P2: Investigate a Dataset (tmdb.csv)

Introduction

Data Overview

```
    -In the tmdb.csv contains information about 10,000 movies, in which including u
ser ratings and revenue.
```

Questions:

```
    1.Which movies had highest and lowest budgets?
    2.Average runtime of all the movies
    3.Movies with most and least earned revenue.
    4.Movies with longest and shortest runtime values.
    5.Year of release vs revenue earned.

    Whit respect to Revenue earn by movies.
    6. Successful genres
    7. Most frequent cast
    8. Average Budget
    9. Average Duration
    10.Year of release
```

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

#importing important files
import pandas as pd
import numpy as np
import seaborn as sns
from datetime import datetime
import pprint
import matplotlib.pyplot as plt
%matplotlib inline
```

Data wrangling

After observing the dataset and questions for analysis we are keeping only important data and deleting unused data so we can make our calculation easy and uderstandable.

In [2]:
```
tmdb_data = pd.read_csv('tmdb-movies.csv')
tmdb_data.head()
```

Out[2]:

	id	imdb_id	popularity	budget	revenue	original_title	cast	
0	135397	tt0369610	32.985763	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	
1	76341	tt1392190	28.419936	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	
2	262500	tt2908446	13.112507	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	http://ww
3	140607	tt2488496	11.173104	200000000	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	htt
4	168259	tt2820852	9.335014	190000000	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	

5 rows × 21 columns

Obsevations from the data set

1. Some missing value in budeget and revenue column are zero.
2. No standar unit for currency is used in this dataset So, i am assuming the currency unit is dollar.

In [3]:
```
tmdb_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 [4]:
```
tmdb_data.shape
```

Out[4]:
```
(10866, 21)
```

In [5]:
```
tmdb_data.dtypes
```

Out[5]:
```
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 [6]:
```
tmdb_data.describe()
```

Out[6]:

	id	popularity	budget	revenue	runtime	vote_count	vo
count	10866.000000	10866.000000	1.086600e+04	1.086600e+04	10866.000000	10866.000000	10
mean	66064.177434	0.646441	1.462570e+07	3.982332e+07	102.070863	217.389748	
std	92130.136561	1.000185	3.091321e+07	1.170035e+08	31.381405	575.619058	
min	5.000000	0.000065	0.000000e+00	0.000000e+00	0.000000	10.000000	
25%	10596.250000	0.207583	0.000000e+00	0.000000e+00	90.000000	17.000000	
50%	20669.000000	0.383856	0.000000e+00	0.000000e+00	99.000000	38.000000	
75%	75610.000000	0.713817	1.500000e+07	2.400000e+07	111.000000	145.750000	
max	417859.000000	32.985763	4.250000e+08	2.781506e+09	900.000000	9767.000000	

In [7]:
```
tmdb_data.isna()
```

Out[7]:

	id	imdb_id	popularity	budget	revenue	original_title	cast	homepage	director	ta
0	False	False	False	False	False	False	False	False	False	F
1	False	False	False	False	False	False	False	False	False	F
2	False	False	False	False	False	False	False	False	False	F
3	False	False	False	False	False	False	False	False	False	F
4	False	False	False	False	False	False	False	False	False	F
...	...	...	...	...	...	...	...	...	...	
10861	False	False	False	False	False	False	False	True	False	
10862	False	False	False	False	False	False	False	True	False	F
10863	False	False	False	False	False	False	False	True	False	
10864	False	False	False	False	False	False	False	True	False	F
10865	False	False	False	False	False	False	False	True	False	F

10866 rows × 21 columns

Data Cleaning

1. Check for missing data

In [8]:
```
tmdb_data.columns[tmdb_data.isnull().any()]
```

Out[8]:
```
Index(['imdb_id', 'cast', 'homepage', 'director', 'tagline', 'keywords',
       'overview', 'genres', 'production_companies'],
      dtype='object')
```

Based on the question, observation and the missing data i am going to remove the unued data such as id, imdb_id, homepage, production_companies, key words, homepage.

In [9]:
```
#creating a list of columb to be deleted
del_col=['id', 'imdb_id','homepage', 'keywords', 'overview', 'production_compa
nies']

