Import libraries to use for this project

In [1]:

```
import pandas as pd
import sqlite3
import numpy as np
import os
from pandasql import sqldf
import matplotlib.pyplot as plt
import seaborn as sns
```

Data Understanding and Exploration

1. **IMDB database**

In [2]:

```
#connect to the SQL database
# Define the path to the database file

db_path = "data\im.db\im.db"
conn = sqlite3.connect(db_path)
```

In [3]:

```
#view list of tables
query =  "SELECT name FROM sqlite_master WHERE type='table';"
imdb_df = pd.read_sql(query, conn)
imdb_df
```

Out[3]:

	name
0	movie_basics
1	directors
2	known_for
3	movie_akas
4	movie_ratings
5	persons
6	principals
7	writers
8	moviesInfo

In [4]:

```
#view details of the first table - movie basics
movie_basics_query = "SELECT * FROM movie_basics"
movie_basics_df = pd.read_sql(movie_basics_query, conn)
movie_basics_df
```

Out[4]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
2	**tt0069049**	**The Other Side of the Wind**	**The Other Side of the Wind**	**2018**	**122.0**	**Drama**
3	**tt0069204**	**Sabse Bada Sukh**	**Sabse Bada Sukh**	**2018**	**NaN**	**Comedy,Drama**
4	**tt0100275**	**The Wandering Soap Opera**	**La Telenovela Errante**	**2017**	**80.0**	**Comedy,Drama,Fantasy**
...	**...**	**...**	**...**	**...**	**...**	**...**
146139	**tt9916538**	**Kuambil Lagi Hatiku**	**Kuambil Lagi Hatiku**	**2019**	**123.0**	**Drama**
146140	**tt9916622**	**Rodolpho Teóphilo - O Legado de um Pioneiro**	**Rodolpho Teóphilo - O Legado de um Pioneiro**	**2015**	**NaN**	**Documentary**
146141	**tt9916706**	**Dankyavar Danka**	**Dankyavar Danka**	**2013**	**NaN**	**Comedy**
146142	**tt9916730**	**6 Gunn**	**6 Gunn**	**2017**	**116.0**	**None**
146143	**tt9916754**	**Chico Albuquerque - Revelações**	**Chico Albuquerque - Revelações**	**2013**	**NaN**	**Documentary**

146144 rows × 6 columns

In [5]:

```
movie_basics_df.columns
#use the .info method to have a general idea about the dataframe - the columns, their val
ues

movie_basics_df.info
```

Out[5]:

```
<bound method DataFrame.info of          movie_id                                     primary
_title  \
0       tt0063540                                      Sunghursh
1       tt0066787                 One Day Before the Rainy Season
2       tt0069049                      The Other Side of the Wind
3       tt0069204                                 Sabse Bada Sukh
4       tt0100275                       The Wandering Soap Opera
...           ...                                              ...
146139  tt9916538                             Kuambil Lagi Hatiku
146140  tt9916622  Rodolpho Teóphilo - O Legado de um Pioneiro
146141  tt9916706                                  Dankyavar Danka
146142  tt9916730                                        6 Gunn
146143  tt9916754                  Chico Albuquerque - Revelações

                                  original_title  start_year  \
0                                      Sunghursh        2013
1                                Ashad Ka Ek Din        2019
2                     The Other Side of the Wind        2018
3                                Sabse Bada Sukh        2018
4                           La Telenovela Errante        2017
...                                           ...         ...
146139                     Kuambil Lagi Hatiku        2019
146140  Rodolpho Teóphilo - O Legado de um Pioneiro        2015
146141                           Dankyavar Danka        2013
146142                                    6 Gunn        2017
146143              Chico Albuquerque - Revelações        2013

        runtime_minutes                genres
0                 175.0    Action,Crime,Drama
1                 114.0       Biography,Drama
2                 122.0                 Drama
3                   NaN          Comedy,Drama
4                  80.0  Comedy,Drama,Fantasy
...                 ...                   ...
146139            123.0                 Drama
146140              NaN           Documentary
146141              NaN                Comedy
146142            116.0                  None
146143              NaN           Documentary

[146144 rows x 6 columns]>
```

[146144 rows x 6 columns]>

movie basic table has 6 column : movie_id primary_title original_title start_year runtime_minutes genres

In [6]:

```
#read the contents of the second table to use for this project - movie ratings
movie_ratings_query = "SELECT * FROM movie_ratings"
movie_ratings_df = pd.read_sql(movie_ratings_query, conn)
movie_ratings_df
```

Out[6]:

	movie_id	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559
2	tt1042974	6.4	20
3	tt1043726	4.2	50352
4	tt1060240	6.5	21
...	...	...	...
73851	tt9805820	8.1	25
73852	tt9844256	7.5	24
73853	tt9851050	4.7	14
73854	tt9886934	7.0	5
73855	tt9894098	6.3	128

73856 rows × 3 columns

Movie ratings has three columns - movie_id, averagerating, numvotes

DATA CLEANING

In [7]:

```
#check to establish if the movie_basic df has any missing values
movie_basics_df.isna().sum()
```

Out[7]:

```
movie_id              0
primary_title         0
original_title       21
start_year            0
runtime_minutes    31739
genres              5408
dtype: int64
```

In [8]:

```
#check for missing values in the movies_basics dataframe in percentage
missing_percentage = movie_basics_df.isna().mean() * 100
missing_percentage
```

Out[8]:

```
movie_id            0.000000
primary_title       0.000000
original_title      0.014369
start_year          0.000000
runtime_minutes    21.717621
genres              3.700460
dtype: float64
```

In [9]:

```
#VISUALLY CHECK FOR NULL VALUES IN THE FIRST TABLE
query = """SELECT *
              FROM movie_basics
              WHERE runtime_minutes IS NULL;"""
movie_basics_null = pd.read_sql(query, conn)
movie_basics_null
```

Out[9]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	None	Comedy,Drama
1	tt0112502	Bigfoot	Bigfoot	2017	None	Horror,Thriller
2	tt0139613	O Silêncio	O Silêncio	2012	None	Documentary,History
3	tt0187902	How Huang Fei-hong Rescued the Orphan from the...	How Huang Fei-hong Rescued the Orphan from the...	2011	None	None
4	tt0250404	Godfather	Godfather	2012	None	Crime,Drama
...	...	...	...	...	...	...
31734	tt9915790	Bobbyr Bondhura	Bobbyr Bondhura	2019	None	Family
31735	tt9916428	The Secret of China	The Secret of China	2019	None	Adventure,History,War
31736	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	None	Documentary
31737	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	None	Comedy
31738	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	None	Documentary

31739 rows × 6 columns

In [10]:

```
len(movie_basics_null)
```

Out[10]:

```
31739
```

There are 31,739 rows that have no input/data for the runtime minutes for the movies. The number of rows in the table are 146,144, that makes for almost 22% of the total data with missing values. Because the data is more than 20%, it is crucial to explore imputation techniques to fill in the gaps. The imputation technique used for this set is the median incase there are outliers in the column.

The genres column has a 3% output which indicates that only 3% of rows in that column have missing data. Because the missing data in this column is less than 5 %, it is considered safe to drop this rows without it significantly impacting the analysis

In [11]:

```
print(missing_percentage[missing_percentage > 0])
```

```
original_title      0.014369
runtime_minutes    21.717621
genres              3.700460
dtype: float64
```

In [12]:

```
##Fill missing values for columns with more than 20% missing data
movie_basics_cleaned = movie_basics_df.fillna(movie_basics_df.median())
movie_basics_cleaned
```

Out[12]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	87.0	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	87.0	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	87.0	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	87.0	Documentary

146144 rows × 6 columns

In [13]:

```
#check if there are missing vlaues in the cleaned df
runtime_minutes_null_check = movie_basics_cleaned.isnull().mean() * 100
runtime_minutes_null_check
```

Out[13]:

```
movie_id           0.000000
primary_title      0.000000
original_title     0.014369
start_year         0.000000
runtime_minutes    0.000000
genres             3.700460
dtype: float64
```

Once the dataframe has been imputed by using the median, the dataframe is further cleaned by dropping the rows with missing values. As per the cell above, the output shows that the column named genres has 3.7 % of its values missing. Droping the rows makes more sense because the proportion of rows with missing values is very small compared to the overall dataset

In [14]:

```
movie_basics_clean_df = movie_basics_cleaned.dropna()
movie_basics_clean_df
```

Out[14]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	87.0	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...

146138	**tt9916428**	**The Secret of China**	**The Secret of China**	**2019**	**87.0**	**Adventure,History,War**
146139	**tt9916538**	**Kuambil Lagi Hatiku**	**Kuambil Lagi Hatiku**	**2019**	**123.0**	**Drama**
146140	**tt9916622**	**Rodolpho Teóphilo - O Legado de um Pioneiro**	**Rodolpho Teóphilo - O Legado de um Pioneiro**	**2015**	**87.0**	**Documentary**
146141	**tt9916706**	**Dankyavar Danka**	**Dankyavar Danka**	**2013**	**87.0**	**Comedy**
146143	**tt9916754**	**Chico Albuquerque - Revelações**	**Chico Albuquerque - Revelações**	**2013**	**87.0**	**Documentary**

140734 rows × 6 columns

In [15]:

```
#check to see if there are still any missing data
movie_basics_clean_df.isna().sum()
```

Out[15]:

```
movie_id           0
primary_title      0
original_title     0
start_year         0
runtime_minutes    0
genres             0
dtype: int64
```

Initially, there were missing values in the original column title but after dropping the rows with missing vlaues, they were dropped as well.

In [16]:

```
#check to see if there are any missing values
movie_basics_clean_df.isna().sum()
```

Out[16]:

```
movie_id           0
primary_title      0
original_title     0
start_year         0
runtime_minutes    0
genres             0
dtype: int64
```

The last datafame called "movie_basics_clean_df" is clean

SAVE THE CLEANED df TO A NEW TABLE IN THE DATABASE. The new table is called moviesInfo.

In [17]:

```
movie_basics_clean_df.to_sql('moviesInfo',conn, if_exists='replace', index=False)
```

DATAFRAME 2 DATA CLEANING - movie_ratings_df

In [18]:

```
#check df info
movie_ratings_df.info
```

Out[18]:

```
<bound method DataFrame.info of          movie_id  averagerating  numvotes
0      tt10356526            8.3        31
1      tt10384606            8.9       559
2       tt1042974            6.4        20
3       tt1043726            4.2     50352
```

```
4        tt1060240             6.5         21
...            ...             ...        ...
73851    tt9805820             8.1         25
73852    tt9844256             7.5         24
73853    tt9851050             4.7         14
73854    tt9886934             7.0          5
73855    tt9894098             6.3        128

[73856 rows x 3 columns]>
```

In [19]:

```
#check to see if there are any null values in the df
movie_ratings_df.isna().sum()
```

Out[19]:

```
movie_id         0
averagerating    0
numvotes         0
dtype: int64
```

There are no null values in this dataframe

Exploratory Data Analysis

Analyzing the two clean tables - moviesInfo and movie_ratings

Curious to find out

1. **Which movies have the highest and lowest rating?**
2. **What is the distribution of movie ratings?**
3. **What is the common movie genre**
4. **What is the average rating based per each genre?**
5. **what is the rating distribution of popular genres?**

In [20]:

```
#join the two dataframes together based group by
query_movie_info = """SELECT mi.movie_id, mi.primary_title, mi.start_year, mi.genres, mr.
averagerating
                        FROM moviesInfo mi
                        JOIN movie_ratings mr
                        ON mi.movie_id = mr.movie_id
                        GROUP BY genres
                        order by mr.averagerating ;

                    """
joined_movie_df = pd.read_sql(query_movie_info, conn)
joined_movie_df
```

Out[20]:

	movie_id	primary_title	start_year	genres	averagerating
0	tt3437164	Maldito Amor	2014	Comedy,History,Horror	1.1
1	tt1865374	Futures Past	2012	Action,Biography,History	1.3
2	tt5161302	Eyal Hirrifah	2015	Comedy,Musical,Sport	1.4
3	tt0937353	The Devil's Flower	2010	Mystery,Romance	1.7
4	tt0249516	Foodfight!	2012	Action,Animation,Comedy	1.9

	movie_id	primary_title	start_year	genres	averagerating
918	tt5903964	The Long Count Teaser	2016	History,Sport	9.2
919	tt3856476	Sunakali	2017	Documentary,Family,Musical	9.3
920	tt4135932	Lost Conquest	2015	Comedy,Documentary,Fantasy	9.4
921	tt10146728	Foosballers	2019	Comedy,Documentary,Sport	9.7
922	tt1740810	Love on a Leash	2010	Documentary,Family,Romance	9.7

923 rows × 5 columns

1. Which movies have the highest and lowest rating?

In [21]:

```
#top 10 highest rated movies
top_rated_movies = joined_movie_df.sort_values(by="averagerating", ascending=False).head
(10)
top_rated_movies[['primary_title','genres','averagerating']]
```

Out[21]:

	primary_title	genres	averagerating
922	Love on a Leash	Documentary,Family,Romance	9.7
921	Foosballers	Comedy,Documentary,Sport	9.7
920	Lost Conquest	Comedy,Documentary,Fantasy	9.4
919	Sunakali	Documentary,Family,Musical	9.3
918	The Long Count Teaser	History,Sport	9.2
917	Ratne Price Sa Kosara	Documentary,History,War	9.2
916	Los días de Ayotzinapa (The 43s)	Crime,Documentary,Drama	9.2
915	Sweet Science	Action,Documentary,Sport	9.2
914	Road to Pride	Comedy,Documentary,Romance	9.1
913	Blood Army	War	9.0

In [22]:

```
#top 10 lowest rated movies
lowest_rated_movies = joined_movie_df.sort_values(by='averagerating').head(10)
lowest_rated_movies[['primary_title', 'genres', 'averagerating']]
```

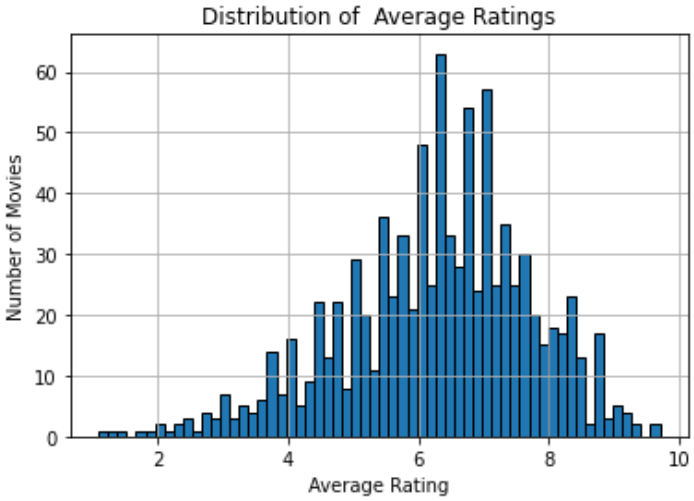
Out[22]:

	primary_title	genres	averagerating
0	Maldito Amor	Comedy,History,Horror	1.1
1	Futures Past	Action,Biography,History	1.3
2	Eyal Hirrifah	Comedy,Musical,Sport	1.4
3	The Devil's Flower	Mystery,Romance	1.7
4	Foodfight!	Action,Animation,Comedy	1.9
5	The Hospital 2	Adult,Horror	2.0
6	Battle Earth	Action,Sci-Fi,War	2.1
7	Fahr zur Hölle	Action,Mystery	2.2
8	Ladies Mafia	Adventure,Crime,Romance	2.3
9	The Broken Key	History,Sci-Fi,Thriller	2.3

2. Distribution of movie ratings.

In [23]:

```
joined_movie_df['averagerating'].hist(bins=60, edgecolor="black")
plt.title("Distribution of  Average Ratings")
plt.xlabel("Average Rating")
plt.ylabel("Number of Movies")
plt.show()
```



Most of the movie ratings in the IMDB database have an average rating of 6 out of 10

what is the mode of the ratings in the database

In [24]:

```
joined_movie_df['averagerating'].mode()
```

Out[24]:

```
0    6.4
dtype: float64
```

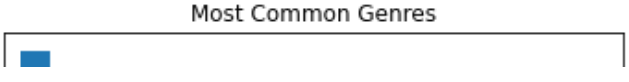
In [25]:

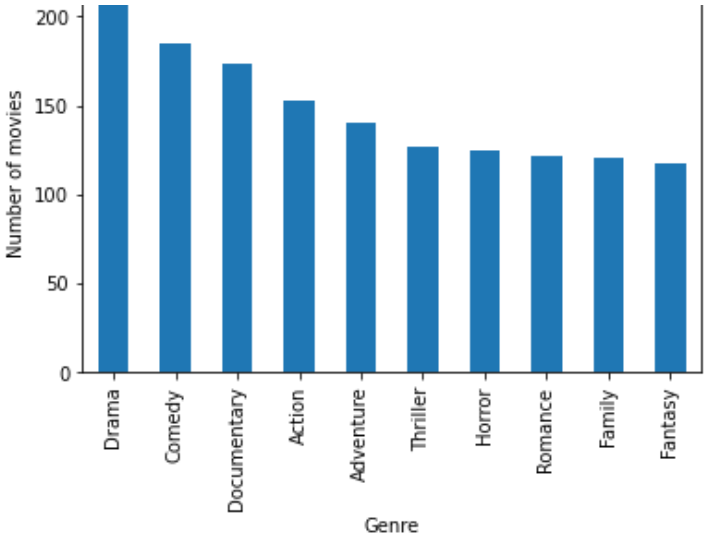
```
#most movies in the IMDB DB have an average rating of 6.4
```

3. Most common genres

In [26]:

```
#split the genres column and make it into separate rows
df_genres = joined_movie_df['genres'].str.split(',', expand=True).stack().reset_index(lev
el=1, drop=True)
df_genres.name = 'genre'
genre_counts = df_genres.value_counts()


# check how many counts there are
len(genre_counts) #there are 26 genre counts

#plot the bar of the most common genres
genre_counts.head(10).plot(kind='bar')
plt.title('Most Common Genres')
plt.xlabel('Genre')
plt.ylabel('Number of movies')
plt.show()
```

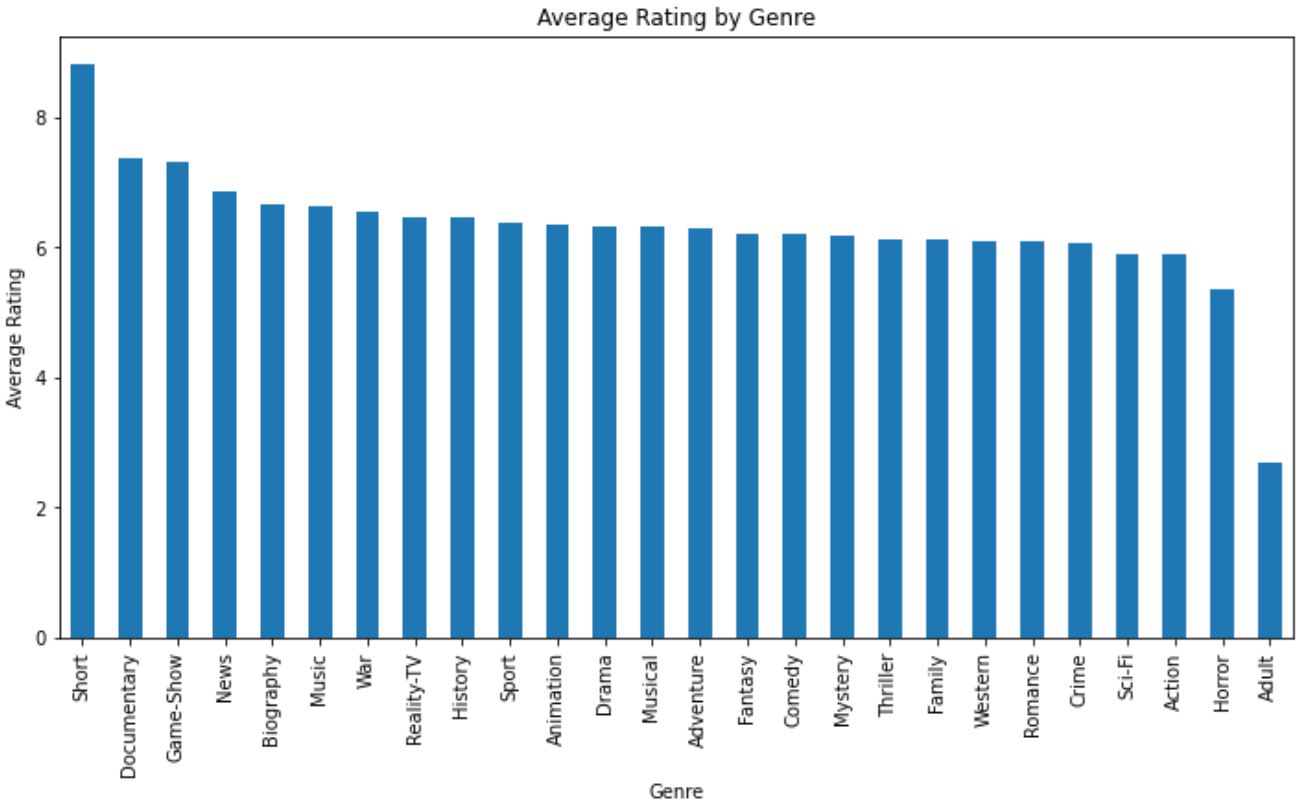




4. What is the average rating based per each genre?

In [27]:

