Project: Investigate a Dataset (TMDb_Movies Dataset)

Table of Contents Introduction Data Wrangling Exploratory Data Analysis Conclusions

over view

> **Tip**: this report is about data analysis of movies according to genres , revenue,budget and rating and it help us to find the best of movies that people attracted to them and how much the production team pay for that we get data from this link https://www.kaggle.com/tmdb/tmdb-movie-metadata

Question(s) for Analysis

```
1-what's the most produces year of movies?
2-what's the most profitable according to year?
3-what's the most productive type of movies?
4-what's the most profitable type of movies ?
5-what's the most popular movies genre?
```

In [44]:
```python
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sbs
import pandas as pd
```

General proporties

1-importing data and check it 2-look at data an choose from it the coloumns we need 3-delete from the table the coloumns that we willn't use 4-check the coloums that have unknown value and if it will affect on analysis we will remove this coloums 5-check data with less missing value we will clean it 6-remove the duplicated row

importing data and check it,look at data and choose from coloums we need.

In [46]:
```python
df=pd.read_csv('tmdb-movies.csv')
df.head()
```

Out[46]:

	id	imdb_id	popularity	popularity.1	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime	gen
0	135397	tt0369610	32.985763	33.985763	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	http://www.jurassicworld.com/	Colin Trevorrow	The park is open.	...	Twenty-two years after the events of Jurassic ...	124	Action|Adventure|Scie Fiction|Thri
1	76341	tt1392190	28.419936	29.419936	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	http://www.madmaxmovie.com/	George Miller	What a Lovely Day.	...	An apocalyptic story set in the furthest reach...	120	Action|Adventure|Scie Fiction|Thri
2	262500	tt2908446	13.112507	14.112507	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	http://www.thedivergentseries.movie/#insurgent	Robert Schwentke	One Choice Can Destroy You	...	Beatrice Prior must confront her inner demons ...	119	Adventure|Scie Fiction|Thri
3	140607	tt2488496	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	http://www.starwars.com/films/star-wars-episod...	J.J. Abrams	Every generation has a story.	...	Thirty years after defeating the Galactic Empi...	136	Action|Adventure|Scie Fiction|Fant
4	168259	tt2820852	9.335014	10.335014	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	http://www.furious7.com/	James Wan	Vengeance Hits Home	...	Deckard Shaw seeks revenge against Dominic Tor...	137	Action|Crime|Thri

5 rows × 21 columns

1-cleaning data by convert nan value in numerical coloums to zero 2-check null value 3-drop coloumns which has more null value and willn't be benfit for analysis 4-check null value again and drop it 5-check duplicates row and drop it 6-check data types and covert numerical value from float to integer and convert object to string

In [48]:
```python
movies_tmdb_rev=['budget_adj','revenue_adj','runtime']
df[movies_tmdb_rev]=df[movies_tmdb_rev].replace(0,np.nan)
df.head()
```

Out[48]:

	id	imdb_id	popularity	popularity.1	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime	gen
0	135397	tt0369610	32.985763	33.985763	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	http://www.jurassicworld.com/	Colin Trevorrow	The park is open.	...	Twenty-two years after the events of Jurassic ...	124.0	Action|Adventure|Scie Fiction|Thri
1	76341	tt1392190	28.419936	29.419936	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	http://www.madmaxmovie.com/	George Miller	What a Lovely Day.	...	An apocalyptic story set in the furthest reach...	120.0	Action|Adventure|Scie Fiction|Thri
2	262500	tt2908446	13.112507	14.112507	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	http://www.thedivergentseries.movie/#insurgent	Robert Schwentke	One Choice Can Destroy You	...	Beatrice Prior must confront her inner demons ...	119.0	Adventure|Scie Fiction|Thri
3	140607	tt2488496	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	http://www.starwars.com/films/star-wars-episod...	J.J. Abrams	Every generation has a story.	...	Thirty years after defeating the Galactic Empi...	136.0	Action|Adventure|Scie Fiction|Fant
4	168259	tt2820852	9.335014	10.335014	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	http://www.furious7.com/	James Wan	Vengeance Hits Home	...	Deckard Shaw seeks revenge against Dominic Tor...	137.0	Action|Crime|Thri

5 rows × 21 columns

delete from the table the coloumns that we willn't need

In [50]:
```python
df.isnull().sum()
```

Out[50]:
```
id                         0
imdb_id                   10
popularity                 0
popularity.1               0
revenue                    0
original_title             0
cast                      76
homepage                7930
director                  44
tagline                 2824
keywords                1493
overview                   4
runtime                   31
genres                    23
production_companies    1030
release_date               0
vote_count                 0
vote_average               0
release_year               0
budget_adj              5696
revenue_adj             6016
dtype: int64
```

In [102...
```python
df_movies=df.drop(['imdb_id','cast','homepage','tagline','overview','release_date','director','keywords','production_companies'],axis=1)
df_movies.head()
```

Out[102...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939.3	1.392446e+09
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939.3	3.481613e+08
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955.5	2.716190e+08
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919.0	1.902723e+09
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923.1	1.385749e+09

In [103...
```python
df_movies.isnull().sum()
```

Out[103...
```
id                   0
popularity           0
popularity.1         0
revenue              0
original_title       0
runtime             31
genres              23
vote_count           0
vote_average         0
release_year         0
budget_adj        5696
revenue_adj       6016
dtype: int64
```

In [104...
```python
movies_tmdb=df_movies.dropna()
movies_tmdb.head()
```

Out[104...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939.3	1.392446e+09
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939.3	3.481613e+08
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955.5	2.716190e+08
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919.0	1.902723e+09
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923.1	1.385749e+09

In [105...
```python
print(movies_tmdb.shape)
```

```
(3855, 12)
```

In [106...
```python
movies_tmdb.isnull().sum()
```

Out[106...
```
id                0
popularity        0
popularity.1      0
revenue           0
original_title    0
runtime           0
genres            0
vote_count        0
vote_average      0
release_year      0
budget_adj        0
revenue_adj       0
dtype: int64
```

In [107...
```python
movies_tmdb.duplicated().sum()
```

Out[107...
```
1
```

In [108...
```python
movies_tmdb=movies_tmdb.drop_duplicates()
movies_tmdb.head()
```

Out[108...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939.3	1.392446e+09
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939.3	3.481613e+08
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955.5	2.716190e+08
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919.0	1.902723e+09
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923.1	1.385749e+09

In [109...
```python
movies_tmdb.dtypes
```

Out[109...
```
id                  int64
popularity        float64
popularity.1      float64
revenue             int64
original_title     object
runtime           float64
genres             object
vote_count          int64
vote_average      float64
release_year        int64
budget_adj        float64
revenue_adj       float64
dtype: object
```

In [110...
```python
integer=['revenue_adj','budget_adj']
movies_tmdb[integer]=movies_tmdb[integer].applymap(np.int64)
movies_tmdb.head()
```

Out[110...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939	1392445893
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939	348161292
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955	271619025
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919	1902723130
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923	1385748801

In [118...
```python
movies_tmdb['profit'] = movies_tmdb['revenue']-movies_tmdb['budget_adj']
movies_tmdb['profit'] = movies_tmdb['profit'].apply(np.int64)
movies_tmdb.head()
```

Out[118...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj	profit
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939	1392445893	1375528871
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939	348161292	240436415
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955	271619025	194038246
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919	1902723130	1884178306
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923	1385748801	1331449437

In [112...
```python
movies_tmdb['genres']=movies_tmdb['genres'].apply(np.str_)
```

In [119...
```python
movies_tmdb.dtypes
```

Out[119...
```
id                  int64
popularity        float64
popularity.1      float64
revenue             int64
original_title     object
runtime           float64
genres             object
vote_count          int64
vote_average      float64
release_year        int64
budget_adj          int64
revenue_adj         int64
profit              int64
dtype: object
```

In [114...
```python
print(movies_tmdb.shape)
```

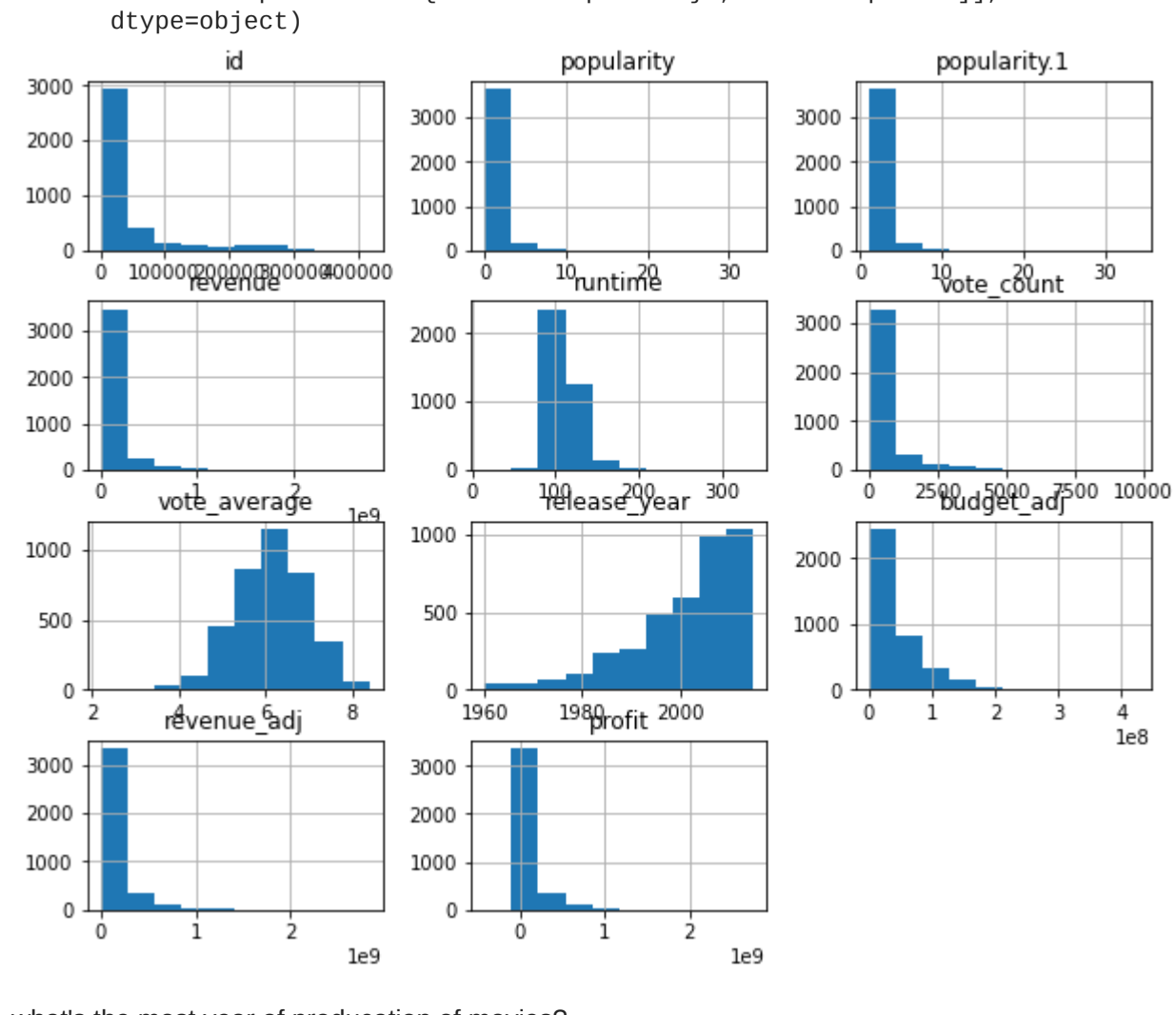
```
(3854, 13)
```

In [115...
```python
movies_tmdb.duplicated().sum()
```

Out[115...
```
0
```

In [116...
```python
movies_tmdb.hist(figsize=(10,8))
```

Out[116...
```
array([[<AxesSubplot:title={'center':'id'}>,
        <AxesSubplot:title={'center':'popularity'}>,
        <AxesSubplot:title={'center':'popularity.1'}>],
       [<AxesSubplot:title={'center':'revenue'}>,
        <AxesSubplot:title={'center':'runtime'}>,
        <AxesSubplot:title={'center':'vote_count'}>],
       [<AxesSubplot:title={'center':'vote_average'}>,
        <AxesSubplot:title={'center':'release_year'}>,
        <AxesSubplot:title={'center':'budget_adj'}>],
       [<AxesSubplot:title={'center':'revenue_adj'}>,
        <AxesSubplot:title={'center':'profit'}>, <AxesSubplot:>]],
      dtype=object)
```

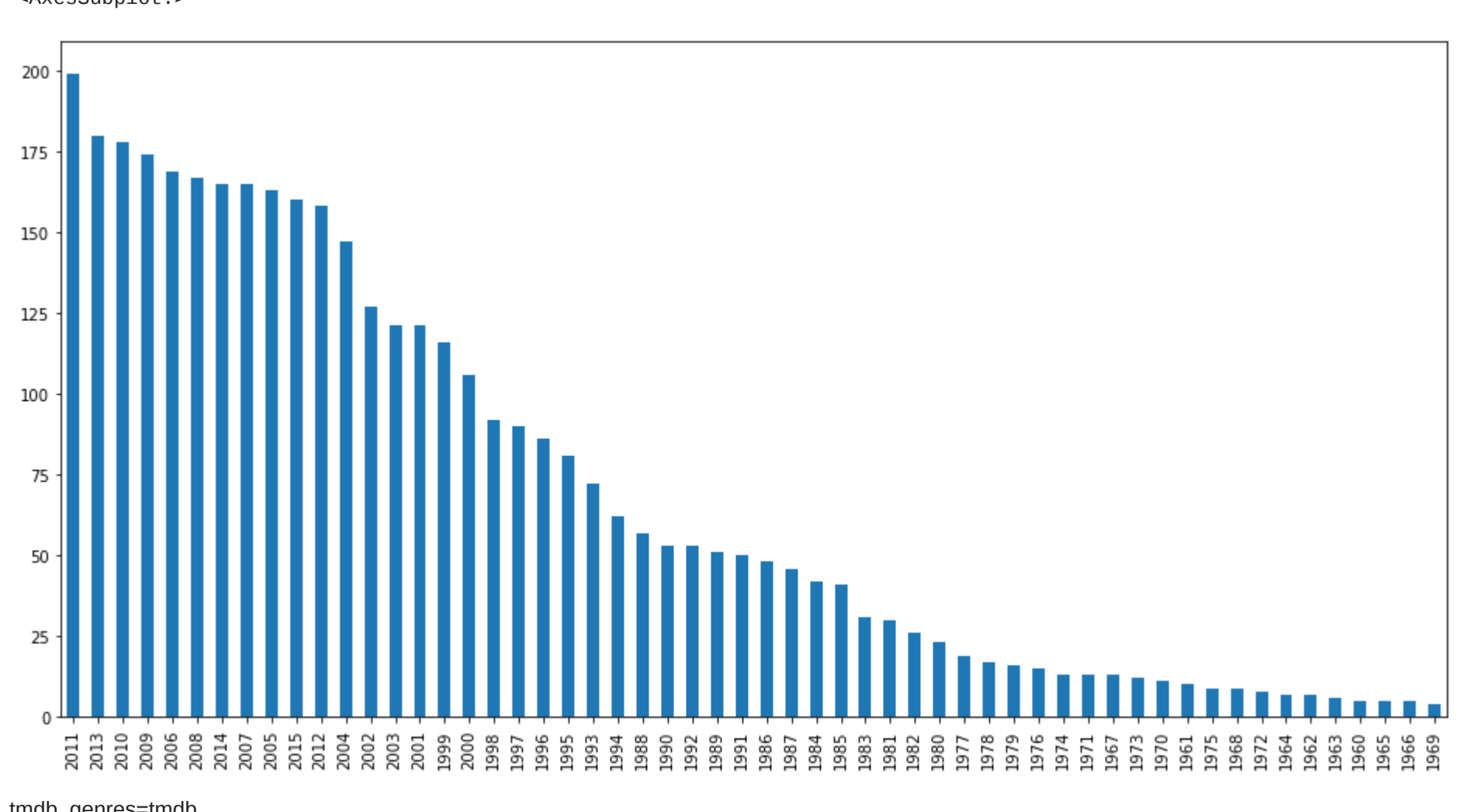


what's the most year of producation of movies?

what's the most produces year of movies ? it appears for us that number of movies increases gradully by year

In [66]:
```python
movies_tmdb['release_year'].value_counts().plot(kind='bar',figsize=(16,8))
```

Out[66]:
```
<AxesSubplot:>
```



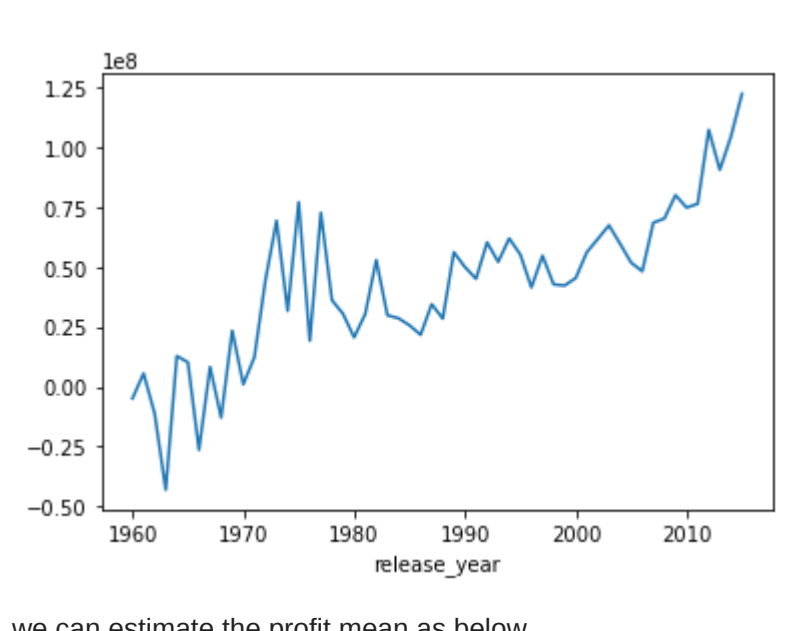
tmdb_genres=tmdb

what's the most profitable according to year? we found the profit of movies increases gradually by year

In [123...
```python
movies_tmdb.groupby('release_year').profit.mean().plot()
movies_tmdb.head()
```

Out[123...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj	profit
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939	1392445893	1375528871
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939	348161292	240436415
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955	271619025	194038246
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919	1902723130	1884178306
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923	1385748801	1331449437



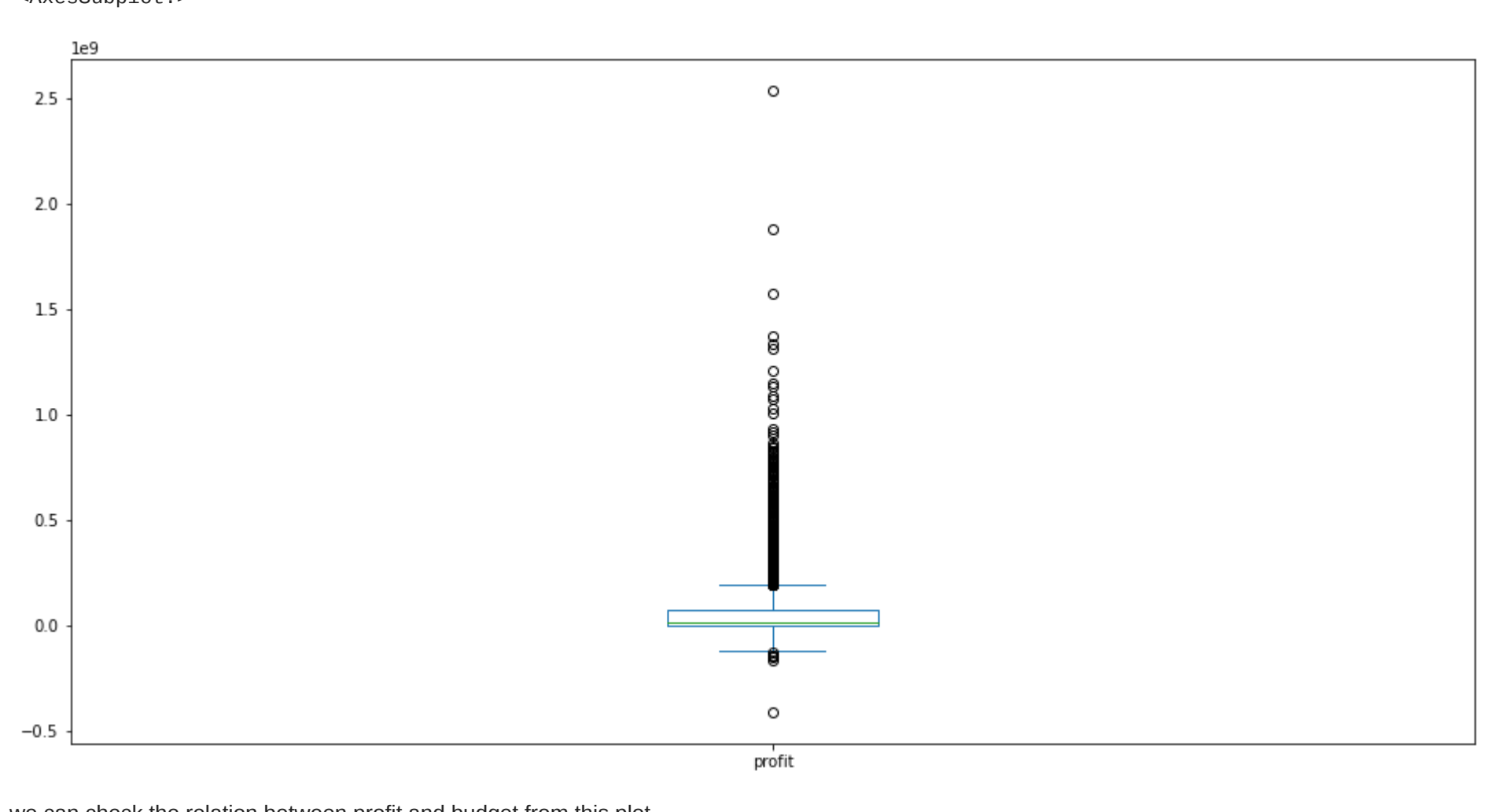
we can estimate the profit mean as below

In [188...
```python
movies_tmdb['profit'].describe()
```

Out[188...
```
count    3.854000e+03
mean     6.344662e+07
std      1.508990e+08
min     -4.139124e+08
25%     -5.129096e+06
50%      1.414312e+07
75%      7.415011e+07
max      2.540619e+09
Name: profit, dtype: float64
```

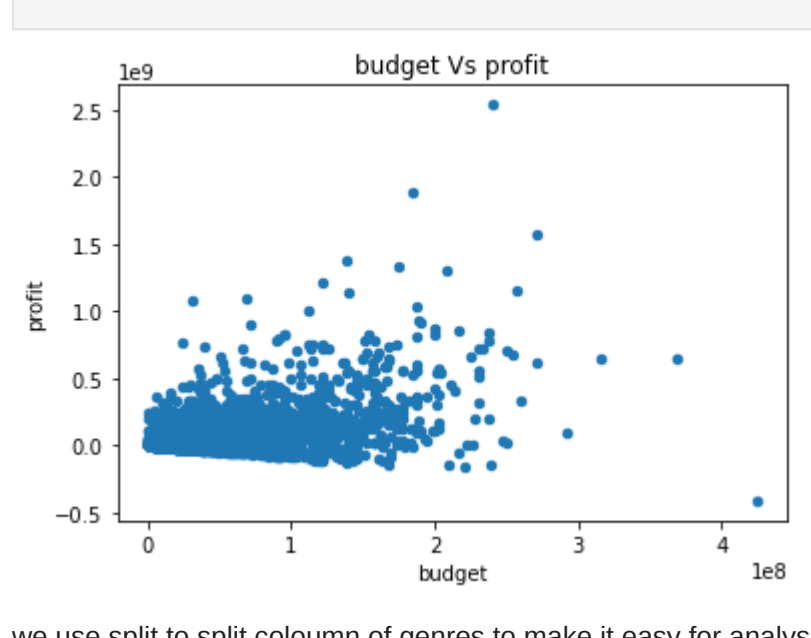
In [185...
```python
movies_tmdb['profit'].plot(kind='box',figsize=(16,8))
```

Out[185...
```
<AxesSubplot:>
```



we can check the relation between profit and budget from this plot

In [197...
```python
movies_tmdb.plot(x='budget_adj',y='profit',kind='scatter')
plt.title('budget Vs profit')
plt.xlabel('budget')
plt.ylabel('profit');
```



we use split to split coloumn of genres to make it easy for analysing data and add the column after splitting to table to make more analysis

In [198...
```python
genres_df = movies_tmdb['genres'].str.split("|", expand=True)
```

In [199...
```python
genres_movies = genres_df.stack()

genres_movies = pd.DataFrame(genres_df)
genres_movies.head()
```

Out[199...

	0	1	2	3	4
0	Action	Adventure	Science Fiction	Thriller	None
1	Action	Adventure	Science Fiction	Thriller	None
2	Adventure	Science Fiction	Thriller	None	None
3	Action	Adventure	Science Fiction	Fantasy	None
4	Action	Crime	Thriller	None	None

In [200...
```python
genres_movies_count = genres_df.stack()

genres_movies_count= pd.DataFrame(genres_movies_count)
genres_movies_count.head()
```

Out[200...

		0
0	0	Action
	1	Adventure
	2	Science Fiction
	3	Thriller
1	0	Action

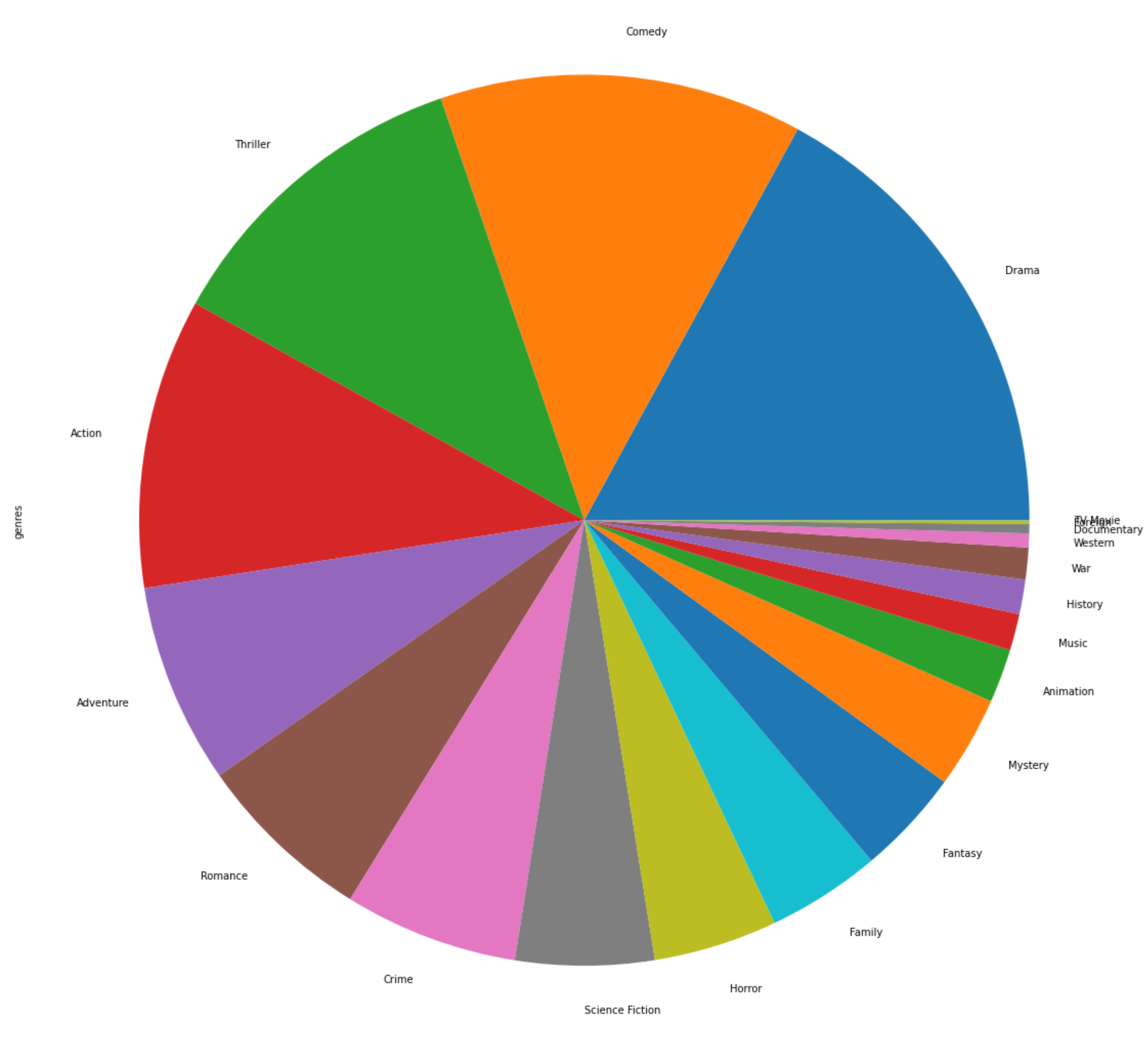
what's the most productive type of movies? from the table we find drama movies is the most productive type of movies

In [159...
```python
genres_movies_count.rename(columns={0:'genres'}, inplace=True)
genres_movies_count.genres.value_counts()
```

Out[159...
```
Drama              1756
Comedy             1358
Thriller           1204
Action             1085
Adventure           749
Romance             667
Crime               651
Science Fiction     519
Horror              463
Family              425
Fantasy             396
Mystery             344
Animation           201
Music               136
History             129
War                 119
Western              52
Documentary          35
Foreign              13
TV Movie              1
Name: genres, dtype: int64
```

In [160...
```python
genres_movies_count.genres.value_counts().plot(kind='pie',figsize=(20,20))
```

Out[160...
```
<AxesSubplot:ylabel='genres'>
```



In [184...
```python
movies_tmdb['genres_new']=genres_df
movies_tmdb.head(10)
```

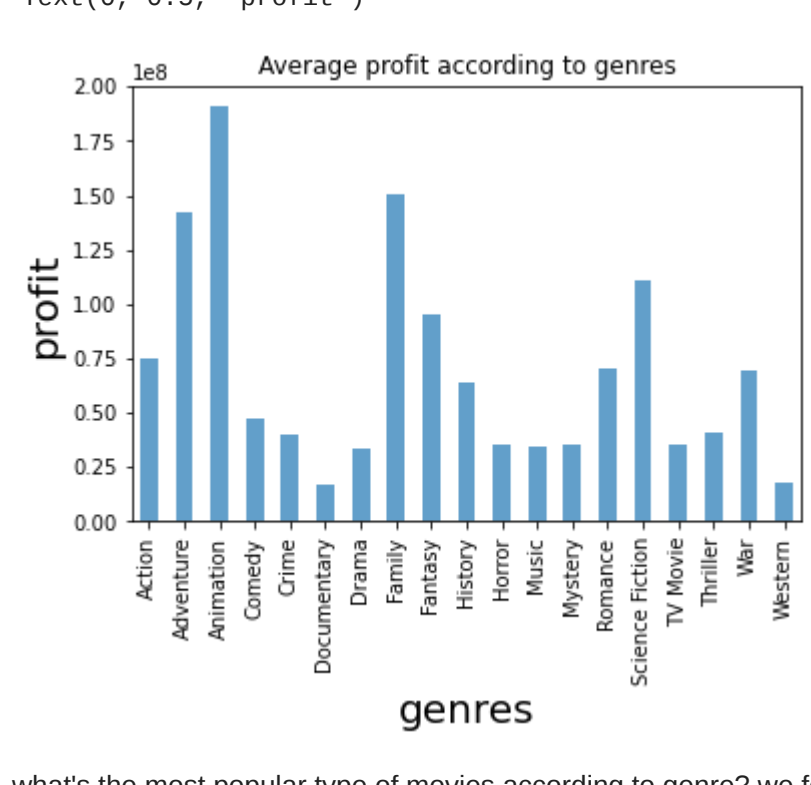
Out[184...

	id	popularity	popularity.1	revenue	original_title	runtime	genres	vote_count	vote_average	release_year	budget_adj	revenue_adj	profit	genres_new
0	135397	32.985763	33.985763	1513528810	Jurassic World	124.0	Action|Adventure|Science Fiction|Thriller	5562	6.5	2015	137999939	1392445893	1375528871	Action
1	76341	28.419936	29.419936	378436354	Mad Max: Fury Road	120.0	Action|Adventure|Science Fiction|Thriller	6185	7.1	2015	137999939	348161292	240436415	Action
2	262500	13.112507	14.112507	295238201	Insurgent	119.0	Adventure|Science Fiction|Thriller	2480	6.3	2015	101199955	271619025	194038246	Adventure
3	140607	11.173104	12.173104	2068178225	Star Wars: The Force Awakens	136.0	Action|Adventure|Science Fiction|Fantasy	5292	7.5	2015	183999919	1902723130	1884178306	Action
4	168259	9.335014	10.335014	1506249360	Furious 7	137.0	Action|Crime|Thriller	2947	7.3	2015	174799923	1385748801	1331449437	Action
5	281957	9.110700	10.110700	532950503	The Revenant	156.0	Western|Drama|Adventure|Thriller	3929	7.2	2015	124199945	490314247	408750558	Western
6	87101	8.654359	9.654359	440603537	Terminator Genisys	125.0	Science Fiction|Action|Thriller|Adventure	2598	5.8	2015	142599937	405355075	298003600	Science Fiction
7	286217	7.667400	8.667400	595380321	The Martian	141.0	Drama|Adventure|Science Fiction	4572	7.6	2015	99359956	547749654	496020365	Drama
8	211672	7.404165	8.404165	1156730962	Minions	91.0	Family|Animation|Adventure|Comedy	2893	6.5	2015	68079970	1064192017	1088650992	Family
9	150540	6.326804	7.326804	853708609	Inside Out	94.0	Comedy|Animation|Family	3935	8.0	2015	160999929	785411574	692708680	Comedy

what's the most profitable type of movies according to genre? we found that animation is the most profitable type of movies

In [182...
```python
revenue_mean =movies_tmdb.groupby('genres_new')['profit'].mean()
revenue_mean.plot(kind='bar', title='Average profit according to genres', alpha=0.7);
plt.xlabel('genres', fontsize=20)
plt.ylabel('profit', fontsize=20)
```

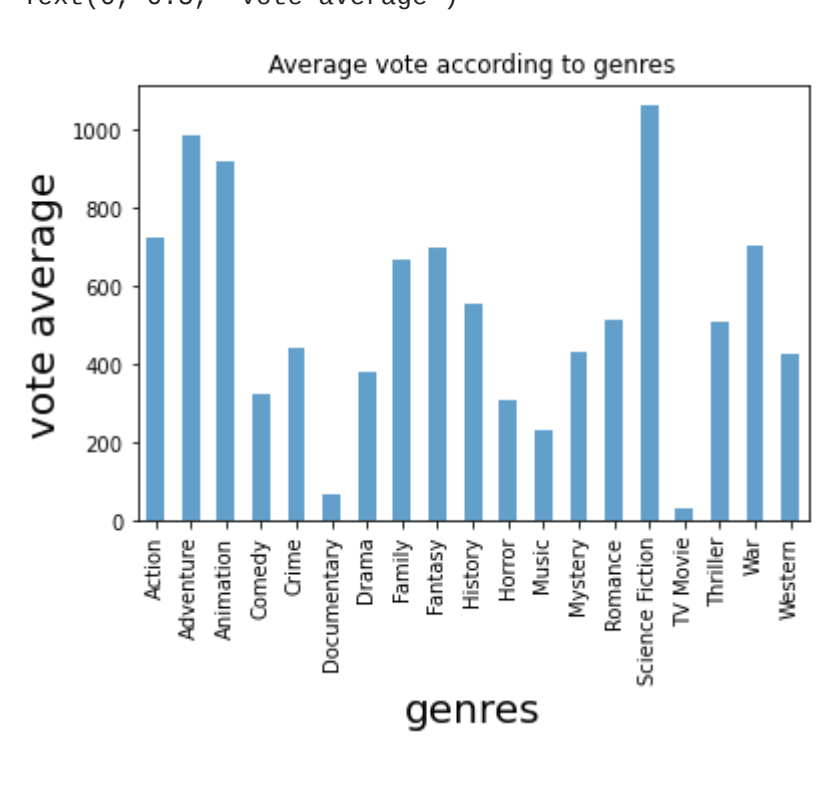
Out[182...
```
Text(0, 0.5, 'profit')
```



what's the most popular type of movies according to genre? we found that animation and adventure is the most popular type of movie

In [202...
```python
vote_average=movies_tmdb.groupby('genres_new')['vote_count'].mean()
vote_average.plot(kind='bar', title='Average vote according to genres', alpha=0.7);
plt.xlabel('genres', fontsize=20)
plt.ylabel('vote average', fontsize=20)
```

Out[202...
```
Text(0, 0.5, 'vote average')
```



conclusion

from this data study we know alot of things that will be benefit for producer we found that a great number of people vote on animation and adventure and science fiction movies and a few number of people vote on documentry and this also appears obviously when we revise the profit for each type of movies we found that animation and adventure movies are movies which get high profit commparing to other movies and from this data analysis we found that number of movies produces is increasing gradullyby years which means that the production of movies by year play an important role in income for country and this also appear when we check the profit according to years