Udacity_proj2

April 5, 2019

```
In [20]: # 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 pandas as pd
         import matplotlib.pyplot as plt
         import seaborn as sns
         import numpy as np
         %matplotlib inline
```

Investigating the shape of Data.

```
In [21]: # 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.
         df = pd.read_csv('tmdb-movies.csv')
         df.head

Out[21]: <bound method NDFrame.head of             id    imdb_id  popularity     budget     reven
         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
         5      281957  tt1663202    9.110700  135000000   532950503
         6       87101  tt1340138    8.654359  155000000   440603537
         7      286217  tt3659388    7.667400  108000000   595380321
         8      211672  tt2293640    7.404165   74000000  1156730962
         9      150540  tt2096673    6.326804  175000000   853708609
         10     206647  tt2379713    6.200282  245000000   880674609
         11      76757  tt1617661    6.189369  176000003   183987723
         12     264660  tt0470752    6.118847   15000000    36869414
         13     257344  tt2120120    5.984995   88000000   243637091
         14      99861  tt2395427    5.944927  280000000  1405035767
         15     273248  tt3460252    5.898400   44000000   155760117
         16     260346  tt2446042    5.749758   48000000   325771424
         17     102899  tt0478970    5.573184  130000000   518602163
```

18	150689	tt1661199	5.556818	95000000	542351353
19	131634	tt1951266	5.476958	160000000	650523427
20	158852	tt1964418	5.462138	190000000	209035668
21	307081	tt1798684	5.337064	30000000	91709827
22	254128	tt2126355	4.907832	110000000	470490832
23	216015	tt2322441	4.710402	40000000	569651467
24	318846	tt1596363	4.648046	28000000	133346506
25	177677	tt2381249	4.566713	150000000	682330139
26	214756	tt2637276	4.564549	68000000	215863606
27	207703	tt2802144	4.503789	81000000	403802136
28	314365	tt1895587	4.062293	20000000	88346473
29	294254	tt4046784	3.968891	61000000	311256926
...	...	...	...	...	...
10836	38720	tt0061170	0.239435	0	0
10837	19728	tt0060177	0.291704	0	0
10838	22383	tt0060862	0.151845	0	0
10839	13353	tt0060550	0.276133	0	0
10840	34388	tt0060437	0.102530	0	0
10841	42701	tt0062262	0.264925	75000	0
10842	36540	tt0061199	0.253437	0	0
10843	29710	tt0060588	0.252399	0	0
10844	23728	tt0059557	0.236098	0	0
10845	5065	tt0059014	0.230873	0	0
10846	17102	tt0059127	0.212716	0	0
10847	28763	tt0060548	0.034555	0	0
10848	2161	tt0060397	0.207257	5115000	12000000
10849	28270	tt0060445	0.206537	0	0
10850	26268	tt0060490	0.202473	0	0
10851	15347	tt0060182	0.342791	0	0
10852	37301	tt0060165	0.227220	0	0
10853	15598	tt0060086	0.163592	0	0
10854	31602	tt0060232	0.146402	0	0
10855	13343	tt0059221	0.141026	700000	0
10856	20277	tt0061135	0.140934	0	0
10857	5921	tt0060748	0.131378	0	0
10858	31918	tt0060921	0.317824	0	0
10859	20620	tt0060955	0.089072	0	0
10860	5060	tt0060214	0.087034	0	0
10861	21	tt0060371	0.080598	0	0
10862	20379	tt0060472	0.065543	0	0
10863	39768	tt0060161	0.065141	0	0
10864	21449	tt0061177	0.064317	0	0
10865	22293	tt0060666	0.035919	19000	0

	original_title \
0	Jurassic World
1	Mad Max: Fury Road
2	Insurgent

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3                       Star Wars: The Force Awakens
4                                          Furious 7
5                                       The Revenant
6                                 Terminator Genisys
7                                        The Martian
8                                            Minions
9                                         Inside Out
10                                           Spectre
11                                Jupiter Ascending
12                                        Ex Machina
13                                            Pixels
14                          Avengers: Age of Ultron
15                                 The Hateful Eight
16                                           Taken 3
17                                           Ant-Man
18                                        Cinderella
19          The Hunger Games: Mockingjay - Part 2
20                                      Tomorrowland
21                                          Southpaw
22                                       San Andreas
23                               Fifty Shades of Grey
24                                     The Big Short
25               Mission: Impossible - Rogue Nation
26                                             Ted 2
27                        Kingsman: The Secret Service
28                                         Spotlight
29                       Maze Runner: The Scorch Trials
...                                              ...
10836                                  Walk Don't Run
10837                                    The Blue Max
10838                               The Professionals
10839           It's the Great Pumpkin, Charlie Brown
10840                               Funeral in Berlin
10841                                    The Shooting
10842              Winnie the Pooh and the Honey Tree
10843                                        Khartoum
10844                                    Our Man Flint
10845                                  Carry On Cowboy
10846                      Dracula: Prince of Darkness
10847                                 Island of Terror
10848                                 Fantastic Voyage
10849                                           Gambit
10850                                           Harper
10851                                        Born Free
10852                     A Big Hand for the Little Lady
10853                                            Alfie
10854                                        The Chase
10855                           The Ghost & Mr. Chicken
```

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10856                                 The Ugly Dachshund
10857                                       Nevada Smith
10858  The Russians Are Coming, The Russians Are Coming
10859                                            Seconds
10860                                Carry On Screaming!
10861                                 The Endless Summer
10862                                         Grand Prix
10863                                Beregis Avtomobilya
10864                             What's Up, Tiger Lily?
10865                           Manos: The Hands of Fate

                                                    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 ...
5      Leonardo DiCaprio|Tom Hardy|Will Poulter|Domhn...
6      Arnold Schwarzenegger|Jason Clarke|Emilia Clar...
7      Matt Damon|Jessica Chastain|Kristen Wiig|Jeff ...
8      Sandra Bullock|Jon Hamm|Michael Keaton|Allison...
9      Amy Poehler|Phyllis Smith|Richard Kind|Bill Ha...
10     Daniel Craig|Christoph Waltz|LÃ©a Seydoux|Ralp...
11     Mila Kunis|Channing Tatum|Sean Bean|Eddie Redm...
12     Domhnall Gleeson|Alicia Vikander|Oscar Isaac|S...
13     Adam Sandler|Michelle Monaghan|Peter Dinklage|...
14     Robert Downey Jr.|Chris Hemsworth|Mark Ruffalo...
15     Samuel L. Jackson|Kurt Russell|Jennifer Jason ...
16     Liam Neeson|Forest Whitaker|Maggie Grace|Famke...
17     Paul Rudd|Michael Douglas|Evangeline Lilly|Cor...
18     Lily James|Cate Blanchett|Richard Madden|Helen...
19     Jennifer Lawrence|Josh Hutcherson|Liam Hemswor...
20     Britt Robertson|George Clooney|Raffey Cassidy|...
21     Jake Gyllenhaal|Rachel McAdams|Forest Whitaker...
22     Dwayne Johnson|Alexandra Daddario|Carla Gugino...
23     Dakota Johnson|Jamie Dornan|Jennifer Ehle|Eloi...
24     Christian Bale|Steve Carell|Ryan Gosling|Brad ...
25     Tom Cruise|Jeremy Renner|Simon Pegg|Rebecca Fe...
26     Mark Wahlberg|Seth MacFarlane|Amanda Seyfried|...
27     Taron Egerton|Colin Firth|Samuel L. Jackson|Mi...
28     Mark Ruffalo|Michael Keaton|Rachel McAdams|Lie...
29     Dylan O'Brien|Kaya Scodelario|Thomas Brodie-Sa...
...                                                  ...
10836  Cary Grant|Samantha Eggar|Jim Hutton|John Stan...
10837  George Peppard|James Mason|Ursula Andress|Jere...
10838  Burt Lancaster|Lee Marvin|Robert Ryan|Woody St...
10839  Christopher Shea|Sally Dryer|Kathy Steinberg|A...
10840  Michael Caine|Paul Hubschmid|Oskar Homolka|Eva...
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10841  Will Hutchins|Millie Perkins|Jack Nicholson|Wa...
10842  Sterling Holloway|Junius Matthews|Sebastian Ca...
10843  Charlton Heston|Laurence Olivier|Richard Johns...
10844  James Coburn|Lee J. Cobb|Gila Golan|Edward Mul...
10845  Sid James|Jim Dale|Angela Douglas|Kenneth Will...
10846  Christopher Lee|Barbara Shelley|Andrew Keir|Fr...
10847  Peter Cushing|Edward Judd|Carole Gray|Eddie By...
10848  Stephen Boyd|Raquel Welch|Edmond O'Brien|Donal...
10849  Michael Caine|Shirley MacLaine|Herbert Lom|Joh...
10850  Paul Newman|Lauren Bacall|Julie Harris|Arthur ...
10851  Virginia McKenna|Bill Travers|Geoffrey Keen|Pe...
10852  Henry Fonda|Joanne Woodward|Jason Robards|Paul...
10853  Michael Caine|Shelley Winters|Millicent Martin...
10854  Marlon Brando|Jane Fonda|Robert Redford|E.G. M...
10855  Don Knotts|Joan Staley|Liam Redmond|Dick Sarge...
10856  Dean Jones|Suzanne Pleshette|Charles Ruggles|K...
10857  Steve McQueen|Karl Malden|Brian Keith|Arthur K...
10858  Carl Reiner|Eva Marie Saint|Alan Arkin|Brian K...
10859  Rock Hudson|Salome Jens|John Randolph|Will Gee...
10860  Kenneth Williams|Jim Dale|Harry H. Corbett|Joa...
10861  Michael Hynson|Robert August|Lord 'Tally Ho' B...
10862  James Garner|Eva Marie Saint|Yves Montand|Tosh...
10863  Innokentiy Smoktunovskiy|Oleg Efremov|Georgi Z...
10864  Tatsuya Mihashi|Akiko Wakabayashi|Mie Hama|Joh...
10865  Harold P. Warren|Tom Neyman|John Reynolds|Dian...

                                             homepage  \
0                     http://www.jurassicworld.com/
1                       http://www.madmaxmovie.com/
2        http://www.thedivergentseries.movie/#insurgent
3      http://www.starwars.com/films/star-wars-episod...
4                          http://www.furious7.com/
5          http://www.foxmovies.com/movies/the-revenant
6                    http://www.terminatormovie.com/
7           http://www.foxmovies.com/movies/the-martian
8                      http://www.minionsmovie.com/
9                 http://movies.disney.com/inside-out
10         http://www.sonypictures.com/movies/spectre/
11                   http://www.jupiterascending.com
12                      http://exmachina-movie.com/
13                     http://www.pixels-movie.com/
14     http://marvel.com/movies/movie/193/avengers_ag...
15                      http://thehatefuleight.com/
16                      http://www.taken3movie.com/
17           http://marvel.com/movies/movie/180/ant-man
18                                                NaN
19                  http://www.thehungergames.movie/
20              http://movies.disney.com/tomorrowland
```

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21                                                 NaN
22                   http://www.sanandreasmovie.com/
23       https://www.facebook.com/fiftyshadesofgreymovie
24                  http://www.thebigshortmovie.com/
25                  http://www.missionimpossible.com
26                                                 NaN
27                     http://www.kingsmanmovie.com/
28                   http://www.spotlightthefilm.com
29                       http://mazerunnermovies.com
...                                                ...
10836                                              NaN
10837                                              NaN
10838                                              NaN
10839                                              NaN
10840                                              NaN
10841                                              NaN
10842                                              NaN
10843                                              NaN
10844                                              NaN
10845                                              NaN
10846                                              NaN
10847                                              NaN
10848                                              NaN
10849                                              NaN
10850                                              NaN
10851                                              NaN
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10856                                              NaN
10857                                              NaN
10858                                              NaN
10859                                              NaN
10860                                              NaN
10861                                              NaN
10862                                              NaN
10863                                              NaN
10864                                              NaN
10865                                              NaN

                               director  \
0                        Colin Trevorrow
1                          George Miller
2                      Robert Schwentke
3                            J.J. Abrams
4                              James Wan
5       Alejandro GonzÃąlez IÃśÃąrritu
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6                         Alan Taylor
7                        Ridley Scott
8             Kyle Balda|Pierre Coffin
9                         Pete Docter
10                         Sam Mendes
11     Lana Wachowski|Lilly Wachowski
12                       Alex Garland
13                     Chris Columbus
14                        Joss Whedon
15                  Quentin Tarantino
16                    Olivier Megaton
17                        Peyton Reed
18                    Kenneth Branagh
19                   Francis Lawrence
20                          Brad Bird
21                     Antoine Fuqua
22                        Brad Peyton
23                 Sam Taylor-Johnson
24                         Adam McKay
25             Christopher McQuarrie
26                    Seth MacFarlane
27                     Matthew Vaughn
28                       Tom McCarthy
29                           Wes Ball
...                               ...
10836                 Charles Walters
10837                 John Guillermin
10838                  Richard Brooks
10839                   Bill Melendez
10840                    Guy Hamilton
10841                   Monte Hellman
10842             Wolfgang Reitherman
10843    Basil Dearden|Eliot Elisofon
10844                     Daniel Mann
10845                   Gerald Thomas
10846                  Terence Fisher
10847                  Terence Fisher
10848               Richard Fleischer
10849                    Ronald Neame
10850                     Jack Smight
10851                      James Hill
10852                    Fielder Cook
10853                   Lewis Gilbert
10854                     Arthur Penn
10855                     Alan Rafkin
10856                    Norman Tokar
10857                  Henry Hathaway
10858                  Norman Jewison
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10859             John Frankenheimer
10860                  Gerald Thomas
10861                    Bruce Brown
10862             John Frankenheimer
10863                 Eldar Ryazanov
10864                    Woody Allen
10865               Harold P. Warren

                                                 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      ...
5         (n. One who has returned, as if from the dead.)      ...
6                                     Reset the future      ...
7                                       Bring Him Home      ...
8           Before Gru, they had a history of bad bosses      ...
9               Meet the little voices inside your head.      ...
10                               A Plan No One Escapes      ...
11                               Expand your universe.      ...
12     There is nothing more human than the will to s...      ...
13                                            Game On.      ...
14                                 A New Age Has Come.      ...
15      No one comes up here without a damn good reason.      ...
16                                        It Ends Here      ...
17                          Heroes Don't Get Any Bigger      ...
18                      Midnight is just the beginning.      ...
19                          The fire will burn forever.      ...
20          Imagine a world where nothing is impossible.      ...
21                                     Believe in Hope.      ...
22     A rescue pilot survived an earthquake, this is...      ...
23                                     Are you curious?      ...
24                                 This is a true story.      ...
25                  Desperate Times. Desperate Measures.      ...
26                               Ted is Coming, Again.      ...
27                                  Manners maketh man.      ...
28                   Break the story. Break the silence.      ...
29                       The Maze Was Just the Beginning.      ...
...                                                  ...      ...
10836              Run, don't walk to see Walk, Don't Run.      ...
10837            There was no quiet on the Western Front!      ...
10838                              Rough, tough and ready.      ...
10839       Every year he rises from the pumpkin patch...      ...
10840                                                 NaN      ...
10841  Suspenseful desert pursuit in the "High Noon" ...      ...
10842                                                 NaN      ...
10843  Where the Nile divides, the great Cinerama adv...      ...
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10844                        The ORIGINAL man of mystery!      ...
10845                              How the west was lost!      ...
10846  DEAD for Ten Years DRACULA, Prince of Darkness...      ...
10847  How could they stop the devouring death...that...      ...
10848  A Fantastic and Spectacular Voyage... Through ...      ...
10849             Shirley MacLaine raises Michael Caine!      ...
10850    Harper takes a case - and the payoff is murder.      ...
10851  From The Pages Of The Beloved Best Seller... A...      ...
10852  All the action you can take...all the adventur...      ...
10853                 Is any man an Alfie? Ask any girl!      ...
10854                                    The chase is on!      ...
10855  G-G-GUARANTEED! YOU'LL BE SCARED UNTIL YOU LAU...      ...
10856  A HAPPY HONEYMOON GOES TO THE DOGS!...When a G...      ...
10857  Some called him savage- and some called him sa...      ...
10858   IT'S A PLOT! ...to make the world die laughing!!      ...
10859                                                NaN      ...
10860  Carry On Screaming with the Hilarious CARRY ON...      ...
10861                                                NaN      ...
10862  Cinerama sweeps YOU into a drama of speed and ...      ...
10863                                                NaN      ...
10864                           WOODY ALLEN STRIKES BACK!      ...
10865       It's Shocking! It's Beyond Your Imagination!      ...

                                                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
5      In the 1820s, a frontiersman, Hugh Glass, sets...     156
6      The year is 2029. John Connor, leader of the r...     125
7      During a manned mission to Mars, Astronaut Mar...     141
8      Minions Stuart, Kevin and Bob are recruited by...      91
9      Growing up can be a bumpy road, and it's no ex...      94
10     A cryptic message from Bondâs past sends him...    148
11     In a universe where human genetic material is ...     124
12     Caleb, a 26 year old coder at the world's larg...     108
13     Video game experts are recruited by the milita...     105
14     When Tony Stark tries to jumpstart a dormant p...     141
15     Bounty hunters seek shelter from a raging bliz...     167
16     Ex-government operative Bryan Mills finds his ...     109
17     Armed with the astonishing ability to shrink i...     115
18     When her father unexpectedly passes away, youn...     112
19     With the nation of Panem in a full scale war, ...     136
20     Bound by a shared destiny, a bright, optimisti...     130
21     Billy "The Great" Hope, the reigning junior mi...     123
22     In the aftermath of a massive earthquake in Ca...     114
23     When college senior Anastasia Steele steps in ...     125
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24     The men who made millions from a global econom...     130
25     Ethan and team take on their most impossible m...     131
26     Newlywed couple Ted and Tami-Lynn want to have...     115
27     The story of a super-secret spy organization t...     130
28     The true story of how The Boston Globe uncover...     128
29     Thomas and his fellow Gladers face their great...     132
...                                                  ...     ...
10836  British industrialist Sir William Rutland - "B...     114
10837  A young pilot in the German air force of 1918,...     156
10838  The Professionals is a 1966 American Western f...     117
10839  This classic "Peanuts" tale focuses on the thu...      25
10840  Colonel Stok, a Soviet intelligence officer re...     102
10841  A hired gun seeks to enact revenge on a group ...      82
10842  Christopher Robin's bear attempts to raid a be...      25
10843  English General Charles George Gordon, a devou...     134
10844  When scientists use eco-terrorism to impose th...     108
10845  Stodge City is in the grip of the Rumpo Kid an...      93
10846  Whilst vacationing in the Carpathian Mountain,...      90
10847  A small island community is overrun with creep...      89
10848  The science of miniaturization has been unlock...     100
10849  Harry Dean (Michael Caine) has a perfect plan ...     109
10850  Harper is a cynical private eye in the best tr...     121
10851  Born Free (1966) is an Open Road Films Ltd./Co...      95
10852  A naive traveler in Laredo gets involved in a ...      95
10853  The film tells the story of a young man who le...     114
10854  Most everyone in town thinks that Sheriff Cald...     135
10855  Luther Heggs aspires to being a reporter for h...      90
10856  The Garrisons (Dean Jones and Suzanne Pleshett...      93
10857  Nevada Smith is the young son of an Indian mot...     128
10858  Without hostile intent, a Soviet sub runs agro...     126
10859  A secret organisation offers wealthy people a ...     100
10860  The sinister Dr Watt has an evil scheme going...     87
10861  The Endless Summer, by Bruce Brown, is one of ...      95
10862  Grand Prix driver Pete Aron is fired by his te...     176
10863  An insurance agent who moonlights as a carthie...      94
10864  In comic Woody Allen's film debut, he took the...      80
10865  A family gets lost on the road and stumbles up...      74

                                                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
5                     Western|Drama|Adventure|Thriller
6            Science Fiction|Action|Thriller|Adventure
7                      Drama|Adventure|Science Fiction
8                    Family|Animation|Adventure|Comedy
```

```
9                                  Comedy|Animation|Family
10                                  Action|Adventure|Crime
11              Science Fiction|Fantasy|Action|Adventure
12                                  Drama|Science Fiction
13                          Action|Comedy|Science Fiction
14                       Action|Adventure|Science Fiction
15                            Crime|Drama|Mystery|Western
16                                  Crime|Action|Thriller
17                       Science Fiction|Action|Adventure
18                           Romance|Fantasy|Family|Drama
19                          War|Adventure|Science Fiction
20       Action|Family|Science Fiction|Adventure|Mystery
21                                           Action|Drama
22                                  Action|Drama|Thriller
23                                          Drama|Romance
24                                           Comedy|Drama
25                                                 Action
26                                                 Comedy
27                          Crime|Comedy|Action|Adventure
28                                  Drama|Thriller|History
29                        Action|Science Fiction|Thriller
...                                                   ...
10836                                      Comedy|Romance
10837                          War|Action|Adventure|Drama
10838                            Action|Adventure|Western
10839                                    Family|Animation
10840                                            Thriller
10841                                             Western
10842                                    Animation|Family
10843                  Adventure|Drama|War|History|Action
10844         Adventure|Comedy|Fantasy|Science Fiction
10845                                      Comedy|Western
10846                                              Horror
10847                              Science Fiction|Horror
10848                           Adventure|Science Fiction
10849                                 Action|Comedy|Crime
10850                 Action|Drama|Thriller|Crime|Mystery
10851              Adventure|Drama|Action|Family|Foreign
10852                                             Western
10853                                Comedy|Drama|Romance
10854                                Thriller|Drama|Crime
10855                        Comedy|Family|Mystery|Romance
10856                                 Comedy|Drama|Family
10857                                      Action|Western
10858                                          Comedy|War
10859             Mystery|Science Fiction|Thriller|Drama
10860                                              Comedy
10861                                         Documentary
```

```
10862                                 Action|Adventure|Drama
10863                                         Mystery|Comedy
10864                                          Action|Comedy
10865                                                 Horror

                                    production_companies release_date  \
0      Universal Studios|Amblin Entertainment|Legenda...       6/9/15
1      Village Roadshow Pictures|Kennedy Miller Produ...      5/13/15
2      Summit Entertainment|Mandeville Films|Red Wago...      3/18/15
3              Lucasfilm|Truenorth Productions|Bad Robot     12/15/15
4      Universal Pictures|Original Film|Media Rights ...       4/1/15
5      Regency Enterprises|Appian Way|CatchPlay|Anony...     12/25/15
6                Paramount Pictures|Skydance Productions      6/23/15
7      Twentieth Century Fox Film Corporation|Scott F...      9/30/15
8          Universal Pictures|Illumination Entertainment      6/17/15
9      Walt Disney Pictures|Pixar Animation Studios|W...       6/9/15
10                          Columbia Pictures|Danjaq|B24     10/26/15
11     Village Roadshow Pictures|Dune Entertainment|A...       2/4/15
12     DNA Films|Universal Pictures International (UP...      1/21/15
13           Columbia Pictures|Happy Madison Productions      7/16/15
14     Marvel Studios|Prime Focus|Revolution Sun Studios      4/22/15
15     Double Feature Films|The Weinstein Company|Fil...     12/25/15
16     Twentieth Century Fox Film Corporation|M6 Film...       1/1/15
17                                        Marvel Studios      7/14/15
18     Walt Disney Pictures|Genre Films|Beagle Pug Fi...      3/12/15
19     Studio Babelsberg|StudioCanal|Lionsgate|Walt D...     11/18/15
20                    Walt Disney Pictures|Babieka|A113      5/19/15
21               Escape Artists|Riche-Ludwig Productions      6/15/15
22     New Line Cinema|Village Roadshow Pictures|Warn...      5/27/15
23     Focus Features|Trigger Street Productions|Mich...      2/11/15
24     Paramount Pictures|Plan B Entertainment|Regenc...     12/11/15
25     Paramount Pictures|Skydance Productions|China ...      7/23/15
26     Universal Pictures|Media Rights Capital|Fuzzy ...      6/25/15
27     Twentieth Century Fox Film Corporation|Marv Fi...      1/24/15
28     Participant Media|Open Road Films|Anonymous Co...      11/6/15
29     Gotham Group|Temple Hill Entertainment|TSG Ent...       9/9/15
...                                                  ...          ...
10836                       Columbia Pictures Corporation       1/1/66
10837              Twentieth Century Fox Film Corporation      6/21/66
10838                                   Columbia Pictures      11/1/66
10839                             Warner Bros. Home Video     10/27/66
10840                         Lowndes Productions Limited     12/22/66
10841                                       Proteus Films     10/23/66
10842                                                 NaN       1/1/66
10843                   Julian Blaustein Productions Ltd.       6/9/66
10844                                    20th Century Fox      1/16/66
10845                            Peter Rogers Productions       3/1/66
10846     Seven Arts Productions|Hammer Film Productions       1/9/66
```

10847	Planet Film Productions|Protelco	6/20/66
10848	Twentieth Century Fox Film Corporation	8/24/66
10849	Universal Pictures	12/16/66
10850	Warner Bros.	2/23/66
10851	High Road	6/22/66
10852	Eden Productions Inc.	5/31/66
10853	NaN	3/29/66
10854	Horizon Pictures|Columbia Pictures Corporation	2/17/66
10855	Universal Pictures	1/20/66
10856	Walt Disney Pictures	2/16/66
10857	Paramount Pictures|Solar Productions|Embassy P...	6/10/66
10858	The Mirisch Corporation	5/25/66
10859	Gibraltar Productions|Joel Productions|John Fr...	10/5/66
10860	Peter Rogers Productions|Anglo-Amalgamated Fil...	5/20/66
10861	Bruce Brown Films	6/15/66
10862	Cherokee Productions|Joel Productions|Douglas ...	12/21/66
10863	Mosfilm	1/1/66
10864	Benedict Pictures Corp.	11/2/66
10865	Norm-Iris	11/15/66

	vote_count	vote_average	release_year	budget_adj	revenue_adj
0	5562	6.5	2015	1.379999e+08	1.392446e+09
1	6185	7.1	2015	1.379999e+08	3.481613e+08
2	2480	6.3	2015	1.012000e+08	2.716190e+08
3	5292	7.5	2015	1.839999e+08	1.902723e+09
4	2947	7.3	2015	1.747999e+08	1.385749e+09
5	3929	7.2	2015	1.241999e+08	4.903142e+08
6	2598	5.8	2015	1.425999e+08	4.053551e+08
7	4572	7.6	2015	9.935996e+07	5.477497e+08
8	2893	6.5	2015	6.807997e+07	1.064192e+09
9	3935	8.0	2015	1.609999e+08	7.854116e+08
10	3254	6.2	2015	2.253999e+08	8.102203e+08
11	1937	5.2	2015	1.619199e+08	1.692686e+08
12	2854	7.6	2015	1.379999e+07	3.391985e+07
13	1575	5.8	2015	8.095996e+07	2.241460e+08
14	4304	7.4	2015	2.575999e+08	1.292632e+09
15	2389	7.4	2015	4.047998e+07	1.432992e+08
16	1578	6.1	2015	4.415998e+07	2.997096e+08
17	3779	7.0	2015	1.195999e+08	4.771138e+08
18	1495	6.8	2015	8.739996e+07	4.989630e+08
19	2380	6.5	2015	1.471999e+08	5.984813e+08
20	1899	6.2	2015	1.747999e+08	1.923127e+08
21	1386	7.3	2015	2.759999e+07	8.437300e+07
22	2060	6.1	2015	1.012000e+08	4.328514e+08
23	1865	5.3	2015	3.679998e+07	5.240791e+08
24	1545	7.3	2015	2.575999e+07	1.226787e+08
25	2349	7.1	2015	1.379999e+08	6.277435e+08
26	1666	6.3	2015	6.255997e+07	1.985944e+08

```
27          3833          7.6          2015  7.451997e+07  3.714978e+08
28          1559          7.8          2015  1.839999e+07  8.127872e+07
29          1849          6.4          2015  5.611998e+07  2.863562e+08
...          ...          ...           ...           ...           ...
10836         11          5.8          1966  0.000000e+00  0.000000e+00
10837         12          5.5          1966  0.000000e+00  0.000000e+00
10838         21          6.0          1966  0.000000e+00  0.000000e+00
10839         49          7.2          1966  0.000000e+00  0.000000e+00
10840         13          5.7          1966  0.000000e+00  0.000000e+00
10841         12          5.5          1966  5.038511e+05  0.000000e+00
10842         12          7.9          1966  0.000000e+00  0.000000e+00
10843         12          5.8          1966  0.000000e+00  0.000000e+00
10844         13          5.6          1966  0.000000e+00  0.000000e+00
10845         15          5.9          1966  0.000000e+00  0.000000e+00
10846         16          5.7          1966  0.000000e+00  0.000000e+00
10847         13          5.3          1966  0.000000e+00  0.000000e+00
10848         42          6.7          1966  3.436265e+07  8.061618e+07
10849         14          6.1          1966  0.000000e+00  0.000000e+00
10850         14          6.0          1966  0.000000e+00  0.000000e+00
10851         15          6.6          1966  0.000000e+00  0.000000e+00
10852         11          6.0          1966  0.000000e+00  0.000000e+00
10853         26          6.2          1966  0.000000e+00  0.000000e+00
10854         17          6.0          1966  0.000000e+00  0.000000e+00
10855         14          6.1          1966  4.702610e+06  0.000000e+00
10856         14          5.7          1966  0.000000e+00  0.000000e+00
10857         10          5.9          1966  0.000000e+00  0.000000e+00
10858         11          5.5          1966  0.000000e+00  0.000000e+00
10859         22          6.6          1966  0.000000e+00  0.000000e+00
10860         13          7.0          1966  0.000000e+00  0.000000e+00
10861         11          7.4          1966  0.000000e+00  0.000000e+00
10862         20          5.7          1966  0.000000e+00  0.000000e+00
10863         11          6.5          1966  0.000000e+00  0.000000e+00
10864         22          5.4          1966  0.000000e+00  0.000000e+00
10865         15          1.5          1966  1.276423e+05  0.000000e+00

[10866 rows x 21 columns]>
```

```
In [22]: 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 [23]:
```
# to check the number of rows and coloumn
df.tail()
```

Out[23]:
```
          id    imdb_id  popularity  budget  revenue  \
10861     21  tt0060371    0.080598       0        0
10862  20379  tt0060472    0.065543       0        0
10863  39768  tt0060161    0.065141       0        0
10864  21449  tt0061177    0.064317       0        0
10865  22293  tt0060666    0.035919   19000        0

                 original_title  \
10861        The Endless Summer
10862                Grand Prix
10863       Beregis Avtomobilya
10864    What's Up, Tiger Lily?
10865  Manos: The Hands of Fate

                                                    cast homepage  \
10861  Michael Hynson|Robert August|Lord 'Tally Ho' B...      NaN
10862  James Garner|Eva Marie Saint|Yves Montand|Tosh...      NaN
10863  Innokentiy Smoktunovskiy|Oleg Efremov|Georgi Z...      NaN
10864  Tatsuya Mihashi|Akiko Wakabayashi|Mie Hama|Joh...      NaN
10865  Harold P. Warren|Tom Neyman|John Reynolds|Dian...      NaN

                 director                                        tagline  \
10861         Bruce Brown                                            NaN
10862  John Frankenheimer  Cinerama sweeps YOU into a drama of speed and ...
10863      Eldar Ryazanov                                            NaN
10864         Woody Allen                          WOODY ALLEN STRIKES BACK!
```

```
10865    Harold P. Warren      It's Shocking! It's Beyond Your Imagination!

         ...                                           overview runtime  \
10861    ...       The Endless Summer, by Bruce Brown, is one of ...       95
10862    ...       Grand Prix driver Pete Aron is fired by his te...      176
10863    ...       An insurance agent who moonlights as a carthie...       94
10864    ...       In comic Woody Allen's film debut, he took the...       80
10865    ...       A family gets lost on the road and stumbles up...       74

                      genres  \
10861            Documentary
10862  Action|Adventure|Drama
10863         Mystery|Comedy
10864          Action|Comedy
10865                 Horror

                                    production_companies release_date  \
10861                                  Bruce Brown Films      6/15/66
10862  Cherokee Productions|Joel Productions|Douglas ...     12/21/66
10863                                            Mosfilm       1/1/66
10864                             Benedict Pictures Corp.      11/2/66
10865                                          Norm-Iris     11/15/66

      vote_count  vote_average  release_year    budget_adj  revenue_adj
10861         11           7.4          1966      0.000000          0.0
10862         20           5.7          1966      0.000000          0.0
10863         11           6.5          1966      0.000000          0.0
10864         22           5.4          1966      0.000000          0.0
10865         15           1.5          1966  127642.279154          0.0

[5 rows x 21 columns]
```

In [24]:
```
# statistic values for this data
df.describe()
```

Out[24]:
```
                  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 [25]:
```
# check the rows and columns of this dataset
df.shape
```

Out[25]:
```
(10866, 21)
```

In [26]:
```
# check each columns number of unique values
df.nunique()
```

Out[26]:
```
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
```

In [27]:
```
df.isnull().sum()
```

Out[27]:
```
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
```

Data cleaning process by filling null values with mean and also drop duplicate data

```
In [28]: # drop unuseful columns
         df.drop(['id','imdb_id', 'homepage','overview'],axis=1,inplace=True)  # do not forget i

         df.fillna(df.mean(), inplace = True)
         df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10866 entries, 0 to 10865
Data columns (total 17 columns):
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
director                10822 non-null object
tagline                 8042 non-null object
keywords                9373 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(5), object(8)
memory usage: 1.4+ MB
```

```
In [29]: # calculate sum of null value for each coloumn
         df.isnull().sum()
```

```
Out[29]: popularity                 0
         budget                     0
         revenue                    0
         original_title             0
         cast                      76
         director                  44
         tagline                 2824
         keywords                1493
         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 [30]: # Drop null values for each coloumn containing null values
         df.dropna(inplace = True)
         df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7032 entries, 0 to 10865
Data columns (total 17 columns):
popularity              7032 non-null float64
budget                  7032 non-null int64
revenue                 7032 non-null int64
original_title          7032 non-null object
cast                    7032 non-null object
director                7032 non-null object
tagline                 7032 non-null object
keywords                7032 non-null object
runtime                 7032 non-null int64
genres                  7032 non-null object
production_companies    7032 non-null object
release_date            7032 non-null object
vote_count              7032 non-null int64
vote_average            7032 non-null float64
release_year            7032 non-null int64
budget_adj              7032 non-null float64
revenue_adj             7032 non-null float64
dtypes: float64(4), int64(5), object(8)
memory usage: 988.9+ KB
```

```
In [31]: # to replace all the zero value in coloumn with mean value.
         df['popularity']=df['popularity'].replace(0,df['popularity'].mean())
```

```
df['revenue']=df['revenue'].replace(0,df['revenue'].mean())
df['runtime']=df['runtime'].replace(0,df['runtime'].mean())
df['budget_adj']=df['budget_adj'].replace(0,df['budget_adj'].mean())
df['revenue_adj']=df['revenue_adj'].replace(0,df['revenue_adj'].mean())
```

In [32]:
```
df.describe()
```

Out[32]:

```
        popularity        budget       revenue      runtime   vote_count  \
count  7032.000000  7.032000e+03  7.032000e+03  7032.000000  7032.000000
mean      0.829463  2.084426e+07  8.339878e+07   104.882895   312.684300
std       1.180185  3.602117e+07  1.330625e+08    23.704753   693.182087
min       0.000188  0.000000e+00  2.000000e+00     4.000000    10.000000
25%       0.278573  0.000000e+00  2.824752e+07    92.000000    24.000000
50%       0.506241  5.000000e+06  5.931630e+07   101.000000    73.000000
75%       0.956217  2.600000e+07  5.931630e+07   114.000000   263.000000
max      32.985763  4.250000e+08  2.781506e+09   705.000000  9767.000000

       vote_average  release_year    budget_adj   revenue_adj
count   7032.000000   7032.000000  7.032000e+03  7.032000e+03
mean       6.013239   1999.383817  3.484685e+07  1.074617e+08
std        0.876516     13.468216  3.492787e+07  1.631156e+08
min        1.500000   1960.000000  9.693980e-01  2.861934e+00
25%        5.500000   1992.000000  2.037761e+07  3.923478e+07
50%        6.100000   2003.000000  2.500950e+07  7.643072e+07
75%        6.600000   2010.000000  3.463336e+07  7.643072e+07
max        8.400000   2015.000000  4.250000e+08  2.827124e+09
```

In [33]:
```
# calculate sum of all duplicated value
df.duplicated().sum()
```

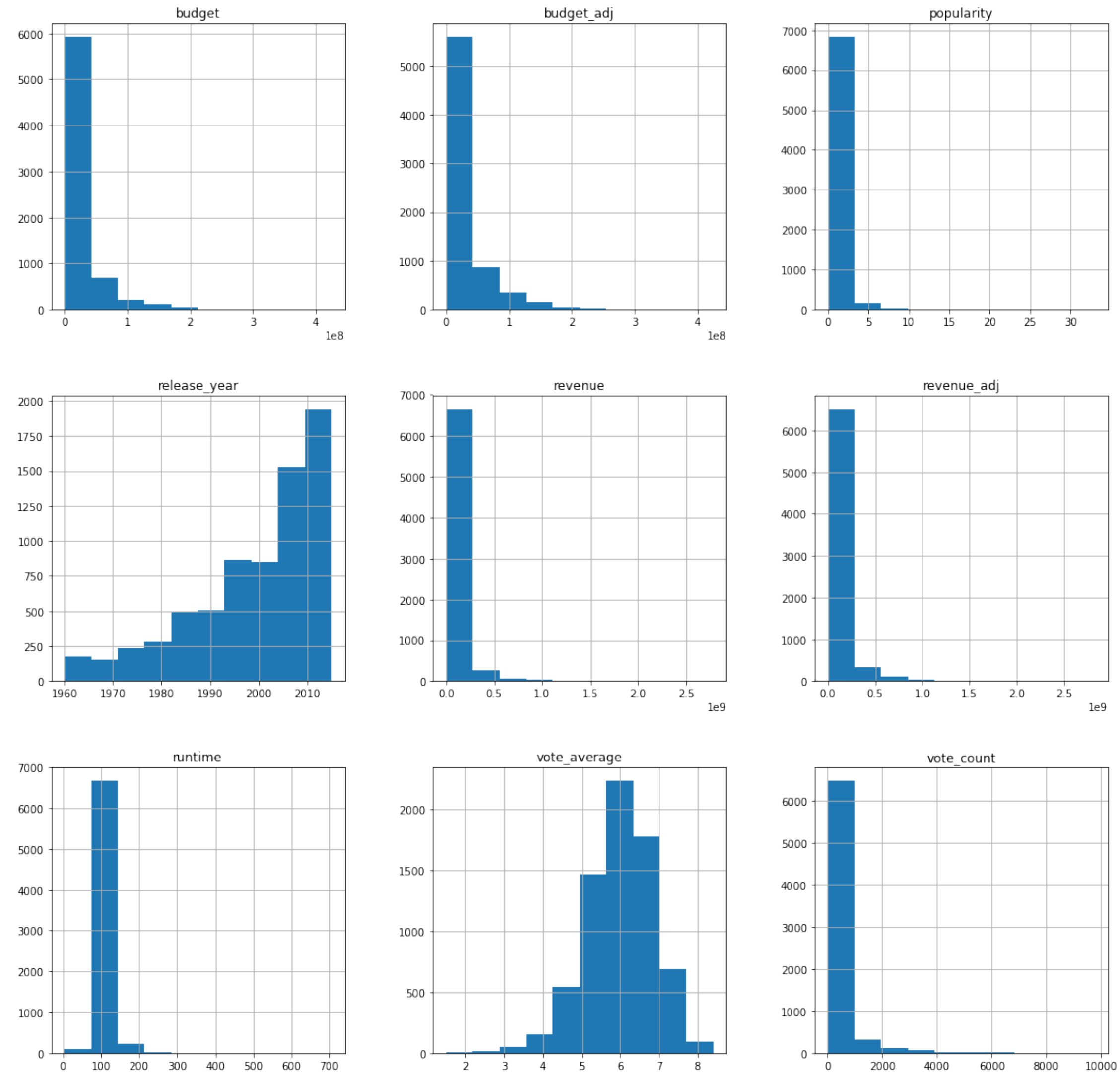
Out[33]: 1

In [34]:
```
# Drop duplicate value
df.drop_duplicates(inplace=True)
```

In [35]:
```
# calculate sum of all duplicated value
df.duplicated().sum()
```

Out[35]: 0

In [36]:
```
# visulize each variables
df.hist(figsize=(18,18));
```



Exploration with Visuals and Conclusions
The questions about this dataset:

1) Does higher budget mean higher popularity ?
2) Do the runtime affect the vote count and popularity?
3) Is Higher popularity means higher profits ?
4) What are the Features Associate with Top 10 Revenue Movies ?

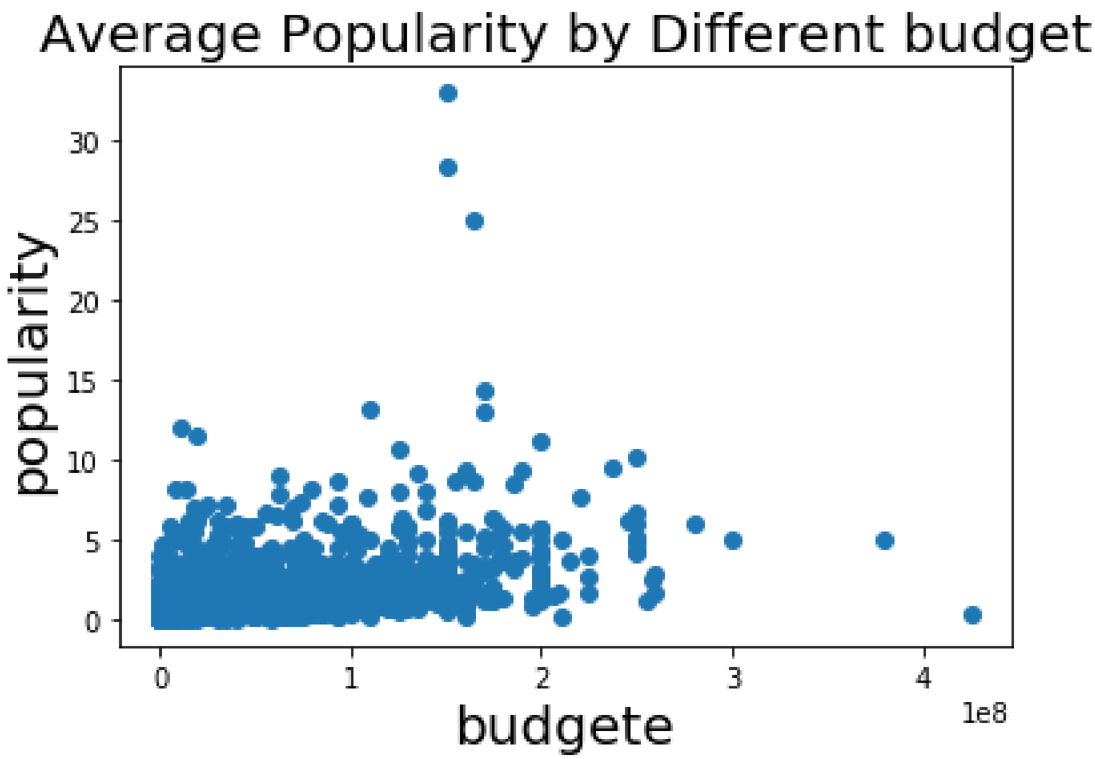
EVALUATING QUESTION 1

1) Does higher budget mean higher popularity ?

```
In [37]: # plot the relation between budget and popularity
         x = df['budget']
         y = df['popularity']

         plt.scatter(x,y)
         plt.title('Average Popularity by Different budget',fontsize=20)
         plt.xlabel('budgete',fontsize=20)
         plt.ylabel('popularity',fontsize=20)
```

```
Out[37]: Text(0,0.5,'popularity')
```



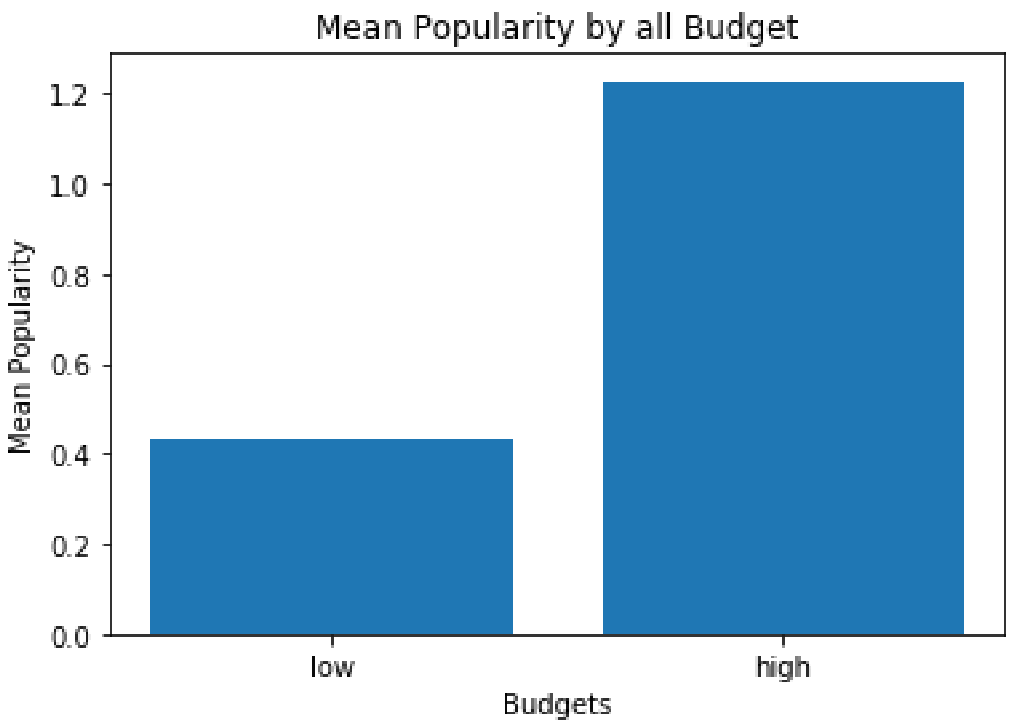
As per the above scatter plot its very difficult to observe strong relationship between popularity and budget. So we use other method to observe the relationship between them. In this method we divide data set in to two group on the basis of median.

```
In [38]: # divide the budget into two groups : lesser_cost and more_cost.
         med = df['budget'].median()
         lesser_cost =  df.query('budget < {}'.format(med))
         more_cost =  df.query('budget >= {}'.format(med))
```

```
In [39]: # check lesser cost and more cost  mean values
         mean_low_budget = lesser_cost['popularity'].mean()
         mean_high_budget = more_cost['popularity'].mean()
```

In [40]:
```
# create a bar chart with the values we get above
locations = [1,2]
heights = [mean_low_budget , mean_high_budget]
labels=['low','high']
plt.bar(locations, heights, tick_label = labels)
plt.title('Mean Popularity by all Budget')
plt.xlabel('Budgets')
plt.ylabel('Mean Popularity')
```

Out[40]: `Text(0,0.5,'Mean Popularity')`



In [41]:
```
increase_percentage = (mean_high_budget - mean_low_budget) / mean_high_budget * 100
increase_percentage
```

Out[41]: `64.898675962706122`

Answer for question 1

From the above bar plot we conclude that higher budget movie gains higher popularity. Higher budget movie have Mean popularity more than twice than the Mean popularity of lower budget movie.

EVALUATING QUESTION 2

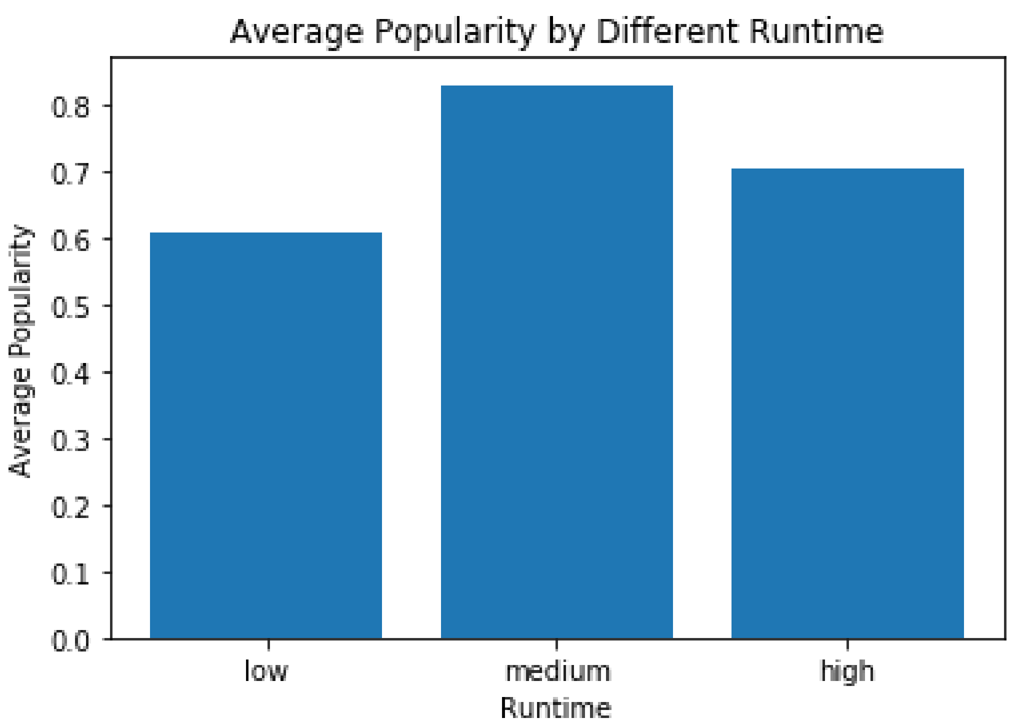
2) Do the runtime affect the vote count and popularity?

In [42]:
```
# There 3 groups with query().  <60 min: lowest    , 60 min <=   <= - 120 min: medium ,
lowest =  df.query('runtime < {}'.format(100))
med =  df.query('runtime < {}'.format(200))
highest = df.query('runtime > {}'.format(200))
```

In [43]:
```
# check mean popularity of different movie lengths
mean_of_lowest = lowest['popularity'].mean()
mean_of_med = med['popularity'].mean()
mean_of_highest = highest['popularity'].mean()
```

In [44]:
```
locations = [1,2,3]
heights = [mean_of_lowest, mean_of_med, mean_of_highest]
labels=['low','medium','high']
plt.bar(locations, heights, tick_label = labels)
plt.title('Average Popularity by Different Runtime')
plt.xlabel('Runtime')
plt.ylabel('Average Popularity')
```

Out[44]:
```
Text(0,0.5,'Average Popularity')
```

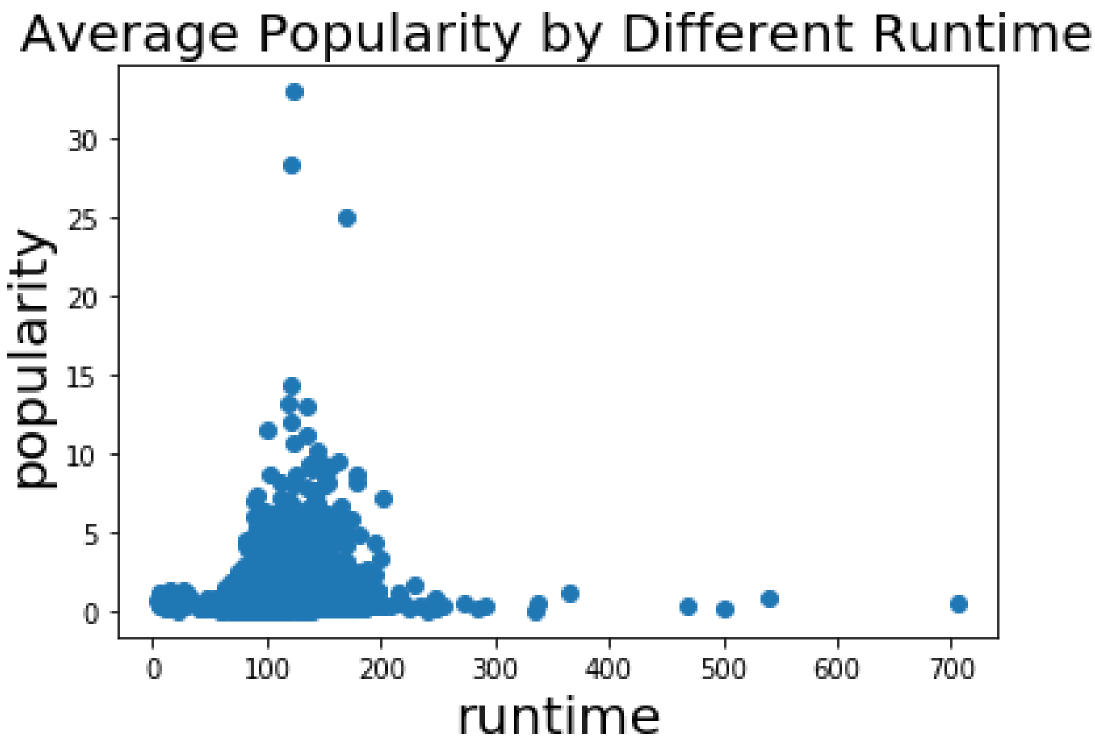


In [45]:
```
# scatter plot between runtime and popularity
x = df['runtime']
y = df['popularity']
```

```
plt.scatter(x,y)

plt.title('Average Popularity by Different Runtime',fontsize=20)
plt.xlabel('runtime',fontsize=20)
plt.ylabel('popularity',fontsize=20)
```

Out[45]: Text(0,0.5,'popularity')



ANSWER FOR QUESTION 2

From the above two plots, we can simply say that If the movies are within 200 minutes,it will be more popular. Once the movies run over 200 minutes, it's hard for them to gain high popularity

EVALUATING QUESTION 3

3) Is Higher popularity means higher profits ?

In [49]:
```
# calculation for the mean of popularity
mean = df['popularity'].median()
lowest_popularity =  df.query('popularity < {}'.format(mean))
more_popularity =  df.query('popularity >= {}'.format(mean))
```

In [50]:
```
# create a new column called profit.
df['profit'] = df['revenue'] - df['budget']
```

In [51]:
```
# average net profit for low_popularity and high_popularity
mean_profit_of_low = lowest_popularity['profit'].mean()
```

```
mean_profit_of_high = more_popularity['profit'].mean()
df.head()
```

Out[51]:

```
   popularity     budget       revenue                original_title  \
0   32.985763  150000000  1.513529e+09                Jurassic World
1   28.419936  150000000  3.784364e+08            Mad Max: Fury Road
2   13.112507  110000000  2.952382e+08                     Insurgent
3   11.173104  200000000  2.068178e+09  Star Wars: The Force Awakens
4    9.335014  190000000  1.506249e+09                     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

                        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

                                            keywords  runtime  \
0  monster|dna|tyrannosaurus rex|velociraptor|island    124.0
1   future|chase|post-apocalyptic|dystopia|australia    120.0
2  based on novel|revolution|dystopia|sequel|dyst...    119.0
3              android|spaceship|jedi|space opera|3d    136.0
4                car race|speed|revenge|suspense|car    137.0

                                      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

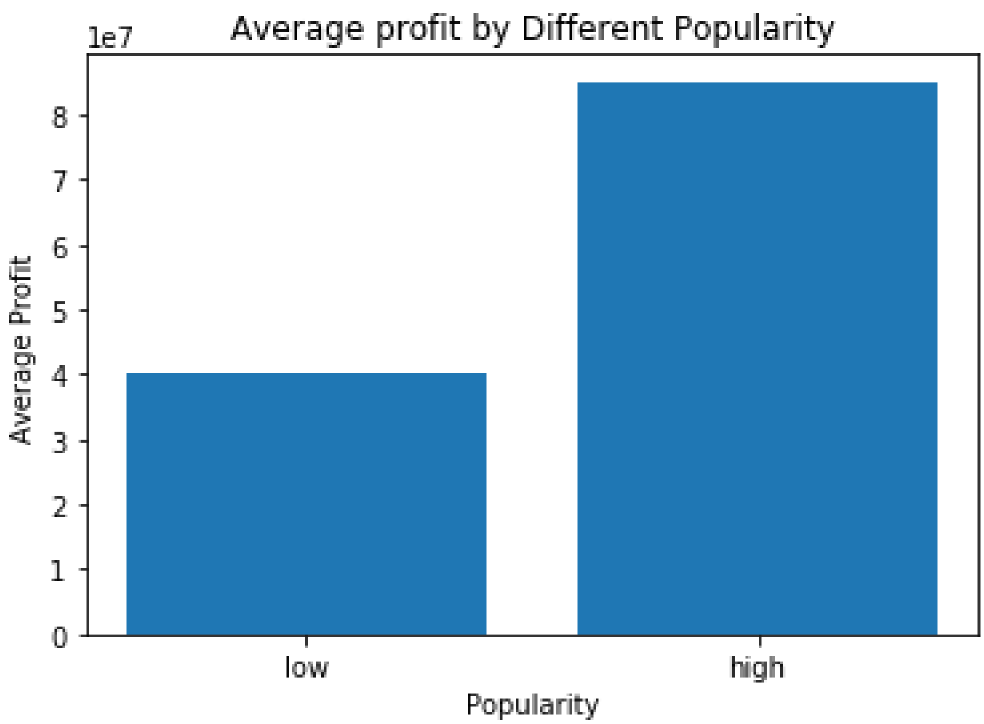
                                production_companies release_date  vote_count  \
0  Universal Studios|Amblin Entertainment|Legenda...       6/9/15        5562
1  Village Roadshow Pictures|Kennedy Miller Produ...      5/13/15        6185
2  Summit Entertainment|Mandeville Films|Red Wago...      3/18/15        2480
3          Lucasfilm|Truenorth 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        profit
0           6.5          2015  1.379999e+08  1.392446e+09  1.363529e+09
1           7.1          2015  1.379999e+08  3.481613e+08  2.284364e+08
```

2	6.3	2015	1.012000e+08	2.716190e+08	1.852382e+08
3	7.5	2015	1.839999e+08	1.902723e+09	1.868178e+09
4	7.3	2015	1.747999e+08	1.385749e+09	1.316249e+09

In [52]:
```
# create a bar chart with the values we get above
locations = [1,2]
heights = [mean_profit_of_low, mean_profit_of_high]
labels=['low','high']
plt.bar(locations, heights, tick_label = labels)
plt.title('Average profit by Different Popularity')
plt.xlabel('Popularity')
plt.ylabel('Average Profit')
```

Out[52]: Text(0,0.5,'Average Profit')



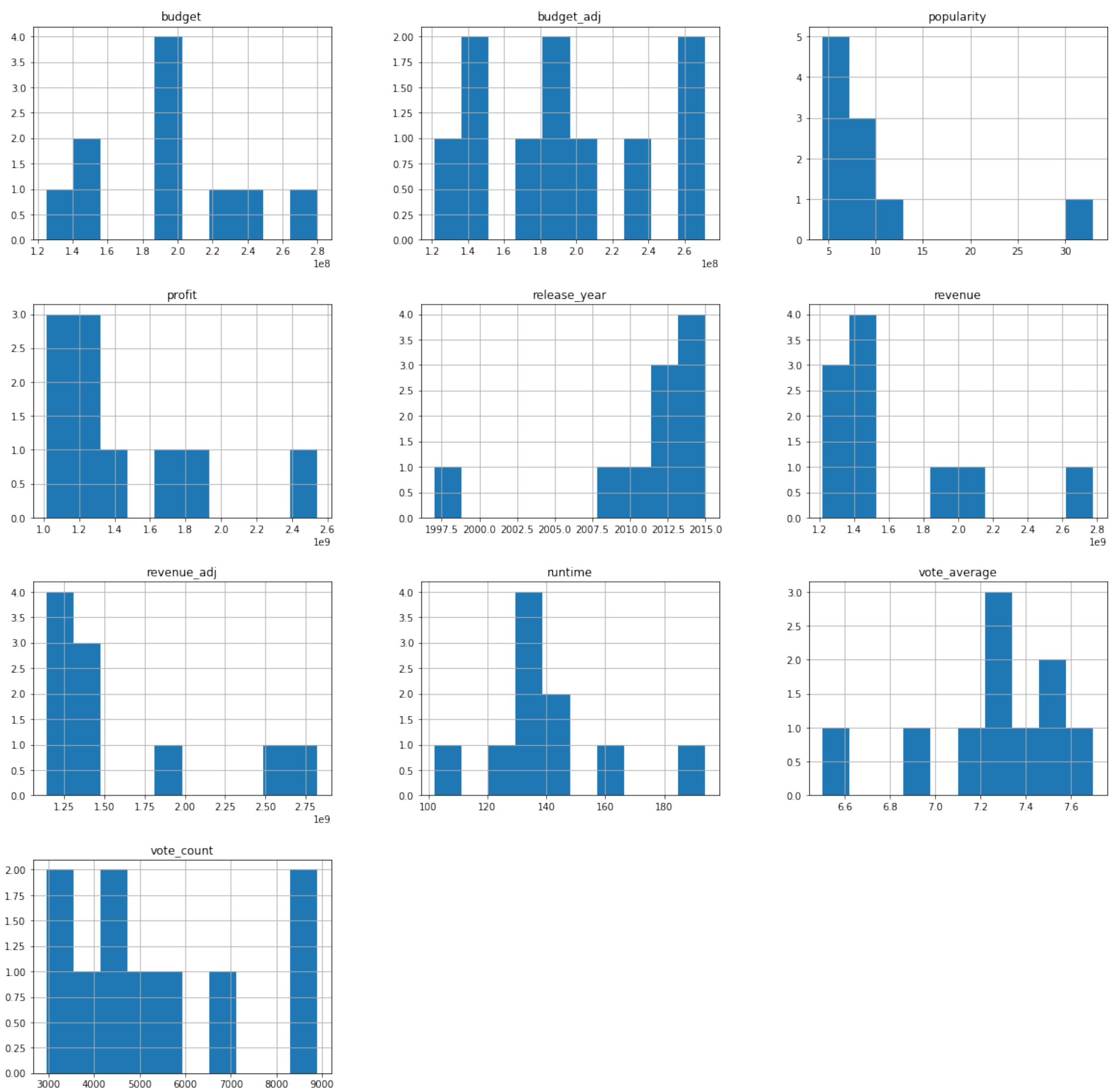
ANSWER FOR QUESTION 3
From the above graph we observe that higher popularity leads to more Average profit.
EVALUATING QUESTION 4

4) What are the Features Associate with Top 10 Revenue Movies ?

In [53]:
```
top10_revenue = df.nlargest(10,'revenue')
top10_revenue.hist(figsize=(20,20))
```

Out[53]:
```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7f94e9f7c6d8>,
        <matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea0a7320>,
```

```
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea0d8908>],
[<matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea0aae80>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea0959e8>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea095b38>],
[<matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea10f2b0>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94ea078da0>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94e9ff80f0>],
[<matplotlib.axes._subplots.AxesSubplot object at 0x7f94eae61d68>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94e9f94ef0>,
 <matplotlib.axes._subplots.AxesSubplot object at 0x7f94eaec3b38>]], dtype=objec
```



ANSWER FOR QUESTION 4

From the above plot we conclude that Runtime ranges from 100 mins to 200 mins. The released year are between 1995 to 2015 leads to top 10 revenue movies.

1 CONCLUSION

1) Higher budget movie gains higher popularity. Higher budget movie have Mean popularity more than twice than the Mean popularity of lower budget movie.
2) If the movies are within 200 minutes,it will be more popular. Once the movies run over 200 minutes, it's hard for them to gain high popularity.
3) Higher popularity leads to more Average profit.
4) Runtime ranges from 100 mins to 200 mins. The released year are between 1995 to 2015 leads to top 10 revenue movies.

2 LIMITATIONS

1) There are plenty of missing data and many zeros which effect the data analysis process.
2) Its very difficult to know how the measurement should be done for coloumn like vote_counts and popularity.
3) For movies outside the country currency is not indicated. So its also effect the data analysis process.

3 REFERENCE

1) I mainly watch instructor video to know the data analysis process after watching video i follow the same steps.
2) I have also paid account of Data Camp. So i also refer some steps from there.

```
In [ ]:
```