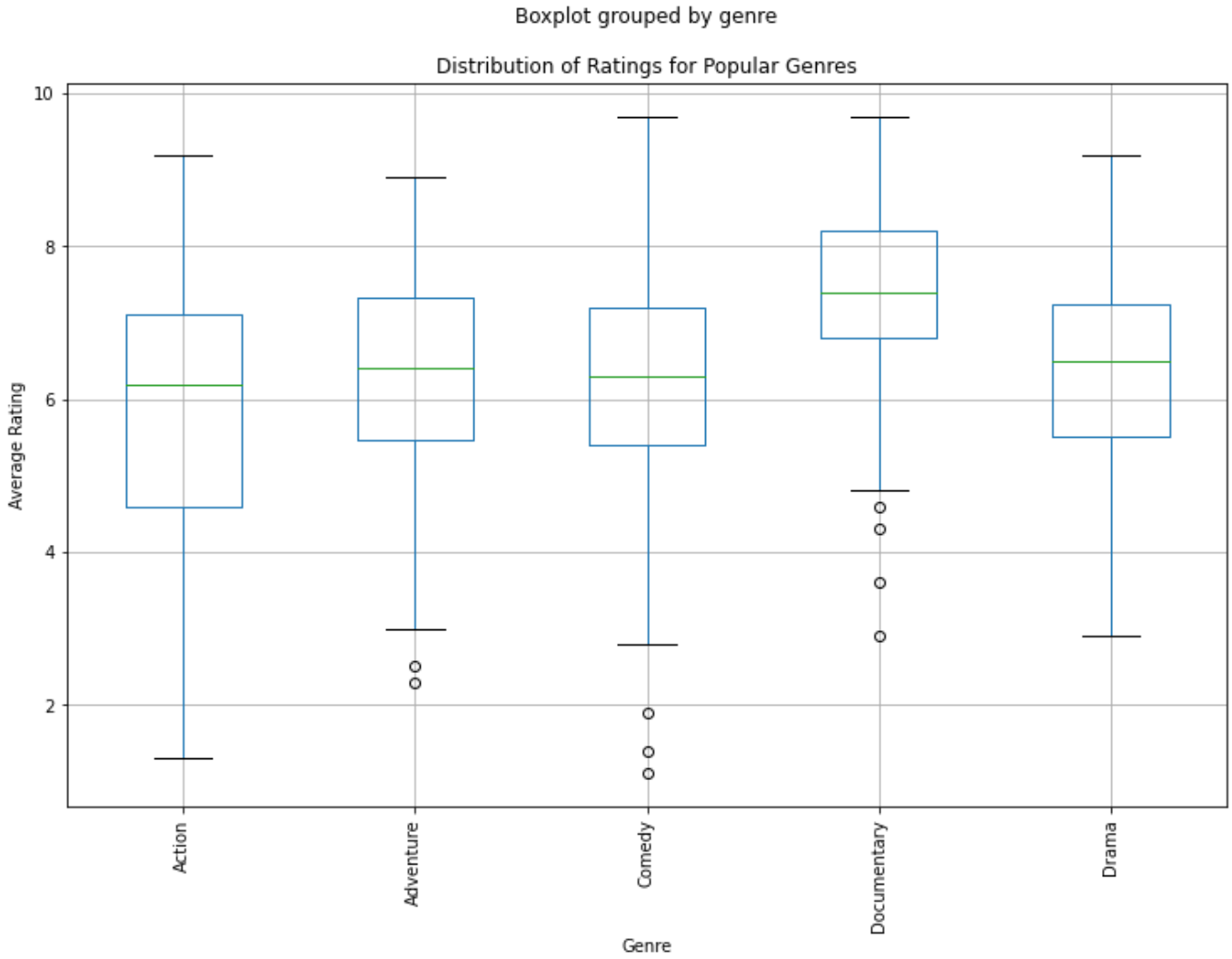
```
#merge the genres back into the original dataframe
expanded_joined_df = joined_movie_df.drop('genres', axis=1).join(df_genres)

# Compute the average rating per genre
avg_rating_per_genre = expanded_joined_df.groupby('genre')['averagerating'].mean().sort_
values(ascending=False)


#bar plot
avg_rating_per_genre.plot(kind='bar',figsize=(12,6))
plt.title('Average Rating by Genre')
plt.xlabel('Genre')
plt.ylabel('Average Rating')
plt.show()
```



5. Rating distribution for popular Genres

In [28]:

```
popular_genres = genre_counts.head(5).index

df_popular_genres = expanded_joined_df[expanded_joined_df['genre'].isin(popular_genres)]

# Box plot of ratings for popular genres
df_popular_genres.boxplot(column='averagerating', by='genre', figsize=(12, 8), rot=90)
plt.title('Distribution of Ratings for Popular Genres')
plt.xlabel('Genre')
plt.ylabel('Average Rating')
plt.show()
```



Initial Data Exploration on the BOM MOVIE dataframe

In [29]:

```
#read the csv file to a dataframe

bom_movie_df = pd.read_csv(r'data\bom.movie_gross.csv')
bom_movie_df.head(5)
```

Out[29]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010

In [30]:

```
#more info on the dataset to understand the structure
bom_movie_df.info
```

Out[30]:

```
<bound method DataFrame.info of                                                 title      s
tudio  domestic_gross  \
0                                    Toy Story 3          BV     415000000.0
1                     Alice in Wonderland (2010)          BV     334200000.0
2     Harry Potter and the Deathly Hallows Part 1          WB     296000000.0
3                                       Inception          WB     292600000.0
4                            Shrek Forever After        P/DW     238700000.0
...                                          ...         ...             ...
3382                                The Quake       Magn.           6200.0
3383                 Edward II (2018 re-release)          FM           4800.0
3384                                  El Pacto        Sony           2500.0
3385                                  The Swan  Synergetic           2400.0
3386                           An Actor Prepares       Grav.           1700.0

     foreign_gross  year
0        652000000  2010
1        691300000  2010
2        664300000  2010
3        535700000  2010
4        513900000  2010
...            ...   ...
3382           NaN  2018
3383           NaN  2018
3384           NaN  2018
3385           NaN  2018
3386           NaN  2018

[3387 rows x 5 columns]>
```

In [31]:

```
#Check on the datatypes of each column
bom_movie_df.dtypes
```

Out[31]:

```
title              object
studio             object
domestic_gross    float64
foreign_gross      object
year                int64
dtype: object
```

Data Cleaning -Handle Missing Values

In [32]:

```
#check to see if there are any null values
bom_movie_df.isna().sum()
```

Out[32]:

```
title                0
studio               5
domestic_gross      28
foreign_gross     1350
year                 0
dtype: int64
```

In [33]:

```
#check for missing values in the movies_basics dataframe in percentage
bomdf_missing_percentage = bom_movie_df.isna().mean() * 100
bomdf_missing_percentage
```

Out[33]:

```
title              0.000000
studio             0.147623
domestic_gross     0.826690
foreign_gross     39.858282
year               0.000000
dtype: float64
```

The dataset has missing value in columns : studio, domestic gross, and foreign cost. As *my* rule of thumb, the columns with mising values that are less than 5%, the rows with the missing values will be dropped, as this is will not significantly impact the analysis.

In [34]:

```
#removing missing values from 2 columns "studio" and "domestic_gross"
bom_mov_clean1 = bom_movie_df.dropna(subset=['studio','domestic_gross'])
bom_mov_clean1
```

Out[34]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010
...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	NaN	2018
3383	Edward II (2018 re-release)	FM	4800.0	NaN	2018
3384	El Pacto	Sony	2500.0	NaN	2018
3385	The Swan	Synergetic	2400.0	NaN	2018
3386	An Actor Prepares	Grav.	1700.0	NaN	2018

3356 rows × 5 columns

In [35]:

```
#check to see if the missing calues have been removed from the two columns
bom_mov_clean1.isna().sum()
```

Out[35]:

```
title                0
studio               0
domestic_gross       0
foreign_gross     1349
year                 0
dtype: int64
```

The only column left that has missing values is the foreign_gross column with 1,349 values missing! That is 40% of the total column of that data as shown in the cell below.

In [36]:

```
bom_mov_clean1['foreign_gross'].isna().mean() * 100
```

Out[36]:

```
40.19666269368295
```

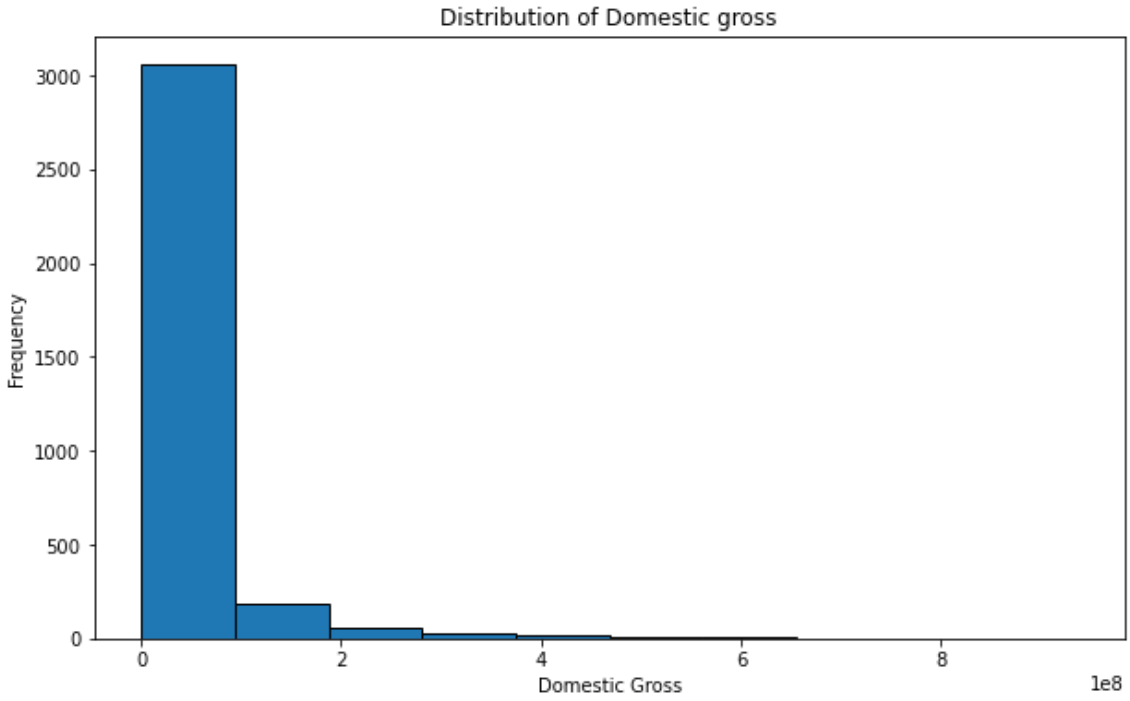
Imputing the missing values can be a practical solution. Replace the missing values with a statistical measure either mean or median.

1. **First, check whether the data in the column Domestic gross is normally distributed or not, to decide whether**

1. First, check whether the data in the column Domestic gross is normally distributed or not, to decide whether to use the mean for normal distribution or median imputation if there are outliers/not normally distributed in the foreign gross column. ***The assumption been made here is that both values in these two columns are positively corelated and are similar***

In [37]:

```
# plot histogram
plt.figure(figsize=(10, 6))
plt.hist(bom_mov_clean1['domestic_gross'],bins=10, edgecolor="black")
plt.title("Distribution of Domestic gross")
plt.xlabel("Domestic Gross")
plt.ylabel("Frequency")
plt.show()
```



Using the domestic gross as a case study to see how the foreign gross is distributed, there is an uneven distribution, hence use the median as the imputation techniques for the foreign gross.

In [38]:

```
#use the median as the imputation technique to remove missing values
#convert the string to numeric as it was a string
bom_mov_clean1["foreign_gross"] = pd.to_numeric(bom_movie_df['foreign_gross'],errors="co
erce")

#find the median
median_foreign_gross = bom_mov_clean1['foreign_gross'].median()

#impute the null values with the median
bom_mov_clean1['foreign_gross'] = bom_mov_clean1['foreign_gross'].fillna(median_foreign_g
ross)
bom_mov_clean1
```

```
<ipython-input-38-e3fe964af55c>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_g
uide/indexing.html#returning-a-view-versus-a-copy
  bom_mov_clean1["foreign_gross"] = pd.to_numeric(bom_movie_df['foreign_gross'],errors="c
oerce")
<ipython-input-38-e3fe964af55c>:9: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_g
```

```
uide/indexing.html#returning-a-view-versus-a-copy
  bom_mov_clean1['foreign_gross'] = bom_mov_clean1['foreign_gross'].fillna(median_foreign
_gross)
```

Out[38]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000.0	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000.0	2010
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000.0	2010
3	Inception	WB	292600000.0	535700000.0	2010
4	Shrek Forever After	P/DW	238700000.0	513900000.0	2010
...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	19600000.0	2018
3383	Edward II (2018 re-release)	FM	4800.0	19600000.0	2018
3384	El Pacto	Sony	2500.0	19600000.0	2018
3385	The Swan	Synergetic	2400.0	19600000.0	2018
3386	An Actor Prepares	Grav.	1700.0	19600000.0	2018

3356 rows × 5 columns

In [39]:

```
# confirm that there are no missing values
bom_mov_clean1.isna().mean()* 100
```

Out[39]:

```
title             0.0
studio            0.0
domestic_gross    0.0
foreign_gross     0.0
year              0.0
dtype: float64
```

The dataframe is clean

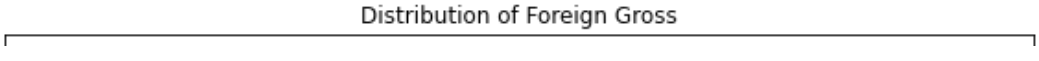
Univariate Analysis

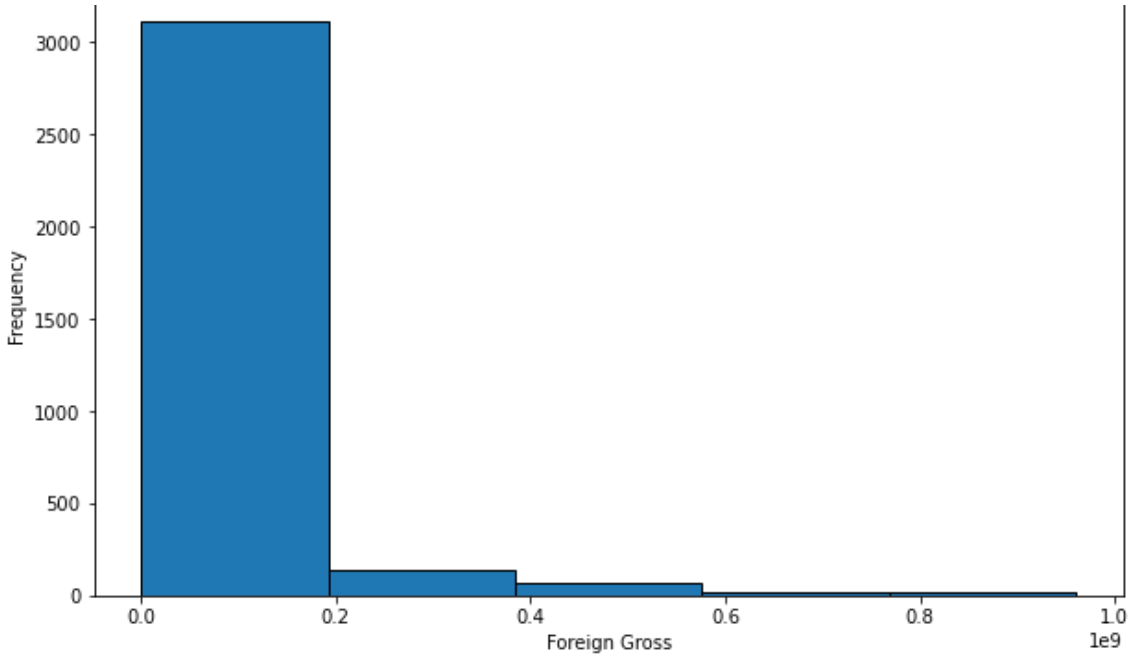
1. **What is the distribution of the gross revenues?**
2. **what is the distribution of movies by year?**
3. **What is the comparison of the gross revenues**
4. **what is the gross revenue by year?**
5. **Which studio generates the highest domestic and local gross? - Performance of the studios**

1. **Distribution of Gross Revenues**

In [40]:

```
plt.figure(figsize=(10, 6))
plt.hist(bom_mov_clean1['foreign_gross'], bins=5, edgecolor='k')
plt.title('Distribution of Foreign Gross')
plt.xlabel('Foreign Gross')
plt.ylabel('Frequency')
plt.show()

#1e9 represents 1,000,000,000
```

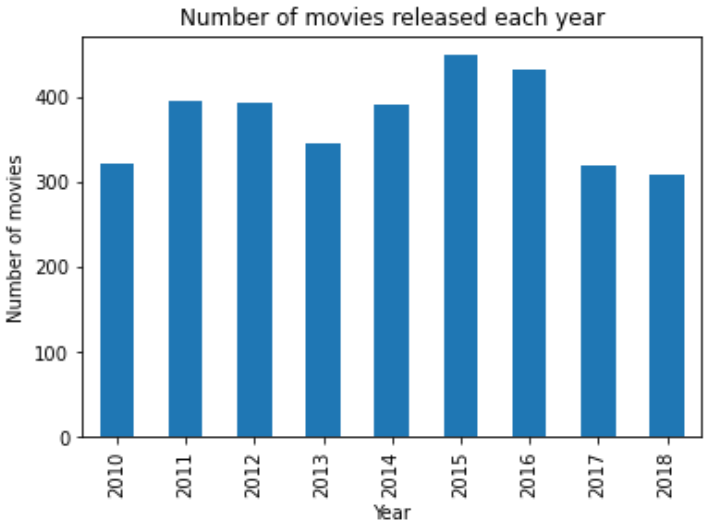




1. **Distribution of Movies per Year**

In [41]:

```
bom_mov_clean1['year'].value_counts().sort_index().plot(kind='bar')
plt.title('Number of movies released each year')
plt.xlabel('Year')
plt.ylabel('Number of movies')
plt.show()
```

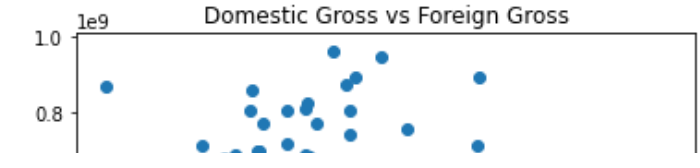


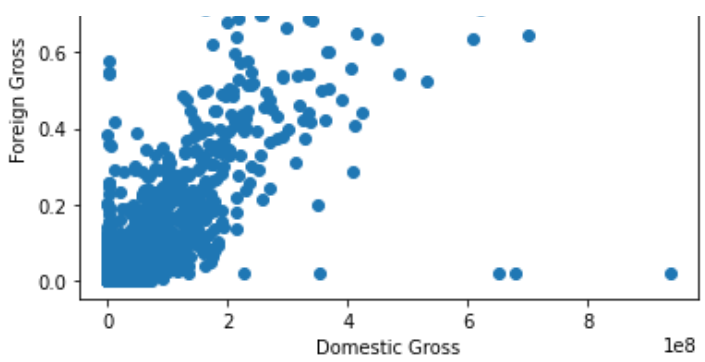
Bivariate Analysis

1. **comparison of gross revenues**

In [42]:

```
plt.scatter(bom_mov_clean1['domestic_gross'], bom_mov_clean1['foreign_gross'])
plt.title('Domestic Gross vs Foreign Gross')
plt.xlabel('Domestic Gross')
plt.ylabel('Foreign Gross')
plt.show()
```





In [ ]:

```
```

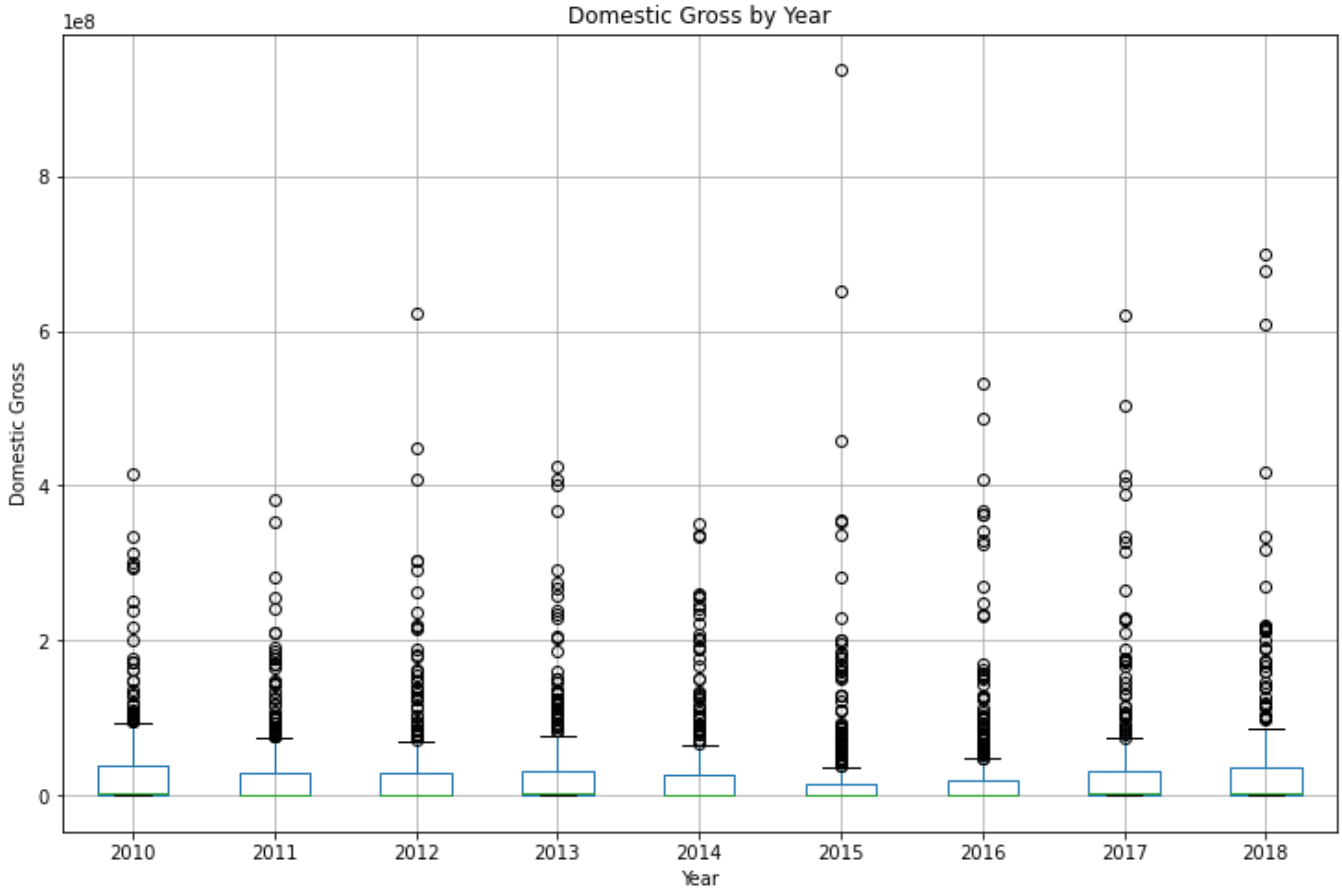
1e8 represents 100,000,000(one hundred million) 1 x 10^8

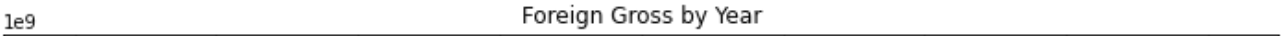
1e9 reps 1 billion 1 x 10^9

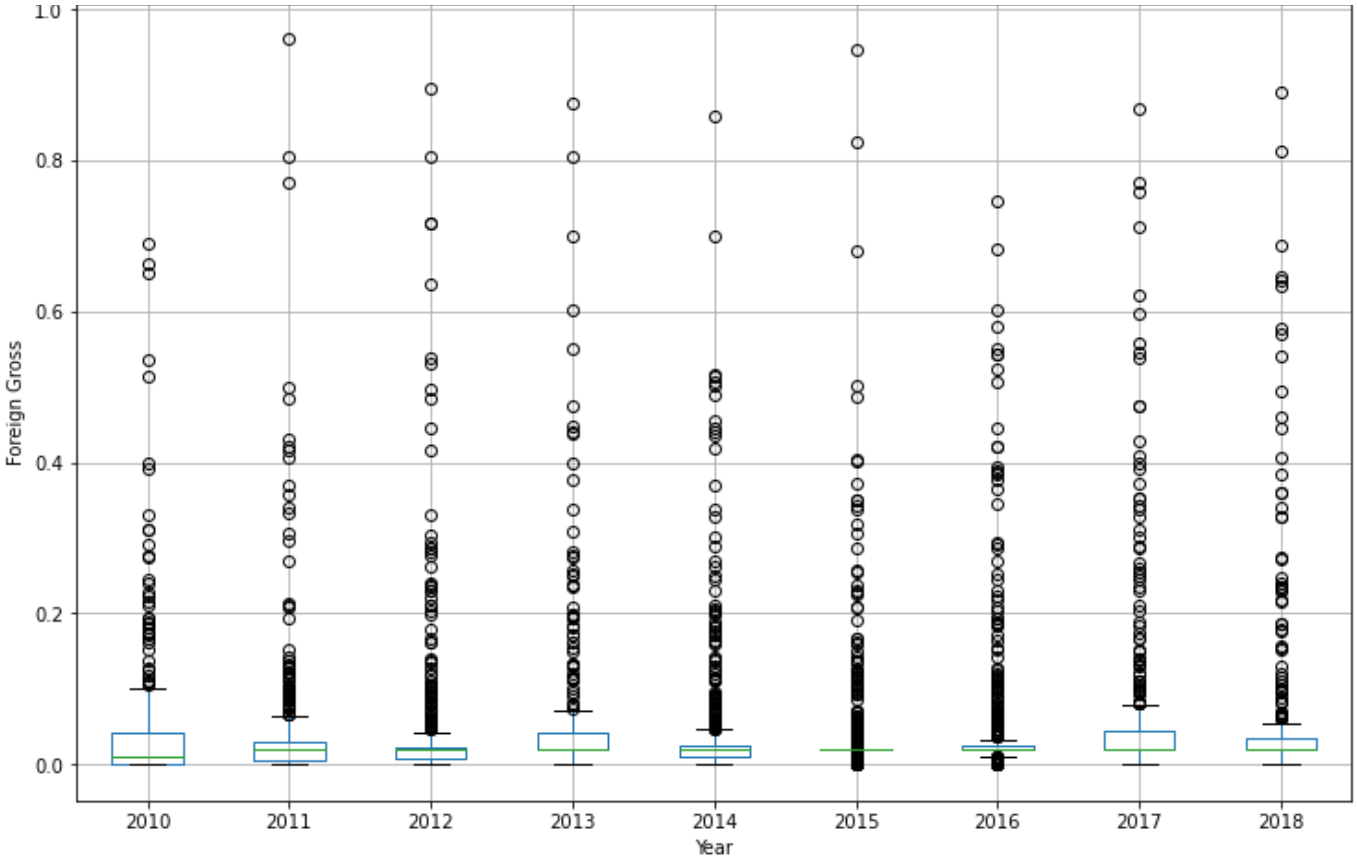
1. **Gross revenue by year**

In [43]:

```
bom_mov_clean1.boxplot(column='domestic_gross', by='year', figsize=(12, 8))
plt.title('Domestic Gross by Year')
plt.suptitle('')
plt.xlabel('Year')
plt.ylabel('Domestic Gross')
plt.show()

bom_mov_clean1.boxplot(column='foreign_gross', by='year', figsize=(12, 8))
plt.title('Foreign Gross by Year')
plt.suptitle('')
plt.xlabel('Year')
plt.ylabel('Foreign Gross')
plt.show()
```



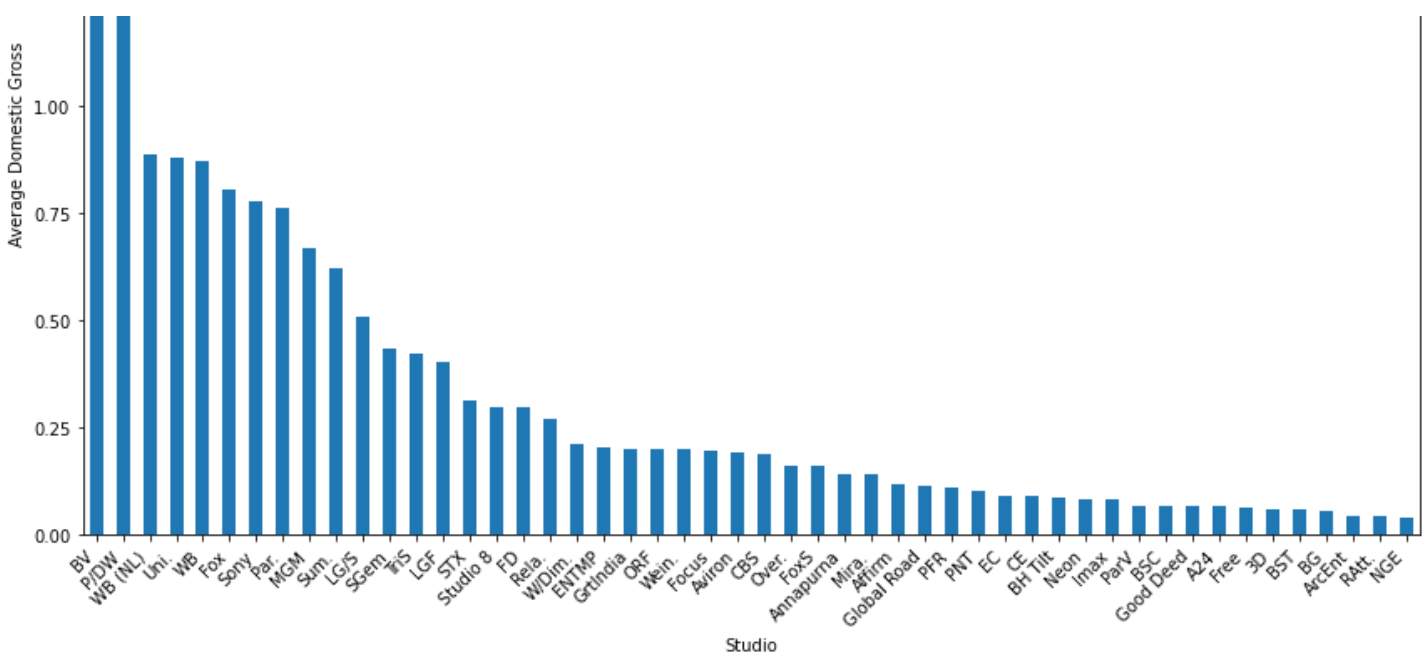


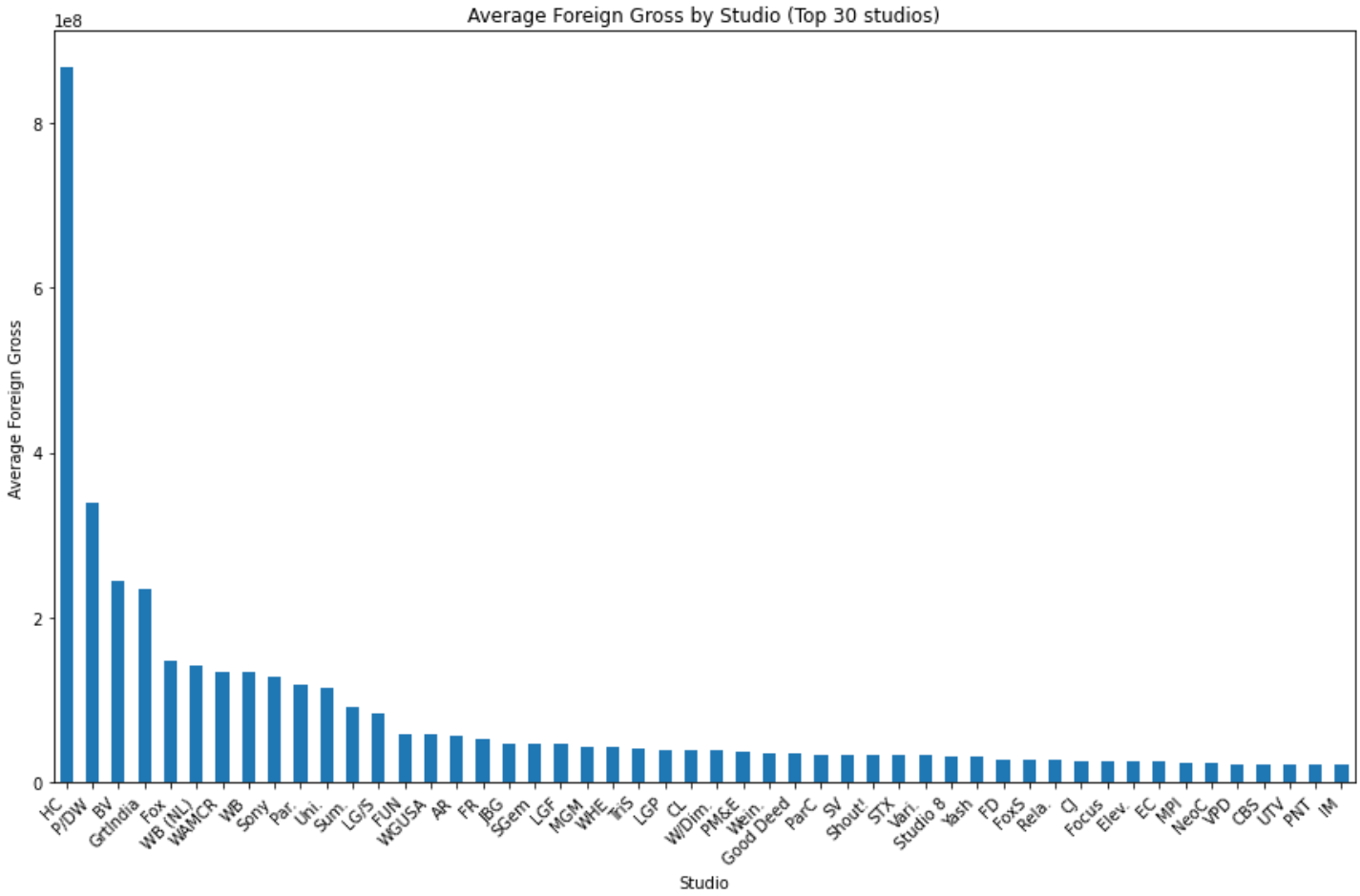


1. Gross revenue by studio

In [44]:

```
# Group by studio and calculate the mean domestic gross and foreign gross
avg_domestic_gross_by_studio = bom_mov_clean1.groupby('studio')['domestic_gross'].mean().
sort_values(ascending=False)
avg_foreign_gross_by_studio = bom_mov_clean1.groupby('studio')['foreign_gross'].mean().s
ort_values(ascending=False)


# Select the top 50 studios
top_30_studios = avg_domestic_gross_by_studio.head(50)
top_30_studios_f = avg_foreign_gross_by_studio.head(50)
# Plot the bar chart
top_30_studios.plot(kind='bar', figsize=(12, 8))
plt.title('Average Domestic Gross by Studio (Top 30 Studios)')
plt.xlabel('Studio')
plt.ylabel('Average Domestic Gross')
plt.xticks(rotation=45, ha='right')  # Rotate x-axis labels for better readability
plt.tight_layout()  # Adjust layout to prevent clipping of labels
plt.show()


top_30_studios_f.plot(kind='bar', figsize=(12,8))
plt.title('Average Foreign Gross by Studio (Top 30 studios)')
plt.xlabel('Studio')
plt.ylabel('Average Foreign Gross')
plt.xticks(rotation=45, ha='right')  # Rotate x-axis labels for better readability
plt.tight_layout()  # Adjust layout to prevent clipping of labels
plt.show()
```





1. Top rated movies by Gross revenues

In [45]:

```
bom_mov_clean1['total_gross'] = bom_mov_clean1['domestic_gross'] + bom_mov_clean1['foreign_gross']
top_movies = bom_mov_clean1.sort_values(by='total_gross', ascending=False).head(10)
top_movies[['title', 'total_gross']]
```

```
<ipython-input-45-be146240aa6c>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  bom_mov_clean1['total_gross'] = bom_mov_clean1['domestic_gross'] + bom_mov_clean1['foreign_gross']
```

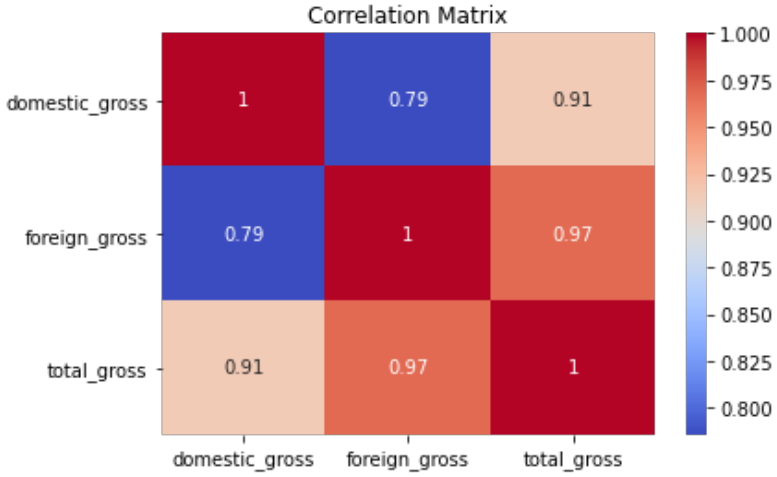
Out[45]:

	title	total_gross
727	Marvel's The Avengers	1.518900e+09
1875	Avengers: Age of Ultron	1.405400e+09
3080	Black Panther	1.347000e+09
328	Harry Potter and the Deathly Hallows Part 2	1.341500e+09
2758	Star Wars: The Last Jedi	1.332600e+09
3081	Jurassic World: Fallen Kingdom	1.309500e+09
1127	Frozen	1.276400e+09
2759	Beauty and the Beast (2017)	1.263500e+09
3082	Incredibles 2	1.242800e+09
1128	Iron Man 3	1.214800e+09

Correlation Analysis

In [46]:

```
correlation_matrix = bom_mov_clean1[['domestic_gross', 'foreign_gross', 'total_gross']].c
orr()
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm')
plt.title('Correlation Matrix')
plt.show()
```



Third dataset

data\rt.movie_info.tsv

In [47]:

```
import pandas as pd
rt_movie = pd.read_csv('data/rt.movie_info.tsv', sep = '\t')
rt_movie
```

Out[47]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	curr
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 1971	Sep 25, 2001	
		New York				David			

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	curr
1	3	City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	Jan 1, 2013	
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13, 1996	Apr 18, 2000	
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9, 1994	Aug 27, 1997	
4	7	NaN	NR	Drama|Romance	Rodney Bennett	Giles Cooper	NaN	NaN	
...	...	...	...	...	...	...	...	...	
1555	1996	Forget terrorists or hijackers -- there's a ha...	R	Action and Adventure|Horror|Mystery and Suspense	NaN	NaN	Aug 18, 2006	Jan 2, 2007	
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 23, 1993	Apr 17, 2001	
1557	1998	Based on a novel by Richard Powell, when the l...	G	Classics|Comedy|Drama|Musical and Performing Arts	Gordon Douglas	NaN	Jan 1, 1962	May 11, 2004	
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr 1, 1993	Jan 29, 2002	
1559	2000	Suspended from the force, Paris cop Hubert is ...	R	Action and Adventure|Art House and Internation...	NaN	Luc Besson	Sep 27, 2001	Feb 11, 2003	

1560 rows × 12 columns

In [48]:

```
rt_movie.info
```

Out[48]:

```
<bound method DataFrame.info of         id                                               syn
opsis rating  \
0        1  This gritty, fast-paced, and innovative police...      R
1        3  New York City, not-too-distant-future: Eric Pa...      R
2        5  Illeana Douglas delivers a superb performance ...      R
3        6  Michael Douglas runs afoul of a treacherous su...      R
4        7                                                NaN     NR
...    ...                                                ...    ...
1555  1996  Forget terrorists or hijackers -- there's a ha...      R
1556  1997  The popular Saturday Night Live sketch was exp...     PG
1557  1998  Based on a novel by Richard Powell, when the l...      G
1558  1999  The Sandlot is a coming-of-age story about a g...     PG
1559  2000  Suspended from the force, Paris cop Hubert is ...      R

                                          genre            director  \
0                Action and Adventure|Classics|Drama    William Friedkin
```

```
1                    Drama|Science Fiction and Fantasy    David Cronenberg
2                    Drama|Musical and Performing Arts      Allison Anders
3                           Drama|Mystery and Suspense      Barry Levinson
4                                       Drama|Romance      Rodney Bennett
...                                               ...                 ...
1555   Action and Adventure|Horror|Mystery and Suspense                 NaN
1556                 Comedy|Science Fiction and Fantasy        Steve Barron
1557  Classics|Comedy|Drama|Musical and Performing Arts      Gordon Douglas
1558    Comedy|Drama|Kids and Family|Sports and Fitness  David Mickey Evans
1559  Action and Adventure|Art House and Internation...                 NaN

                                            writer  theater_date  \
0                                    Ernest Tidyman   Oct 9, 1971
1                        David Cronenberg|Don DeLillo  Aug 17, 2012
2                                    Allison Anders  Sep 13, 1996
3                     Paul Attanasio|Michael Crichton   Dec 9, 1994
4                                     Giles Cooper           NaN
...                                            ...           ...
1555                                           NaN  Aug 18, 2006
1556  Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner  Jul 23, 1993
1557                                           NaN   Jan 1, 1962
1558                 David Mickey Evans|Robert Gunter   Apr 1, 1993
1559                                   Luc Besson  Sep 27, 2001

          dvd_date currency  box_office      runtime             studio
0     Sep 25, 2001      NaN         NaN  104 minutes                NaN
1      Jan 1, 2013        $     600,000  108 minutes  Entertainment One
2     Apr 18, 2000      NaN         NaN  116 minutes                NaN
3     Aug 27, 1997      NaN         NaN  128 minutes                NaN
4              NaN      NaN         NaN  200 minutes                NaN
...            ...      ...         ...          ...                ...
1555   Jan 2, 2007        $  33,886,034  106 minutes    New Line Cinema
1556  Apr 17, 2001      NaN         NaN   88 minutes  Paramount Vantage
1557  May 11, 2004      NaN         NaN  111 minutes                NaN
1558  Jan 29, 2002      NaN         NaN  101 minutes                NaN
1559  Feb 11, 2003      NaN         NaN   94 minutes  Columbia Pictures

[1560 rows x 12 columns]>
```

In [49]:

```
rt_movie.columns
```

Out[49]:

```
Index(['id', 'synopsis', 'rating', 'genre', 'director', 'writer',
       'theater_date', 'dvd_date', 'currency', 'box_office', 'runtime',
       'studio'],
      dtype='object')
```

In [50]:

```
# check the datatype of the dataframe
rt_movie.dtypes
# all variables are objects
```

Out[50]:

```
id              int64
synopsis       object
rating         object
genre          object
director       object
writer         object
theater_date   object
dvd_date       object
currency       object
box_office     object
runtime        object
studio         object
dtype: object
```

In [51]:

In [51]:

```
#check for missing values in % form
rt_movie.isna().mean() * 100
```

Out[51]:

```
id              0.000000
synopsis        3.974359
rating          0.192308
genre           0.512821
director       12.756410
writer         28.782051
theater_date   23.012821
dvd_date       23.012821
currency       78.205128
box_office     78.205128
runtime         1.923077
studio         68.333333
dtype: float64
```

DATA CLEANING

The rt_movie dataframe has many missing values in all columns except the id column. As my rule of thumb, columns with missing values of less than 5 %, those rows will be dropped.

In [52]:

```
# drop the rows that have missing values in the synopsis, rating, genre,rutime columns
#check the datatype, object
# the values are "words"/ strings in base python

rt_movie_clean_1 = rt_movie.dropna(subset = ['synopsis', 'rating', 'genre', 'runtime'])
rt_movie_clean_1
```

Out[52]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	curr
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 1971	Sep 25, 2001	
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	Jan 1, 2013	
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13, 1996	Apr 18, 2000	
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9, 1994	Aug 27, 1997	
5	8	The year is 1942. As the Allies unite overseas...	PG	Drama|Kids and Family	Jay Russell	Gail Gilchriest	Mar 3, 2000	Jul 11, 2000	
...	...	...	...	...	...	...	...	...	...
1555	1996	Forget terrorists or hijackers	R	Action and Adventure|Horror|Mystery and	NaN	NaN	Aug 18, 2006	Jan 2,	

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	curr
	1990	hijackers -- there's ha...	R	Adventure|Horror|Mystery and Suspense	NaN	NaN	Aug 18, 2000	2007	
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 23, 1993	Apr 17, 2001	
1557	1998	Based on a novel by Richard Powell, when the l...	G	Classics|Comedy|Drama|Musical and Performing Arts	Gordon Douglas	NaN	Jan 1, 1962	May 11, 2004	
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr 1, 1993	Jan 29, 2002	
1559	2000	Suspended from the force, Paris cop Hubert is ...	R	Action and Adventure|Art House and Internation...	NaN	Luc Besson	Sep 27, 2001	Feb 11, 2003	

1482 rows × 12 columns

In [53]:

```
#check for missing values in % form
rt_movie_clean_1.isna().mean() * 100
```

Out[53]:

```
id              0.000000
synopsis        0.000000
rating          0.000000
genre           0.000000
director       11.538462
writer         26.585695
theater_date   19.635628
dvd_date       19.635628
currency       77.192982
box_office     77.192982
runtime         0.000000
studio         67.071525
dtype: float64
```

The columns that had missing values of less than 5% have been cleaned by dropping their associated rows as it wont have a big impact on data analysis.

In [54]:

```
#checking whether the director column has a mode value
print(rt_movie_clean_1['director'].mode())
print(rt_movie_clean_1['writer'].mode())
print(rt_movie_clean_1['studio'].mode())
```

```
0    Steven Spielberg
dtype: object
0    Woody Allen
dtype: object
0    Universal Pictures
dtype: object
```

In [55]:

```
#drop the rows whose columns have less than 20% missing values
#dropping becasue they are all not categorical data to use the mode, median or mode are n
or really useful
#because the values are not numerical
```

```
rt_movie_clean_2  = rt_movie_clean_1.dropna(subset=['director', 'theater_date','dvd_date
', 'writer'])
rt_movie_clean_2
```

Out[55]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	currency
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 1971	Sep 25, 2001	NaN
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	Jan 1, 2013	$
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13, 1996	Apr 18, 2000	NaN
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9, 1994	Aug 27, 1997	NaN
5	8	The year is 1942. As the Allies unite overseas...	PG	Drama|Kids and Family	Jay Russell	Gail Gilchriest	Mar 3, 2000	Jul 11, 2000	NaN
...	...	...	...	...	...	...	...	...	...
1545	1985	A woman who joins the undead against her will ...	R	Horror|Mystery and Suspense	Sebastian Gutierrez	Sebastian Gutierrez	Jun 1, 2007	Oct 9, 2007	$
1550	1990	A hard-working Sicilian heads for Switzerland ...	R	Art House and International|Comedy|Drama	Franco Brusati	Nino Manfredi|Franco Brusati|laia Fiastri	Jun 1, 1974	May 2, 2005	NaN
1552	1992	The title character, played by John Turturro, ...	R	Comedy|Drama	Joel Coen	Joel Coen|Ethan Coen	Aug 21, 1991	May 20, 2003	NaN
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 23, 1993	Apr 17, 2001	NaN
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr 1, 1993	Jan 29, 2002	NaN

881 rows × 12 columns

In [56]:

```
#check for missing values in % form
```

```
rt_movie_clean_2.isna().mean() * 100
```

Out[56]:

```
id              0.000000
synopsis        0.000000
rating          0.000000
genre           0.000000
director        0.000000
writer          0.000000
theater_date    0.000000
dvd_date        0.000000
currency       70.715096
box_office     70.715096
runtime         0.000000
studio         59.477866
dtype: float64
```

In [57]:

```
#drop the remaining columns with missing dat aof more than 30%
rt_movies_final = rt_movie_clean_2.dropna(axis="columns")
rt_movies_final
```

Out[57]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	runtime
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	Oct 9, 1971	Sep 25, 2001	104 minutes
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Aug 17, 2012	Jan 1, 2013	108 minutes
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Sep 13, 1996	Apr 18, 2000	116 minutes
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	Dec 9, 1994	Aug 27, 1997	128 minutes
5	8	The year is 1942. As the Allies unite overseas...	PG	Drama|Kids and Family	Jay Russell	Gail Gilchriest	Mar 3, 2000	Jul 11, 2000	95 minutes
...	...	...	...	...	...	...	...	...	...
1545	1985	A woman who joins the undead against her will ...	R	Horror|Mystery and Suspense	Sebastian Gutierrez	Sebastian Gutierrez	Jun 1, 2007	Oct 9, 2007	98 minutes
1550	1990	A hard-working Sicilian heads for Switzerland ...	R	Art House and International|Comedy|Drama	Franco Brusati	Nino Manfredi|Franco Brusati|Iaia Fiastri	Jun 1, 1974	May 2, 2005	112 minutes
1552	1992	The title character, played by John	R	Comedy|Drama	Joel Coen	Joel Coen|Ethan Coen	Aug 21, 1991	May 20, 2003	116 minutes

	id	Tu... synopsis	rating	genre	director	writer	theater_date	dvd_date	runtime
1556	1997	The popular Saturday Night Live sketch was exp...	PG	Comedy|Science Fiction and Fantasy	Steve Barron	Terry Turner|Tom Davis|Dan Aykroyd|Bonnie Turner	Jul 23, 1993	Apr 17, 2001	88 minutes
1558	1999	The Sandlot is a coming-of-age story about a g...	PG	Comedy|Drama|Kids and Family|Sports and Fitness	David Mickey Evans	David Mickey Evans|Robert Gunter	Apr 1, 1993	Jan 29, 2002	101 minutes

881 rows × 9 columns

In [58]:

```
#check for missing values in % form
rt_movies_final.isna().mean() * 100
```

Out[58]:

```
id              0.0
synopsis        0.0
rating          0.0
genre           0.0
director        0.0
writer          0.0
theater_date    0.0
dvd_date        0.0
runtime         0.0
dtype: float64
```

In [59]:

```
rt_movies_final.describe()
```

Out[59]:

	id
count	881.000000
mean	1005.664018
std	576.094502
min	1.000000
25%	507.000000
50%	1000.000000
75%	1508.000000
max	1999.000000

In [60]:

```
rt_movies_final.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 881 entries, 0 to 1558
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   id            881 non-null    int64 
 1   synopsis      881 non-null    object
 2   rating        881 non-null    object
 3   genre         881 non-null    object
 4   director      881 non-null    object
 5   writer        881 non-null    object
 6   theater_date  881 non-null    object
 7   dvd_date      881 non-null    object
 8   runtime       881 non-null    object
```

```
 8   runtime       881 non-null    object
dtypes: int64(1), object(8)
memory usage: 68.8+ KB
```

In [61]:

```
#CONVERT THE DATATYPES TO THE RIGHT DATAYPES
rt_movies_final['theater_date'] = pd.to_datetime(rt_movies_final['theater_date'])
rt_movies_final['dvd_date'] = pd.to_datetime(rt_movies_final['dvd_date'])
```

```
<ipython-input-61-662382cd6021>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  rt_movies_final['theater_date'] = pd.to_datetime(rt_movies_final['theater_date'])
<ipython-input-61-662382cd6021>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  rt_movies_final['dvd_date'] = pd.to_datetime(rt_movies_final['dvd_date'])
```

In [62]:

```
rt_movies_final.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 881 entries, 0 to 1558
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype         
---  ------        --------------  -----         
 0   id            881 non-null    int64         
 1   synopsis      881 non-null    object        
 2   rating        881 non-null    object        
 3   genre         881 non-null    object        
 4   director      881 non-null    object        
 5   writer        881 non-null    object        
 6   theater_date  881 non-null    datetime64[ns]
 7   dvd_date      881 non-null    datetime64[ns]
 8   runtime       881 non-null    object        
dtypes: datetime64[ns](2), int64(1), object(6)
memory usage: 68.8+ KB
```

In [63]:

```
# Remove the 'minutes' text and convert to integer
rt_movies_final['runtime'] = rt_movies_final['runtime'].str.replace(' minutes', '').astype(int)
rt_movies_final.head(2)
```

```
<ipython-input-63-b0450549d6a1>:2: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  rt_movies_final['runtime'] = rt_movies_final['runtime'].str.replace(' minutes', '').astype(int)
```

Out[63]:

	id	synopsis	rating	genre	director	writer	theater_date	dvd_date	runtime
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	1971-10-09	2001-09-25	104
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	2012-08-17	2013-01-01	108

In [64]:

```
rt_movies_final.describe()
```

Out[64]:

	id	runtime
count	881.000000	881.000000
mean	1005.664018	106.809308
std	576.094502	21.877447
min	1.000000	52.000000
25%	507.000000	93.000000
50%	1000.000000	103.000000
75%	1508.000000	116.000000
max	1999.000000	358.000000

In [65]:

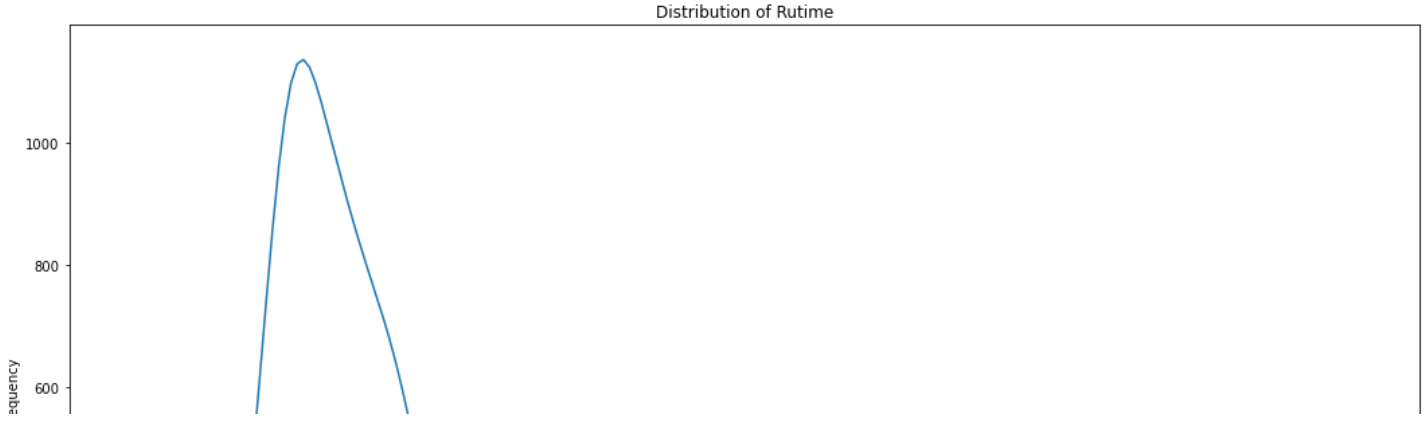
```
rt_movies_final.info()
```

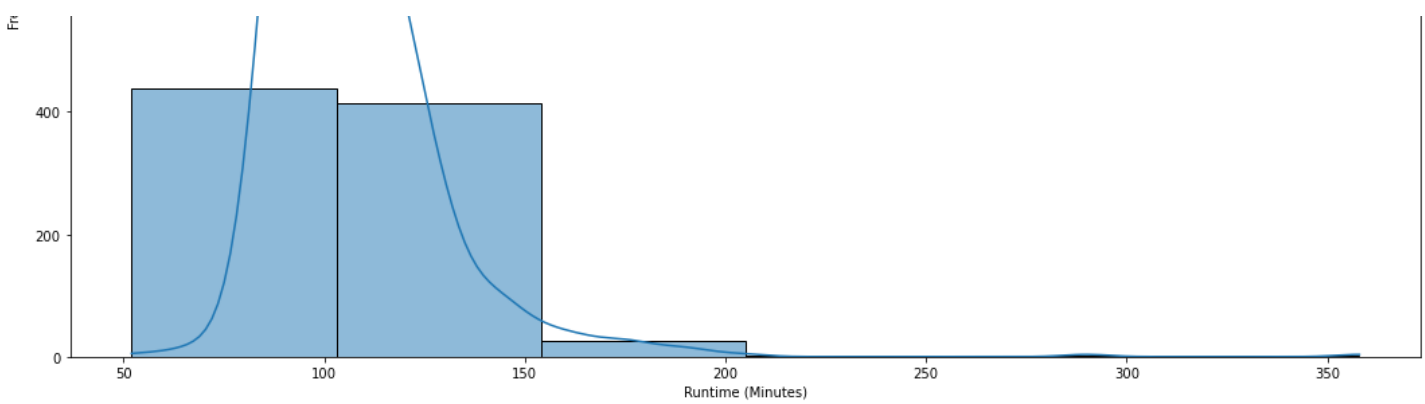
```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 881 entries, 0 to 1558
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype         
---  ------        --------------  -----         
 0   id            881 non-null    int64         
 1   synopsis      881 non-null    object        
 2   rating        881 non-null    object        
 3   genre         881 non-null    object        
 4   director      881 non-null    object        
 5   writer        881 non-null    object        
 6   theater_date  881 non-null    datetime64[ns]
 7   dvd_date      881 non-null    datetime64[ns]
 8   runtime       881 non-null    int32         
dtypes: datetime64[ns](2), int32(1), int64(1), object(5)
memory usage: 65.4+ KB
```

1. What is the distribution of runtime minutes of the movies?

In [66]:

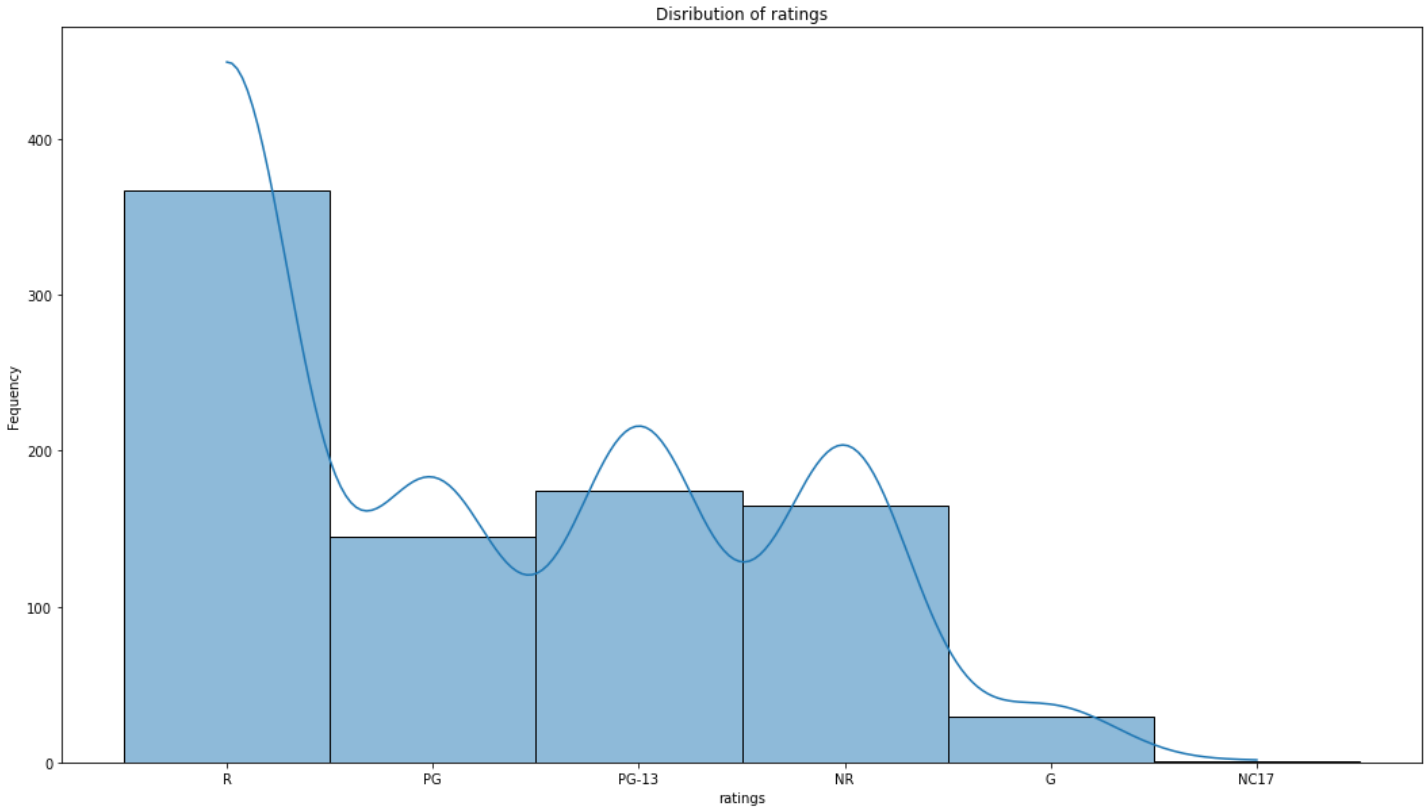
```
#plot a histogram

plt.figure(figsize=(18,10))
sns.histplot(rt_movies_final['runtime'], bins=6, kde=True )
plt.title('Distribution of Rutime')
plt.xlabel('Runtime (Minutes)')
plt.ylabel('Frequency')
plt.show()
```





In [67]:

```
plt.figure(figsize=(18,10))
sns.histplot(rt_movies_final['rating'], bins= 6, kde=True)
plt.title( 'Disribution of ratings')
plt.xlabel('ratings')
plt.ylabel('Fequency')
plt.show()
```



ANALYZING CATEGORICAL DATA

In [68]:

```
rt_movies_final['genre_list']= rt_movies_final['genre'].str.split('|')

all_genres = rt_movies_final['genre_list'].explode().value_counts()
all_genres
```

```
<ipython-input-68-ca926bb444c8>:1: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy
  rt_movies_final['genre_list']= rt_movies_final['genre'].str.split('|')
```

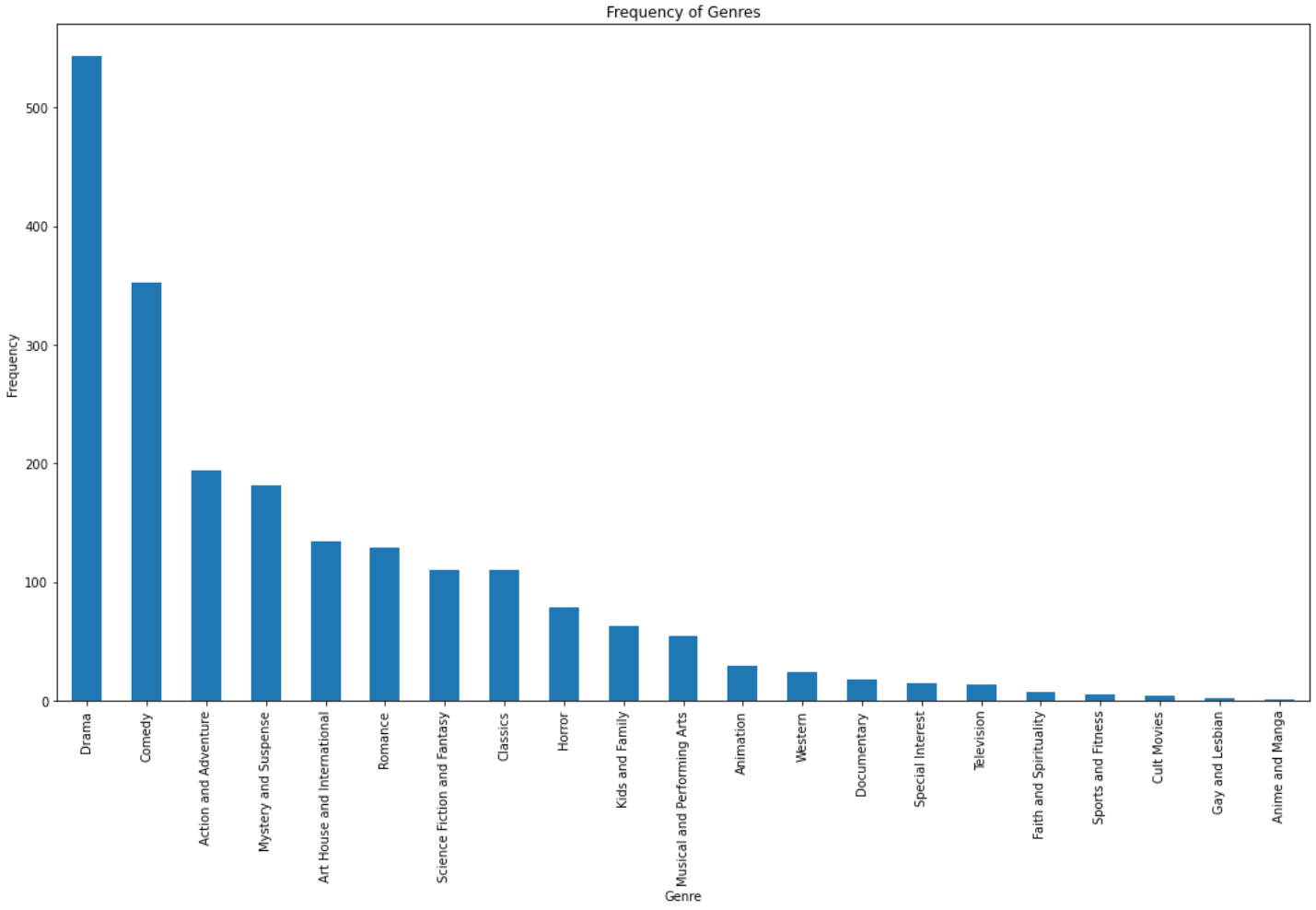
Out[68]:

```
Drama                     543
Comedy                    352
```

```
Action and Adventure            194
Mystery and Suspense            182
Art House and International     134
Romance                         129
Science Fiction and Fantasy     110
Classics                        110
Horror                           79
Kids and Family                  63
Musical and Performing Arts      55
Animation                        29
Western                          24
Documentary                      18
Special Interest                 15
Television                       14
Faith and Spirituality            7
Sports and Fitness                5
Cult Movies                       4
Gay and Lesbian                   2
Anime and Manga                   1
Name: genre_list, dtype: int64
```

In [69]:

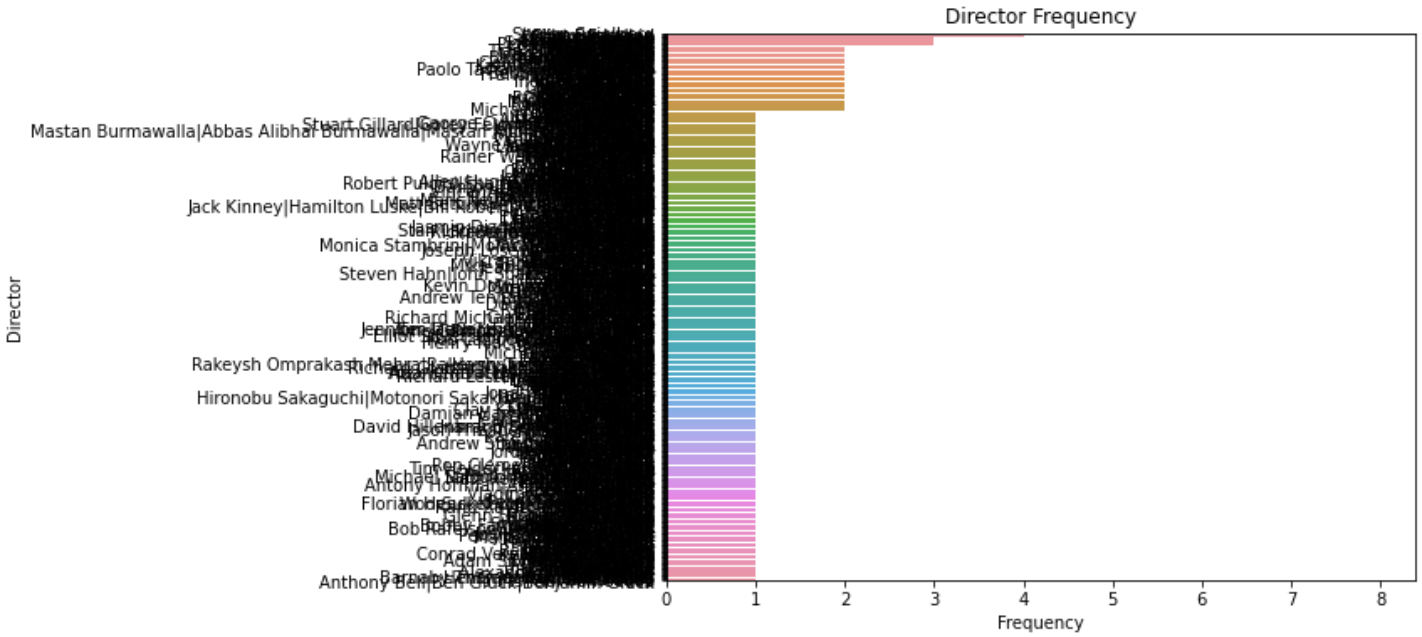
```
#plot the distribution of genres

plt.figure(figsize = (18,10))
all_genres.plot(kind='bar')
plt.title('Frequency of Genres')
plt.xlabel('Genre')
plt.ylabel('Frequency')
plt.show()
```



In [73]:

```
#Director Analysis
plt.figure(figsize=(8,6))
sns.countplot(y="director",data = rt_movies_final, order= rt_movies_final['director'].val
ue_counts(20).index)
```

```
plt.title('Director Frequency')
plt.xlabel('Frequency')
plt.ylabel('Director')
plt.show()
```



In [ ]: