Movie Data Analysis

Overview

Microsoft wants to create a new movie studio and create original video content like the big film companies. To this end, they first want to understand how they can successfully enter the movie industry. I decided to change my focus on the profitability of movies in relation to movie studios, release time of the movie and the actual language of the movie.Some of the aspects of a movie I could investigate, will be the questions below:

- What month/ season is the most profit-making to release a movie?
- What are the most well-liked genre on foreign language movies?
- What production budgets and the famous movie studios.

Datasets

- im.db
- born.movie_gross.csv.gz
- rt.movie_info.tsv.gz
- rt.reviews.tsv.gz
- tmbd.movies.csv.gz

Import Libraries

In [1]:

```
import pandas as pd
import numpy as np
import os
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
from glob import glob
import sqlite3
```

Import Data and Create Tables

In [2]:

```
bom_movie_gross = pd.read_csv("zippedData/bom.movie_gross.csv.gz")
bom_movie_gross
```

Out[2]:

	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

3387 rows × 5 columns

In [3]:

```
rt_movie_info = pd.read_csv("zippedData/rt.movie_info.tsv.gz", delimiter="\t")
rt_movie_info
```

Out[3]:

	id	synopsis	rating	genre	director	writer	the
0	1	This gritty, fast-paced, and innovative police...	R	Action and Adventure|Classics|Drama	William Friedkin	Ernest Tidyman	C
1	3	New York City, not-too-distant-future: Eric Pa...	R	Drama|Science Fiction and Fantasy	David Cronenberg	David Cronenberg|Don DeLillo	Au
2	5	Illeana Douglas delivers a superb performance ...	R	Drama|Musical and Performing Arts	Allison Anders	Allison Anders	Se
3	6	Michael Douglas runs afoul of a treacherous su...	R	Drama|Mystery and Suspense	Barry Levinson	Paul Attanasio|Michael Crichton	D
4	7	NaN	NR	Drama|Romance	Rodney Bennett	Giles Cooper	
...	...	...	...	...	...	...	
1555	1996	Forget terrorists or hijackers -- there's a ha...	R	Action and Adventure|Horror|Mystery and Suspense	NaN	NaN	Au
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	Ju
1557	1998	Based on a novel by Richard Powell, when the l...	G	Classics|Comedy|Drama|Musical and Performing Arts	Gordon Douglas	NaN	J
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	A
1559	2000	Suspended from the force, Paris cop Hubert is ...	R	Action and Adventure|Art House and Internation...	NaN	Luc Besson	Se

1560 rows × 12 columns

This does not include all of the CSVs! Make sure you open and explore some of the other ones.

In [4]:

```
csv_files = glob('./zippedData/*.csv.gz')
tsv_files = glob('./zippedData/*.tsv.gz')
files = csv_files + tsv_files
type(files)
```

Out[4]:

```
list
```

In [5]:

```
#clean file name
#create dictionary of dataframes of each csv and tsv
files_dict = {}
for filename in files:
    if 'csv' in str(os.path.basename(filename)):
        filename_cleaned = os.path.basename(filename).replace(".csv.gz", "")\
        .replace(".", "_")
        filename_df = pd.read_csv(filename, compression='gzip', index_col=0)
        files_dict[filename_cleaned] = filename_df
    else:
        filename_cleaned = os.path.basename(filename).replace(".tsv.gz", "")\
        .replace(".", "_")
        filename_df = pd.read_csv\
        (filename, compression='gzip', delimiter ='\t', index_col=0, encoding ='ISO-8859-1'
        files_dict[filename_cleaned] = filename_df
```

In [6]:

```
# to view file names from pairs in our dictionary
files_dict.keys()
```

Out[6]:

```
dict_keys(['bom_movie_gross', 'tn_movie_budgets', 'tmdb_movies', 'rt_movie_i
nfo', 'rt_reviews'])
```

In [7]:

```
files_dict['rt_movie_info'].info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1560 entries, 1 to 2000
Data columns (total 11 columns):
 #   Column        Non-Null Count  Dtype 
---  ------        --------------  ----- 
 0   synopsis      1498 non-null   object
 1   rating        1557 non-null   object
 2   genre         1552 non-null   object
 3   director      1361 non-null   object
 4   writer        1111 non-null   object
 5   theater_date  1201 non-null   object
 6   dvd_date      1201 non-null   object
 7   currency      340 non-null    object
 8   box_office    340 non-null    object
 9   runtime       1530 non-null   object
 10  studio        494 non-null    object
dtypes: object(11)
memory usage: 146.2+ KB
```

In [8]:

```
conn = sqlite3.connect("movies_db.sqlite")
```

In [9]:

```
def create_sql_table_from_df(df, name, conn):
    try:
        df.to_sql(name, conn)
        print(f"Created table {name}")
    except Exception as e:
        print(f"could not make table {name}")
        print(e)
```

In [10]:

```
for name, table in files_dict.items():
    create_sql_table_from_df(table, name, conn)
```

```
could not make table bom_movie_gross
Table 'bom_movie_gross' already exists.
could not make table tn_movie_budgets
Table 'tn_movie_budgets' already exists.
could not make table tmdb_movies
Table 'tmdb_movies' already exists.
could not make table rt_movie_info
Table 'rt_movie_info' already exists.
could not make table rt_reviews
Table 'rt_reviews' already exists.
```

SQL DATA

In [11]:

```
#It unzips the SQL data, since SQLite doesn't work with zipped data.
! unzip -n zippedData/im.db.zip
```

```
Archive:  zippedData/im.db.zip
```

In [12]:

```
#code that reads one of the data tables from the database:
import sqlite3
```

In [13]:

```
conn = sqlite3.connect("im.db")
```

In [14]:

```
movie_basics = pd.read_sql("SELECT * FROM movie_basics;", conn)
movie_basics
```

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	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantas
...	...	...	...	...	...	.
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	Documentar
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comed
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	None
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentar

146144 rows × 6 columns

Aspect I: What month/ season is the most profitable to release a movie?

For Profit and Release Dates Exploratory Data Analysis

Will clean the date and add relevant columns by determining the profit of each movie, the month of release, ensuring the date types are correct, and remove duplicates.

In [15]:

```
#this is to create a dataframe from the movie budgets file
budgets_and_release_dates_df = files_dict['tn_movie_budgets']
```

In [16]:

```
#this is to check the columns
budgets_and_release_dates_df.head()
```

Out[16]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross
id					
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963
5	Dec 15, 2017	Star Wars Ep. VIII: The Last Jedi	$317,000,000	$620,181,382	$1,316,721,747

In [17]:

```
#this is to review the data types
budgets_and_release_dates_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 5782 entries, 1 to 82
Data columns (total 5 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   release_date       5782 non-null   object
 1   movie              5782 non-null   object
 2   production_budget  5782 non-null   object
 3   domestic_gross     5782 non-null   object
 4   worldwide_gross    5782 non-null   object
dtypes: object(5)
memory usage: 271.0+ KB
```

In [18]:

```
# this is to change datatype to  release date to a datetime object to extract the month
budgets_and_release_dates_df['release_date'] = pd.to_datetime\
                                (budgets_and_release_dates_df['release_date'])
```

In [19]:

```
budgets_and_release_dates_df[budgets_and_release_dates_df.columns[2:]] \
        = budgets_and_release_dates_df[budgets_and_release_dates_df.columns[2:]]\
        .apply(lambda x: x.str.replace('$',''))\
        .apply(lambda x: x.str.replace(',','')).astype(np.int64)
```

```
/tmp/ipykernel_214/843939371.py:3: FutureWarning: The default value of regex
will change from True to False in a future version. In addition, single char
acter regular expressions will *not* be treated as literal strings when rege
x=True.
  .apply(lambda x: x.str.replace('$',''))\
```

In [20]:

```
budgets_and_release_dates_df['movie_profit'] \
        = budgets_and_release_dates_df['worldwide_gross']\
        - budgets_and_release_dates_df['production_budget']
```

In [21]:

```
budgets_and_release_dates_df.head()
```

Out[21]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	movie_profit
id						
1	2009-12-18	Avatar	425000000	760507625	2776345279	2351345279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	635063875
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	-200237650
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	1072413963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	999721747

In [22]:

```
budgets_and_release_dates_df['release_month'] = \
        pd.DatetimeIndex(budgets_and_release_dates_df['release_date']).month
```

In [23]:

```
duplicate_budgets_and_release_dates_df = \
        budgets_and_release_dates_df[budgets_and_release_dates_df.duplicated()]
```

In [24]:

```
duplicate_budgets_and_release_dates_df
```

Out[24]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	movie_profit	rel
id							

In [25]:

```
budgets_and_release_dates_df.head()
```

Out[25]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	movie_profit
id						
1	2009-12-18	Avatar	425000000	760507625	2776345279	2351345279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	635063875
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	-200237650
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	1072413963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	999721747

In [26]:

```
#to check for earliest value in our datetime column
budgets_and_release_dates_df['release_date'].min()
```

Out[26]:

```
Timestamp('1915-02-08 00:00:00')
```

In [27]:

```
#to check for number of entries
budgets_and_release_dates_df.shape
```

Out[27]:

```
(5782, 7)
```

Data Review

We will review the data using a SQL query to get a better sense of the scale of the profit numbers

In [28]:

```
cur = conn.cursor()
```

In [29]:

```
cur.execute("""SELECT movie_profit, release_month
            FROM budgets_release_dates
            WHERE release_date > 2000-01-01
            ORDER BY movie_profit DESC;""").fetchall()
```

```
 (663420425, 5),
 (662457969, 9),
 (662316233, 5),
 (647330936, 5),
 (642820459, 5),
 (641575131, 11),
 (638102828, 6),
 (637557727, 11),
 (636860230, 5),
 (635063875, 5),
 (632806292, 8),
 (629300444, 5),
 (626519699, 6),
 (624850637, 7),
 (623008101, 11),
 (622402853, 11),
 (617500281, 3),
 (609456552, 7),
 (601921271, 6),
 (601635413, 5),
```

In [30]:

```
budgets_and_release_dates_df.groupby('release_month').mean()
```

Out[30]:

release_month	production_budget	domestic_gross	worldwide_gross	movie_profit
1	2.084349e+07	2.394962e+07	4.656382e+07	2.572033e+07
2	2.804642e+07	3.541465e+07	7.154453e+07	4.349811e+07
3	3.078208e+07	3.857299e+07	8.063337e+07	4.985129e+07
4	2.380283e+07	2.732840e+07	5.992026e+07	3.611743e+07
5	4.713520e+07	6.669795e+07	1.622680e+08	1.151328e+08
6	4.309912e+07	6.582791e+07	1.425230e+08	9.942391e+07
7	4.254616e+07	6.072804e+07	1.409636e+08	9.841746e+07
8	2.555609e+07	3.216821e+07	6.097841e+07	3.542232e+07
9	2.181290e+07	2.314989e+07	4.669369e+07	2.488078e+07
10	2.039266e+07	2.442350e+07	4.946456e+07	2.907190e+07
11	4.260006e+07	5.818117e+07	1.357416e+08	9.314157e+07
12	3.325161e+07	4.610082e+07	1.016932e+08	6.844157e+07

In [31]:

```
cur.execute("""SELECT avg(movie_profit), release_month
            FROM budgets_release_dates
            GROUP BY release_month
            ORDER BY avg(movie_profit) DESC;""").fetchall()
```

Out[31]:

```
[(115132808.4004914, 5),
 (99423910.9519833, 6),
 (98417458.35909091, 7),
 (93141569.2510288, 11),
 (68441565.30604027, 12),
 (49851292.36170213, 3),
 (43498106.821428575, 2),
 (36117428.171806164, 4),
 (35422316.85685484, 8),
 (29071903.781849913, 10),
 (25720334.109510086, 1),
 (24880784.866125762, 9)]
```

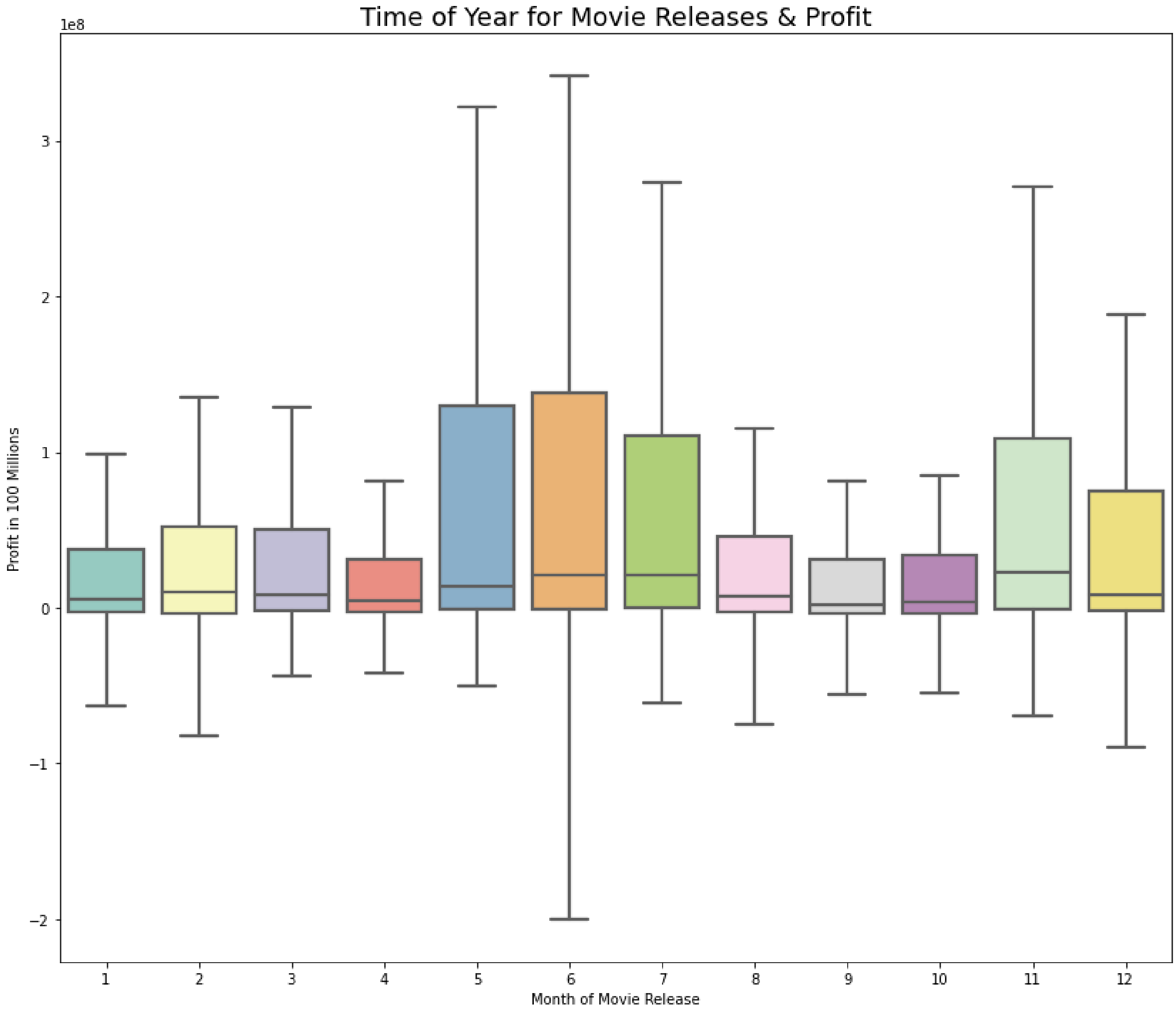
Data Visualization

Plotting the data using a boxplot to show the profits for each month. I used a boxplot so that we can see the IQR for movie profits and how the vary from month to month. We will also remove the outliers but leave the whiskers to get a good sense of the full range of movie success of the month.

In [32]:

```
#create a boxplot using release month and profit
x = budgets_and_release_dates_df['release_month']
y = budgets_and_release_dates_df['movie_profit']
f, ax = plt.subplots(figsize=(14,12))
sns.set_style('darkgrid')
sns.set_context('talk')
sns.boxplot(x, y, palette='Set3', showfliers=False)
plt.title('Time of Year for Movie Releases & Profit')
plt.ylabel('Profit in 100 Millions')
plt.xlabel('Month of Movie Release')
plt.show()
```

```
/opt/conda/lib/python3.9/site-packages/seaborn/_decorators.py:36: FutureWarn
ing: Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other argumen
ts without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



Findings

From the boxplot, there's dual seasonality of higher profits during the summer and at the end of the year. The highest profit in summer can be realized during the months of June and in November toward the winter months.

Recommendations

Microsoft should take into account the seasonality of profits and target movies to be released in May or June to ensure a higher likelihood of it being a hit.

Future Action

I should continue to track by genre what the best time is for a movie release, or examine the ROI for movies in certain genres.

Aspect II : What are the most well-liked genre on foreign language movies?

Turning to the genre and market of movies, there has been an increase recognition and market towards non-English films over the last years. In the event Microsoft decides to pursue the independent or film-right acquisition at festivals, this analysis would help in building confidence on how to select a genre type and whether it would be profitable.

For Non- English genres and popularity rating Explatory Data Analysis

In [33]:

```
files_dict.keys()
```

Out[33]:

```
dict_keys(['bom_movie_gross', 'tn_movie_budgets', 'tmdb_movies', 'rt_movie_i
nfo', 'rt_reviews'])
```

In [34]:

```
movie_basics = pd.read_sql("SELECT * FROM movie_basics;", conn)
movie_basics
```

Out[34]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genre
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Dram
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Dram
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Dram
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Dram
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantas
...	...	...	...	...	...	.
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Dram
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentar
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comed
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	Non
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentar

146144 rows × 6 columns

In [35]:

```
movie_basics['genre_lst'] = movie_basics['genres'].str.split(',')
```

In [36]:

```
movie_basics.head()
```

Out[36]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres	ge
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	[Bi
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	[C
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy	[C F

In [37]:

```
df_explode = movie_basics.explode('genre_lst')
```

In [38]:

```
df_explode['genre_lst'].value_counts()
```

Out[38]:

```
Documentary    51640
Drama          49883
Comedy         25312
Thriller       11883
Horror         10805
Action         10335
Romance         9372
Biography       8722
Crime           6753
Adventure       6465
Family          6227
History         6225
Mystery         4659
Music           4314
Fantasy         3516
Sci-Fi          3365
Animation       2799
Sport           2234
News            1551
Musical         1430
War             1405
Western          467
Reality-TV        98
Talk-Show         50
Adult             25
Short             11
Game-Show          4
Name: genre_lst, dtype: int64
```

In [39]:

```
df_explode.groupby('genre_lst').mean()['runtime_minutes']
```

Out[39]:

```
genre_lst
Action         100.019729
Adult           86.285714
Adventure       85.782404
Animation       80.674520
Biography       74.129960
Comedy          93.920165
Crime           95.508631
Documentary     72.107879
Drama           94.281372
Family          83.192047
Fantasy         91.918707
Game-Show      117.000000
History         78.756430
Horror          87.351383
Music           82.339474
Musical         95.423684
Mystery         93.233888
News            66.418635
Reality-TV      80.233333
Romance        100.219710
Sci-Fi          90.547855
Short           16.400000
Sport           80.939456
Talk-Show       86.736842
Thriller        94.351337
War             87.136697
Western        100.332474
Name: runtime_minutes, dtype: float64
```

Data Review

In [40]:

```
non_EN_popularity_df = files_dict['tmdb_movies']
```

In [41]:

```
non_EN_popularity_df.head()
```

Out[41]:

	genre_ids	id	original_language	original_title	popularity	release_date	title	vote_av
0	[12, 14, 10751]	12444	en	Harry Potter and the Deathly Hallows: Part 1	33.533	2010-11-19	Harry Potter and the Deathly Hallows: Part 1	
1	[14, 12, 16, 10751]	10191	en	How to Train Your Dragon	28.734	2010-03-26	How to Train Your Dragon	
2	[12, 28, 878]	10138	en	Iron Man 2	28.515	2010-05-07	Iron Man 2	
3	[16, 35, 10751]	862	en	Toy Story	28.005	1995-11-22	Toy Story	
4	[28, 878, 12]	27205	en	Inception	27.920	2010-07-16	Inception	

In [42]:

```
non_EN_popularity_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 26517 entries, 0 to 26516
Data columns (total 9 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   genre_ids          26517 non-null  object 
 1   id                 26517 non-null  int64  
 2   original_language  26517 non-null  object 
 3   original_title     26517 non-null  object 
 4   popularity         26517 non-null  float64
 5   release_date       26517 non-null  object 
 6   title              26517 non-null  object 
 7   vote_average       26517 non-null  float64
 8   vote_count         26517 non-null  int64  
dtypes: float64(2), int64(2), object(5)
memory usage: 2.0+ MB
```

In [43]:

```
non_en_movie_details_df = movie_basics.merge(non_EN_popularity_df,\
                                    left_on ='original_title',right_on='title',\
                                    how ='inner')
```

In [44]:

```
non_en_movie_details_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 21205 entries, 0 to 21204
Data columns (total 16 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   movie_id           21205 non-null  object 
 1   primary_title      21205 non-null  object 
 2   original_title_x   21205 non-null  object 
 3   start_year         21205 non-null  int64  
 4   runtime_minutes    19426 non-null  float64
 5   genres             20881 non-null  object 
 6   genre_lst          20881 non-null  object 
 7   genre_ids          21205 non-null  object 
 8   id                 21205 non-null  int64  
 9   original_language  21205 non-null  object 
 10  original_title_y   21205 non-null  object 
 11  popularity         21205 non-null  float64
 12  release_date       21205 non-null  object 
 13  title              21205 non-null  object 
 14  vote_average       21205 non-null  float64
 15  vote_count         21205 non-null  int64  
dtypes: float64(3), int64(3), object(10)
memory usage: 2.8+ MB
```

In [45]:

```
non_en_movie_details_df = non_en_movie_details_df \
                        [non_en_movie_details_df['original_language'] != 'en']
```

In [46]:

```
non_en_movie_details_df = non_en_movie_details_df[non_en_movie_details_df\
                        ['vote_count'] >= 100]
```

In [47]:

```
non_en_movie_details_df = non_en_movie_details_df.drop_duplicates\
                        (subset = 'id', keep = 'first')
```

In [48]:

```
non_en_movie_details_df.shape
```

Out[48]:

```
(148, 16)
```

In [49]:

```
non_en_movie_details_df['start_year'].min()
```

Out[49]:

```
2010
```

In [50]:

```
non_en_movie_details_df['start_year'].max()
```

Out[50]:

```
2020
```

In [51]:

```
table_test = movie_basics.merge(non_EN_popularity_df,\
                                    left_on ='original_title',right_on='title',\
                                    how ='inner')
```

In [52]:

```
table_test.drop(table_test[table_test['original_language'] == 'en'].index,
inplace = True)
```

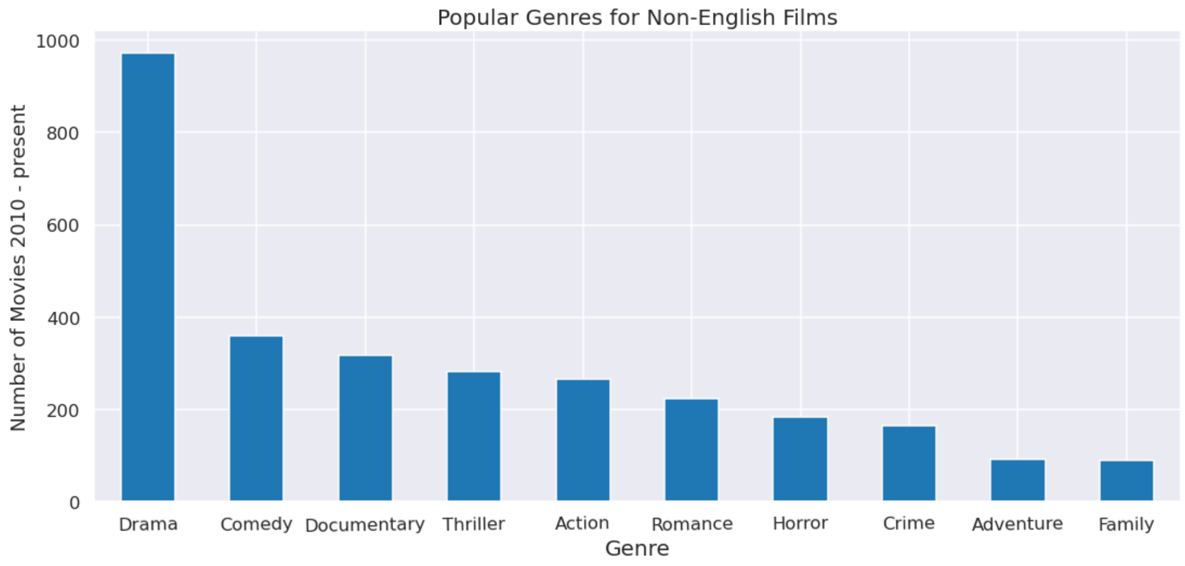
In [53]:

```
table_test = table_test.explode('genre_lst')
```

Data Visualization

In [54]:

```
#plotting a bar chart of genre and count dictionary
table_test['genre_lst'].value_counts()[:10].plot(kind = 'bar', figsize=(18, 8))
sns.axes_style('darkgrid')
sns.set_context('talk')
plt.title('Popular Genres for Non-English Films', fontsize=20);
plt.ylabel('Number of Movies 2010 - present', fontsize=18);
plt.xlabel('Genre', fontsize=20);
plt.xticks(rotation=1);
```



In [55]:

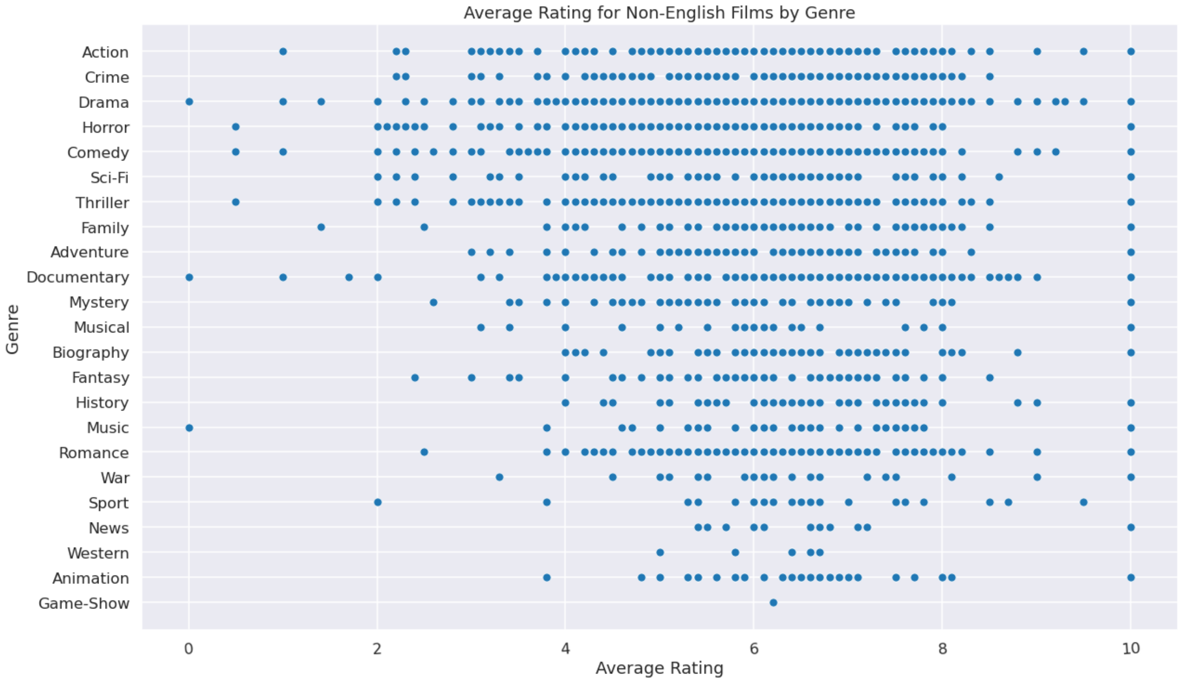
```
table_test3 = table_test.drop(['start_year', 'runtime_minutes', 'id', 'popularity', 'vote_c
```

In [56]:

```
#plot scatterplot of average voter rating of each movie by genre
rating_x = table_test['vote_average']
rating_y = table_test['genre_lst']

f, ax = plt.subplots(figsize=(20,12))
sns.set_style('darkgrid')
sns.set_context('talk')
sns.scatterplot(rating_x, rating_y)
plt.title('Average Rating for Non-English Films by Genre')
plt.xticks(rotation=4)
plt.ylabel('Genre')
plt.xlabel('Average Rating')
plt.show()
```

```
/opt/conda/lib/python3.9/site-packages/seaborn/_decorators.py:36: FutureWarn
ing: Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other argumen
ts without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [57]:

```
cur = conn.cursor()
```

In [58]:

```
cur.execute("""SELECT genre_lst,
           AVG(vote_average) AS genre_average,
           COUNT(genre_lst)AS number_films
           FROM non_en_movie_details
           GROUP BY genre_lst
           ORDER BY AVG(vote_average) DESC
           LIMIT 20;""")
genre_df=pd.DataFrame(cur.fetchall())
genre_df.columns = [i[0] for i in cur.description]
genre_df
```

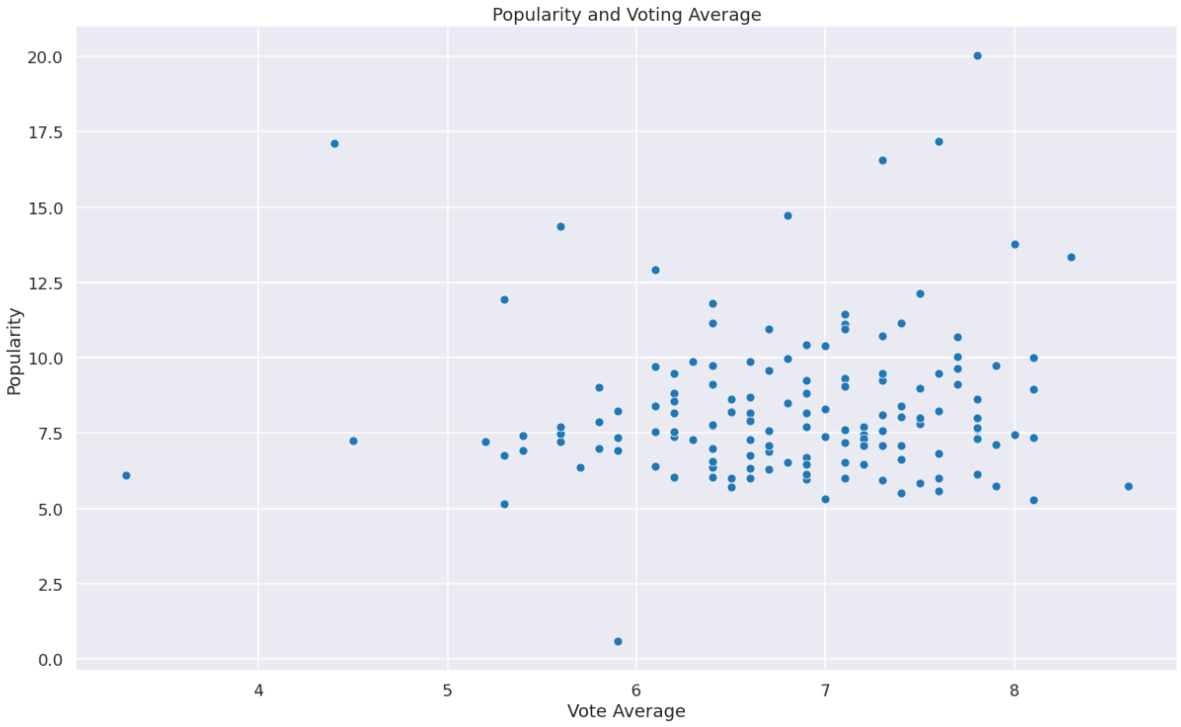
Out[58]:

	genre_lst	genre_average	number_films
0	History	6.769388	49
1	News	6.615385	13
2	Documentary	6.457098	317
3	Biography	6.431818	88
4	Animation	6.393182	44
5	Music	6.368519	54
6	Sport	6.333333	36
7	None	6.309756	0
8	Crime	6.307831	166
9	Drama	6.287037	972
10	War	6.282759	29
11	Family	6.281111	90
12	Romance	6.270852	223
13	Game-Show	6.200000	1
14	Western	6.185714	7
15	Mystery	6.116667	78
16	Action	6.102996	267
17	Comedy	6.046240	359
18	Adventure	5.993548	93
19	Fantasy	5.983333	72

In [59]:

```
#since we have a separate column on 'popularity' in addition to voting,
#plot the popularity against the vote average
#check correlation between vote average and popularity
popularity_and_voting_x = non_en_movie_details_df  ['vote_average']
popularity_and_voting_y  =   non_en_movie_details_df ['popularity']
f, ax = plt.subplots(figsize=(20,12))
sns.set_style('darkgrid')
sns.set_context('talk')
sns.scatterplot(popularity_and_voting_x,popularity_and_voting_y,)
plt.title('Popularity and Voting Average')
plt.xticks(rotation=4)
plt.ylabel('Popularity')
plt.xlabel('Vote Average')
plt.show()
```

```
/opt/conda/lib/python3.9/site-packages/seaborn/_decorators.py:36: FutureWarn
ing: Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other argumen
ts without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [60]:

```
# confirm there is no correlation between vote average and popularity
non_en_movie_details_df.corr()
```

Out[60]:

	start_year	runtime_minutes	id	popularity	vote_average	vote_count
start_year	1.000000	-0.054703	0.280687	0.024870	-0.106298	-0.123149
runtime_minutes	-0.054703	1.000000	0.033240	-0.152062	0.168227	-0.105931
id	0.280687	0.033240	1.000000	0.290735	-0.048454	-0.041259
popularity	0.024870	-0.152062	0.290735	1.000000	0.080619	0.457667
vote_average	-0.106298	0.168227	-0.048454	0.080619	1.000000	0.206017
vote_count	-0.123149	-0.105931	-0.041259	0.457667	0.206017	1.000000

Findings

Non- English Drama and Comedy are likely to attract more viewers.

Recommendations

If Microsoft Studio decides to go ahead with production and distribution of foreign films , drama and comedy would likely attact move viewers.

Future Action

Exploring further what foreign language films are appealing to moviegoers (and more profitable). We should also find additional sources to gauge moviegoer sentiment rather than the vore average and popularity from our dataset.

Aspect 3: What production budgets and the famous movie studios.

In [61]:

```
budgets_and_release_dates_df.head()
```

Out[61]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	movie_profit
id						
1	2009-12-18	Avatar	425000000	760507625	2776345279	2351345279
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	635063875
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	-200237650
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	1072413963
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	999721747

Reviewing the Box Office Magic, Rotten Tomatoes tables and our existing dataframe from the previous question to see which has the longest data set on studio information. We would like to determine which studios are releasing the most movies, and would like to compare the production budgets of those studios.

In [62]:

```
rt_studios_df = files_dict['rt_movie_info']
```

In [63]:

```
rt_studios_df['studio'].value_counts()
```

Out[63]:

```
Universal Pictures           35
Paramount Pictures           27
20th Century Fox             26
Sony Pictures Classics       22
Warner Bros. Pictures        21
                             ..
Orion Pictures Corporation    1
Factory 25                    1
A24 and DIRECTV               1
First Look Pictures           1
IDP Distribution              1
Name: studio, Length: 200, dtype: int64
```

In [64]:

```
bom_studios_df = files_dict['bom_movie_gross']
```

In [65]:

```
bom_studios_df.head()
```

Out[65]:

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

In [66]:

```
bom_studios_df.reset_index(inplace = True)
```

In [67]:

```
bom_studios_df.head()
```

Out[67]:

	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 [68]:

```
duplicate_bom_studios_df = bom_studios_df[bom_studios_df.duplicated()]
```

In [69]:

```
duplicate_bom_studios_df
```

Out[69]:

	title	studio	domestic_gross	foreign_gross	year

In [70]:

```
bom_studios_df['studio'].value_counts()
```

Out[70]:

```
IFC           166
Uni.          147
WB            140
Fox           136
Magn.         136
             ...
E1              1
PI              1
ELS             1
PalT            1
Synergetic      1
Name: studio, Length: 257, dtype: int64
```

Data Review

In [71]:

```
bom_studios_df['year'].min()
```

Out[71]:

```
2010
```

In [72]:

```
bom_studios_df['year'].max()
```

Out[72]:

```
2018
```

In [73]:

```
bom_studios_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3387 entries, 0 to 3386
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           3387 non-null   object 
 1   studio          3382 non-null   object 
 2   domestic_gross  3359 non-null   float64
 3   foreign_gross   2037 non-null   object 
 4   year            3387 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 132.4+ KB
```

In [74]:

```
top_studios_df = bom_studios_df['studio'].value_counts().reset_index()
top_studios_df.columns = ['studio', 'count']
```

In [75]:

```
top_studios_df = top_studios_df[top_studios_df['count'] >= 100]
```

In [76]:

```
bom_studios_df.reset_index(inplace = True)
```

In [77]:

```
bom_studios_df.index
```

Out[77]:

```
RangeIndex(start=0, stop=3387, step=1)
```

In [78]:

```
studio_budget_details_df = pd.merge(bom_studios_df,\
                                    budgets_and_release_dates_df,\
                                    left_on='title', right_on='movie',\
                                    how = 'inner')
```

In [79]:

```
studio_budget_details_df
```

Out[79]:

	index	title	studio	domestic_gross_x	foreign_gross	year	release_date	movie
0	0	Toy Story 3	BV	415000000.0	652000000	2010	2010-06-18	Toy Story 3
1	3	Inception	WB	292600000.0	535700000	2010	2010-07-16	Inception
2	4	Shrek Forever After	P/DW	238700000.0	513900000	2010	2010-05-21	Shrek Forever After
3	5	The Twilight Saga: Eclipse	Sum.	300500000.0	398000000	2010	2010-06-30	The Twilight Saga: Eclipse
4	6	Iron Man 2	Par.	312400000.0	311500000	2010	2010-05-07	Iron Man 2
...	...	...	...	...	...	...	...	...
1242	3253	Gotti	VE	4300000.0	NaN	2018	2018-06-15	Gotti
1243	3259	Ben is Back	RAtt.	3700000.0	NaN	2018	2018-12-07	Ben is Back
1244	3271	Bilal: A New Breed of Hero	VE	491000.0	1700000	2018	2018-02-02	Bilal: A New Breed of Hero
1245	3279	Mandy	RLJ	1200000.0	NaN	2018	2018-09-14	Mandy
1246	3281	Lean on Pete	A24	1200000.0	NaN	2018	2018-04-06	Lean on Pete

1247 rows × 13 columns

In [80]:

```
studio_budget_year_df = studio_budget_details_df.groupby(['studio', 'year'],\
                        as_index = False)['production_budget'].sum()
```

In [81]:

```
studio_budget_year_df.head()
```

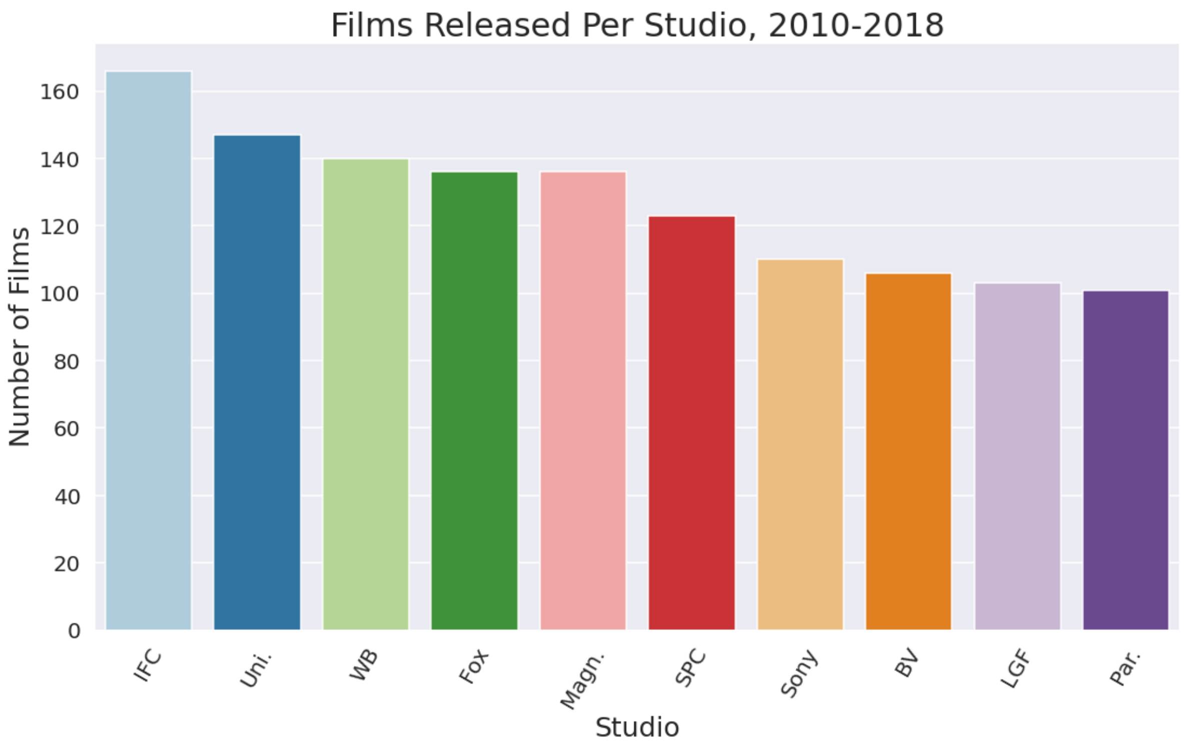
Out[81]:

	studio	year	production_budget
0	3D	2010	5000000
1	A24	2013	7500000
2	A24	2014	34500000
3	A24	2015	36000000
4	A24	2016	15000000

In [82]:

```
studios_x = top_studios_df['studio']
studios_y = top_studios_df['count']
f, ax = plt.subplots(figsize=(18,10))
sns.set_style('darkgrid')
sns.set_context('talk')
sns.barplot(studios_x, studios_y, palette='Paired')
plt.title('Films Released Per Studio, 2010-2018', fontsize=30)
plt.xticks(rotation=60, fontsize=20)
plt.yticks(fontsize=20)
plt.ylabel('Number of Films', fontsize = 25)
plt.xlabel('Studio', fontsize = 25)
plt.show()
```

```
/opt/conda/lib/python3.9/site-packages/seaborn/_decorators.py:36: FutureWarn
ing: Pass the following variables as keyword args: x, y. From version 0.12,
the only valid positional argument will be `data`, and passing other argumen
ts without an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [83]:

```
top_studios_df
```

Out[83]:

	studio	count
0	IFC	166
1	Uni.	147
2	WB	140
3	Fox	136
4	Magn.	136
5	SPC	123
6	Sony	110
7	BV	106
8	LGF	103
9	Par.	101

In [84]:

```
studio_list = top_studios_df['studio'].tolist()
```

In [85]:

```
studio_list
```

Out[85]:

```
['IFC', 'Uni.', 'WB', 'Fox', 'Magn.', 'SPC', 'Sony', 'BV', 'LGF', 'Par.']
```

In [86]:

```
studio_budget_year_df.studio.unique()
```

Out[86]:

```
array(['3D', 'A24', 'ALP', 'ATO', 'Affirm', 'Alc', 'Amazon', 'Anch.',
       'Annapurna', 'App.', 'BBC', 'BG', 'BH Tilt', 'BSC', 'BST', 'BV',
       'CBS', 'CE', 'CJ', 'Cleopatra', 'Cohen', 'DR', 'Drft.', 'EC',
       'ELS', 'ENTMP', 'EOne', 'Eros', 'FCW', 'FD', 'First', 'Focus',
       'Fox', 'FoxS', 'Free', 'GK', 'Global Road', 'Gold.', 'GrtIndia',
       'IFC', 'IM', 'IVP', 'IW', 'Jan.', 'KE', 'Kino', 'LD', 'LG/S',
       'LGF', 'LGP', 'MBox', 'MGM', 'MNE', 'Magn.', 'Mira.', 'Mont.',
       'NFC', 'NM', 'Neon', 'OMNI/FSR', 'ORF', 'Orch.', 'Osci.', 'Over.',
       'P/DW', 'P4', 'PFR', 'PH', 'PNT', 'Par.', 'ParV', 'RAtt.', 'RLJ',
       'RTWC', 'Rela.', 'Relbig.', 'SGem', 'SMod', 'SPC', 'STX', 'Saban',
       'Scre.', 'Sony', 'Strand', 'Studio 8', 'Sum.', 'TFA', 'TriS',
       'Trib.', 'UTV', 'Uni.', 'VE', 'Viv.', 'W/Dim.', 'WB', 'WB (NL)',
       'WHE', 'Wein.', 'Yash'], dtype=object)
```

In [87]:

```
top_10_studios_df = studio_budget_year_df[studio_budget_year_df['studio']\
                                          .isin(studio_list)]

top_10_studios_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 84 entries, 30 to 278
Data columns (total 3 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   studio             84 non-null     object
 1   year               84 non-null     int64 
 2   production_budget  84 non-null     int64 
dtypes: int64(2), object(1)
memory usage: 2.6+ KB
```

In [88]:

```
top_10_studios_df.studio.unique()
```

Out[88]:

```
array(['BV', 'Fox', 'IFC', 'LGF', 'Magn.', 'Par.', 'SPC', 'Sony', 'Uni.',
       'WB'], dtype=object)
```

In [89]:

```
cur.execute("""SELECT studio,
            AVG(production_budget) AS avg_yrly_budget
            FROM top_10_studios
            GROUP BY studio
            ORDER BY avg_yrly_budget DESC;""")
yrly_budget_df = pd.DataFrame(cur.fetchall())
yrly_budget_df.columns = [i[0] for i in cur.description]
yrly_budget_df
```

Out[89]:

	studio	avg_yrly_budget
0	BV	1.050089e+09
1	WB	9.108556e+08
2	Fox	8.617222e+08
3	Uni.	7.330778e+08
4	Sony	5.611667e+08
5	Par.	5.300000e+08
6	LGF	2.299320e+08
7	SPC	4.437000e+07
8	IFC	3.875250e+07
9	Magn.	2.522000e+07

In [90]:

```
grouped_studios_df = top_10_studios_df.groupby('studio')
```

In [91]:

```
grouped_studios_df.head()
```

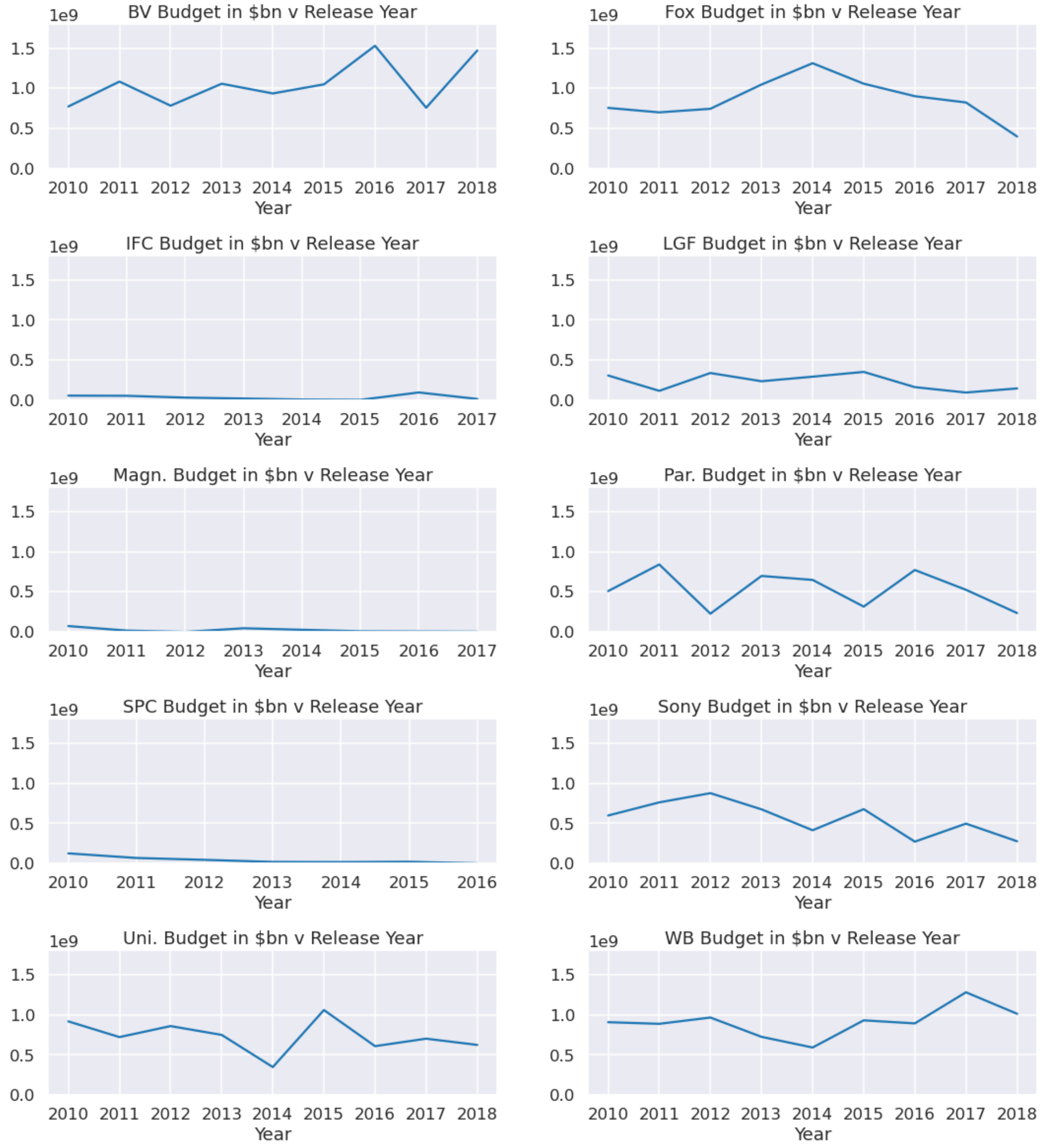
Out[91]:

	studio	year	production_budget
30	BV	2010	775000000
31	BV	2011	1084600000
32	BV	2012	785000000
33	BV	2013	1058000000
34	BV	2014	937200000
77	Fox	2010	757500000
78	Fox	2011	702000000
79	Fox	2012	746500000
80	Fox	2013	1048000000
81	Fox	2014	1313000000
104	IFC	2010	59450000
105	IFC	2011	57500000
106	IFC	2012	34820000
107	IFC	2013	23250000
108	IFC	2014	11000000
126	LGF	2010	309787650
127	LGF	2011	119100000
128	LGF	2012	340500000
129	LGF	2013	238500000
130	LGF	2014	295000000
142	Magn.	2010	74000000
143	Magn.	2011	17400000
144	Magn.	2012	1020000
145	Magn.	2013	46500000
146	Magn.	2015	9000000
172	Par.	2010	509000000
173	Par.	2011	840000000
174	Par.	2012	228000000
175	Par.	2013	697000000
176	Par.	2014	648000000
216	SPC	2010	127200000
217	SPC	2011	70150000
218	SPC	2012	47040000
219	SPC	2013	21000000

	studio	year	production_budget
220	SPC	2014	19000000
228	Sony	2010	598000000
229	Sony	2011	761500000
230	Sony	2012	876000000
231	Sony	2013	675000000
232	Sony	2014	415000000
253	Uni.	2010	918000000
254	Uni.	2011	722700000
255	Uni.	2012	859500000
256	Uni.	2013	750000000
257	Uni.	2014	350000000
270	WB	2010	908000000
271	WB	2011	887700000
272	WB	2012	966000000
273	WB	2013	726000000
274	WB	2014	593000000

In [92]:

```
plt.figure(figsize=(18,20))
for index, (studio, production_budget) in enumerate(grouped_studios_df):
    ax = plt.subplot(5, 2, index+1)
    production_budget.plot(x='year', y='production_budget', ax=ax, legend=False)
    ax.set_title(studio + ' Budget in $bn v Release Year', loc='center')
    ax.set_xlabel('Year')
    ax.set_ylim(0, 1800000000)
plt.subplots_adjust(hspace = .6)
```



Findings

The major film studios,(Warner Bros, Universal, Paramount, Fox and BV) as presumed, regularly has the highest annual production budgets (of approx. $1bn) than smaller independent distributors (such as Sony Pictures Classic, Magnolia Studios and IFC) that acquire and distributed films

Recommendations

Microsoft should consider the prospect of attaching its name to film acquisition and distribution rather than original production. As these lower budget movies still made it to top 10 together with the major film, it might be an appropriate model to enter the industry.

Future Action

In order to get a sense of possibility, we will need to gauge the actual profitability of the acquisition and distribution model as compared to original production model.

Conclusion

From the above analysis, I can conclude by summarizing our findings and recommend the following:

I recommend launching into the movie industry through an acquisition/distribution model as more top movies can be produced at a lower budget than producing an original movie as major film studios do. Although there is wide variety of popular genre in foreign language film, I recommend choosing Drama or Comedy genre if the business decides to go with a foreign language film production or distribution. I would recommend planning for movie releases towards the summer or at the end of the year. It is important to point out that the month of June has recorded both huge profits and huge losses too.

In [93]:

```
conn.close()
```