Investigate_a_Dataset

November 11, 2020

1 Project: Investigate a Dataset (TMDB movies)

1.1 Table of Contents

## Introduction - Which year has the highest release of movies? - What are the top 20 most expensive movies? - which Movies with Highest And Lowest Votes? - How do ratings correlate with commercial success (profits)? - What is the average runtime of all movies? ### TMDB movies

#### This data set contains information about 10,000 movies collected from The Movie Database (TMDb), including user ratings and revenue.

```
In [1]: # Use this cell to set up import statements for all of the packages that you
        #   plan to use.
        # Remember to include a 'magic word' so that your visualizations are plotted
        #   inline with the notebook. See this page for more:
        #   http://ipython.readthedocs.io/en/stable/interactive/magics.html
        import numpy as np
        import pandas as pd
        import matplotlib as plt
        import matplotlib.pyplot as plt
        %matplotlib inline
        import seaborn as sns
```

## Data Wrangling

1.1.1 Gathering Data

```
In [2]: # Load your data and print out a few lines. Perform operations to inspect data
        #   types and look for instances of missing or possibly errant data.

        data=pd.read_csv ("tmdb-movies.csv")
        data.head()
```

```
Out[2]:        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]
```

1.1.2 Assess Data

```
In [3]: data.shape
```

```
Out[3]: (10866, 21)
```

```
In [4]: data.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
```

```
In [5]: data.describe()
```

```
Out[5]:                  id    popularity        budget       revenue       runtime  \
        count   10866.000000  10866.000000  1.086600e+04  1.086600e+04  10866.000000
        mean    66064.177434      0.646441  1.462570e+07  3.982332e+07    102.070863
        std     92130.136561      1.000185  3.091321e+07  1.170035e+08     31.381405
        min         5.000000      0.000065  0.000000e+00  0.000000e+00      0.000000
        25%     10596.250000      0.207583  0.000000e+00  0.000000e+00     90.000000
        50%     20669.000000      0.383856  0.000000e+00  0.000000e+00     99.000000
        75%     75610.000000      0.713817  1.500000e+07  2.400000e+07    111.000000
        max    417859.000000     32.985763  4.250000e+08  2.781506e+09    900.000000

                 vote_count  vote_average  release_year    budget_adj   revenue_adj
        count  10866.000000  10866.000000  10866.000000  1.086600e+04  1.086600e+04
        mean     217.389748      5.974922   2001.322658  1.755104e+07  5.136436e+07
        std      575.619058      0.935142     12.812941  3.430616e+07  1.446325e+08
        min       10.000000      1.500000   1960.000000  0.000000e+00  0.000000e+00
        25%       17.000000      5.400000   1995.000000  0.000000e+00  0.000000e+00
        50%       38.000000      6.000000   2006.000000  0.000000e+00  0.000000e+00
        75%      145.750000      6.600000   2011.000000  2.085325e+07  3.369710e+07
        max     9767.000000      9.200000   2015.000000  4.250000e+08  2.827124e+09
```

```
In [6]: data.budget.value_counts()
```

```
Out[6]: 0            5696
        20000000      190
        15000000      183
        25000000      178
        10000000      176
        30000000      165
        5000000       141
        40000000      134
        35000000      128
        12000000      120
        50000000      112
        6000000       109
        8000000       102
        3000000       101
        60000000       99
        7000000        92
        4000000        84
        2000000        81
        18000000       74
        1000000        73
        70000000       66
        11000000       65
```

```
45000000       64
80000000       62
13000000       59
17000000       59
14000000       56
22000000       54
3500000        52
75000000       51
             ...
9100000         1
34200000        1
818418          1
14200000        1
8400000         1
22997992        1
7000            1
220000          1
23600000        1
1645000         1
82500000        1
27220000        1
5112027         1
75              1
1052753         1
225000          1
115             1
12000           1
163000000       1
2240000         1
786675          1
4250000         1
207000000       1
61733           1
19885552        1
51500000        1
25500000        1
1350000         1
7920000         1
4653000         1
Name: budget, Length: 557, dtype: int64
```

```
In [7]: data.revenue.value_counts()
```

```
Out[7]: 0            6016
        12000000       10
        10000000        8
        11000000        7
        6000000         6
```

```
5000000          6
2000000          6
13000000         5
20000000         5
14000000         5
30000000         5
7000000          4
4300000          4
4000000          4
1000000          4
50000000         4
25000000         4
60000000         3
6700000          3
11               3
16000000         3
15               3
29000000         3
21000000         3
100000000        3
102000000        3
3                3
16               3
2500000          3
70000000         3
                 ...
42721196         1
79958599         1
40084041         1
442965           1
50752337         1
30857814         1
1400000          1
7027290          1
303788635        1
10300000         1
45916769         1
26049082         1
211989043        1
41009669         1
346079773        1
4729352          1
23159305         1
272742922        1
525              1
2626800          1
39946780         1
3117985          1
```

```
        22270           1
        65884703        1
        4500000         1
        53676580        1
        617000          1
        13001257        1
        504050219       1
        20518905        1
        Name: revenue, Length: 4702, dtype: int64
```

```
In [8]: data.runtime.value_counts()
```

```
Out[8]: 90     547
        95     358
        100    335
        93     328
        97     306
        96     300
        91     297
        94     292
        92     270
        98     270
        88     270
        89     253
        105    250
        101    232
        99     231
        102    228
        85     227
        103    212
        87     211
        106    211
        108    205
        104    201
        86     197
        107    194
        110    194
        112    152
        84     142
        120    140
        111    140
        109    140
              ...
        294      1
        366      1
        470      1
        550      1
        566      1
```

```
31       1
500      1
372      1
292      1
252      1
257      1
417      1
561      1
705      1
34       1
194      1
210      1
226      1
242      1
250      1
282      1
338      1
19       1
51       1
223      1
235      1
20       1
220      1
236      1
219      1
Name: runtime, Length: 247, dtype: int64
```

1.1.3 Tidiness Issues

```
- Drop duplicate Rows.
```

1.1.4 Quality

```
- Drop unnecessary columns:imdb_id,homepage,keywords,tag_line,overview,revenue_adj,budget_adj.
- Wrong data types (id need to convert to string).
- Wrong data types (relase_date need to convert to datetime).
- Drop the movies which are having zero value of budget and revenue.
- Drop the movies which having missing data (cast,director,geners,production_companies).
```

1.1.5 Data Cleaning

Tidiness Issues

Define:

- Removing duplicates rows from dataset.

Code:

```
In [9]: data.drop_duplicates(inplace=True)
```

Test:

```
In [10]: data.shape
```

```
Out[10]: (10865, 21)
```

Quality

Define:

- removing unnecessary columns:imdb_id,homepage,keywords,tag_line,overview,revenue_adj,budget_adj.

Code:

```
In [11]: data.drop(['imdb_id','homepage','keywords','tagline','overview','revenue_adj','budget_a
```

Test:

```
In [12]: data.shape
```

```
Out[12]: (10865, 14)
```

Define:

- converting id to string.

Code:

```
In [13]: data['id']=str(data['id'])
```

Test:

```
In [14]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10865 entries, 0 to 10865
Data columns (total 14 columns):
id                      10865 non-null object
popularity              10865 non-null float64
budget                  10865 non-null int64
revenue                 10865 non-null int64
original_title          10865 non-null object
cast                    10789 non-null object
director                10821 non-null object
runtime                 10865 non-null int64
genres                  10842 non-null object
```

```
production_companies    9835 non-null object
release_date            10865 non-null object
vote_count              10865 non-null int64
vote_average            10865 non-null float64
release_year            10865 non-null int64
dtypes: float64(2), int64(5), object(7)
memory usage: 1.2+ MB
```

Define:

- converting relase_date to datatime

Code:

```
In [15]: data['release_date']=pd.to_datetime(data['release_date'])
```

Test:

```
In [16]: data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10865 entries, 0 to 10865
Data columns (total 14 columns):
id                      10865 non-null object
popularity              10865 non-null float64
budget                  10865 non-null int64
revenue                 10865 non-null int64
original_title          10865 non-null object
cast                    10789 non-null object
director                10821 non-null object
runtime                 10865 non-null int64
genres                  10842 non-null object
production_companies    9835 non-null object
release_date            10865 non-null datetime64[ns]
vote_count              10865 non-null int64
vote_average            10865 non-null float64
release_year            10865 non-null int64
dtypes: datetime64[ns](1), float64(2), int64(5), object(6)
memory usage: 1.2+ MB
```

Define:

- removing movies with zero values in budget and revenue.

Code:

```
In [17]: data=data[data['budget']!=0]
         data=data[data['revenue']!=0]
```

Test:

```
In [18]: data.shape

Out[18]: (3854, 14)
```

Define:

- removing missing data in cast,director,geners,production_companies.

Code:

```
In [19]: data=data[data.cast.notnull()]
         data=data[data.director.notnull()]
         data=data[data.production_companies.notnull()]
```

Test:

```
In [20]: data.shape

Out[20]: (3805, 14)

In [21]: data.info()
```

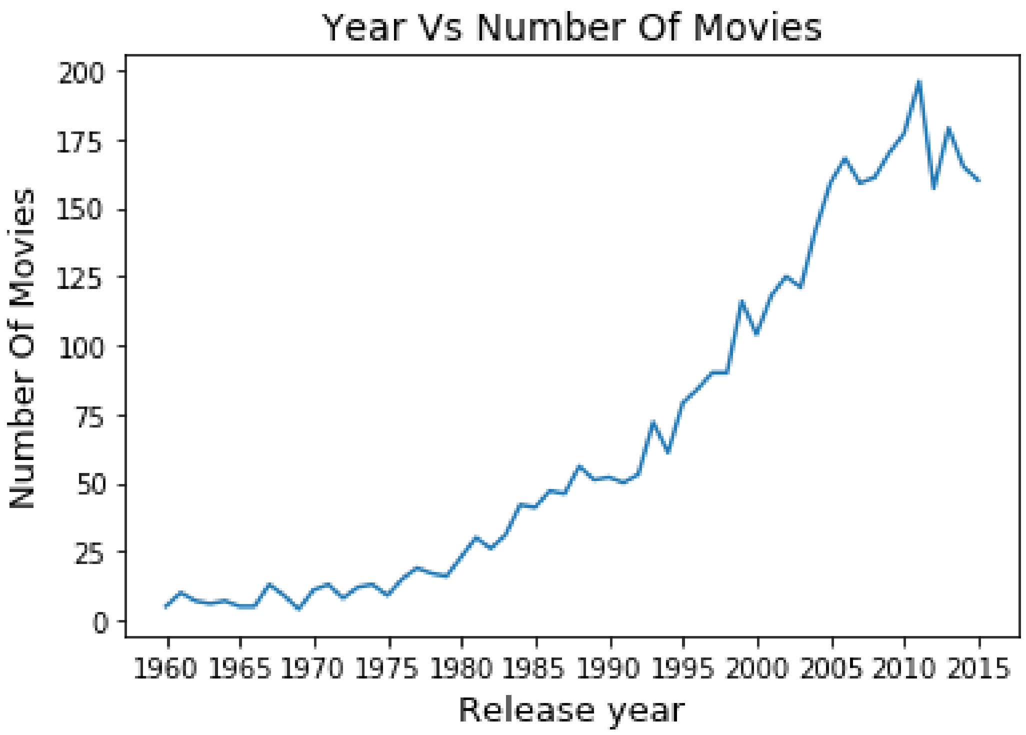
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 3805 entries, 0 to 10848
Data columns (total 14 columns):
id                      3805 non-null object
popularity              3805 non-null float64
budget                  3805 non-null int64
revenue                 3805 non-null int64
original_title          3805 non-null object
cast                    3805 non-null object
director                3805 non-null object
runtime                 3805 non-null int64
genres                  3805 non-null object
production_companies    3805 non-null object
release_date            3805 non-null datetime64[ns]
vote_count              3805 non-null int64
vote_average            3805 non-null float64
release_year            3805 non-null int64
dtypes: datetime64[ns](1), float64(2), int64(5), object(6)
memory usage: 445.9+ KB
```

## Exploratory Data Analysis

Tip: Now that you've trimmed and cleaned your data, you're ready to move on to exploration. Compute statistics and create visualizations with the goal of addressing the research questions that you posed in the Introduction section. It is recommended that you be systematic with your approach. Look at one variable at a time, and then follow it up by looking at relationships between variables.

1.1.6 Research Question 1 (Which year has the highest release of movies?)

```
In [22]: data.groupby('release_year').count()['id'].plot(xticks = np.arange(1960,2016,5))

         #set the figure size and labels
         sns.set(rc={'figure.figsize':(10,5)})
         plt.title("Year Vs Number Of Movies",fontsize = 14)
         plt.xlabel('Release year',fontsize = 13)
         plt.ylabel('Number Of Movies',fontsize = 13)
         #set the style sheet
         sns.set_style("whitegrid")
```

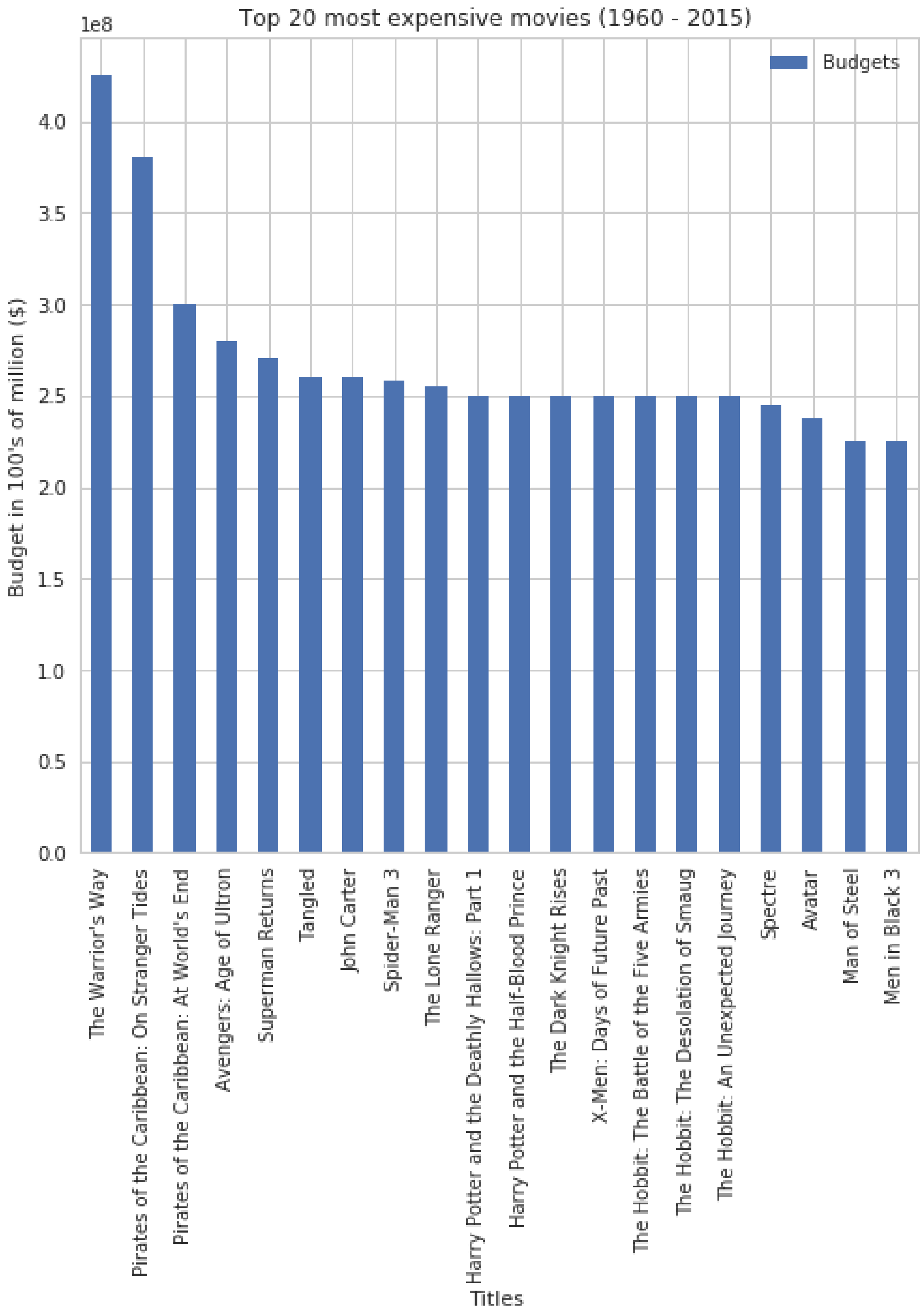


Movies number increase year by year but after 2010 it start decreases, by calculations that year 2010 has the highest release of movies.

1.1.7 Research Question 2 (What are the top 20 most expensive movies?)

```
In [23]: sorted_budget = data['budget'].sort_values(ascending=False)[:20]
         high_budget=pd.DataFrame()
         titles_exp=[]
         budgets=[]
         for i in sorted_budget.index:
             titles_exp.append(data.loc[i,'original_title'])
```

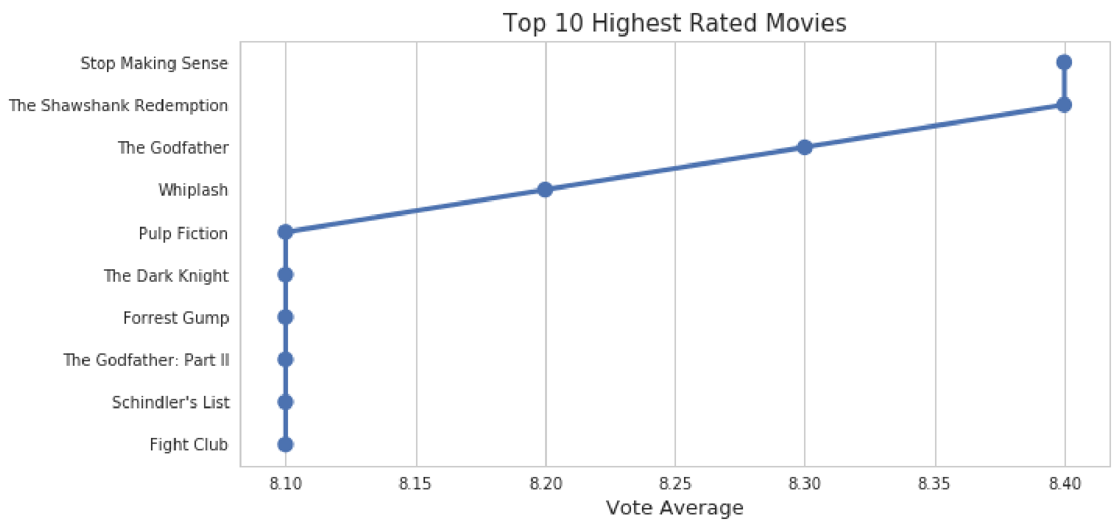
```
    budgets.append(sorted_budget.loc[i])
high_budget['Titles']=titles_exp
high_budget['Budgets']=budgets
high_budget.set_index('Titles',inplace=True)
high_budget.plot(kind ='bar',figsize=(8,8))
plt.title('Top 20 most expensive movies (1960 - 2015) ');
plt.ylabel('Budget in 100\'s of million ($)');
```


Top 20 most expensive movies (1960 - 2015)
1e8
Budgets
Budget in 100's of million ($)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
The Warrior's Way
Pirates of the Caribbean: On Stranger Tides
Pirates of the Caribbean: At World's End
Avengers: Age of Ultron
Superman Returns
Tangled
John Carter
Spider-Man 3
The Lone Ranger
Harry Potter and the Deathly Hallows: Part 1
Harry Potter and the Half-Blood Prince
The Dark Knight Rises
X-Men: Days of Future Past
The Hobbit: The Battle of the Five Armies
The Hobbit: The Desolation of Smaug
The Hobbit: An Unexpected Journey
Spectre
Avatar
Man of Steel
Men in Black 3
Titles

The top 20 most expensive movies ("The Warrior's Way", 'Pirates of the Caribbean: On Stranger Tides', "Pirates of the Caribbean: At World's End", 'Avengers: Age of Ultron', 'Superman Returns', 'Tangled', 'John Carter', 'Spider-Man 3', 'The Lone Ranger', 'Harry Potter and the Deathly Hallows: Part 1', 'Harry Potter and the Half-Blood Prince', 'The Dark Knight Rises', 'X-Men: Days of Future Past', 'The Hobbit: The Battle of the Five Armies', 'The Hobbit: The Desolation of Smaug', 'The Hobbit: An Unexpected Journey', 'Spectre', 'Avatar', 'Man of Steel', 'Men in Black 3').

1.1.8 Research Question 3 (which Movies with Highest And Lowest Votes?)

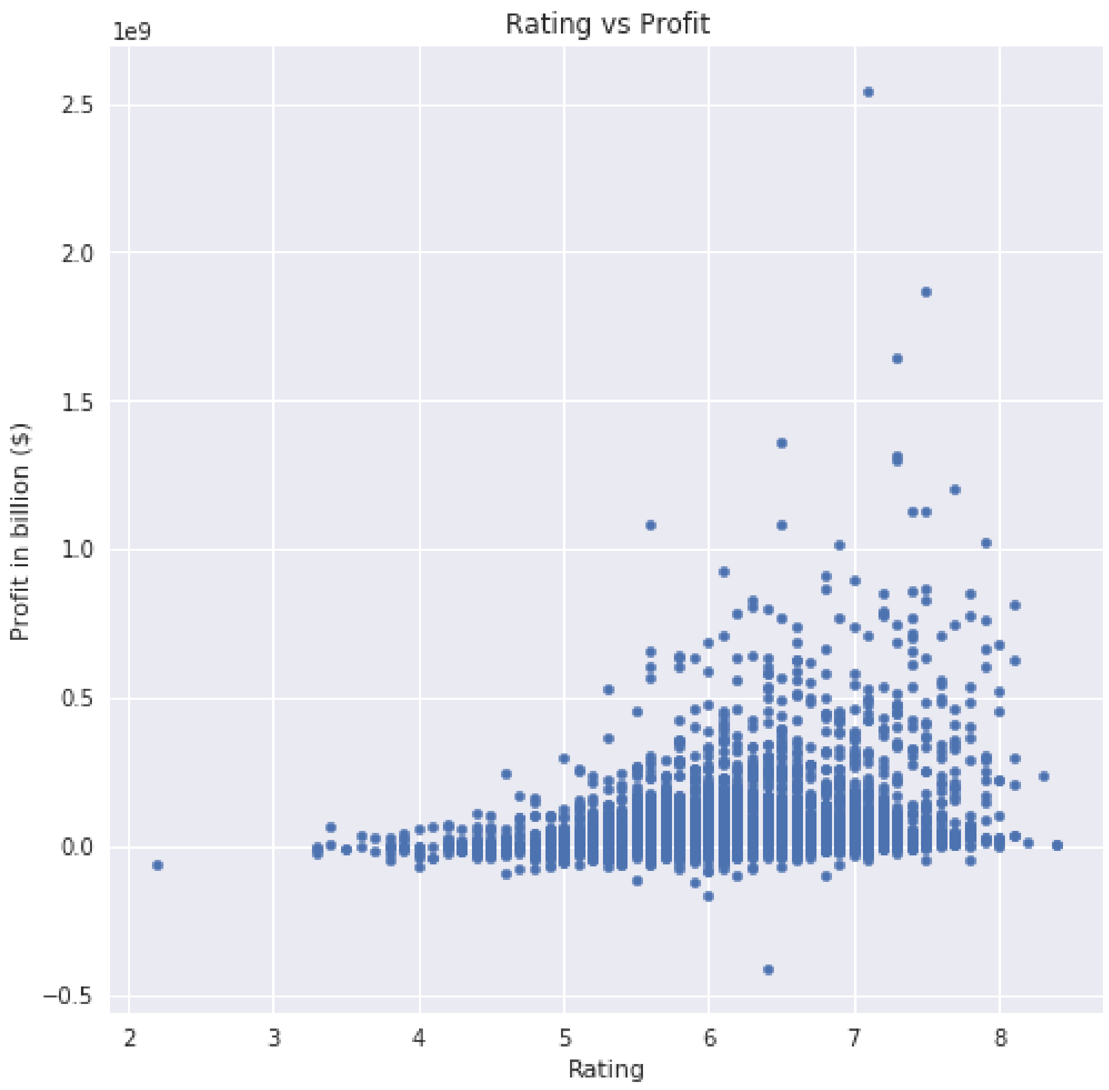
```
In [24]: info = pd.DataFrame(data['vote_average'].sort_values(ascending = False))
         info['original_title'] = data['original_title']
         d = list(map(str,(info['original_title'])))

         ##extract the top 10 highly rated movies data from the list and dataframe.
         x = list(d[:10])
         y = list(info['vote_average'][:10])

         #make the point plot and setup the title and labels.
         ax = sns.pointplot(x=y,y=x)
         sns.set(rc={'figure.figsize':(10,5)})
         ax.set_title("Top 10 Highest Rated Movies",fontsize = 15)
         ax.set_xlabel("Vote Average",fontsize = 13)
         #setup the stylesheet
         sns.set_style("darkgrid")
```



The top highest rated movies ('Stop Making Sense', 'The Shawshank Redemption', 'The Godfather', 'Whiplash', 'Pulp Fiction', 'The Dark Knight', 'Forrest Gump', 'The Godfather: Part II', "Schindler's List", 'Fight Club').

1.1.9 Research Question 4 (How do ratings correlate with commercial success (profits)?)

```
In [25]: d=data
         d['Profit']=d['revenue']-d['budget']
         d.plot(x='vote_average',y='Profit',kind='scatter',figsize=(8,8));
         plt.ylabel('Profit in billion ($)');
         plt.xlabel('Rating');
         plt.title('Rating vs Profit');
```



Movies with high ratting have the highest profit.

Research Question 5 (What is the average runtime of all movies?)

```
In [26]: def average_func(column_name):

             return data[column_name].mean()
         average_func('runtime')

Out[26]: 109.35111695137977
```

The average runtime of all movies in this dataset is 109 mins approx. ## Conclusions

1.2 Submitting your Project

Before you submit your project, you need to create a .html or .pdf version of this notebook in the workspace here. To do that, run the code cell below. If it worked correctly, you should get a return code of 0, and you should see the generated .html file in the workspace directory (click on the orange Jupyter icon in the upper left).

Alternatively, you can download this report as .html via the **File** > **Download as** submenu, and then manually upload it into the workspace directory by clicking on the orange Jupyter icon in the upper left, then using the Upload button.

Once you've done this, you can submit your project by clicking on the "Submit Project" button in the lower right here. This will create and submit a zip file with this .ipynb doc and the .html or .pdf version you created. Congratulations!

1.2.1 Conclusions

- 2010 year has the highest release of movies.
- "The Warrior's Way" is the most expensive movie.
- " Stop Making Sense" is the highest ratting movie.
- The average runtime of all movies in this dataset is 109 mins approx.

1.2.2 Limitation

- Units of revenue and budget column: I am not sure that the budgets and revenues all in US dollars?
- the results can only be treated as indicators and are not generalizable.

```
In [27]: from subprocess import call
         call(['python', '-m', 'nbconvert', 'Investigate_a_Dataset.ipynb'])

Out[27]: 0

In [ ]:

In [ ]:
```