#deleting the columns
tmdb_data= tmdb_data.drop(del_col,1)

#previewing the new dataset
tmdb_data.head(3)
```

Out[9]:

	popularity	budget	revenue	original_title	cast	director	tagline	runtime
0	32.985763	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	The park is open.	124
1	28.419936	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	What a Lovely Day.	120
2	13.112507	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	One Choice Can Destroy You	119

2. Remove duplicates

In [10]:
```
tmdb_data.drop_duplicates(inplace=True)
sum(tmdb_data.duplicated())
```

Out[10]:
```
0
```

In [11]:
```
tmdb_data.head(3)
```

Out[11]:

	popularity	budget	revenue	original_title	cast	director	tagline	runtime
0	32.985763	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	The park is open.	124
1	28.419936	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	What a Lovely Day.	120
2	13.112507	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	One Choice Can Destroy You	119

manipulating

In [12]:
```
sep_list=['budget', 'revenue']
tmdb_data[sep_list] = tmdb_data[sep_list].replace(0, np.NAN)
tmdb_data.dropna(subset = sep_list, inplace = True)
rows, col = tmdb_data.shape
print('So after removing such entries, we now have only {} no.of movies.'.form
at(rows-1))
```

```
So after removing such entries, we now have only 3853 no.of movies.
```

4. Changing the release date column into standard date format

In [13]:
```
tmdb_data.release_date = pd.to_datetime(tmdb_data['release_date'])
tmdb_data.head(3)
```

Out[13]:

	popularity	budget	revenue	original_title	cast	director	tagline	runtir
0	32.985763	150000000.0	1.513529e+09	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	The park is open.	1
1	28.419936	150000000.0	3.784364e+08	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	What a Lovely Day.	1
2	13.112507	110000000.0	2.952382e+08	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	One Choice Can Destroy You	1

5.Replacing zero with nan in runtime column

In [14]:
```
tmdb_data['runtime'] =tmdb_data['runtime'].replace(0, np.NAN)
```

Exploratory Data Analysis

1. Which movies had highest and lowest budgets?

```
In [15]: #defining the function
         def calculate(column):
             #for highest earned profit
             high= tmdb_data[column].idxmax()
             high_details=pd.DataFrame(tmdb_data.loc[high])

             #for lowest earned profit
             low= tmdb_data[column].idxmin()
             low_details=pd.DataFrame(tmdb_data.loc[low])

             #collectin data in one place
             info=pd.concat([high_details, low_details], axis=1)

