270160	43
9	**Air Asia**	263205	41
4	**Air India**	259057	45
12	**SpiceJet**	246604	54
6	**GoAir**	229346	45
1	**Air Asia**	179659	28
4	**Vistara**	178590	31
5	**GoAir**	166097	28
4	**Air Asia**	158440	32
9	**GoAir**	146231	23
1	**GoAir**	145632	21
12	**Air Asia**	140192	29
4	**GoAir**	114236	22
12	**GoAir**	65343	12
4	**Multiple carriers**	12186	2
6	**Trujet**	4140	1

In [252]:

```
plt.figure(figsize=(10,6),dpi=200)
sns.barplot(x='month_of_journey',y = 'Price',hue='Airline',data=df,estimator=sum,ci=None
plt.legend(bbox_to_anchor =(1.4,1))
```

Out[252]:

```
<matplotlib.legend.Legend at 0x24eec1ed280>
```

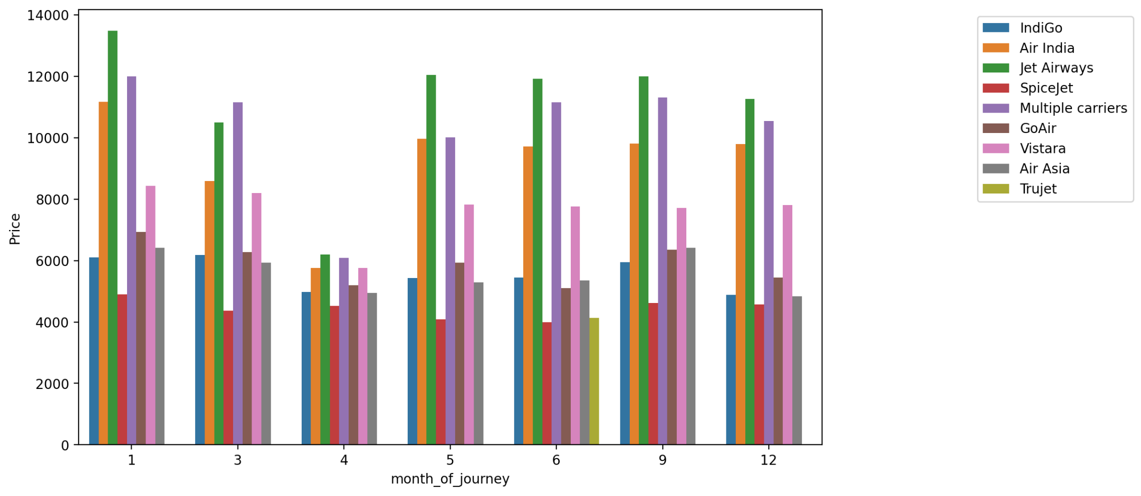


In [253]:

```
plt.figure(figsize=(10,6),dpi=200)
sns.barplot(x='month_of_journey',y = 'Price',hue='Airline',data=df,ci=None)
plt.legend(bbox_to_anchor =(1.2,1))
# showing mean
```

Out[253]:

```
<matplotlib.legend.Legend at 0x24eebf0d7c0>
```



In [254]:

```
# when ci is not none it shows the range in which the data is lying
```