Investigate_a_Dataset

August 31, 2022

1 Project: [TMDB-MOVIE-DATA]

1.1 Table of Contents

Introduction

1.1.1 Dataset Description

Movies has always beeen one of the best forms of entertainment because they offer something for everyone. This range from intense, dramatic, comedy, action, and so much more. Whether you're feeling up or down, there's always something for everyone.

This data set contains information about 10,000 movies collected from The Movie Database (TMDb), including user ratings and revenue. The dataset contains 21 columns 10866 rows. We will be performing an exploratory analysis on the dataset. we will be exploring the data and answering questions which includes; what genres are the most popular, what levels of popularity received the highest rating, and we will also be exploring the data to check the relationship between variables.

1.1.2 Import Libraries

```
In [68]: import numpy as np
         import pandas as pd
         import matplotlib.pyplot as plt
         import seaborn as sns
         % matplotlib inline
```

```
In [69]: # Upgrade pandas to use dataframe.explode() function.
         #!pip install --upgrade pandas==0.25.0
```

```
In [70]: df = pd.read_csv('tmdb-movies.csv')
         df.head()
```

Out[70]:
```
       id    imdb_id  popularity     budget     revenue  \
0  135397  tt0369610   32.985763  150000000  1513528810
1   76341  tt1392190   28.419936  150000000   378436354
2  262500  tt2908446   13.112507  110000000   295238201
3  140607  tt2488496   11.173104  200000000  2068178225
4  168259  tt2820852    9.335014  190000000  1506249360

                 original_title  \
0                Jurassic World
1            Mad Max: Fury Road
2                     Insurgent
3  Star Wars: The Force Awakens
4                     Furious 7

                                                cast  \
0  Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...
1  Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...
2  Shailene Woodley|Theo James|Kate Winslet|Ansel...
3  Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...
4  Vin Diesel|Paul Walker|Jason Statham|Michelle ...

                                            homepage          director  \
0                      http://www.jurassicworld.com/   Colin Trevorrow
1                        http://www.madmaxmovie.com/     George Miller
2     http://www.thedivergentseries.movie/#insurgent  Robert Schwentke
3  http://www.starwars.com/films/star-wars-episod...       J.J. Abrams
4                           http://www.furious7.com/         James Wan

                         tagline      ...        \
0             The park is open.       ...
1             What a Lovely Day.      ...
2     One Choice Can Destroy You      ...
3  Every generation has a story.      ...
4           Vengeance Hits Home       ...

                                            overview runtime  \
0  Twenty-two years after the events of Jurassic ...     124
1  An apocalyptic story set in the furthest reach...     120
2  Beatrice Prior must confront her inner demons ...     119
3  Thirty years after defeating the Galactic Empi...     136
4  Deckard Shaw seeks revenge against Dominic Tor...     137

                                      genres  \
0  Action|Adventure|Science Fiction|Thriller
1  Action|Adventure|Science Fiction|Thriller
2         Adventure|Science Fiction|Thriller
3   Action|Adventure|Science Fiction|Fantasy
4                      Action|Crime|Thriller
```

```
                                    production_companies release_date vote_count  \
0  Universal Studios|Amblin Entertainment|Legenda...       6/9/15       5562
1  Village Roadshow Pictures|Kennedy Miller Produ...      5/13/15       6185
2  Summit Entertainment|Mandeville Films|Red Wago...      3/18/15       2480
3          Lucasfilm|Truenorth Productions|Bad Robot     12/15/15       5292
4  Universal Pictures|Original Film|Media Rights ...       4/1/15       2947

   vote_average  release_year    budget_adj   revenue_adj
0           6.5          2015  1.379999e+08  1.392446e+09
1           7.1          2015  1.379999e+08  3.481613e+08
2           6.3          2015  1.012000e+08  2.716190e+08
3           7.5          2015  1.839999e+08  1.902723e+09
4           7.3          2015  1.747999e+08  1.385749e+09

[5 rows x 21 columns]
```

In [71]:
```
df.shape
```

Out[71]:
```
(10866, 21)
```

There are 10866 rows and 21 columns in this dataset

In [72]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 21 columns):
id                      10866 non-null int64
imdb_id                 10856 non-null object
popularity              10866 non-null float64
budget                  10866 non-null int64
revenue                 10866 non-null int64
original_title          10866 non-null object
cast                    10790 non-null object
homepage                2936 non-null object
director                10822 non-null object
tagline                 8042 non-null object
keywords                9373 non-null object
overview                10862 non-null object
runtime                 10866 non-null int64
genres                  10843 non-null object
production_companies    9836 non-null object
release_date            10866 non-null object
vote_count              10866 non-null int64
vote_average            10866 non-null float64
release_year            10866 non-null int64
budget_adj              10866 non-null float64
revenue_adj             10866 non-null float64
```

```
dtypes: float64(4), int64(6), object(11)
memory usage: 1.7+ MB
```

From the info above, we can tell that cast, homepage, tagline, keywords, overview, genres, and production_companies have missing values

In [73]:
```
#checking the sum of null values
df.isnull().sum()
```

Out[73]:
```
id                         0
imdb_id                   10
popularity                 0
budget                     0
revenue                    0
original_title             0
cast                      76
homepage                7930
director                  44
tagline                 2824
keywords                1493
overview                   4
runtime                    0
genres                    23
production_companies    1030
release_date               0
vote_count                 0
vote_average               0
release_year               0
budget_adj                 0
revenue_adj                0
dtype: int64
```

Isnull further shows the amount of missing values. There are two ways to treat missung values; either by filling them or dropping them. Going further to explore the data, we will kknow which option to go with.

In [74]:
```
#checking the amount of unique values in a dataset
df.nunique()
```

Out[74]:
```
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
```

The above shows the amount of unique values in each columns

In [75]:
```
#checking  for duplicates in Movie title
dup_title = df[df["original_title"].duplicated() == True]
dup_title['original_title'].index
```

Out[75]:
```
Int64Index([ 1133,  1194,  1349,  1440,  1513,  1707,  1753,  1757,  1865,
             2036,
            ...
            10757, 10759, 10767, 10795, 10799, 10818, 10827, 10849, 10853,
            10854],
           dtype='int64', length=295)
```

The above code shows that there are 295 duplicates data in our dataset And we will be removing all duplicate title in the original_title dataset. This will be done in the data cleaning session.

1.1.3 Data Cleaning

Following our steps above, we can see that there data cleaning is requiredd in the dataset,which includes; dropping of nan values, removal of duplicate data e.t.c.

We are going to build a wrangle function to input all our cleaning.

In [76]:
```
#build a wrangle function


def wrangle(filepath):
    #read csv file
    df = pd.read_csv(filepath)

    #drop unwanted columns
    df.drop(columns = ['id', 'imdb_id', 'homepage', 'tagline', 'keywords', 'overview',

    #Drop title Duplicates
    df_dup = df.drop_duplicates('original_title', inplace = True)

    #Drop Nan values
```

```
    drop_genre_na = df.dropna(subset = ['genres'], inplace = True)

    #split and subset to the first index
    df['genre'] = df["genres"].str.split("|", expand = True)[0]

    #Drop genres column
    df.drop(columns = 'genres', inplace = True)

    return df
```

Inside our WRANGLE FUNCTION, the following was done to clean the data;

1. All unwanted columns which includes 'id', 'imdb_id', 'homepage', 'tagline', 'keywords', and 'overview' was dropped.
2. All duplicate title in the original_title was dropped
3. All empty cell in the genre column was dropped.
4. The 'genres' column was split and a new column named 'genre' was created and the old column 'genres' was dropped

```
In [77]: #Loading the clean Data in the wrangle function
         df = wrangle('tmdb-movies.csv')
         df.head()
```

```
Out[77]:    popularity     budget     revenue                original_title  \
         0   32.985763  150000000  1513528810                Jurassic World
         1   28.419936  150000000   378436354            Mad Max: Fury Road
         2   13.112507  110000000   295238201                     Insurgent
         3   11.173104  200000000  2068178225  Star Wars: The Force Awakens
         4    9.335014  190000000  1506249360                     Furious 7

                                                         cast          director  \
         0  Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...   Colin Trevorrow
         1  Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...     George Miller
         2  Shailene Woodley|Theo James|Kate Winslet|Ansel...  Robert Schwentke
         3  Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...       J.J. Abrams
         4  Vin Diesel|Paul Walker|Jason Statham|Michelle ...         James Wan

            runtime release_date  vote_count  vote_average  release_year    budget_adj  \
         0      124       6/9/15        5562           6.5          2015  1.379999e+08
         1      120      5/13/15        6185           7.1          2015  1.379999e+08
         2      119      3/18/15        2480           6.3          2015  1.012000e+08
         3      136     12/15/15        5292           7.5          2015  1.839999e+08
         4      137       4/1/15        2947           7.3          2015  1.747999e+08

             revenue_adj      genre
         0  1.392446e+09     Action
         1  3.481613e+08     Action
         2  2.716190e+08  Adventure
```

```
3  1.902723e+09     Action
4  1.385749e+09     Action
```

In [78]:
```
df.shape
```

Out[78]:
```
(10548, 14)
```

In [79]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10548 entries, 0 to 10865
Data columns (total 14 columns):
popularity        10548 non-null float64
budget            10548 non-null int64
revenue           10548 non-null int64
original_title    10548 non-null object
cast              10475 non-null object
director          10507 non-null object
runtime           10548 non-null int64
release_date      10548 non-null object
vote_count        10548 non-null int64
vote_average      10548 non-null float64
release_year      10548 non-null int64
budget_adj        10548 non-null float64
revenue_adj       10548 non-null float64
genre             10548 non-null object
dtypes: float64(4), int64(5), object(5)
memory usage: 1.2+ MB
```

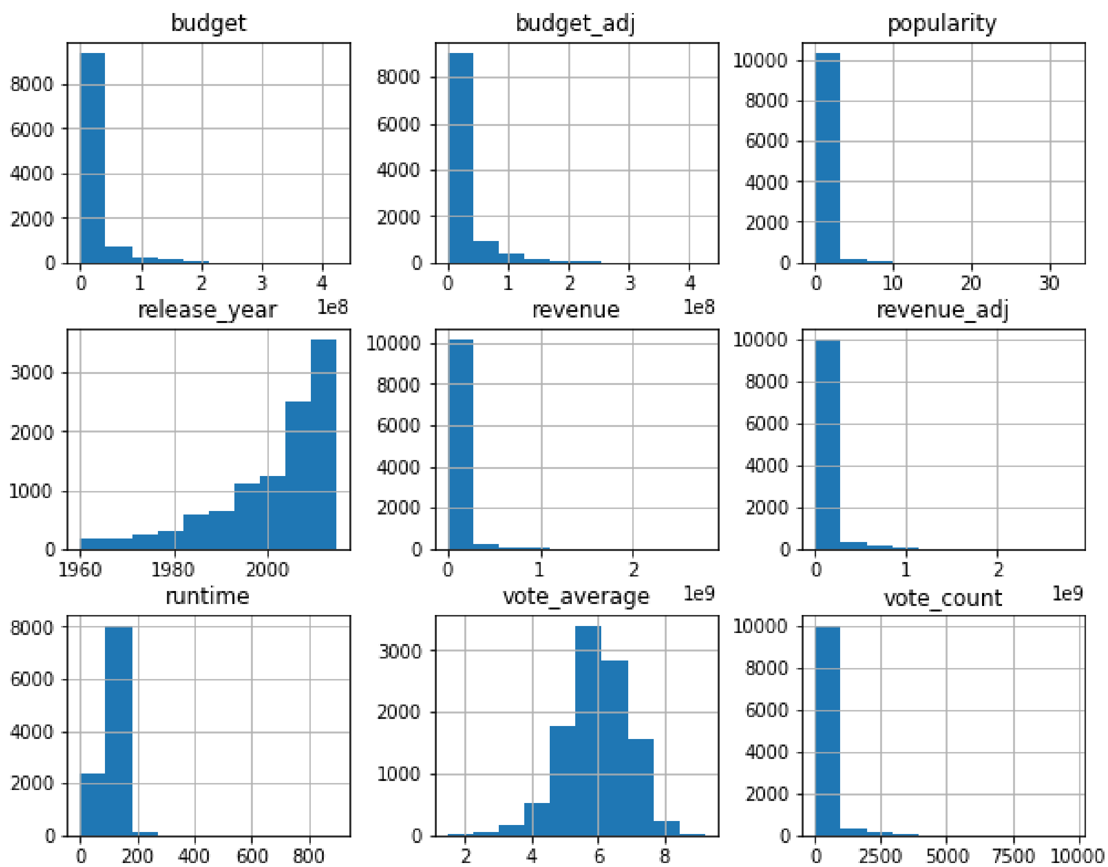
In [80]:
```
#checking  for duplicates in Movie title
dup_title = df[df["original_title"].duplicated() == True]
dup_title['original_title'].index
```

Out[80]:
```
Int64Index([], dtype='int64')
```

After cleaning, There are 10548 rows and 14 columns remaining in the dataset, and there are no duplicate titles in the 'original_title' dataset.

1.1.4 Summary Statistics of movies dataset

In [81]:
```
df.hist(figsize=(10,8));
```



From the histogram above, we can seefrom the 'release_year' that movies were release most in the year 2015. and 'vote_average' appears to be closer to a normal distribution

In [82]:
```
df.describe()
```

Out[82]:

	popularity	budget	revenue	runtime	vote_count
count	10548.000000	1.054800e+04	1.054800e+04	10548.000000	10548.000000
mean	0.649027	1.479945e+07	4.017399e+07	101.898369	219.320440
std	1.008401	3.116716e+07	1.175987e+08	30.253258	580.362722
min	0.000065	0.000000e+00	0.000000e+00	0.000000	10.000000
25%	0.207371	0.000000e+00	0.000000e+00	90.000000	17.000000
50%	0.384765	0.000000e+00	0.000000e+00	99.000000	38.000000
75%	0.715897	1.600000e+07	2.418657e+07	111.000000	148.000000
max	32.985763	4.250000e+08	2.781506e+09	900.000000	9767.000000

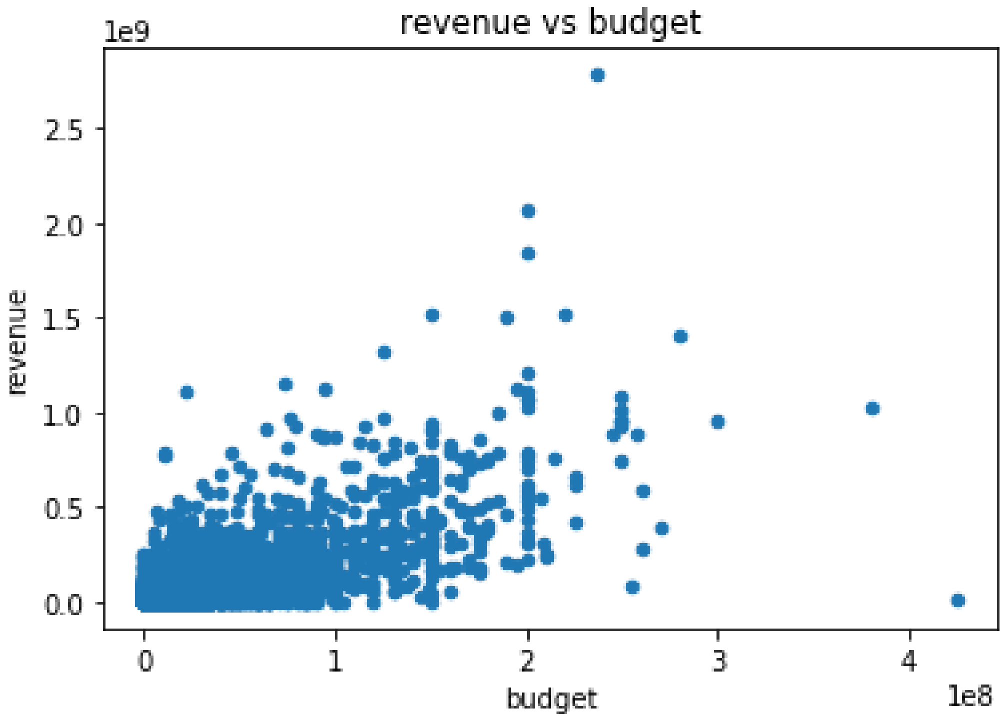
	vote_average	release_year	budget_adj	revenue_adj
count	10548.000000	10548.000000	1.054800e+04	1.054800e+04
mean	5.967965	2001.635002	1.765650e+07	5.128319e+07
std	0.937372	12.594811	3.448349e+07	1.446210e+08
min	1.500000	1960.000000	0.000000e+00	0.000000e+00
25%	5.400000	1995.000000	0.000000e+00	0.000000e+00

```
50%          6.000000    2006.000000   0.000000e+00   0.000000e+00
75%          6.600000    2011.000000   2.099042e+07   3.368783e+07
max          9.200000    2015.000000   4.250000e+08   2.827124e+09
```

Exploratory Data Analysis

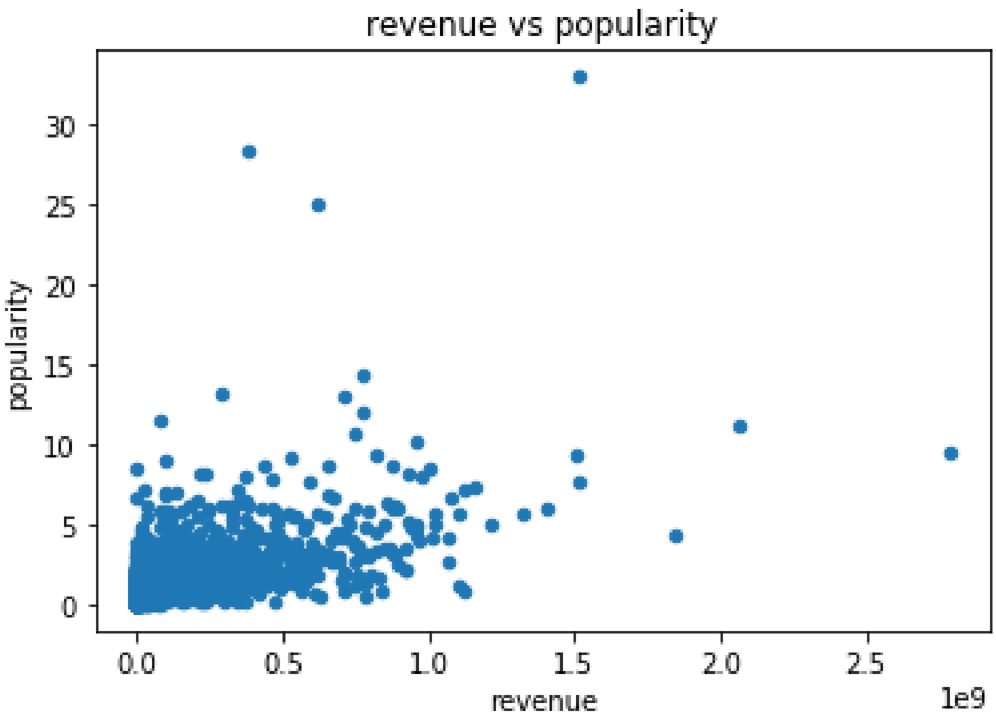
1.1.5 Relationship Between Variables

```
In [83]: df.plot(x = "budget", y = "revenue", kind = "scatter", title = 'revenue vs budget') ;
```



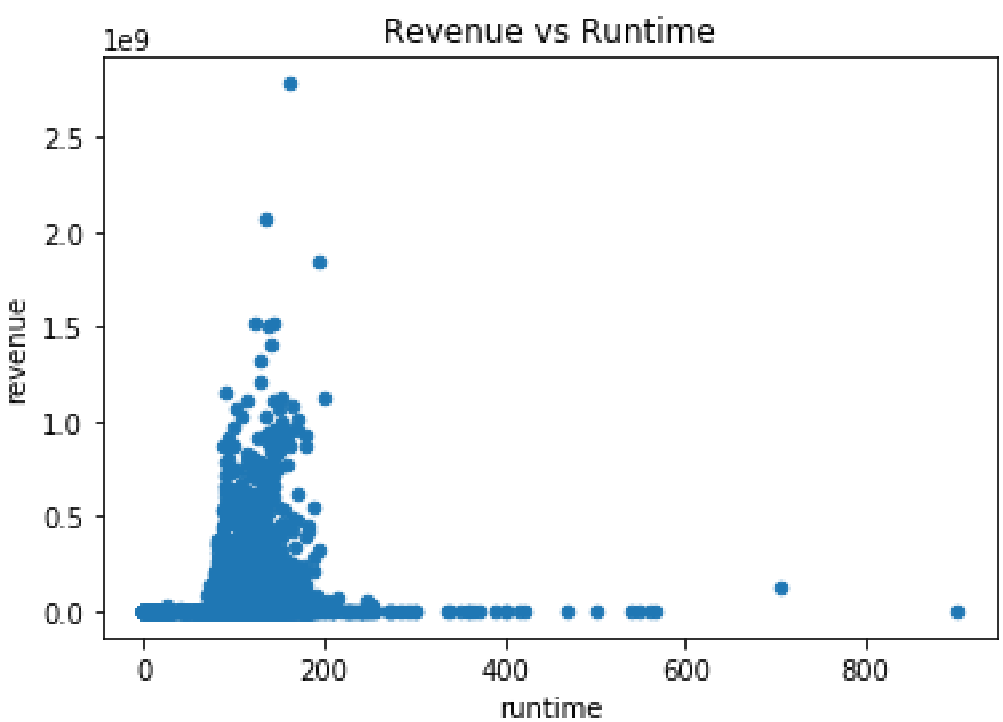
We can say that budget(investment) affects returns(investment) positively

```
In [84]: df.plot(x = "revenue", y = "popularity", kind = 'scatter', title = 'revenue vs populari
```



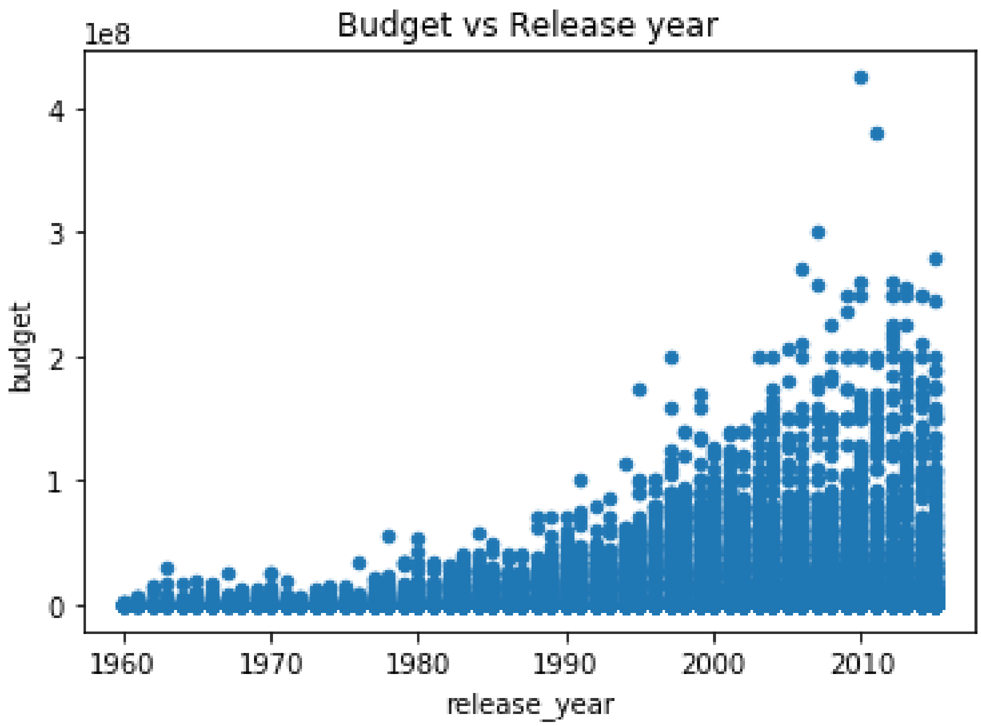
The above shows a slight increase in popularity as revenue increases

```
In [85]: df.plot(x = "runtime", y = "revenue", kind = "scatter", title = 'Revenue vs Runtime');
```



This shows that movies with runtime close to 150 minutes will possibly produce Higher returns('revenue')

```
In [86]: df.plot(x = "release_year", y = "budget", kind = "scatter", title = "Budget vs Release
```



This shows that the cost of movies increased with respect to year

1.1.6 What level of popularity receives the highest average rating?

```
In [87]: df['popularity'].describe()
```

```
Out[87]: count    10548.000000
         mean         0.649027
         std          1.008401
         min          0.000065
         25%          0.207371
         50%          0.384765
         75%          0.715897
         max         32.985763
         Name: popularity, dtype: float64
```

```
In [88]: # Bin edges that will be used to "cut" the data into groups
         bin_edges = [0.000065 , 0.207371, 0.384765, 0.715897, 32.985763]
         # Fill in this list with five values you just found
```

In [89]:
```
bin_names = ["low", "medium",  "moderate_high","high"]
```

In [90]:
```
df['popularity_levels'] = pd.cut(df['popularity'], bin_edges, labels=bin_names)
df.head()
```

Out[90]:
```
   popularity     budget     revenue                original_title  \
0   32.985763  150000000  1513528810                Jurassic World
1   28.419936  150000000   378436354            Mad Max: Fury Road
2   13.112507  110000000   295238201                     Insurgent
3   11.173104  200000000  2068178225  Star Wars: The Force Awakens
4    9.335014  190000000  1506249360                     Furious 7

                                                cast          director  \
0  Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...   Colin Trevorrow
1  Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...     George Miller
2  Shailene Woodley|Theo James|Kate Winslet|Ansel...  Robert Schwentke
3  Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...       J.J. Abrams
4  Vin Diesel|Paul Walker|Jason Statham|Michelle ...         James Wan

   runtime release_date  vote_count  vote_average  release_year    budget_adj  \
0      124       6/9/15        5562           6.5          2015  1.379999e+08
1      120      5/13/15        6185           7.1          2015  1.379999e+08
2      119      3/18/15        2480           6.3          2015  1.012000e+08
3      136     12/15/15        5292           7.5          2015  1.839999e+08
4      137       4/1/15        2947           7.3          2015  1.747999e+08

    revenue_adj      genre popularity_levels
0  1.392446e+09     Action              high
1  3.481613e+08     Action              high
2  2.716190e+08  Adventure              high
3  1.902723e+09     Action              high
4  1.385749e+09     Action              high
```

In [91]:
```
df.groupby('popularity_levels').mean()['vote_average']
```

Out[91]:
```
popularity_levels
low              5.896094
medium           5.798142
moderate_high    5.900341
high             6.277285
Name: vote_average, dtype: float64
```

This shows that Movies with high rating have high vote_average

1.1.7 Do low runtime have the highest revenue?

In [92]:
```
df['runtime'].describe()
```

Out[92]:
```
count    10548.000000
mean       101.898369
```

```
std        30.253258
min         0.000000
25%        90.000000
50%        99.000000
75%       111.000000
max       900.000000
Name: runtime, dtype: float64
```

```
In [93]: low_runtime = df.query("runtime < 99")
         high_runtime = df.query("runtime >=  99")

         # ensure these queries included each sample exactly once
         runtime_samples = df.shape[0]
         runtime_samples == low_runtime['runtime'].count() + high_runtime['runtime'].count() # s
```

```
Out[93]: True
```

```
In [94]: low_runtime.mean()['revenue']
```

```
Out[94]: 19215792.030511059
```

```
In [95]: high_runtime.mean()['revenue']
```

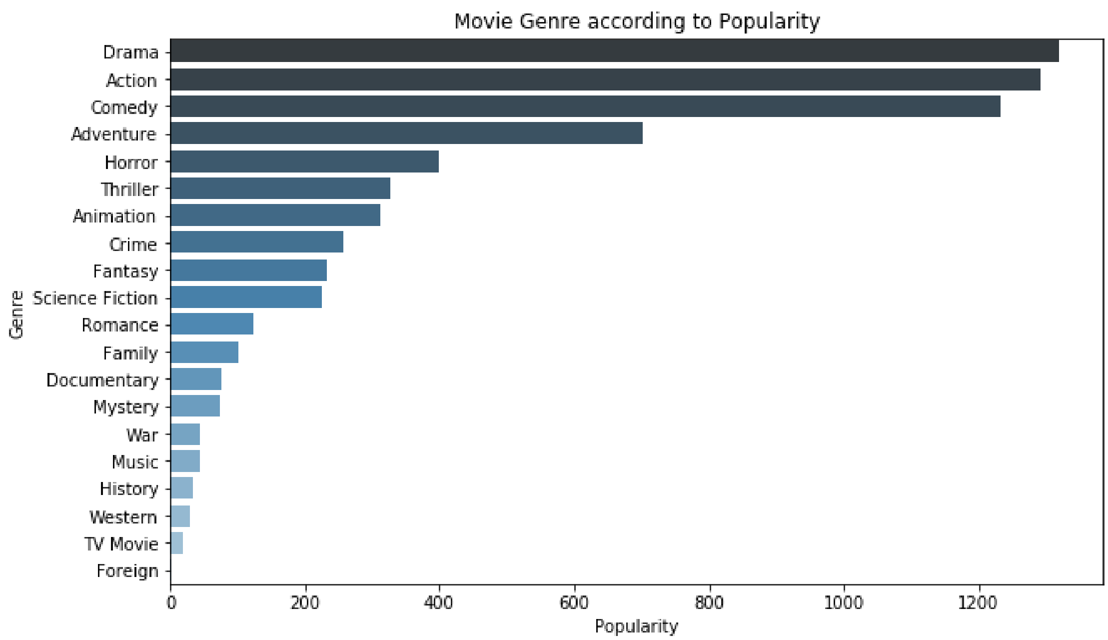
```
Out[95]: 60895096.031108595
```

No, low runtime do not receive high revenue

1.1.8 What genre is most popular?

```
In [96]: df1 = df.groupby('genre').sum()['popularity']
         df1 = pd.DataFrame(df1)
         df1['genre'] = df1.index
```

```
In [97]: fig, ax = plt.subplots(figsize = (10,6))
         sns.barplot(x = 'popularity', y = 'genre',
                     data = df1,
                     palette = "Blues_d",
                     order = df1.sort_values('popularity',ascending = False).genre)
         plt.xlabel('Popularity')
         plt.ylabel('Genre')
         plt.title('Movie Genre according to Popularity') ;
```

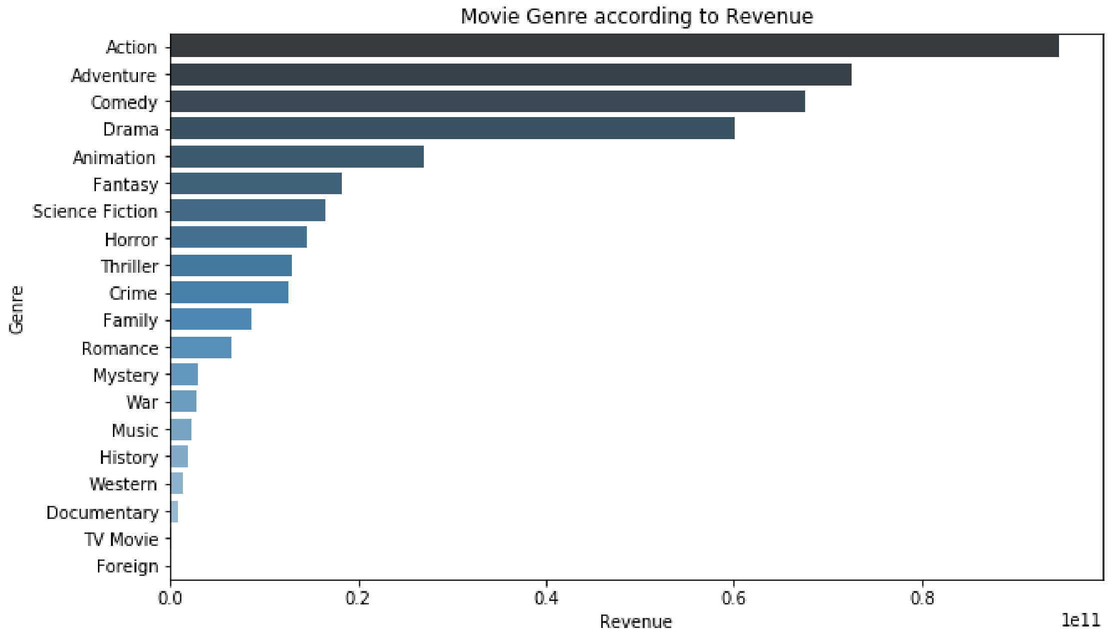


from the above analysis, we can conclude that Drama is the most popular Genre

1.1.9 What Genre has the highest Revenue?

In [98]:
```
df1 = df.groupby('genre').sum()['revenue']
df1 = pd.DataFrame(df1)
df1['genre'] = df1.index
```

In [99]:
```
fig, ax = plt.subplots(figsize = (10,6))
sns.barplot(x = 'revenue', y = 'genre',
            data = df1,
            palette = "Blues_d",
            order = df1.sort_values('revenue',ascending = False).genre)
plt.xlabel('Revenue')
plt.ylabel('Genre')
plt.title('Movie Genre according to Revenue') ;
```



Conclusions

Firstly, I carried out a summary statistics of the dataset. I found out that most movies in the data set were released in the year 2015 and most of the movies have an average runtime of 110 minutes. Furthermore, I performed an exploratory analysis checking on the relationship between variables using the scatter plot, It was clear that a high budget produces high revenue. Also, it was clear that movies with a runtime between 100 to 180 minutes produce high revenue. After that, I analyzed the level of popularity that receives the highest ratings and found out that high popularity receives high ratings. I also found out that low runtime produces low revenues. Lastly, I ran an analysis on the most popular genre according to popularity and revenue and it showed 'Drama' as the most popular and 'Action' as the genre with the highest revenue.

Limitations

I noticed every movie has more than one genre so I was confused at first as to what index in the genre I needed to use but I ended up using the first row in the genre.

```
In [101]: from subprocess import call
          call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])

Out[101]: 0
```