             return info
         calculate('budget')
```

Out[15]:

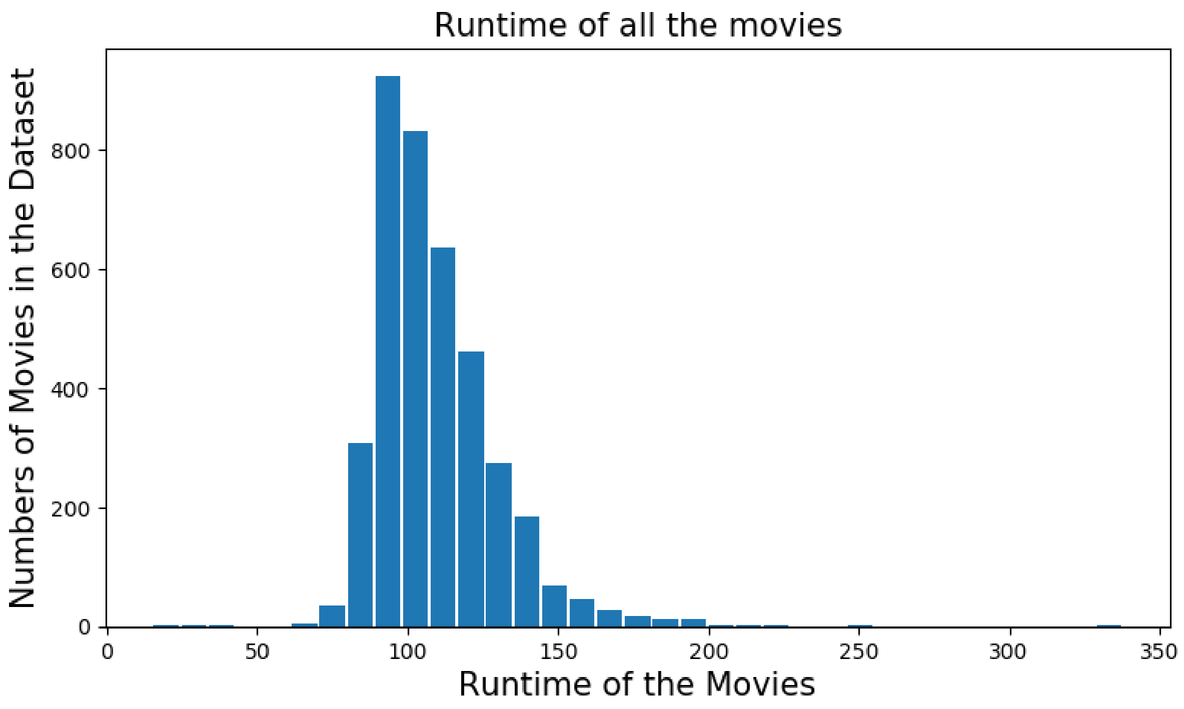
	2244	2618
popularity	0.25054	0.090186
budget	4.25e+08	1
revenue	1.10876e+07	100
original_title	The Warrior's Way	Lost & Found
cast	Kate Bosworth|Jang Dong-gun|Geoffrey Rush|Dann...	David Spade|Sophie Marceau|Ever Carradine|Step...
director	Sngmoo Lee	Jeff Pollack
tagline	Assassin. Hero. Legend.	A comedy about a guy who would do anything to ...
runtime	100	95
genres	Adventure|Fantasy|Action|Western|Thriller	Comedy|Romance
release_date	2010-12-02 00:00:00	1999-04-23 00:00:00
vote_count	74	14
vote_average	6.4	4.8
release_year	2010	1999
budget_adj	4.25e+08	1.30905
revenue_adj	1.10876e+07	130.905

1. Average runtime of all the movies

```
In [16]: def avg_fun(column):
             return tmdb_data[column].mean()
         avg_fun('runtime')
```

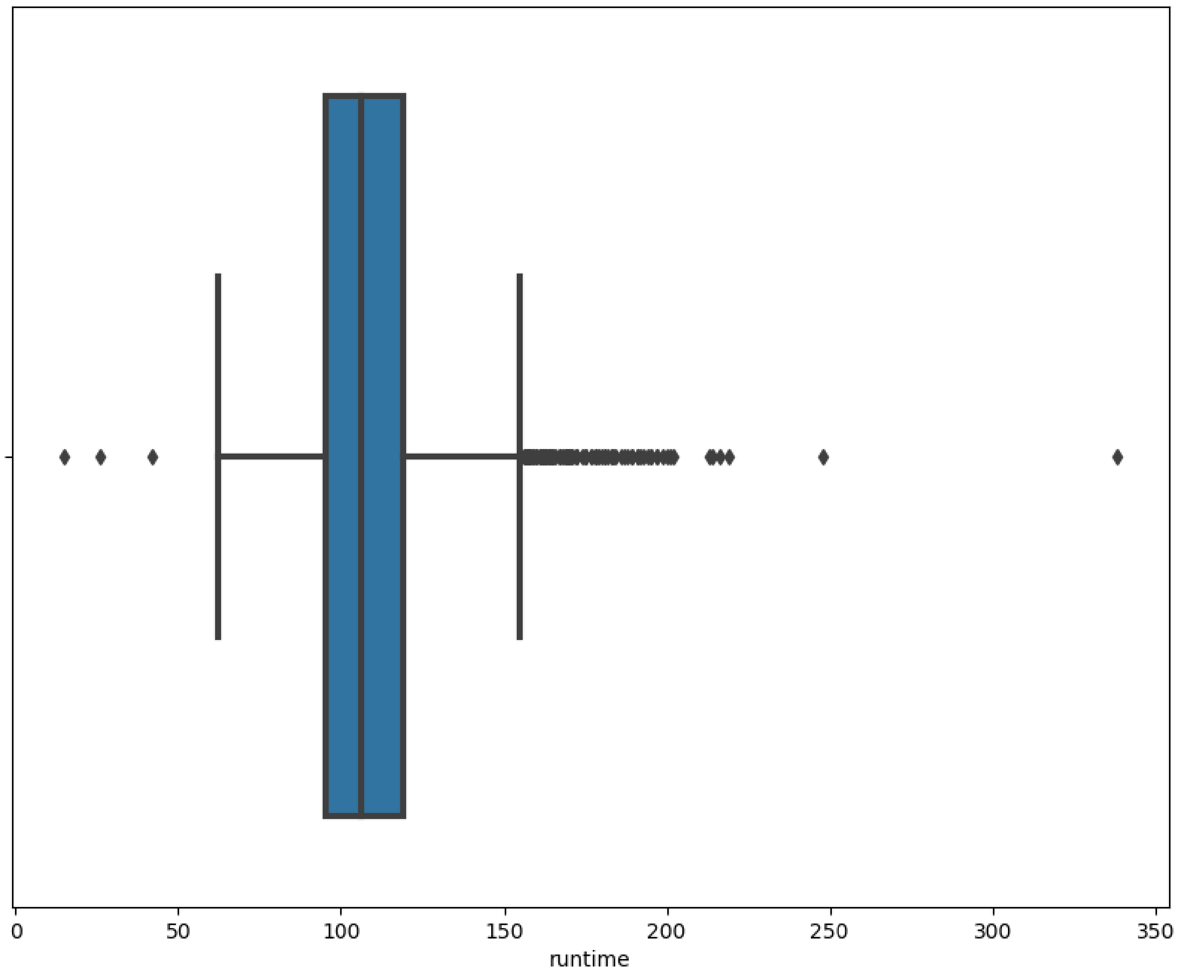
```
Out[16]: 109.22029060716139
```

In [17]:
```
#plotting a histogram of runtime of movies
plt.figure(figsize=(9,5), dpi = 100)
plt.xlabel('Runtime of the Movies', fontsize = 15)
plt.ylabel('Numbers of Movies in the Dataset', fontsize=15)
plt.title('Runtime of all the movies', fontsize=15)
plt.hist(tmdb_data['runtime'], rwidth = 0.9, bins =35)
plt.show()
```

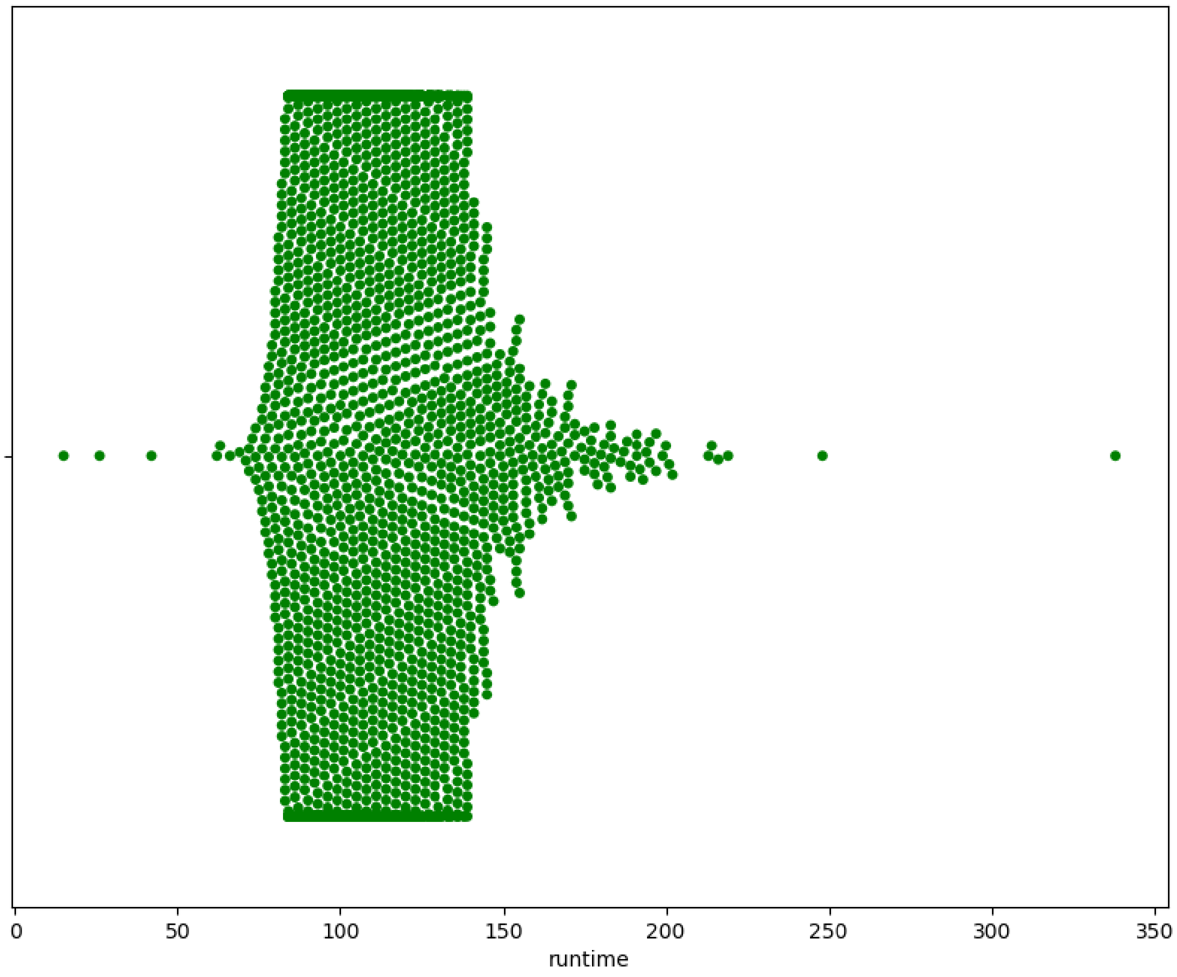


In this histogram is showing positively right skewed. Most of the movies runtime are between 90 to 140. Almost 6,000 and more no.of movies fall in this criteria.

In [18]:
```
import seaborn as sns
plt.figure(figsize=(10,8), dpi = 100)
#using seaborn to generate the boxplot
sns.boxplot(tmdb_data['runtime'], linewidth = 3)
plt.show()
```



In [33]:
```
plt.figure(figsize=(10,8), dpi = 100)
sns.swarmplot(tmdb_data['runtime'], color = 'green')
plt.show()
```



In [19]:
```
tmdb_data['runtime'].describe()
```

Out[19]:
```
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
```

By looking the plot and calcilations, I can conclude that 1. Average runtime for 25% of movies is 95 minutes 2. Average runtime for 50% of movies is 106 minutes 3. Average runtime for 75% of movies is 119 minutes

1. Movies with most and least earned revenue.

In [20]:
```
#defining the function
def calculate(column):
    #for highest earned profit
    high= tmdb_data[column].idxmax()
    high_details=pd.DataFrame(tmdb_data.loc[high])

    #for lowest earned profit
    low= tmdb_data[column].idxmin()
    low_details=pd.DataFrame(tmdb_data.loc[low])

    #collectin data in one place
    info=pd.concat([high_details, low_details], axis=1)

    return info
calculate('revenue')
```

Out[20]:

	1386	**5067**
popularity	9.43277	0.462609
budget	2.37e+08	6e+06
revenue	2.78151e+09	2
original_title	Avatar	Shattered Glass
cast	Sam Worthington|Zoe Saldana|Sigourney Weaver|S...	Hayden Christensen|Peter Sarsgaard|ChloÃ« Sevi...
director	James Cameron	Billy Ray
tagline	Enter the World of Pandora.	NaN
runtime	162	94
genres	Action|Adventure|Fantasy|Science Fiction	Drama|History
release_date	2009-12-10 00:00:00	2003-11-14 00:00:00
vote_count	8458	46
vote_average	7.1	6.4
release_year	2009	2003
budget_adj	2.40887e+08	7.11212e+06
revenue_adj	2.82712e+09	2.37071

Column with 1386 shows the most revenue earned. That is $278151e + 09 Andthecolumnwith5067showsleastearned. Thatis$2.

1. Movies with longest and shortest runtime values.

```
In [21]: calculate('runtime')
```

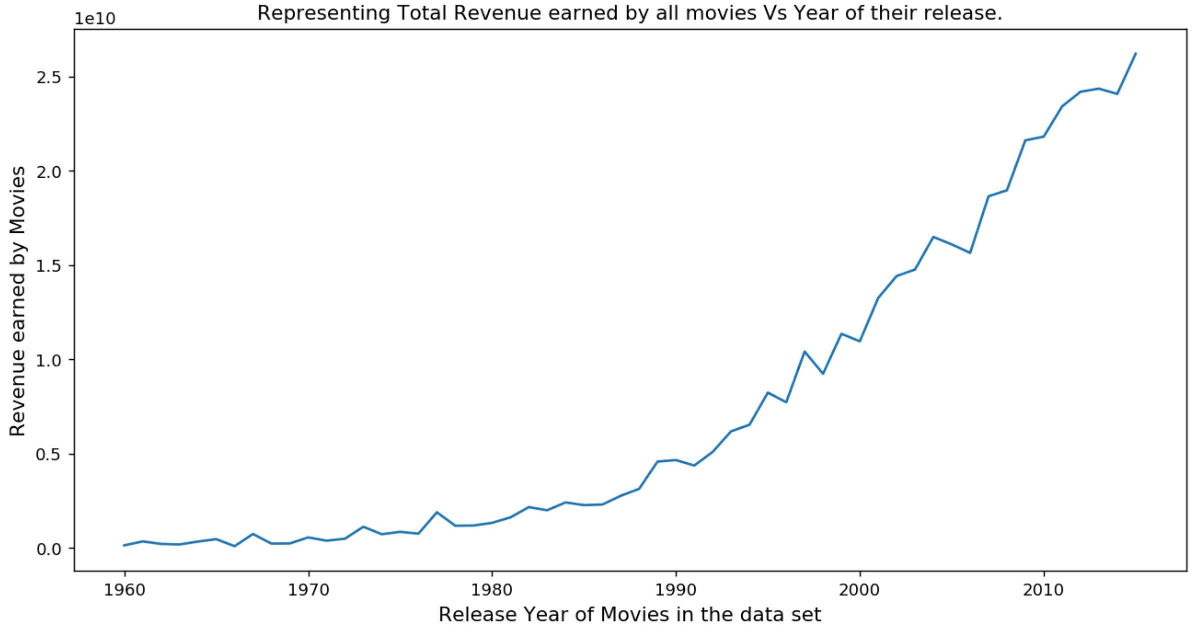
Out[21]:

	2107	5162
popularity	0.534192	0.208637
budget	1.8e+07	10
revenue	871279	5
original_title	Carlos	Kid's Story
cast	Edgar RamÃrez|Alexander Scheer|Fadi Abi Samra...	Clayton Watson|Keanu Reeves|Carrie-Anne Moss|K...
director	Olivier Assayas	Shinichiro Watanabe
tagline	The man who hijacked the world	NaN
runtime	338	15
genres	Crime|Drama|Thriller|History	Science Fiction|Animation
release_date	2010-05-19 00:00:00	2003-06-02 00:00:00
vote_count	35	16
vote_average	6.2	6.8
release_year	2010	2003
budget_adj	1.8e+07	11.8535
revenue_adj	871279	5.92676

Longest runtime show in column 2107 that is 338 minutes. And shortest runtime in column 5162 that is 15 minutes.

1. Year of release vs revenue earned.

In [22]:
```
revenue_year = tmdb_data.groupby('release_year')['revenue'].sum()
plt.figure(figsize=(12,6), dpi = 130)
plt.xlabel('Release Year of Movies in the data set', fontsize = 12)
plt.ylabel('Revenue earned by Movies', fontsize = 12)
plt.title('Representing Total Revenue earned by all movies Vs Year of their re
lease.')
plt.plot(revenue_year)
plt.show()
```



In [23]:
```
revenue_year.idxmax()
```

Out[23]:
```
2015
```

From 1960 to 2015 there was a significant increase in revenue year wise. And in year 2015 earn highest revenue.

What when we fix the revenue earn by movies is $ 50M

In [24]:
```
revenue_data = tmdb_data[tmdb_data['revenue'] >= 50000000]
revenue_data.index = range(len(revenue_data))
revenue_data.index = revenue_data.index + 1
revenue_data.head(3)
```

Out[24]:

	popularity	budget	revenue	original_title	cast	director	tagline	runtir
1	32.985763	150000000.0	1.513529e+09	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	The park is open.	1
2	28.419936	150000000.0	3.784364e+08	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	What a Lovely Day.	1
3	13.112507	110000000.0	2.952382e+08	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	One Choice Can Destroy You	1

In [25]:
```
len(revenue_data)# no of rows
```

Out[25]:
```
1836
```

So dataset is reduced to 1836 from 3853.

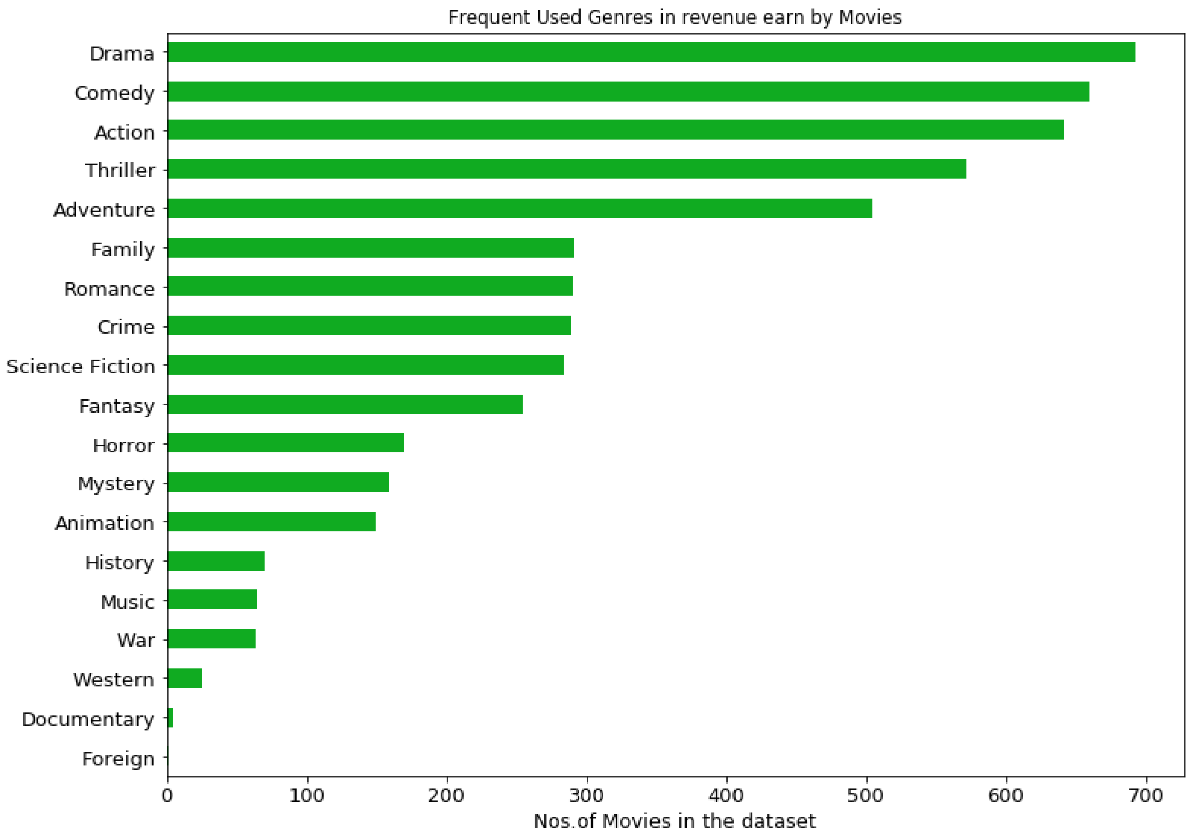
Part 2

1. Succesful Genres

In [26]:
```
def data(column):
    data = revenue_data[column].str.cat(sep = '|')
    data = pd.Series(data.split('|'))
    count = data.value_counts(ascending = False)
    return count
count = data('genres')
count.head()
```

Out[26]:
```
Drama        693
Comedy       660
Action       642
Thriller     572
Adventure    505
dtype: int64
```

In [40]:
```
count.sort_values(ascending = True, inplace = True)
lt = count.plot.barh(color = '#10ab21', fontsize = 13)
lt.set(title = 'Frequent Used Genres in revenue earn by Movies')
lt.set_xlabel('Nos.of Movies in the dataset', color = 'black', fontsize = '13'
)
lt.figure.set_size_inches(12, 9)
plt.show()
```



1. Most Frequent Cast

In [27]:
```
count = data('cast')
count.head()
```

Out[27]:
```
Bruce Willis      32
Tom Cruise        30
Tom Hanks         28
Robert De Niro    28
Brad Pitt         27
dtype: int64
```

Bruce willis is on the top with 32 cast and Tom Cruise on second with 30 cast.

1. Average budget

```
In [28]: def revenue_avg(column):
             return revenue_data[column].mean()
         revenue_avg('budget')
```

```
Out[28]: 58559101.38344227
```

When movies average budget is $59millionthanmoviesearnrevenue$50 million more.

1. Average duration

```
In [29]: revenue_avg('runtime')
```

```
Out[29]: 113.12581699346406
```

when average duration movies is 113 minutes than movies earn $50 million more.

1. Movies popularity

```
In [30]: def revenue_avg(column):
             return revenue_data[column].mean()
         revenue_avg('release_year')
```

```
Out[30]: 2002.6252723311547
```

Average revenue earn by year by release is $2002 million

Conclusions

In this data analysis i can able to find the various factors which involed to earn revenue from the movies. Some finding are below

1. Average budget must be around $60 millon.
2. Average duration should be 113 minutes.
3. Genre should be Drama, Comedy, Action, Thriller, Adventure.
4. Most Frequent Cast are Bruce Willis, Tom Cruise, Robert De Niro, Tom Hanks, Brad Pitt.

These are some factor through which movies earn more revenue and average revenue $2002 million dollar by release years.

Limitations:

The data anaysis process was done which had significant amount of revenue earn is around $50 million on various runtime, budget, genres. But In this dataset i observe that the profit column is missing so we can not analysis on the various fector which lead to profiable movies. And Currency unit is not there so it might be some possibility to miss match in the results.

In [ ]: