Project: Investigate a tmdb movies Dataset

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Introduction

> In this section of the report, We provide a brief introduction to the dataset we've selected for analysis. At the end of this section, we described the questions that we have plan on exploring over the course of the report.

In [110…

```python
#Important libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

TMDB Movies Dataset

This data set contains information about 10,000 movies collected from The Movie Database (TMDb), including user ratings and revenue. we are here to provide helpful questions and its answers.

Questions

1. Which genres are most popular from year to year?
2. What kinds of properties are associated with movies that have high revenues?
3. What movies couldn't cover its budget(revenue = 0)?
4. What is the hieghest release genres?

Data Wrangling

> In this section of the report, we will load in the data, and check for cleanliness, and then trim and clean our dataset for analysis. Then we will make sure that we document our steps carefully and justify our cleaning decisions.

General Properties

In [111…

```python
#Explore and Load, inspect data from the dataset
df = pd.read_csv('tmdb-movies.csv')
df.head()
```

Out[111…

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	tagline	...	overview	runtime	genre
0	135397	tt0369610	32.985763	150000000	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|Scienc Fiction|Thrill
1	76341	tt1392190	28.419936	150000000	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|Scienc Fiction|Thrill
2	262500	tt2908446	13.112507	110000000	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|Scienc Fiction|Thrill
3	140607	tt2488496	11.173104	200000000	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|Scienc Fiction|Fanta
4	168259	tt2820852	9.335014	190000000	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|Thrill

5 rows × 21 columns

In [112…

```python
#We can see there is 10866 entries with 21 columns.
#cast, homepage, director, tagline, keywords, overview, genres and production_companies
#those are the columns with missing values
df.info();
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 21 columns):
 #   Column                Non-Null Count  Dtype
---  ------                --------------  -----
 0   id                    10866 non-null  int64
 1   imdb_id               10856 non-null  object
 2   popularity            10866 non-null  float64
 3   budget                10866 non-null  int64
 4   revenue               10866 non-null  int64
 5   original_title        10866 non-null  object
 6   cast                  10790 non-null  object
 7   homepage              2936 non-null   object
 8   director              10822 non-null  object
 9   tagline               8042 non-null   object
 10  keywords              9373 non-null   object
 11  overview              10862 non-null  object
 12  runtime               10866 non-null  int64
 13  genres                10843 non-null  object
 14  production_companies  9836 non-null   object
 15  release_date          10866 non-null  object
 16  vote_count            10866 non-null  int64
 17  vote_average          10866 non-null  float64
 18  release_year          10866 non-null  int64
 19  budget_adj            10866 non-null  float64
 20  revenue_adj           10866 non-null  float64
dtypes: float64(4), int64(6), object(11)
memory usage: 1.7+ MB
```

In [113…

```python
df.describe()
```

Out[113…

	id	popularity	budget	revenue	runtime	vote_count	vote_average	release_year	budget_adj	revenue_adj
count	10866.000000	10866.000000	1.086600e+04	1.086600e+04	10866.000000	10866.000000	10866.000000	10866.000000	1.086600e+04	1.086600e+04
mean	66064.177434	0.646441	1.462570e+07	3.982332e+07	102.070863	217.389748	5.974922	2001.322658	1.755104e+07	5.136436e+07
std	92130.136561	1.000185	3.091321e+07	1.170035e+08	31.381405	575.619058	0.935142	12.812941	3.430616e+07	1.446325e+08
min	5.000000	0.000065	0.000000e+00	0.000000e+00	0.000000	10.000000	1.500000	1960.000000	0.000000e+00	0.000000e+00
25%	10596.250000	0.207583	0.000000e+00	0.000000e+00	90.000000	17.000000	5.400000	1995.000000	0.000000e+00	0.000000e+00
50%	20669.000000	0.383856	0.000000e+00	0.000000e+00	99.000000	38.000000	6.000000	2006.000000	0.000000e+00	0.000000e+00
75%	75610.000000	0.713817	1.500000e+07	2.400000e+07	111.000000	145.750000	6.600000	2011.000000	2.085325e+07	3.369710e+07
max	417859.000000	32.985763	4.250000e+08	2.781506e+09	900.000000	9767.000000	9.200000	2015.000000	4.250000e+08	2.827124e+09

In [114…

```python
#IMDB_id and release_date are string we can convert them or we may drop them since we don't need those columns.
df.dtypes
```

Out[114…

```
id                        int64
imdb_id                  object
popularity              float64
budget                    int64
revenue                   int64
original_title           object
cast                     object
homepage                 object
director                 object
tagline                  object
keywords                 object
overview                 object
runtime                   int64
genres                   object
production_companies     object
release_date             object
vote_count                int64
vote_average            float64
release_year              int64
budget_adj              float64
revenue_adj             float64
dtype: object
```

In [115…

```python
#Number of unique values in every column
df.nunique()
```

Out[115…

```
id                      10865
imdb_id                 10855
popularity              10814
budget                    557
revenue                  4702
original_title          10571
cast                    10719
homepage                 2896
director                 5067
tagline                  7997
keywords                 8804
overview                10847
runtime                   247
genres                   2039
production_companies     7445
release_date             5909
vote_count               1289
vote_average               72
release_year               56
budget_adj               2614
revenue_adj              4840
dtype: int64
```

Data Cleaning (Duplicates, Null Values, Wrong Types, unnecessary columns)

In [116…

```python
#We will drop those columns since we do not need them
df.drop(['imdb_id','cast','homepage','tagline','keywords','overview','release_date','vote_average','budget_adj','revenue_adj']
        ,axis=1,inplace = True)

df.head()
```

Out[116…

	id	popularity	budget	revenue	original_title	director	runtime	genres	production_companies	vote_count	release_year
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Action|Adventure|Science Fiction|Thriller	Universal Studios|Amblin Entertainment|Legenda...	5562	2015
1	76341	28.419936	150000000	378436354	Mad Max: Fury Road	George Miller	120	Action|Adventure|Science Fiction|Thriller	Village Roadshow Pictures|Kennedy Miller Produ...	6185	2015
2	262500	13.112507	110000000	295238201	Insurgent	Robert Schwentke	119	Adventure|Science Fiction|Thriller	Summit Entertainment|Mandeville Films|Red Wago...	2480	2015
3	140607	11.173104	200000000	2068178225	Star Wars: The Force Awakens	J.J. Abrams	136	Action|Adventure|Science Fiction|Fantasy	Lucasfilm|Truenorth Productions|Bad Robot	5292	2015
4	168259	9.335014	190000000	1506249360	Furious 7	James Wan	137	Action|Crime|Thriller	Universal Pictures|Original Film|Media Rights ...	2947	2015

In [117…

```python
#No. of duplicates in dataset
sum(df.duplicated())
```

Out[117…

1

In [118…

```python
#Drop duplicates
df.drop_duplicates(inplace=True)

#Check Duplicates
sum(df.duplicated())
```

Out[118…

0

In [119…

```python
#Drop null values since they are not numbers i don't suggest filling them with the mean
df.dropna(inplace=True)
df.shape
```

Out[119…

(9806, 11)

In [120…

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

Out[120…

```
id                      0
popularity              0
budget                  0
revenue                 0
original_title          0
director                0
runtime                 0
genres                  0
production_companies    0
vote_count              0
release_year            0
dtype: int64
```

Exploratory Data Analysis

Research Question 1 Which genres are most popular from year to year?

In [121…

```python
#Those are the genres count in every year before spliting
gn_df = df.groupby(df['release_year']).genres.value_counts()
gn_df
```

Out[121…

```
release_year  genres
1960          Horror                                3
              Comedy                                2
              Comedy|Drama|Romance                  2
              Comedy|Romance                        2
              Drama                                 2
                                                   ..
2015          War|Action                            1
              War|Adventure|Science Fiction         1
              War|Drama                             1
              Western|Drama                         1
              Western|Drama|Adventure|Thriller      1
Name: genres, Length: 5697, dtype: int64
```

In [122…

```python
# We can split values in genres column to see the most popular genre
df_copy = df.copy()
ser = df_copy['genres'].str.split('|').apply(pd.Series, 1).stack()
ser.index = ser.index.droplevel(-1)
ser.name = 'genres'
del df_copy['genres']
df_copy = df_copy.join(ser)

# Check on split
df_copy.head()
```

Out[122…

	id	popularity	budget	revenue	original_title	director	runtime	production_companies	vote_count	release_year	genres
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Universal Studios|Amblin Entertainment|Legenda...	5562	2015	Action
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Universal Studios|Amblin Entertainment|Legenda...	5562	2015	Adventure
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Universal Studios|Amblin Entertainment|Legenda...	5562	2015	Science Fiction
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Universal Studios|Amblin Entertainment|Legenda...	5562	2015	Thriller
1	76341	28.419936	150000000	378436354	Mad Max: Fury Road	George Miller	120	Village Roadshow Pictures|Kennedy Miller Produ...	6185	2015	Action

In [123…

```python
#This shows the most popular genre in each year
s_df = df_copy.iloc[:,np.r_[9,10,1]]
pop_df = pd.DataFrame({'popularity' : s_df.groupby([s_df['release_year']]).popularity.max()}).reset_index()
pop_df.index = pop_df['popularity']
s_df = s_df[s_df['popularity'].isin(pop_df.index)]

# Most popular genres in each year
s_df
```

Out[123…

	release_year	genres	popularity
0	2015	Action	32.985763
0	2015	Adventure	32.985763
0	2015	Science Fiction	32.985763
0	2015	Thriller	32.985763
629	2014	Adventure	24.949134
...	...	...	...
10724	1969	Thriller	1.778746
10755	1978	Music	1.697618
10820	1966	Animation	1.227582
10820	1966	Family	1.227582
10820	1966	Comedy	1.227582

166 rows × 3 columns

In [124…

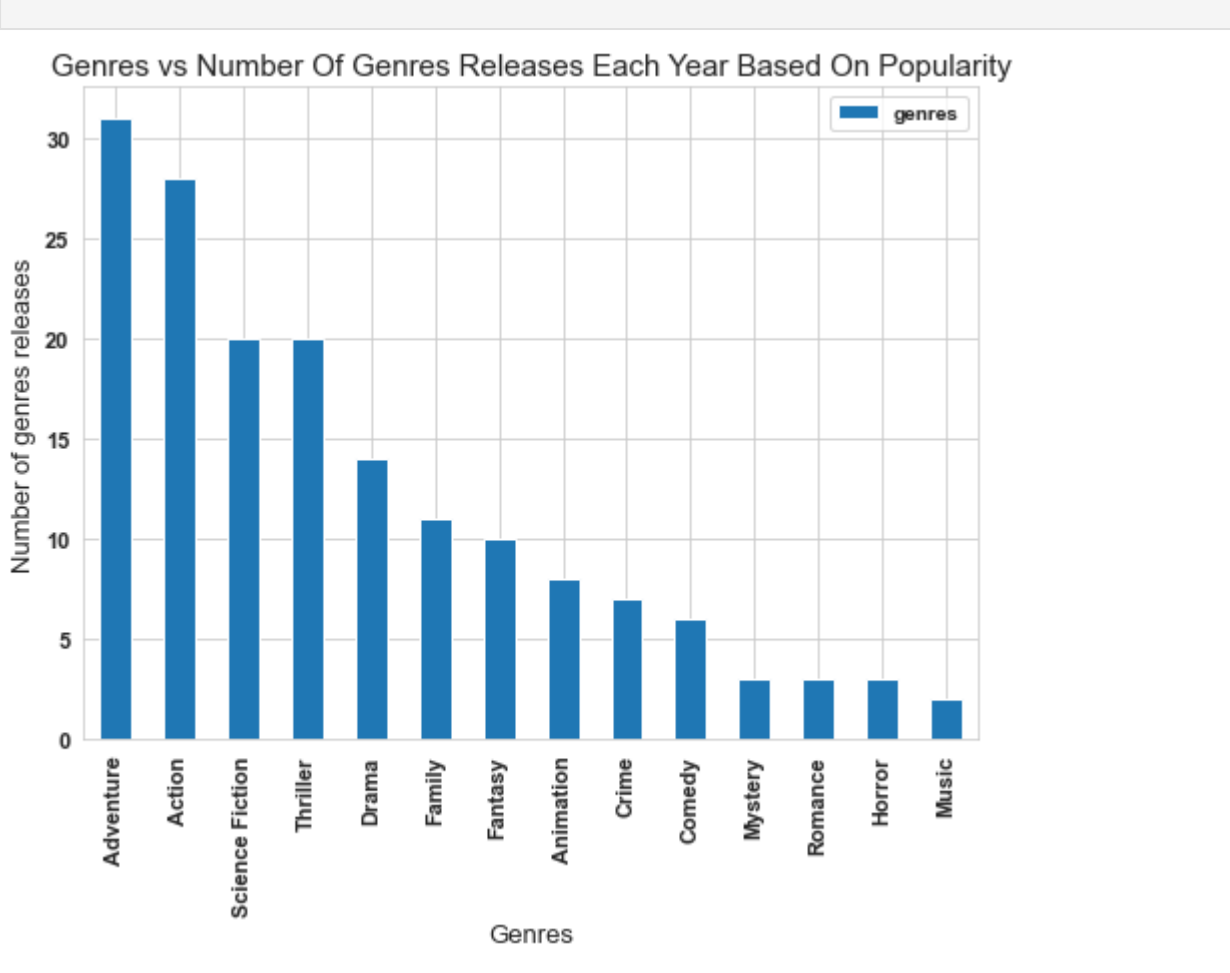
```python
# Most popular genres from year to year based on count and popularity
s_df['genres'].value_counts()
```

Out[124…

```
Adventure          31
Action             28
Science Fiction    20
Thriller           20
Drama              14
Family             11
Fantasy            10
Animation           8
Crime               7
Comedy              6
Mystery             3
Romance             3
Horror              3
Music               2
Name: genres, dtype: int64
```

In [125…

```python
# Plot the bar graph.
s_df['genres'].value_counts().plot(kind='bar', fontsize = 11, figsize=(8,6))

# Set the labels and titles.
plt.title('Genres vs Number Of Genres Releases Each Year Based On Popularity', fontsize = 15)
plt.xlabel('Genres',fontsize = 13)
plt.ylabel('Number of genres releases', fontsize = 13)
plt.legend()
plt.show()
sns.set_style("darkgrid")
```



Research Question 2 What kinds of properties are associated with movies that have high revenues?

In [126…

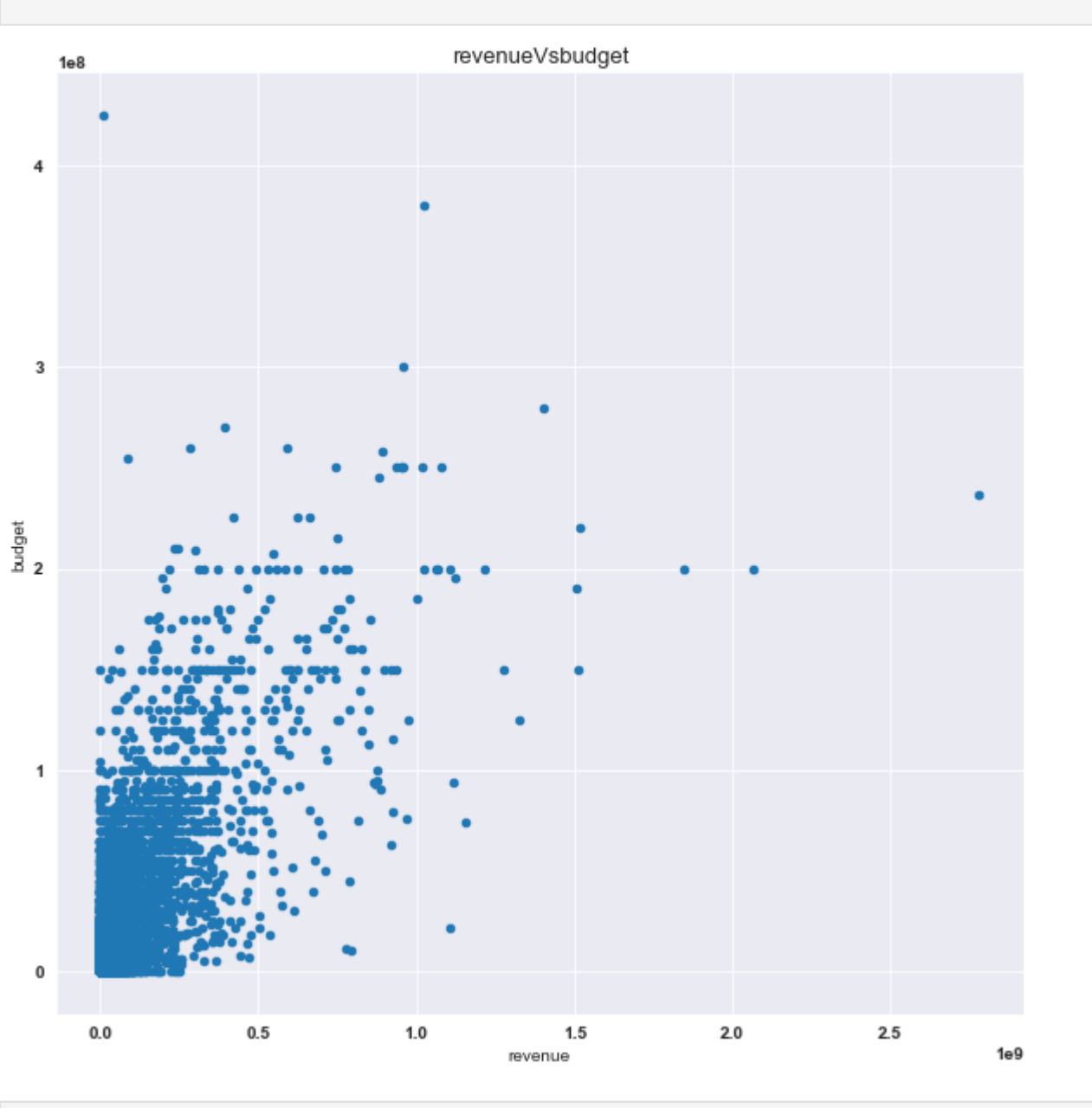
```python
# Sort DF bsed on revenue
df.sort_values("revenue", ascending=False, inplace=True)
df.head(10)
```

Out[126…

	id	popularity	budget	revenue	original_title	director	runtime	genres	production_companies	vote_count	release_year
1386	19995	9.432768	237000000	2781505847	Avatar	James Cameron	162	Action|Adventure|Fantasy|Science Fiction	Ingenious Film Partners|Twentieth Century Fox ...	8458	2009
3	140607	11.173104	200000000	2068178225	Star Wars: The Force Awakens	J.J. Abrams	136	Action|Adventure|Science Fiction|Fantasy	Lucasfilm|Truenorth Productions|Bad Robot	5292	2015
5231	597	4.355219	200000000	1845034188	Titanic	James Cameron	194	Drama|Romance|Thriller	Paramount Pictures|Twentieth Century Fox Film ...	4654	1997
4361	24428	7.637767	220000000	1519557910	The Avengers	Joss Whedon	143	Science Fiction|Action|Adventure	Marvel Studios	8903	2012
0	135397	32.985763	150000000	1513528810	Jurassic World	Colin Trevorrow	124	Action|Adventure|Science Fiction|Thriller	Universal Studios|Amblin Entertainment|Legenda...	5562	2015
4	168259	9.335014	190000000	1506249360	Furious 7	James Wan	137	Action|Crime|Thriller	Universal Pictures|Original Film|Media Rights ...	2947	2015
14	99861	5.944927	280000000	1405035767	Avengers: Age of Ultron	Joss Whedon	141	Action|Adventure|Science Fiction	Marvel Studios|Prime Focus|Revolution Sun Studios	4304	2015
3374	12445	5.711315	125000000	1327817822	Harry Potter and the Deathly Hallows: Part 2	David Yates	130	Adventure|Family|Fantasy	Warner Bros.|Heyday Films|Moving Picture Compa...	3750	2011
5422	109445	6.112766	150000000	1274219009	Frozen	Chris Buck|Jennifer Lee	102	Animation|Adventure|Family	Walt Disney Pictures|Walt Disney Animation Stu...	3369	2013
5425	68721	4.946136	200000000	1215439994	Iron Man 3	Shane Black	130	Action|Adventure|Science Fiction	Marvel Studios	6882	2013

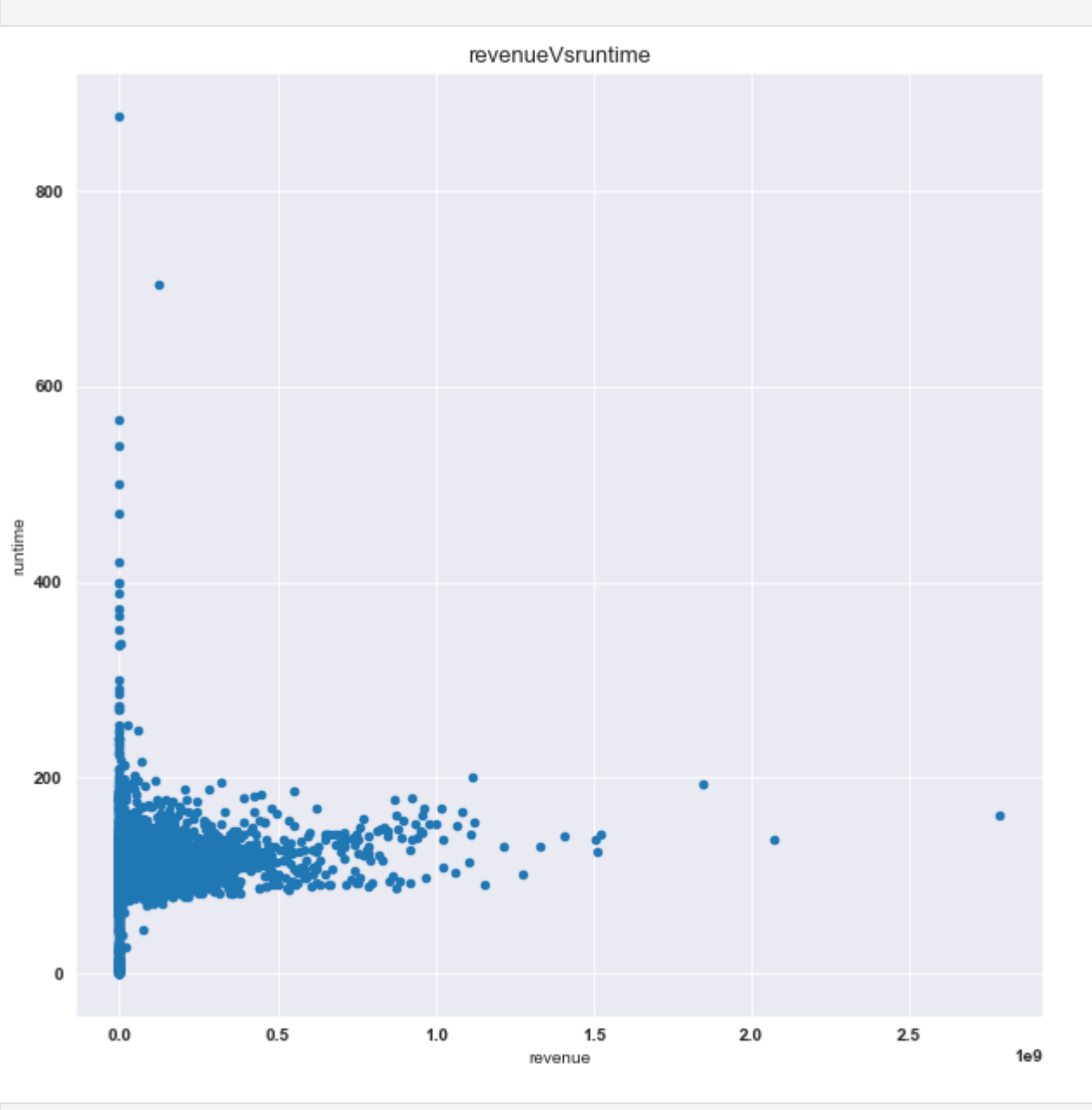
In [127…

```python
# Lets see budget and revenue correlation
def scatter_plt(x,y):
    # Make a scatter plot.
    df.plot(x=x, y=y,kind='scatter', figsize=(10, 10));

    # Set the title and the labels of the scatter plot.
    plt.title(x+"Vs"+y,fontsize=13)
    plt.xlabel(x)
    plt.ylabel(y)

    plt.show()

scatter_plt('revenue','budget')
```



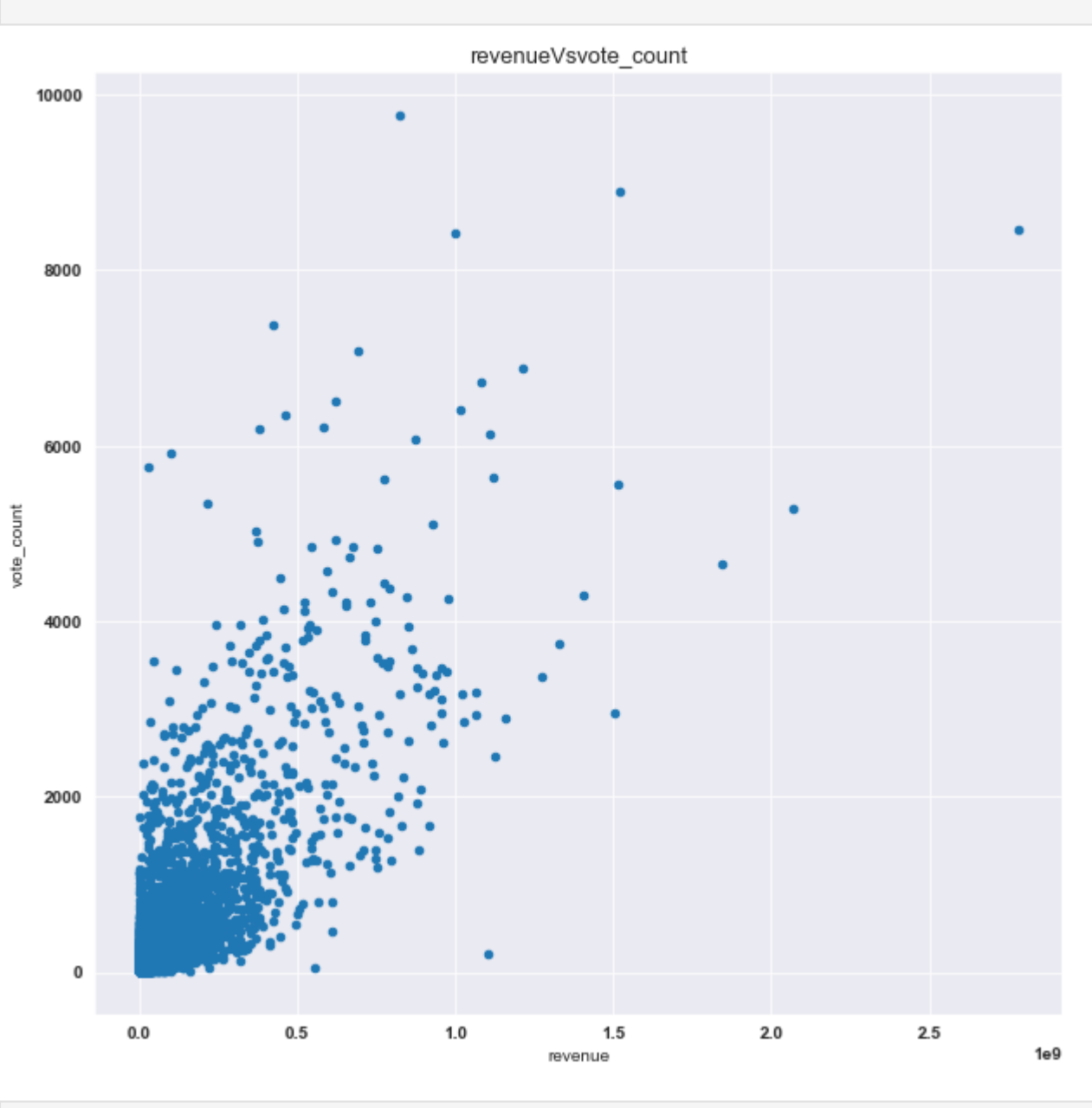
In [128…

```python
# Make a scatter plot.
scatter_plt('revenue','runtime')
```



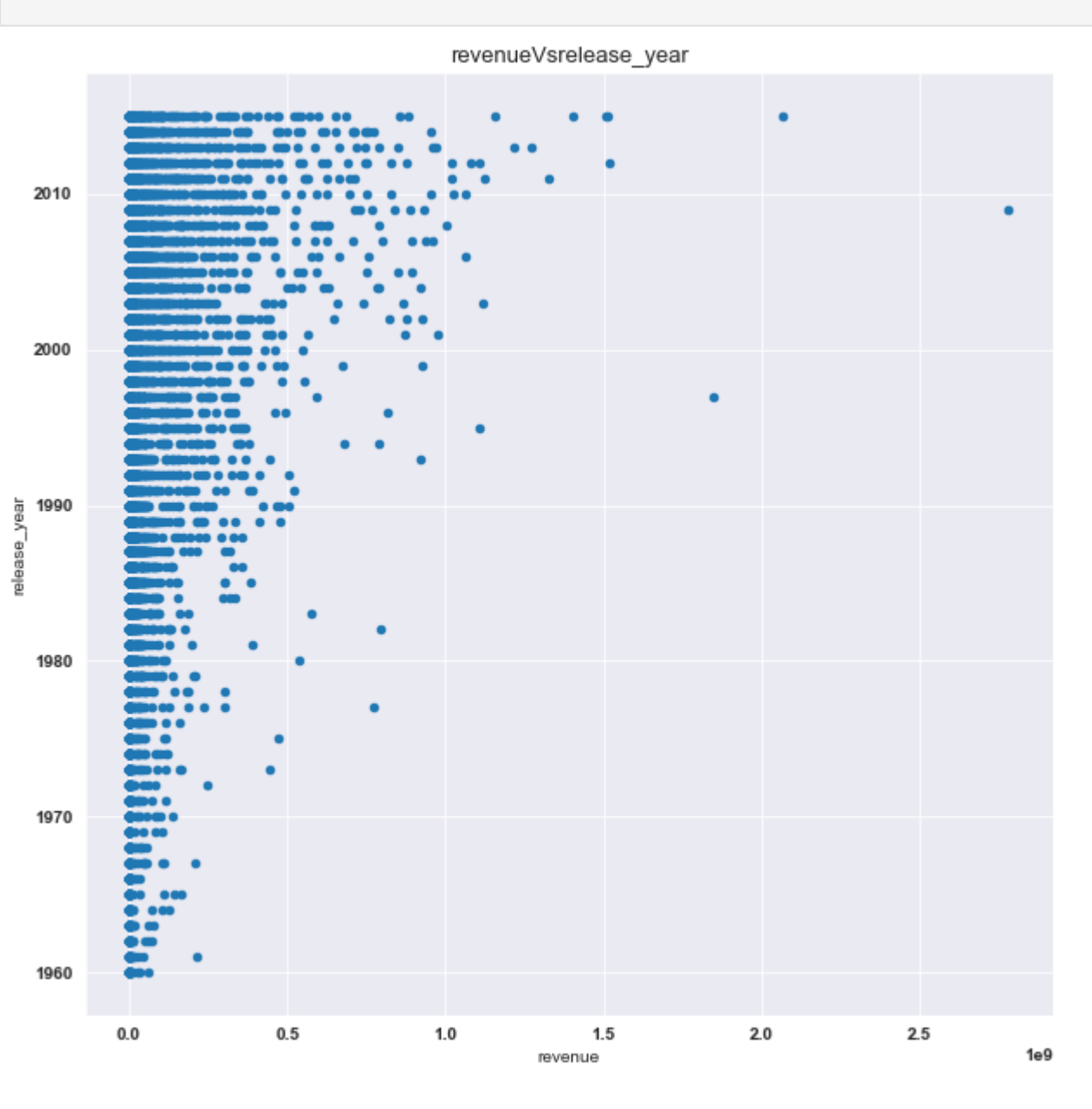
In [129…

```python
# revenue vs vote_count
scatter_plt('revenue','vote_count')
```



In [130…

```python
# revenue vs release_year
scatter_plt('revenue','release_year')
```



Research Question 3 What movies couldn't cover its budget?

In [131…

```python
# Get movies with revenue equal zero
df_bad_movies = df[df['revenue'] <= 0]
df_bad_movies
```

Out[131…

	id	popularity	budget	revenue	original_title	director	runtime	genres	production_companies	vote_count	release_year
8646	12254	0.161600	0	0	Emma	Diarmuid Lawrence	107	TV Movie|Comedy|Drama|Romance	Meridian Broadcasting Ltd	15	1996
8541	47333	0.512197	0	0	Jane Eyre	Franco Zeffirelli	112	Drama|Romance	Miramax Films	21	1996
1199	279973	0.130077	0	0	Nowhere Safe	Brian Brough	93	TV Movie|Drama	Gradual Elevate Media	11	2014
8643	27770	0.185178	3000000	0	Sometimes They Come Back... Again	Adam Grossman	98	Horror	Trimark Pictures	12	1996
8644	38223	0.176222	12000000	0	Harriet the Spy	Bronwen Hughes	100	Comedy|Drama|Family	Paramount Pictures|Rastar Pictures|Nickelodeon...	22	1996
...	...	...	...	...	...	...	...	...	...	...	...
2468	332	0.684185	75000000	0	Inspector Gadget	David Kellogg	78	Action|Adventure|Comedy|Family	Walt Disney Pictures|Caravan Pictures	171	1999
2476	4816	0.627172	0	0	Ghost Dog: The Way of the Samurai	Jim Jarmusch	116	Action|Crime|Drama	Bac Films|Pandora Filmproduktion|Degeto Film|A...	146	1999
2480	12117	0.598565	80	0	Instinct	Jon Turteltaub	126	Drama|Mystery|Thriller	Spyglass Entertainment|Touchstone Pictures	74	1999
2481	13466	0.596782	0	0	October Sky	Joe Johnston	108	Drama|Family	Universal Pictures	118	1999
10865	22293	0.035919	19000	0	Manos: The Hands of Fate	Harold P. Warren	74	Horror	Norm-Iris	15	1966

5054 rows × 11 columns

In [132…

```python
# Number of bad Movies
df_bad_movies['original_title'].nunique()
```

Out[132…

4991

In [133…

```python
# director names and the most director couldn't cover the budget
df_bad_movies['director'].value_counts()
```

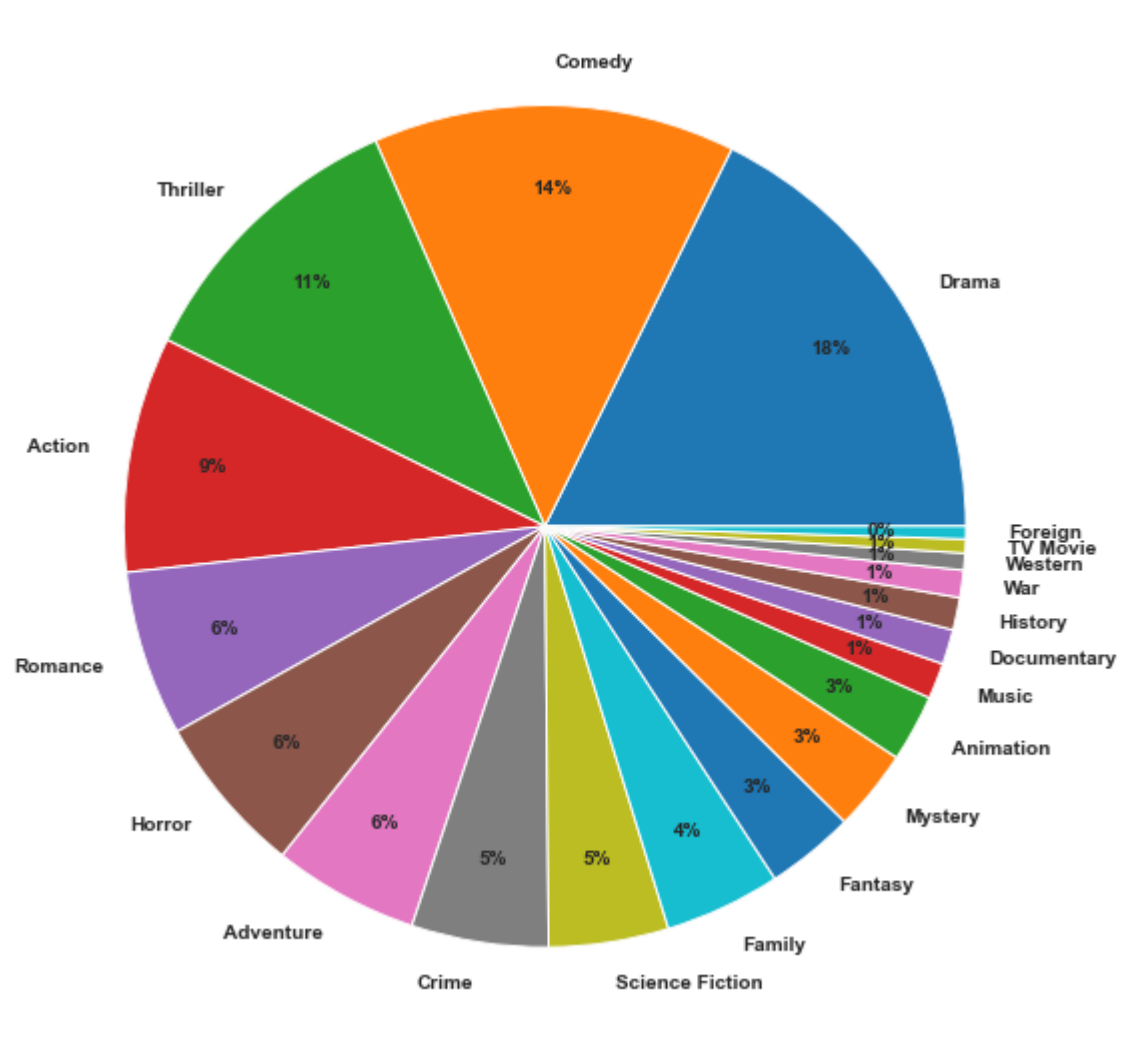
Out[133…

```
Woody Allen                                20
Gerald Thomas                              11
Uwe Boll                                   11
Robert Altman                               9
Norman Jewison                              9
                                           ..
Brady Corbet                                1
Shira Piven                                 1
Wei Tung                                    1
Hiroshi Aoyama|Kazumi Fukushima|Jim Stenstrum    1
Harold P. Warren                            1
Name: director, Length: 3355, dtype: int64
```

Research Question 4 what is the hieghest release genres?

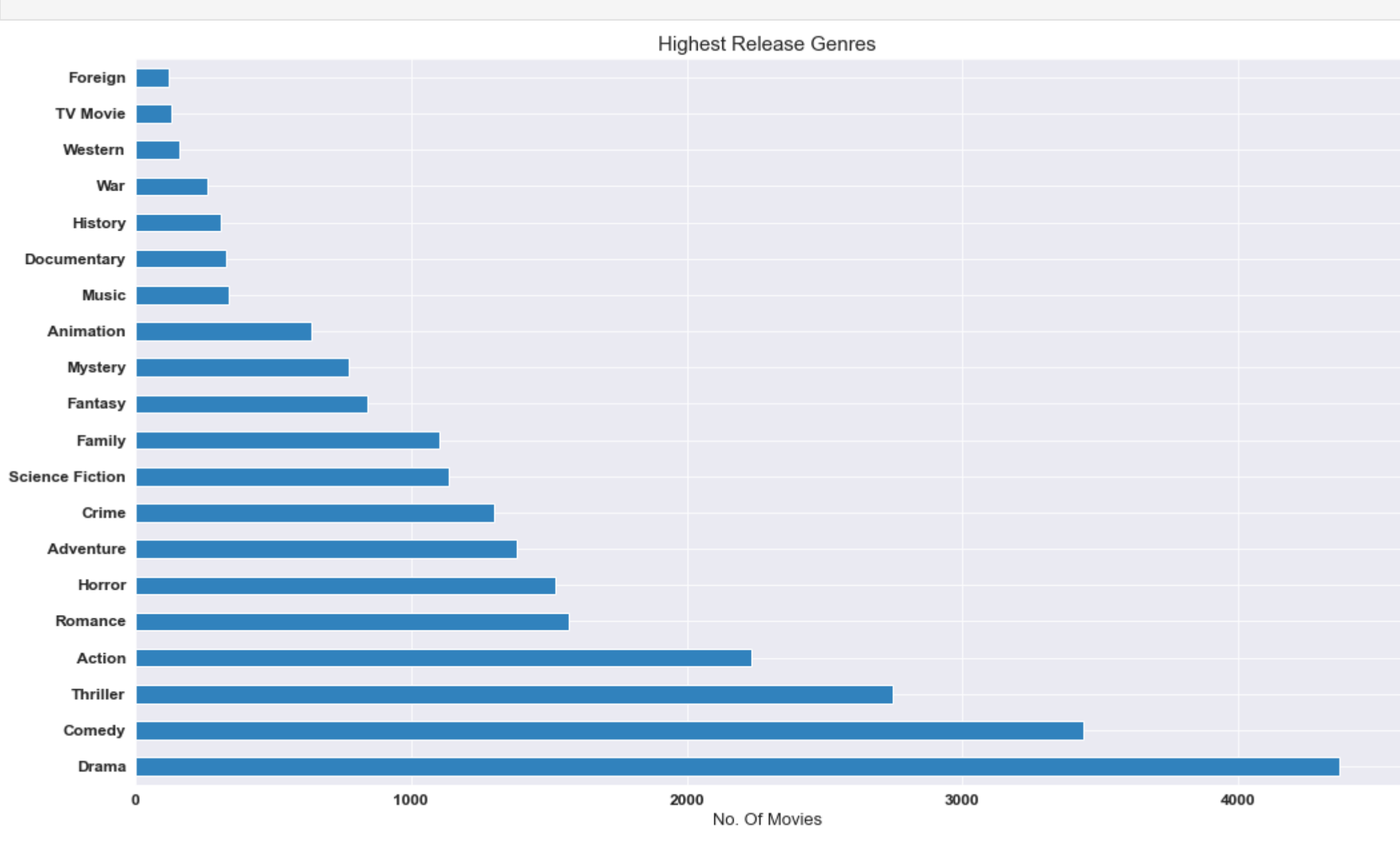
In [134…

```python
# pie chart for hieghest release genres
df_copy['genres'].value_counts().plot(kind='pie', figsize=(8, 8),autopct='%1.0f%%', pctdistance=0.8, label='');
plt.rc('font', weight='bold')
plt.tight_layout()
```



In [135…

```python
# Bar chart for genres count
df_copy['genres'].value_counts().plot(kind= 'barh',figsize = (17,10),fontsize=12,colormap='tab20c')

# Set the title and the labels.
plt.title("Highest Release Genres",fontsize=15)
plt.xlabel('No. Of Movies',fontsize=13)
sns.set_style("whitegrid")
```



Conclusions

> - We found the most popular genres in each year then we got the best from them all and we ranked them based on their counts from year to year Adventure 31 Action 28 Science Fiction 20 Thriller 20 Drama 14 Family 11 Fantasy 10 Animation 8 Crime 7 Comedy 6 Mystery 3 Romance 3 Horror 3 Music 2
> - budget and runtime have higher correlation with revenue than runtime
> - There was 4991 movie couldn't cover the budget like Emma and Jane eyre
> - Woody Allen director had the most number of movies that he couldn't cover Woody Allen 20 Gerald Thomas 11 Uwe Boll 11
> - The hieghest release genres were Drame, Comedy, Thriller, Action, Romance, Horror, Adventure, Crime etc..

In [ ]: