Project: Investigate TMDb movie dataset

Table of Contents

- Introduction
- Data Wrangling
- Exploratory Data Analysis
- Conclusions

Introduction

This analysis treat with TMDb movie dataset to answer about some questions based on adjusted currancy value that corrected for inflation or gross domestic product (GDP) to cover for period of movies release years that about 55 year from 1960 till 2015.

Questions is:

- **What's period that movies released duration?**
- **Which most popular movie weighted by voters and rating number?**
- **Movie with highest or lowest adjusted budget?**
- **Which movie made the highest and lowest adjusted revenue?**
- **Which movie Has the highest or lowest adjusted profit?**
- **Which movie has longest and shorest runtime?**
- **What's avearage runtime of movies?**
- **Which year has the highest count release of movies?**
- **Which year has the highest adjusted profit?**
- **Which genre has the most count of released movies?**
- **Which most star acted in movies?**
- **Which is production company with highest number of released movies?**
- **Which is director who directed maximum Movies?**

In [2]:

```python
# Import statements for all of the packages that you plan to use.
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
% matplotlib inline
```

Data Wrangling

General Properties

In [3]:

```python
# Load data and print out a few lines.
df=pd.read_csv('tmdb-movies.csv')
df.head()
```

Out[3]:

	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://www.tl
3	140607	tt2488496	11.173104	200000000	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	http:/.
4	168259	tt2820852	9.335014	190000000	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	

5 rows × 21 columns

In [4]:

```
# Display Data Frame information
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
```

In [4]:

```
#Display total count of null values in each column
df.isnull().sum()
```

Out[4]:

```
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
```

In [5]:
```
#Check duplicated values
df.duplicated().sum()
```

Out[5]:
```
1
```

Data Cleaning :

- Remove duplicate data
- Convert columns data to suitable type and remove that not useful in our processing
- Remove null and zeros rows

In [6]:
```
# Remove duplicated Values and check after
df.drop_duplicates(inplace=True)
df.duplicated().sum()
```

Out[6]:
```
0
```

In [7]:
```
#Convert 'release_date' column to datatime format and insure from some columns te
df['release_date']=pd.to_datetime(df['release_date'])
df[['cast','genres','production_companies']] = df[['cast','genres','production_c
df[['budget_adj','revenue_adj']]=df[['budget_adj','revenue_adj']].applymap(np.in

df.dtypes
```

Out[7]:
```
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            datetime64[ns]
vote_count                       int64
vote_average                   float64
release_year                     int64
budget_adj                       int64
revenue_adj                      int64
dtype: object
```

In [8]:
```
#Romve columns that not be useful in analysis
df.drop([ 'id', 'imdb_id', 'homepage', 'tagline','keywords', 'overview'],axis=1,
```

In [9]:

```
# Remove all null data in 'budget_adj','revenue_adj' columns and check null valu
df[['budget_adj','revenue_adj']]=df[['budget_adj','revenue_adj']].replace(0, np.
df.dropna(subset=['budget_adj','revenue_adj'],inplace=True)

# Display data frame shape after removing
df.shape
```

Out[9]:

```
(3853, 15)
```

In [10]:

```
#Creating more columns for analysing
df['vote_popularity']=df['vote_count']*df['vote_average']*df['popularity']
df['Profit_adj']=df['revenue_adj']-df['budget_adj']
```

In [11]:

```
df.head()
```

Out[11]:

	popularity	budget	revenue	original_title	cast	director	runtime	
0	32.985763	150000000	1513528810	Jurassic World	Chris Pratt|Bryce Dallas Howard|Irrfan Khan|Vi...	Colin Trevorrow	124	Action|Adv
1	28.419936	150000000	378436354	Mad Max: Fury Road	Tom Hardy|Charlize Theron|Hugh Keays-Byrne|Nic...	George Miller	120	Action|Adv
2	13.112507	110000000	295238201	Insurgent	Shailene Woodley|Theo James|Kate Winslet|Ansel...	Robert Schwentke	119	Adv
3	11.173104	200000000	2068178225	Star Wars: The Force Awakens	Harrison Ford|Mark Hamill|Carrie Fisher|Adam D...	J.J. Abrams	136	Action|Adv
4	9.335014	190000000	1506249360	Furious 7	Vin Diesel|Paul Walker|Jason Statham|Michelle ...	James Wan	137	Actio

Exploratory Data Analysis

Research Question 1 : What's period that movies released duration?

In [11]:

```
#Display period of movies database
period=df['release_year'].max()-df['release_year'].min()
'Movies database cover period about {} years from {} to {}'.format(period,df['re
```

Out[11]:

```
'Movies database cover period about 55 years from 1960 to 2015'
```

Research Question 2 : Which most popular movie weighted by voters and rating number?

In [12]:

```
#Display most max. and min. vote popularity and popularity in movies
df[df['vote_popularity'] == df['vote_popularity'].max()]
```

Out[12]:

	popularity	budget	revenue	original_title	cast	director	runtime	
629	24.949134	165000000	621752480	Interstellar	Matthew McConaughey|Jessica Chastain|Anne Hath...	Christopher Nolan	169	Ad

Most popular movie weighted by voters and rating number is "Interstellar" in 2014

Research Question 3 : Which movie with highest or lowest adjusted budget?

In [13]:

```
#Display most max. and min. adjusted budget in movies
higher_budget_adj=df[df['budget_adj'] == df['budget_adj'].max()]
lower_budget_adj=df[df['budget_adj'] == df['budget_adj'].min()]
pd.concat([higher_budget_adj, lower_budget_adj], axis=0)
```

Out[13]:

	popularity	budget	revenue	original_title	cast	director	runtime	
2244	0.250540	425000000	11087569	The Warrior's Way	Kate Bosworth|Jang Dong-gun|Geoffrey Rush|Dann...	Sngmoo Lee	100	Adventure|F
2618	0.090186	1	100	Lost & Found	David Spade|Sophie Marceau|Ever Carradine|Step...	Jeff Pollack	95	

Movie with highest adjusted budget is "The Warrior's Way" in 2010 and lowest one is "Love, Wedding, Marriage" in 2011

Research Question 4 : Which movie made the highest and lowest adjusted revenue ?

In [14]:

```
#Display most max. and min. adjusted revenue in movies
higher_revenue_adj=df[df['revenue_adj'] == df['revenue_adj'].max()]
lower_revenue_adj=df[df['revenue_adj'] == df['revenue_adj'].min()]
pd.concat([higher_revenue_adj, lower_revenue_adj], axis=0)
```

Out[14]:

	popularity	budget	revenue	original_title	cast	director	runtime	
1386	9.432768	237000000	2781505847	Avatar	Sam Worthington|Zoe Saldana|Sigourney Weaver|S...	James Cameron	162	Action
5067	0.462609	6000000	2	Shattered Glass	Hayden Christensen|Peter Sarsgaard|ChloÃ« Sevi...	Billy Ray	94	
8142	0.552091	6000000	2	Mallrats	Jason Lee|Jeremy London|Shannen Doherty|Claire...	Kevin Smith	94	

Movie with highest adjusted revenue is "Avatar" in 2009 and lowest one is "Shattered Glass " in 2003

Research Question 5 : Which movie Has the highest or lowest adjusted profit?

In [15]:

```
#Display most max. and min. adjusted Profit in movies
higher_profit_adj=df[df['Profit_adj'] == df['Profit_adj'].max()]
lower_profit_adj=df[df['Profit_adj'] == df['Profit_adj'].min()]
pd.concat([higher_profit_adj, lower_profit_adj], axis=0)
```

Out[15]:

	popularity	budget	revenue	original_title	cast	director	runtime	
1329	12.037933	11000000	775398007	Star Wars	Mark Hamill|Harrison Ford|Carrie Fisher|Peter ...	George Lucas	121	Ad
2244	0.250540	425000000	11087569	The Warrior's Way	Kate Bosworth|Jang Dong-gun|Geoffrey Rush|Dann...	Sngmoo Lee	100	Adventure|F

Movie with highest adjusted profit is "Star Wars" in 1977 and lowest one is "The Warrior's Way" in 2010

Research Question 6 : Which movie has longest and shorest runtime?

In [16]:

```
#Display most max. and min. runtime of movies
longest_runtime=df[df['runtime'] == df['runtime'].max()]
shortest_runtime=df[df['runtime'] == df['runtime'].min()]
pd.concat([longest_runtime, shortest_runtime], axis=0)
```

Out[16]:

	popularity	budget	revenue	original_title	cast	director	runtime	
2107	0.534192	18000000	871279	Carlos	Edgar RamÃ-rez|Alexander Scheer|Fadi Abi Samra...	Olivier Assayas	338	Crime|Drama|
5162	0.208637	10	5	Kid's Story	Clayton Watson|Keanu Reeves|Carrie-Anne Moss|K...	Shinichiro Watanabe	15	Science Fict

Movie with longest runtime is "Carlos" in 2010 and lowest one is "Kid's Story" in 2003

Research Question 7 : What's avearage runtime of movies?

In [18]:

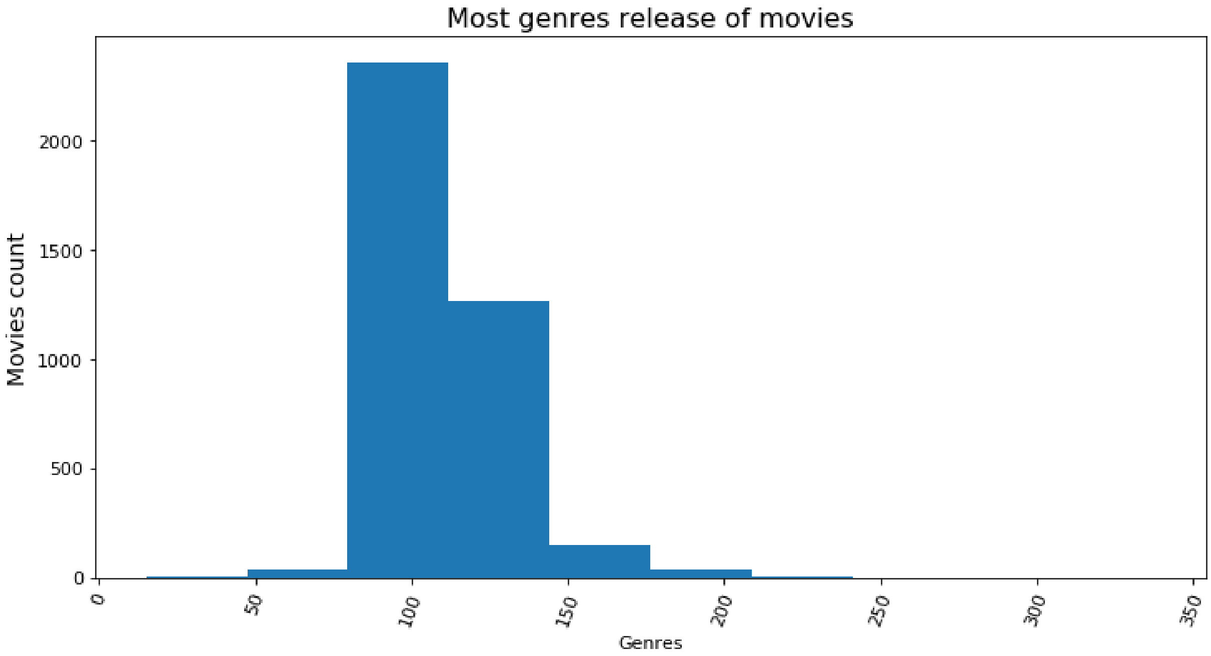
```
#Display runtime of movies statistics
df['runtime'].describe()
```

Out[18]:

```
count    3853.000000
mean      109.225279
std        19.922999
min        15.000000
25%        95.000000
50%       106.000000
75%       119.000000
max       338.000000
Name: runtime, dtype: float64
```

In [42]:

```
df['runtime'].plot(kind='hist',figsize=(12,6),fontsize=11)
plt.xlabel('Genres',fontsize=11)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Most genres release of movies',fontsize=16)
plt.show()
```



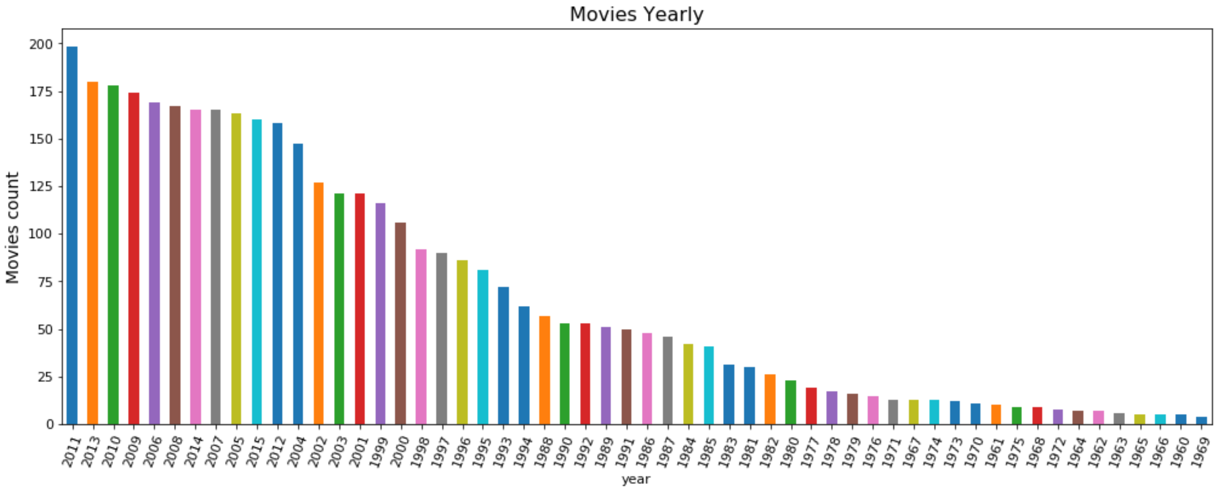
Avearage runtime of movies is nearly 109 minutes

Research Question 8 : Which year has the highest count release of movies?

In [19]:
```python
#Display Most count of movies yearly
movies_count=df['release_year'].value_counts()
movies_count
```

Out[19]:
```
2011    198
2013    180
2010    178
2009    174
2006    169
2008    167
2014    165
2007    165
2005    163
2015    160
2012    158
2004    147
2002    127
2003    121
2001    121
1999    116
2000    106
1998     92
1997     90
1996     86
```

In [102]:
```python
#Make chart as visual display for most count of movies yearly
movies_count.plot(kind='bar',figsize=(17,6),fontsize=11)
plt.xlabel('year',fontsize=11)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Movies Yearly',fontsize=16)
plt.show()
```



The year has the highest count release of movies is 2011 with 198 movies in it

Research Question 9 : Which year has the highest adjusted profit?

In [20]:

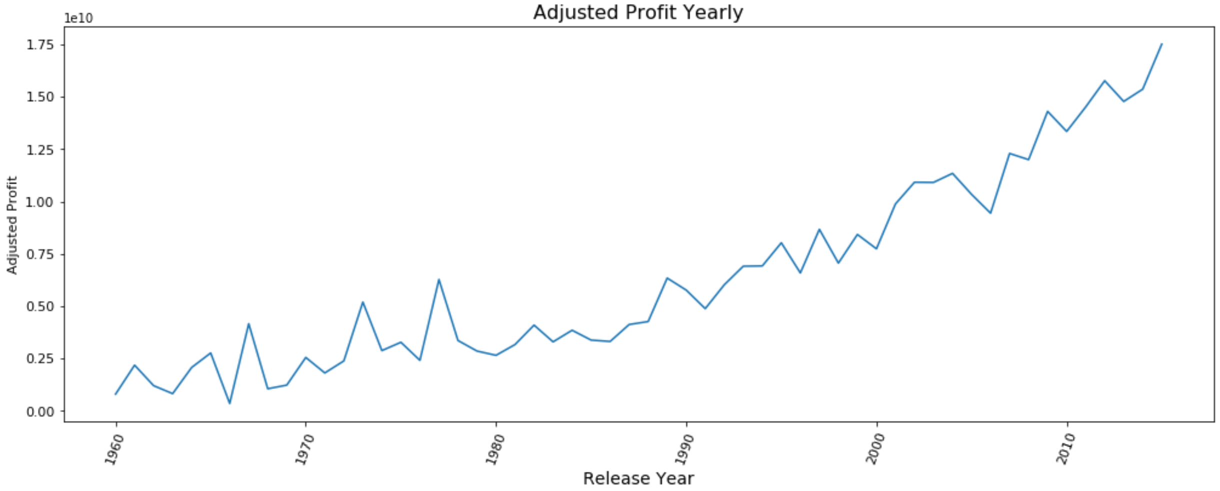
```
#Display Most Adjusted profit of movies yearly
most_profit_year = df.groupby('release_year')['Profit_adj'].sum()
most_profit_year.sort_values(ascending=False)
```

Out[20]:

```
release_year
2015    1.750957e+10
2012    1.576276e+10
2014    1.536030e+10
2013    1.477317e+10
2011    1.450868e+10
2009    1.430005e+10
2010    1.334122e+10
2007    1.228991e+10
2008    1.199481e+10
2004    1.133955e+10
2002    1.091592e+10
2003    1.090780e+10
2005    1.033877e+10
2001    9.879053e+09
2006    9.438970e+09
1997    8.667305e+09
1999    8.421411e+09
1995    8.025003e+09
2000    7.738026e+09
1998    7.055200e+09
1994    6.920674e+09
1993    6.907075e+09
1996    6.584938e+09
1989    6.339278e+09
1977    6.272042e+09
1992    6.018808e+09
1990    5.765886e+09
1973    5.194465e+09
1991    4.880325e+09
1988    4.265061e+09
1967    4.159569e+09
1987    4.123234e+09
1982    4.093921e+09
1984    3.848464e+09
1985    3.379081e+09
1978    3.359749e+09
1986    3.313068e+09
1983    3.295076e+09
1975    3.274711e+09
1981    3.166215e+09
1974    2.877058e+09
1979    2.855318e+09
1965    2.763256e+09
1980    2.651503e+09
1970    2.550225e+09
1976    2.411772e+09
1972    2.384285e+09
1961    2.181770e+09
1964    2.071668e+09
1971    1.810959e+09
1969    1.229648e+09
```

```
1962    1.202945e+09
1968    1.054890e+09
1963    8.217533e+08
1960    7.977407e+08
1966    3.524854e+08
Name: Profit_adj, dtype: float64
```

In [21]:
```
#Make chart as visual display for most adjusted profit movies yearly
most_profit_year.plot(kind='line',figsize=(17,6),fontsize=11)
plt.xlabel('Release Year',fontsize=14)
plt.xticks(rotation=70)
plt.ylabel('Adjusted Profit',fontsize=11)
plt.title('Adjusted Profit Yearly',fontsize=16)
plt.show()
```



The year has the highest adjusted profit is 2015 with nearly 17.5 billion Dollar

Research Question 10 : Which genre has the most count of released movies?

In [22]:

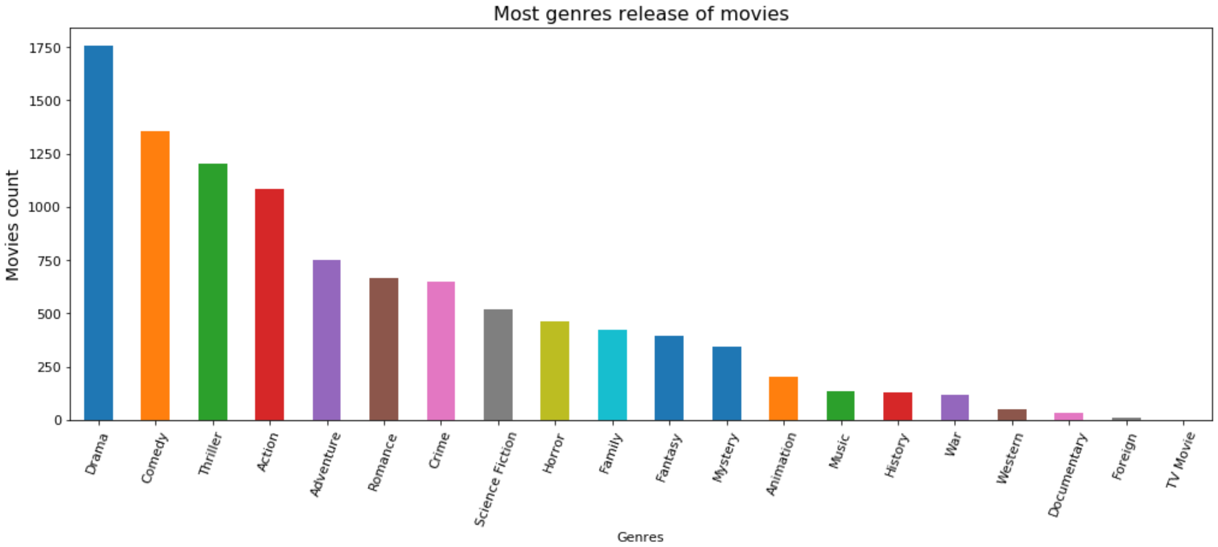
```
#Display most genres release of movies
genres_count=pd.Series(df['genres'].str.cat(sep = '|').split('|')).value_counts(
genres_count
```

Out[22]:

```
Drama              1756
Comedy             1357
Thriller           1204
Action             1085
Adventure           749
Romance             666
Crime               651
Science Fiction     519
Horror              463
Family              425
Fantasy             396
Mystery             344
Animation           201
Music               136
History             129
War                 119
Western              52
Documentary          35
Foreign              13
TV Movie              1
dtype: int64
```

In [112]:

```
#Make chart as visual display for most genres count of movies
genres_count.plot(kind='bar',figsize=(17,6),fontsize=11)
plt.xlabel('Genres',fontsize=11)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Most genres release of movies',fontsize=16)
plt.show()
```



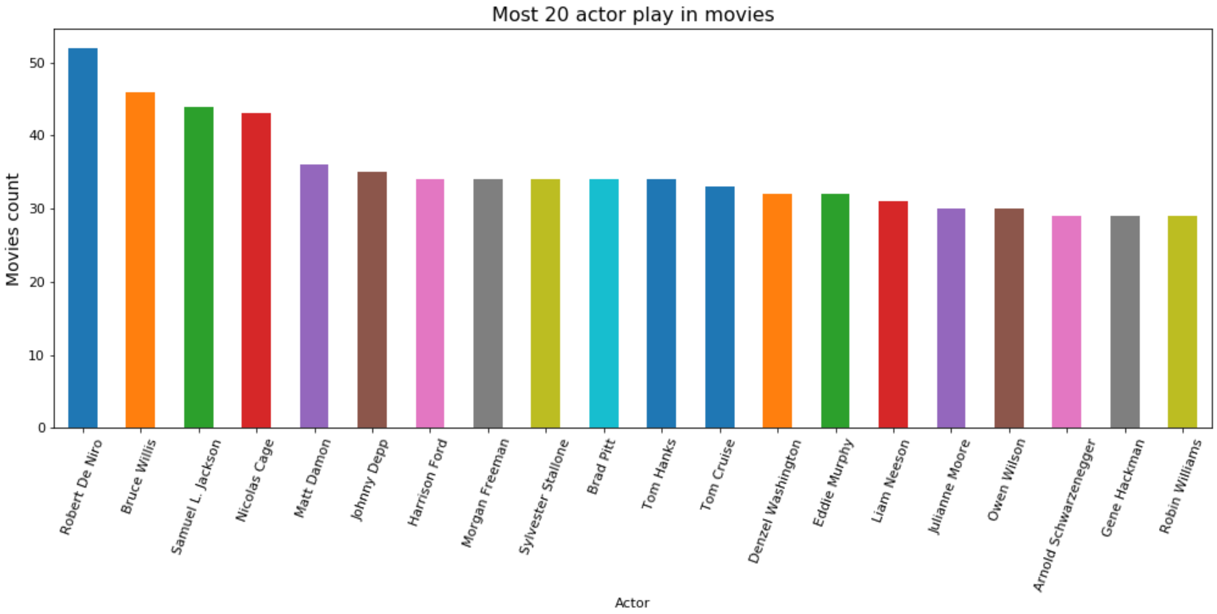
The genre has the most count of released movies is "Drama" with 1755 movies

Research Question 11 : Which most star acted in movies?

In [23]:
```
#Display Most 20 actors played in movies
cast_count=pd.Series(df['cast'].str.cat(sep = '|').split('|')).value_counts().il
cast_count
```

Out[23]:
```
Robert De Niro        52
Bruce Willis          46
Samuel L. Jackson     44
Nicolas Cage          43
Matt Damon            36
Johnny Depp           35
Morgan Freeman        34
Harrison Ford         34
Sylvester Stallone    34
Tom Hanks             34
Brad Pitt             34
Tom Cruise            33
Eddie Murphy          32
Denzel Washington     32
Liam Neeson           31
Julianne Moore        30
Owen Wilson           30
Meryl Streep          29
Willem Dafoe          29
Mark Wahlberg         29
dtype: int64
```

In [113]:
```
#Make chart as visual display for most 20 actor play in movies
cast_count.plot(kind='bar',figsize=(17,6),fontsize=11)
plt.xlabel('Actor',fontsize=11)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Most 20 actor play in movies',fontsize=16)
plt.show()
```



Which most star acted in movies is "Robert De Niro" with 52 movies

Research Question 12 : Which is production company with highest number of released movies?

In [24]:

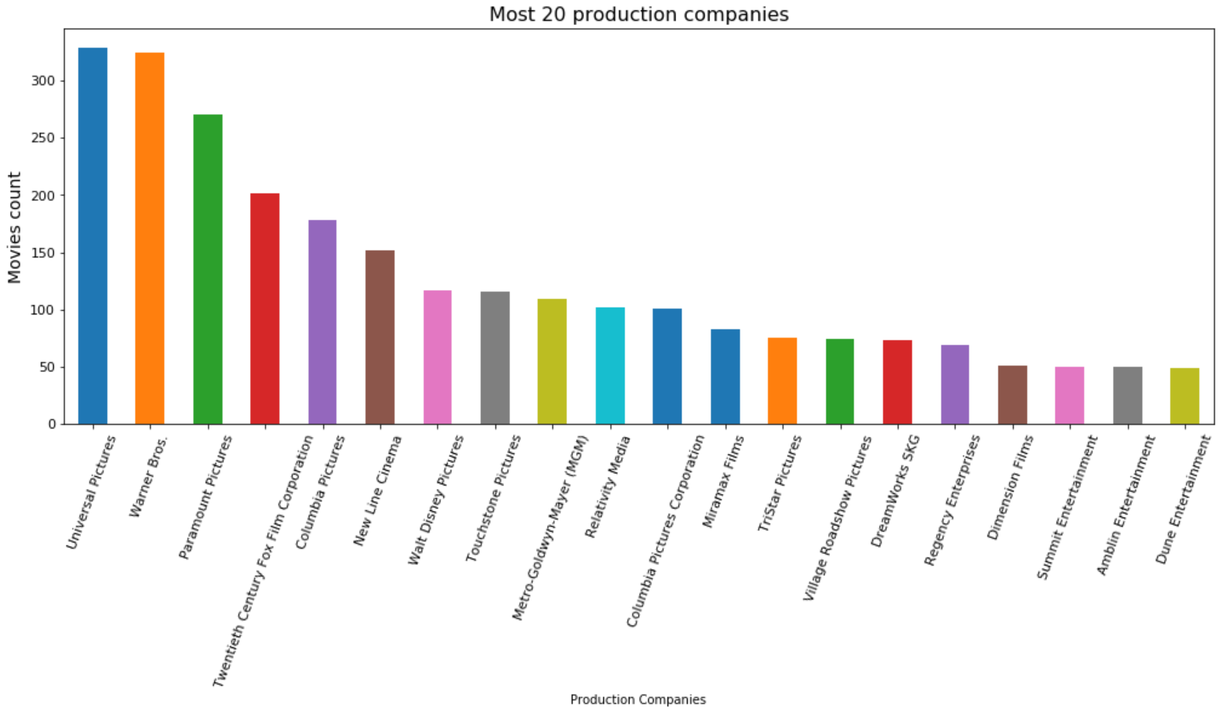
```
#Display Most 20 production companies
most_production_companies=pd.Series(df['production_companies'].str.cat(sep = '|'
most_production_companies
```

Out[24]:

```
Universal Pictures                        329
Warner Bros.                              324
Paramount Pictures                        270
Twentieth Century Fox Film Corporation    201
Columbia Pictures                         178
New Line Cinema                           152
Walt Disney Pictures                      117
Touchstone Pictures                       116
Metro-Goldwyn-Mayer (MGM)                 109
Relativity Media                          102
Columbia Pictures Corporation             101
Miramax Films                              83
TriStar Pictures                           75
Village Roadshow Pictures                  74
DreamWorks SKG                             73
Regency Enterprises                        69
Dimension Films                            51
Summit Entertainment                       50
Amblin Entertainment                       50
Dune Entertainment                         49
dtype: int64
```

In [116]:

```
#Make chart as visual display for most 20 production companies
most_production_companies.plot(kind='bar',figsize=(17,6),fontsize=11)
plt.xlabel('Production Companies',fontsize=10)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Most 20 production companies',fontsize=16)
plt.show()
```



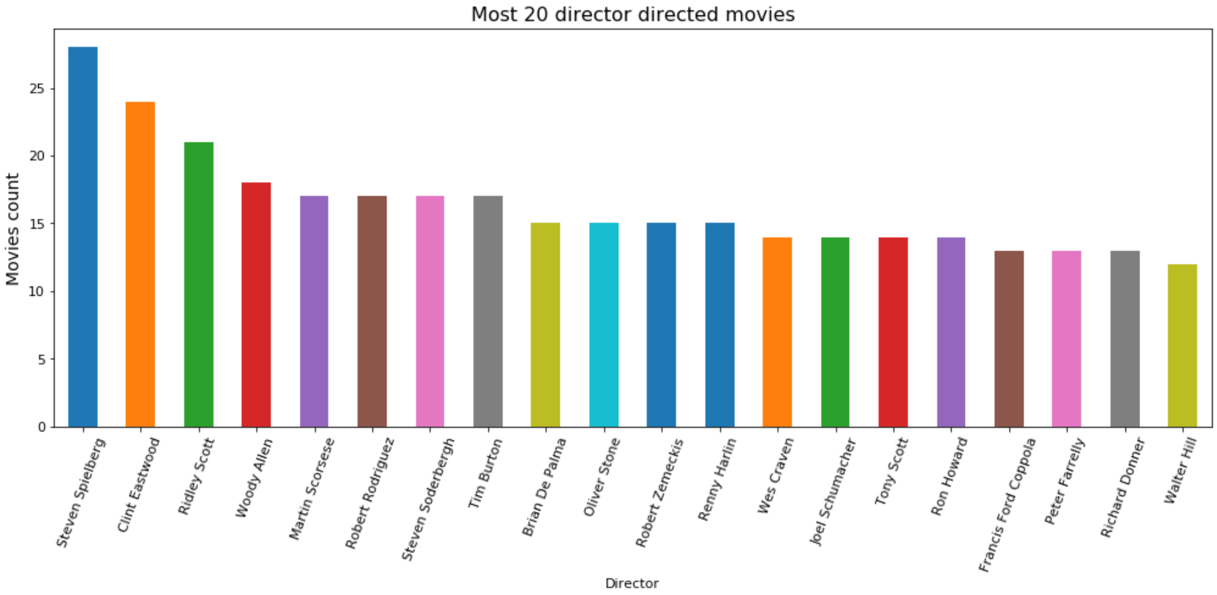
The production company with highest number of released movies is "Universal Pictures" with 329 movies

Research Question 13 : Which is director who directed maximum Movies?

In [25]:
```
#Display Most 20 director directed movies
most_director=pd.Series(df['director'].str.cat(sep = '|').split('|')).value_coun
most_director
```

Out[25]:
```
Steven Spielberg        28
Clint Eastwood          24
Ridley Scott            21
Woody Allen             18
Steven Soderbergh       17
Robert Rodriguez        17
Tim Burton              17
Martin Scorsese         17
Renny Harlin            15
Brian De Palma          15
Robert Zemeckis         15
Oliver Stone            15
Joel Schumacher         14
Ron Howard              14
Wes Craven              14
Tony Scott              14
Richard Donner          13
Francis Ford Coppola    13
Peter Farrelly          13
Walter Hill             12
dtype: int64
```

In [119]:
```
#Make chart as visual display for most 20 director directed movies
most_director.plot(kind='bar',figsize=(17,6),fontsize=11)
plt.xlabel('Director',fontsize=11)
plt.xticks(rotation=70)
plt.ylabel('Movies count',fontsize=14)
plt.title('Most 20 director directed movies',fontsize=16)
plt.show()
```



The director who directed maximum Movies is "Steven Spielberg" with 28 movies

Conclusions

After analysis for TMDb database movie we reached for all answer we aim to :

- **Movies of t s database cover 55 years from 1960 to 2015.**
- **Most popular movie weighted by voters and rating number is "Interstellar" in 2014.**
- **Movie with highest adjusted budget is "The Warrior's Way" in 2010 and lowest one is "Love, Wedding, Marriage" in 2011.**
- **Movie with highest adjusted revenue is "Avatar" in 2009 and lowest one is "Shattered Glass" in 2003.**
- **Movie with highest adjusted profit is "Star Wars" in 1977 and lowest one is "The Warrior's Way" in 2010.**
- **Movie with longest runtime is "Carlos" in 2010 and lowest one is "Kid's Story" in 2003.**
- **Avearage runtime of movies is nearly 109 minutes.**
- **The year has the highest count release of movies is 2011 with 198 movies in it.**
- **The year has the highest adjusted profit is 2015 with nearly 17.5 billion Dollar.**
- **The genre has the most count of released movies is "Drama" with 1755 movies.**
- **Most star acted in movies is "Robert De Niro" with 52 movies.**
- **The production company with highest number of released movies is "Universal Pictures" with 329 movies.**
- **The director who directed maximum Movies is "Steven Spielberg" with 28 movies.**

Limitation

limitation in this database from suitable data to analyise that about 35.5% (3853 data rows) only from genuine data with null cells (about 10866 rows), that make our analysis is not free from errors completely.

In [43]:

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

Out[43]:

```
0
```

In [ ]: