investigate-a-dataset-template

April 29, 2018

1 Project: Investigate a Dataset (Replace this with something more specific!)

1.1 Table of Contents

## Introduction

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

Certain columns, like 'cast' and 'genres', contain multiple values separated by pipe (|) characters. There are some odd characters in the 'cast' column. Don't worry about cleaning them. You can leave them as is. The final two columns ending with "_adj" show the budget and revenue of the associated movie in terms of 2010 dollars, accounting for inflation over time.

Question : Which genres are most popular from year to year? What kinds of properties are associated with movies that have high revenues?

```
In [377]: import numpy as np
          import pandas as pd
          import seaborn as sn
          import matplotlib.pyplot as plt
          from pprint import pprint
```

## Data Wrangling

1.1.1 General Properties

```
In [378]: # Load data
          data = pd.read_csv('data/tmdb-movies.csv')
          data.iloc[0]
```

```
Out[378]: id                                                              135397
          imdb_id                                                      tt0369610
          popularity                                                     32.9858
          budget                                                       150000000
```

```
revenue                                                    1513528810
original_title                                         Jurassic World
cast                    Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...
homepage                                http://www.jurassicworld.com/
director                                              Colin Trevorrow
tagline                                             The park is open.
keywords                monster|dna|tyrannosaurus rex|velociraptor|island
overview                Twenty-two years after the events of Jurassic ...
runtime                                                           124
genres                          Action|Adventure|Science Fiction|Thriller
production_companies    Universal Studios|Amblin Entertainment|Legenda...
release_date                                                   6/9/15
vote_count                                                       5562
vote_average                                                      6.5
release_year                                                     2015
budget_adj                                                   1.38e+08
revenue_adj                                               1.39245e+09
Name: 0, dtype: object
```

1.1.2 Data Cleaning

Removing duplicate rows if any

```
In [379]: # frop duplicates
          pprint("rows before removing duplicates.."+str(len(data)))
          data.drop_duplicates(keep = 'first', inplace = True)
          pprint("rows after removing duplicates.."+str(len(data)))

          #df_new = data.dropna(axis=1,how='all')
          #len(df_new)
```

```
'rows before removing duplicates..10866'
'rows after removing duplicates..10865'
```

*** Removing rows who genres are empty***

```
In [380]: dataWithGenres = data[~data['genres'].isnull()]
          pprint("rows with genres.."+str(len(dataWithGenres)))
          dataWithGenres.head()
```

```
'rows with genres..10842'
```

```
Out[380]:        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]
```

*** Removing rows whose budget and revenue are zero***

```
In [381]: # replace zero to na
          dataWithGenres[['budget', 'revenue']] = dataWithGenres[['budget', 'revenue']].replace(
          #dataWithGenres.head()
          # removing NAN
          dataWithGenres.dropna(subset = ['budget', 'revenue'], inplace = True)
          rows, col = dataWithGenres.shape
          pprint("rows without zero revenue and budget.."+str(len(dataWithGenres)))
```

```
/opt/conda/lib/python3.6/site-packages/pandas/core/frame.py:2352: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
  self[k1] = value[k2]


'rows without zero revenue and budget..3854'


/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:5: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
  """
```

```
In [382]: dataWithGenres.dtypes
```

```
Out[382]: id                          int64
          imdb_id                    object
          popularity                float64
          budget                    float64
          revenue                   float64
          original_title             object
          cast                       object
```

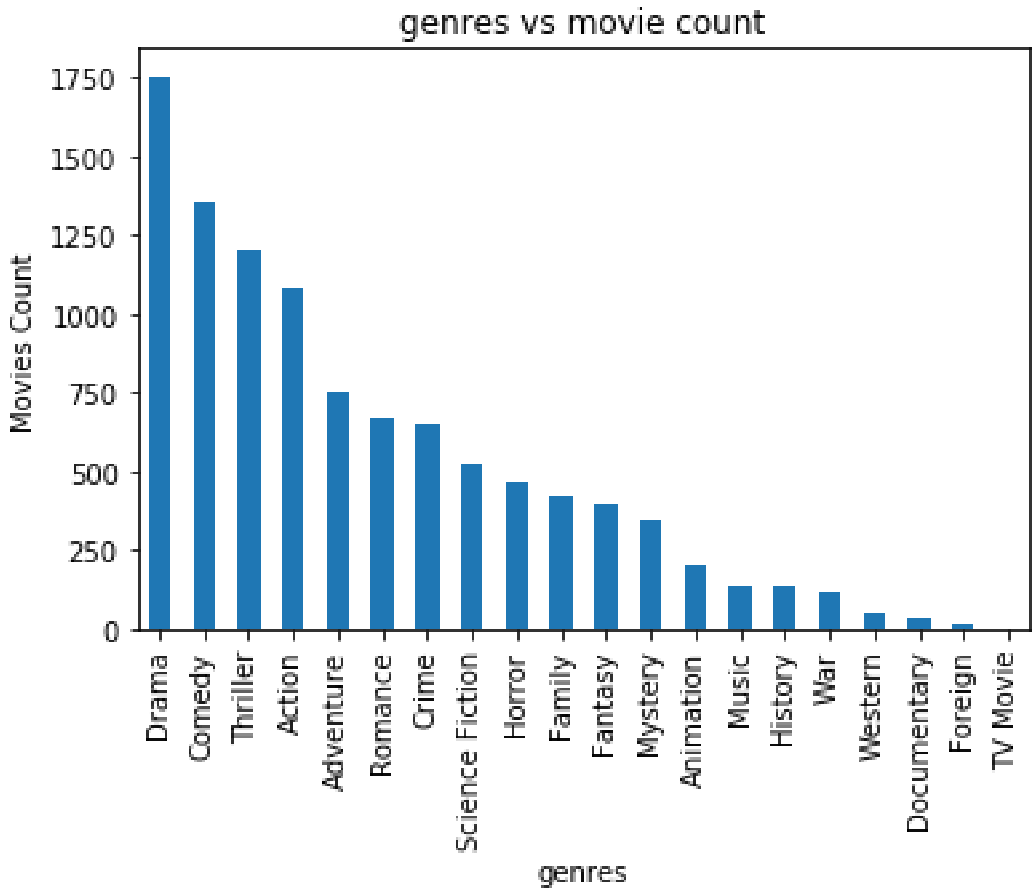
```
homepage                 object
director                 object
tagline                  object
keywords                 object
overview                 object
runtime                   int64
genres                   object
production_companies     object
release_date             object
vote_count                int64
vote_average            float64
release_year              int64
budget_adj              float64
revenue_adj             float64
dtype: object
```

## Exploratory Data Analysis

1.1.3 Which genres are most popular?

```
In [383]: genr_arr = []


          genres_data = dataWithGenres['genres'].str.cat(sep = '|')
          genres_data_split = pd.Series(genres_data.split('|'))

          groupedGenres = genres_data_split.value_counts(ascending = False)
          groupedGenres.plot.bar()
          plt.xlabel('genres')
          #On y-axis
          plt.ylabel('Movies Count')
          #Name of the graph
          plt.title('genres vs movie count')
```

```
Out[383]: Text(0.5,1,'genres vs movie count')
```



Inference : As per the data calculated, movies with 'drama' genres occupied the market. Drama is followed by comedy and thriller

1.1.4 Which average budget of movies

```
In [384]: dataWithGenres['budget'].mean()
```

```
Out[384]: 37203696.954852104
```

Inference. The everage budget for a movie is 37203696.954852104

1.1.5 Which movies gives high revenue

```
In [385]: maxRevMovie = dataWithGenres.iloc[dataWithGenres['revenue'].argmax()]
          maxRevMovie
```

```
Out[385]: id                                                                   9573
          imdb_id                                                         tt0309377
          popularity                                                       0.545907
          budget                                                              5e+07
          revenue                                                       2.61995e+07
          original_title                                                 Blood Work
          cast                    Clint Eastwood|Jeff Daniels|Anjelica Huston|Wa...
          homepage                                                              NaN
          director                                                   Clint Eastwood
          tagline                    He's a heartbeat away from catching the killer
          keywords                      houseboat|heart|investigation|police|ex-cop
          overview                Still recovering from a heart transplant, a re...
          runtime                                                               110
          genres                                       Crime|Drama|Mystery|Thriller
          production_companies            Malpaso Productions|Warner Bros. Pictures
          release_date                                                       8/4/02
          vote_count                                                             89
          vote_average                                                          5.7
          release_year                                                         2002
          budget_adj                                                    6.06131e+07
          revenue_adj                                                   3.17607e+07
          Name: 4021, dtype: object
```

```
In [386]: ### Average runtime of movies
```

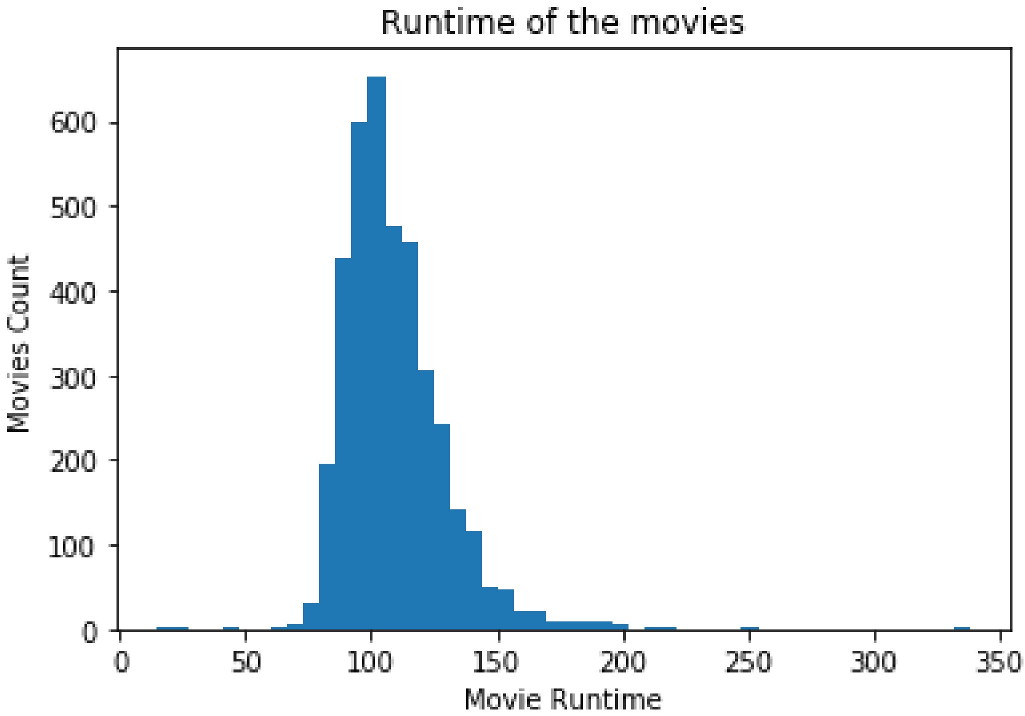
```
In [387]: dataWithGenres['runtime'].mean()
```

```
Out[387]: 109.22029060716139
```

```
In [388]: ### Movies run time plot
```

```
In [389]: data_runtime = dataWithGenres['runtime']
          plt.hist(data_runtime, bins=50)
          plt.xlabel('Movie Runtime')
          #On y-axis
          plt.ylabel('Movies Count')
          #Name of the graph
          plt.title('Runtime of the movies')
```

```
Out[389]: Text(0.5,1,'Runtime of the movies')
```



Inference. The histogram follows positively skewed one where most of the movie runtime falls around 75 to 135.

Will print the statistics based on runtime

```
In [390]: dataWithGenres['runtime'].describe()
```

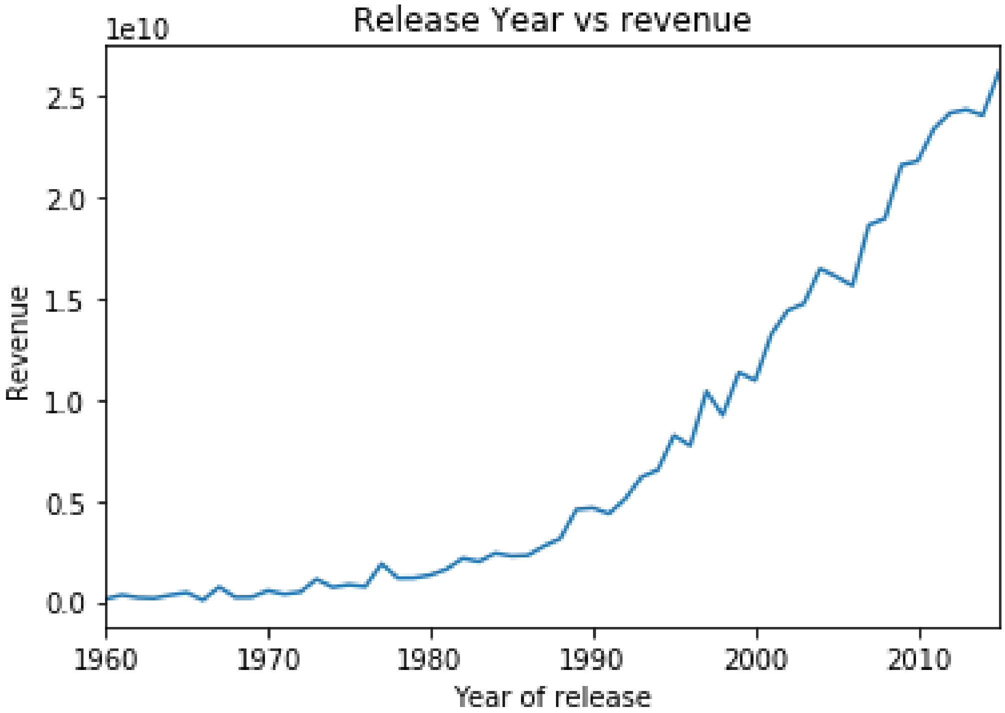
```
Out[390]: count    3854.000000
          mean      109.220291
          std        19.922820
          min        15.000000
          25%        95.000000
          50%       106.000000
          75%       119.000000
          max       338.000000
          Name: runtime, dtype: float64
```

Inference. Based on runtime statistics, average runtime is 109 and it has standard deviation of 19

```
In [391]: ### Release year Vs Revenue
```

```
In [392]: dataByYar = dataWithGenres.groupby('release_year')['revenue'].sum()
          dataByYar.plot.line()
          plt.xlabel('Year of release')
          #On y-axis
          plt.ylabel('Revenue')
          #Name of the graph
          plt.title('Release Year vs revenue')
```

```
Out[392]: Text(0.5,1,'Release Year vs revenue')
```



Inferenece : The maximum revenue is on 2015

```
In [393]: dataByYar.describe()
```

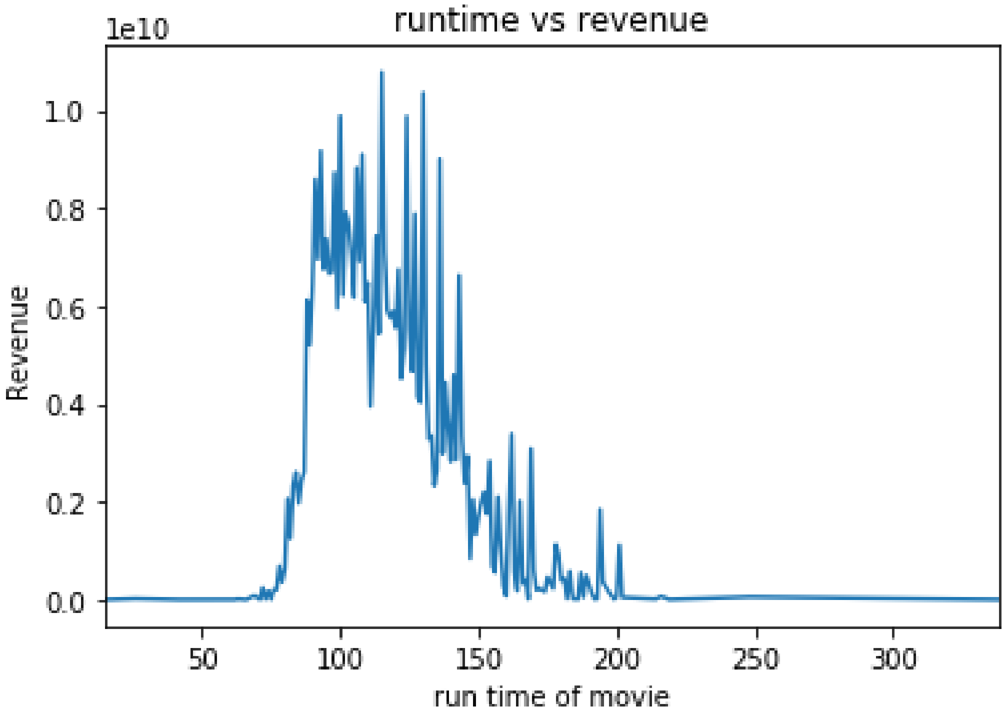
```
Out[393]: count    5.600000e+01
          mean     7.411147e+09
          std      8.242757e+09
          min      8.473669e+07
          25%      7.454036e+08
          50%      2.942177e+09
          75%      1.353885e+10
          max      2.620292e+10
          Name: revenue, dtype: float64
```

###Runtime Vs revenue

```
In [394]: datarunRev = dataWithGenres.groupby('runtime')['revenue'].sum()
          datarunRev.plot.line()
          plt.xlabel('run time of movie')
```

```
#On y-axis
plt.ylabel('Revenue')
#Name of the graph
plt.title('runtime vs revenue')
```

```
Out[394]: Text(0.5,1,'runtime vs revenue')
```



Inference : Based on the graph above, the graph is positively skewed where the revenue is contained by the runtime time. After runtime of 130.. the revenue is decreasing.

1.1.6 What kinds of properties are associated with movies that have high revenues?

```
In [395]: #To find the paroperties that are associated with high revenues. We have to find the c
          data.corr()
```

```
Out[395]:                      id  popularity    budget   revenue   runtime  vote_count  \
          id             1.000000   -0.014351 -0.141341 -0.099235 -0.088368   -0.035555
          popularity    -0.014351    1.000000  0.545481  0.663360  0.139032    0.800828
          budget        -0.141341    0.545481  1.000000  0.734928  0.191300    0.632719
          revenue       -0.099235    0.663360  0.734928  1.000000  0.162830    0.791174
          runtime       -0.088368    0.139032  0.191300  0.162830  1.000000    0.163273
          vote_count    -0.035555    0.800828  0.632719  0.791174  0.163273    1.000000
          vote_average -0.058391    0.209517  0.081067  0.172541  0.156813    0.253818
          release_year  0.511393    0.089806  0.115904  0.057070 -0.117187    0.107962
          budget_adj    -0.189008    0.513555  0.968963  0.706446  0.221127    0.587062
```

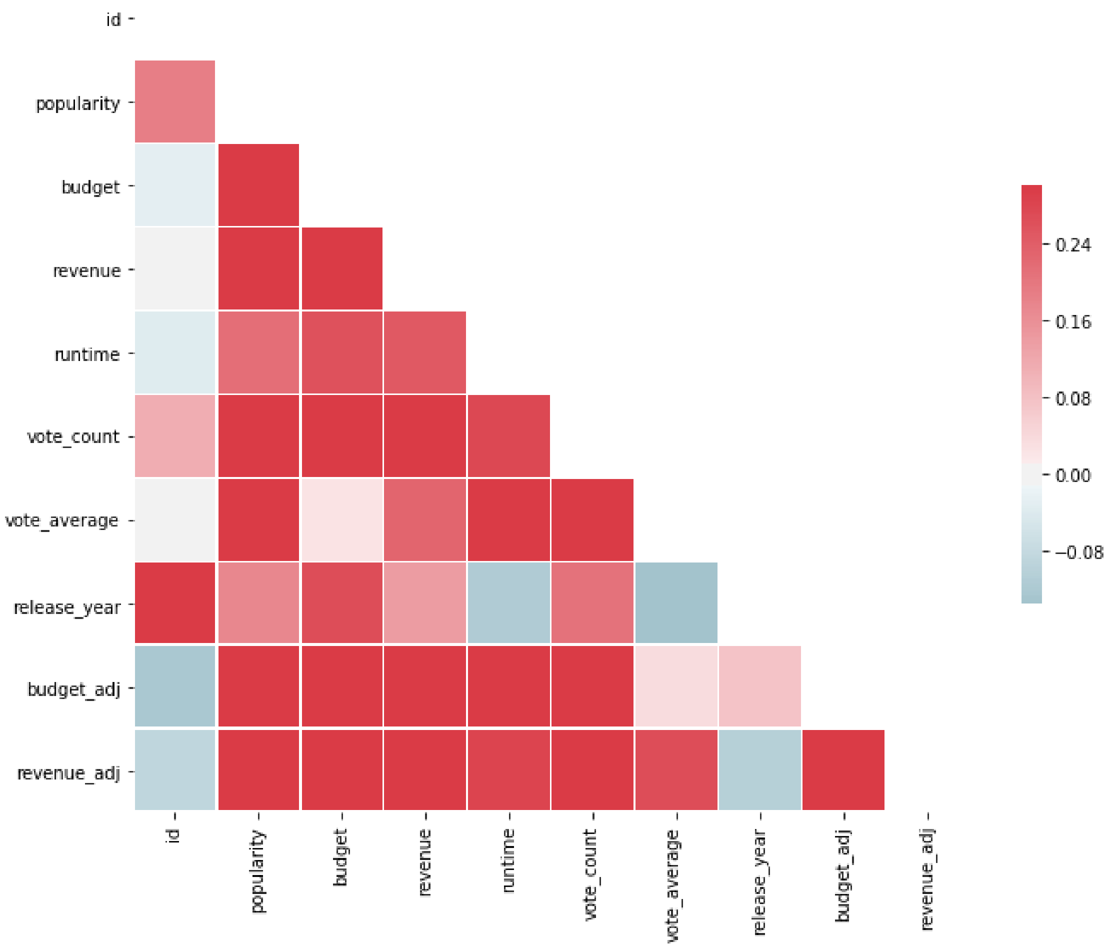
```
revenue_adj  -0.138487    0.609085  0.622531  0.919109  0.175668    0.707941

              vote_average  release_year  budget_adj  revenue_adj
id               -0.058391      0.511393   -0.189008    -0.138487
popularity        0.209517      0.089806    0.513555     0.609085
budget            0.081067      0.115904    0.968963     0.622531
revenue           0.172541      0.057070    0.706446     0.919109
runtime           0.156813     -0.117187    0.221127     0.175668
vote_count        0.253818      0.107962    0.587062     0.707941
vote_average      1.000000     -0.117576    0.093079     0.193062
release_year     -0.117576      1.000000    0.016771    -0.066236
budget_adj        0.093079      0.016771    1.000000     0.646627
revenue_adj       0.193062     -0.066236    0.646627     1.000000
```

As per the table above, revenue is more corrlated with vote_count with the correlation value of 0.79

Inference. Higher the value between columns , higher the correleation is.

In [396]:
```
# Compute the correlation matrix
corr = dataWithGenres.corr()

mask = np.zeros_like(corr, dtype=np.bool)
mask[np.triu_indices_from(mask)] = True

f, ax = plt.subplots(figsize=(11, 9))

cmap = sn.diverging_palette(220, 10, as_cmap=True)

sn.heatmap(corr, mask=mask, cmap=cmap, vmax=.3, center=0,
           square=True, linewidths=.5, cbar_kws={"shrink": .5})
```

Out[396]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7fb50511e908>
```



## Conclusions

As per the data of movies, High revenue is associated with the following in the order it was associated. 1. Vote_count (having correlation value of 79%). If the vote_count is high then obvious more people come and see the movie which in turns increase the revenue) 2. Budget (having correlation value of 73%. Higher the budget is , higher the revenue of movie as per the dataset) 3. Popularity (having correlation value of 66.3%. Higher the popularity of movie is , higher the revenue of movie as per the dataset)

As per the analysis following are important to be considered 1. To get more revenue, the run time of movies should be aroung 109 2. The mean budget of all movies is 37203696. This is average amount to make a good revenue movie 2. As the years moves on, the revenue of movie increases based on the causation mention just above like vote_count, budget, popularity

Limitations : 1. The runtime measure is not shown whether it is second or minutes 2. The measure of budget/revenue are not shown. 3. Few invalid data/duplicate data's has been excluded from analysis. Not sure whether that affecet our analysis. We need to get that data corrected.