Analysis of Genres Vs. Box Office and Profitability

In [1]:
```
# import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# sets the display of float variables so they are not in
# scientific notation
pd.options.display.float_format = '{:.2f}'.format
```

In [2]:
```
# entering color palet for visuals
MIC_OR = '#F25022'
MIC_GR = '#7FBA00'
MIC_BL = '#00A4EF'
MIC_YL = '#FFB900'
MIC_GY = '#737373'

microsoft_color_list = [MIC_OR, MIC_GR, MIC_BL, MIC_YL, MIC_GY]

plt.rcParams['axes.prop_cycle'] = plt.cycler(color=microsoft_color_list)
```

In [3]:
```
!ls
```

```
RT.ipynb
all_data_copy.ipynb
all_data_preparation.ipynb
budget_v_profit.ipynb
data_preparation.ipynb
genre_v_boxoffice.ipynb
genre_v_budget.ipynb
imdb_first_look.ipynb
talent_v_revenue.ipynb
the_movies_db_api.ipynb
```

In [4]:
```
# load in the datasets
df_all_data = pd.read_csv('../data/all_data.csv', index_col=0)
df_movie_info = pd.read_csv('../data/movie_info_budget.csv', index_col=0)
```

Now it's time to take a look at both data frames

In [5]:
```
print(df_all_data.shape)
df_all_data.head(10)
```

```
(34033, 23)
```

Out[5]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
0	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
1	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
2	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
3	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
4	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
5	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
6	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
7	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
8	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
9	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813

10 rows × 23 columns

In [6]:
```
print(df_movie_info.shape)
df_movie_info.head(10)
```

```
(12689, 16)
```

Out[6]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
0	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
1	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
2	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
3	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
4	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
5	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
6	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
7	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
8	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
9	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813

df_all_data will allow me to look at the individual genres and how they performed against box office and profitability

In [7]:
```
# take a look at the columns
df_all_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 34033 entries, 0 to 34032
Data columns (total 23 columns):
 #   Column                 Non-Null Count  Dtype  
---  ------                 --------------  -----  
 0   movie_id               34033 non-null  object 
 1   primary_title          34033 non-null  object 
 2   original_title         34033 non-null  object 
 3   start_year             34033 non-null  int64  
 4   genres                 34033 non-null  object 
 5   average_rating         34033 non-null  float64
 6   num_votes              34033 non-null  int64  
 7   persons_name           34033 non-null  object 
 8   persons_job            34033 non-null  object 
 9   title_norm_movie_info  34033 non-null  object 
 10  id                     34033 non-null  int64  
 11  release_date           34033 non-null  object 
 12  movie                  34033 non-null  object 
 13  production_budget      34033 non-null  int64  
 14  domestic_gross         34033 non-null  int64  
 15  worldwide_gross        34033 non-null  int64  
 16  title_norm_genre_long  34033 non-null  object 
 17  genre                  34033 non-null  object 
 18  new_budget_api         34033 non-null  float64
 19  new_ww_revenue_api     34033 non-null  float64
 20  imdb_id                34033 non-null  object 
 21  vote_average           34033 non-null  float64
 22  vote_count             34033 non-null  float64
dtypes: float64(5), int64(6), object(12)
memory usage: 6.2+ MB
```

In [8]:
```
df_all_data['new_ww_revenue_api'].value_counts()
```

Out[8]:
```
0.00            3326
158162788.00      60
432844677.00      60
3020664.00        60
14618727.00       60
                ...
21164799.00        7
34522221.00        6
```

```
61700416.00        6
111300.00          4
7972967.00         4
Name: new_ww_revenue_api, Length: 1115, dtype: int64
```

In [9]:
```
df_all_data.loc[df_all_data['new_ww_revenue_api'] == 0]
```

Out[9]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
30	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
31	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
32	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
33	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
34	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
...	...	...	...	...	...	...	...
33911	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33912	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33913	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33914	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33915	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683

3326 rows × 23 columns

In [10]:
```
df_all_data['worldwide_gross'].value_counts()
```

Out[10]:
```
0            1313
14618727       60
81831866       60
652127828      60
532938302      60
             ...
433588          6
1109276         4
9082906         4
6653715         3
8374            1
Name: worldwide_gross, Length: 1213, dtype: int64
```

Important to note that the new_ww_revenue_api has the latest numbers for worldwide revenue but there are more 0 values than the old worldwide_gross. So I will create a new column 'worldwide_gross_final' the will use the 'worldwide_gross' value if the 'new_ww_revenue_api' is equal to 0.

In [11]:
```
# creating new 'worldwide_gross_final' column
df_all_data['worldwide_gross_final'] = np.where(df_all_data['new_ww_revenue_api'] == 0,
```

```
                                        df_all_data['worldwide_gross'],
                                        df_all_data['new_ww_revenue_api'])
```

In [12]:
```
# check out the new column. it looks good
df_all_data
```

Out[12]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_v
0	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	35
1	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	35
2	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	35
3	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	35
4	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	35
...	...	...	...	...	...	...	
34028	tt3829266	The Predator	The Predator	2018	Action,Adventure,Sci-Fi	5.40	9
34029	tt3829266	The Predator	The Predator	2018	Action,Adventure,Sci-Fi	5.40	9
34030	tt3829266	The Predator	The Predator	2018	Action,Adventure,Sci-Fi	5.40	9
34031	tt3829266	The Predator	The Predator	2018	Action,Adventure,Sci-Fi	5.40	9
34032	tt3829266	The Predator	The Predator	2018	Action,Adventure,Sci-Fi	5.40	9

34033 rows × 24 columns

In [13]:
```
# taking a closer look at new column if it worked where
# there are 0s in ww_new_revenue_api
df_all_data.loc[df_all_data['new_ww_revenue_api'] == 0]
```

Out[13]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
30	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
31	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
32	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
33	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
34	tt2049386	Alice in Wonderland	Alice in Wonderland	2010	Fantasy,Singing	6.50	6
...	...	...	...	...	...	...	...
33911	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33912	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33913	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33914	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683
33915	tt7137380	Destroyer	Destroyer	2018	Action,Crime,Drama	6.20	13683

3326 rows × 24 columns

Now I'll do the same thing for the budgets of the movie

In [14]:
```
df_all_data['new_budget_api'].value_counts()
```

Out[14]:
```
0.00           2297
40000000.00    1267
20000000.00    1199
30000000.00    1194
35000000.00    1149
               ...
150000.00         9
1900000.00        8
5000.00           8
600000.00         8
225000.00         4
Name: new_budget_api, Length: 205, dtype: int64
```

In [15]:
```
df_all_data['production_budget'].value_counts()
```

Out[15]:
```
20000000    1448
40000000    1307
10000000    1220
35000000    1110
30000000    1108
            ...
42000          8
45000          7
2900000        7
400000         6
225000         4
Name: production_budget, Length: 228, dtype: int64
```

'new_budget_api' has the updated budgets so if these are 0 I will replace them with the 'production_budget' value

I will create a new column 'budget_final'

In [16]:
```
# creating the final budget column
df_all_data['budget_final'] = np.where(df_all_data['new_budget_api'] == 0,
                                       df_all_data['production_budget'],
                                       df_all_data['new_budget_api'])
```

In [17]:
```
# taking a look at the new column
df_all_data[['movie_id', 'production_budget', 'new_budget_api', 'budget_final']]\
    .loc[df_all_data['new_budget_api'] == 0]
```

Out[17]:

	movie_id	production_budget	new_budget_api	budget_final
30	tt2049386	200000000	0.00	200000000.00
31	tt2049386	200000000	0.00	200000000.00
32	tt2049386	200000000	0.00	200000000.00
33	tt2049386	200000000	0.00	200000000.00
34	tt2049386	200000000	0.00	200000000.00
...	...	...	...	...
33375	tt6182908	80000000	0.00	80000000.00
33376	tt6182908	80000000	0.00	80000000.00
33377	tt6182908	80000000	0.00	80000000.00
33378	tt6182908	80000000	0.00	80000000.00
33379	tt6182908	80000000	0.00	80000000.00

2297 rows × 4 columns

I'll add a profitability column that will show the difference between worldwide gross and production budget.

NOTE: Microsoft is a large enough company where they may want to distribute large movies worldwide. This is why I'll gauge profitability based off (worldwide_gross_final - budget_final) rather than (domestic_gross - budget_final)

In [18]:
```
# add profitability column to df_all_data
df_all_data['profitability'] = df_all_data['worldwide_gross_final'] - df_all_data['budg
```

In [19]:
```
# take a look at the new column
df_all_data.head()
```

Out[19]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
0	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
1	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
2	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
3	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813
4	tt1014759	Alice in Wonderland	Alice in Wonderland	2010	Adventure,Family,Fantasy	6.50	358813

5 rows × 26 columns

We don't need the person's name, ratings, and etc.. Only columns we need are ['movie_id', 'genre', 'primary_title', 'budget_final', 'domestic_gross', 'worldwide_gross_final']

Now I need to group by the dataframe in order to get the genres and gross associated with the movie_id. Then from there I can do a final group by to find the average of each genre.

In [20]:
```
# we only need the relevant columns for our analysis
relevant_columns = ['movie_id',
                    'genre',
                    'primary_title',
                    'budget_final',
                    'domestic_gross',
                    'worldwide_gross_final',
                    'profitability']
df_all_filtered = df_all_data[relevant_columns].groupby(['movie_id','genre']).mean().re
```

In [21]:
```
df_all_filtered
```

Out[21]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
0	tt0249516	Action	65000000.00	0	73706.00	-64926294.00
1	tt0249516	Animation	65000000.00	0	73706.00	-64926294.00
2	tt0249516	Comedy	65000000.00	0	73706.00	-64926294.00
3	tt0359950	Adventure	90000000.00	58236838	188133322.00	98133322.00
4	tt0359950	Comedy	90000000.00	58236838	188133322.00	98133322.00
...	...	...	...	...	...	...
3308	tt7784604	Mystery	10000000.00	44069456	80239658.00	70239658.00
3309	tt7959026	Crime	50000000.00	103804407	174804407.00	124804407.00
3310	tt7959026	Drama	50000000.00	103804407	174804407.00	124804407.00
3311	tt7959026	Thriller	50000000.00	103804407	174804407.00	124804407.00
3312	tt8632862	Documentary	5000000.00	6352306	6653715.00	1653715.00

3313 rows × 6 columns

In [22]:
```
df_all_filtered['worldwide_gross_final'].value_counts()
```

Out[22]:
```
0.00           143
10062896.00      6
76196538.00      5
64780213.00      5
260502115.00     3
                ...
7240000.00       1
223652.00        1
101758490.00     1
2368060.00       1
```

```
32438988.00       1
Name: worldwide_gross_final, Length: 1216, dtype: int64
```

It seems there are a good amount of 0s in the dataframe for worldwide_gross_final

I'll explore these 0s as they might skew the average gross/profitability for the genres. The 0s in the worldwide gross could mean these movies were not released interanationally or they were only released on streaming applications.

In [23]:
```
# first filter the data set by worldwide_gross_final == 0
df_all_filtered.loc[df_all_filtered['worldwide_gross_final'] == 0]
```

Out[23]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
16	tt0393049	Comedy	300000.00	0	0.00	-300000.00
17	tt0393049	Drama	300000.00	0	0.00	-300000.00
18	tt0393049	Romance	300000.00	0	0.00	-300000.00
66	tt0464054	Horror	1400000.00	0	0.00	-1400000.00
67	tt0464054	Thriller	1400000.00	0	0.00	-1400000.00
...	...	...	...	...	...	...
3089	tt5022702	Thriller	1000000.00	0	0.00	-1000000.00
3116	tt5127300	Horror	18000000.00	0	0.00	-18000000.00
3150	tt5519340	Action	90000000.00	0	0.00	-90000000.00
3151	tt5519340	Crime	90000000.00	0	0.00	-90000000.00
3152	tt5519340	Fantasy	90000000.00	0	0.00	-90000000.00

143 rows × 6 columns

In [24]:
```
# cross reference movie_id into the df_all_data dataframe
df_all_data.loc[df_all_data['movie_id'] == 'tt5519340']
```

Out[24]:

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
30393	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30394	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30395	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30396	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30397	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30398	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30399	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30400	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30401	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30402	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834

	movie_id	primary_title	original_title	start_year	genres	average_rating	num_votes
30403	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30404	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30405	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30406	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30407	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30408	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30409	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30410	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30411	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30412	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30413	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30414	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30415	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30416	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30417	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30418	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30419	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30420	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30421	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834
30422	tt5519340	Bright	Bright	2017	Action,Crime,Fantasy	6.40	147834

30 rows × 26 columns

This movie went to straight to netlfix so it does not have a worldwide gross. I'll drop the zeros from this column and dataframe because Microsoft does not have a streaming platform and they might want to focus on how well movies did at the box office. There are only 143 0s in the dataset so I don't believe this will have much affect on the dataset.

In [25]:
```
df_all_filtered = df_all_filtered.loc[df_all_filtered['worldwide_gross_final'] != 0]
```

Now I can group the dataframe on genre one more time to get the average budget, domestic gross, worldwide gross, and profitability for each genre.

In [26]:
```
genre_numbers = df_all_filtered.groupby('genre').mean().reset_index()
```

In [27]:
```
# this will show the number of observations for each genre
genre_numbers_count = df_all_filtered.groupby('genre').count().reset_index()
genre_numbers_count.sort_values('movie_id', ascending=False)
```

Out[27]:

	genre	movie_id	budget_final	domestic_gross	worldwide_gross_final	profitability
7	Drama	572	572	572	572	572
4	Comedy	452	452	452	452	452
0	Action	381	381	381	381	381
1	Adventure	315	315	315	315	315
18	Thriller	209	209	209	209	209
5	Crime	191	191	191	191	191
14	Romance	162	162	162	162	162
11	Horror	130	130	130	130	130
15	Sci-Fi	113	113	113	113	113
9	Fantasy	111	111	111	111	111
13	Mystery	106	106	106	106	106
3	Biography	105	105	105	105	105
2	Animation	92	92	92	92	92
8	Family	77	77	77	77	77
12	Music	45	45	45	45	45
10	History	28	28	28	28	28
17	Sport	27	27	27	27	27
6	Documentary	21	21	21	21	21
19	War	16	16	16	16	16
20	Western	9	9	9	9	9
16	Singing	8	8	8	8	8

NOTE: A sample size of less than 30 may be too small for significant results. I'll create a new dataframe without genres with less than 30 observations

In [28]:
```
# take a look at the new dataset
genre_numbers
```

Out[28]:

	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
0	Action	85857217.86	98583883.77	267789354.40	181932136.54
1	Adventure	111359365.09	134049026.22	376202117.43	264842752.34
2	Animation	101782608.70	147567057.25	403221263.11	301438654.41
3	Biography	28255905.71	47558662.94	95339849.15	67083943.44
4	Comedy	44362157.58	66533610.71	148853000.94	104490843.36
5	Crime	35279359.61	43382116.07	92288669.69	57009310.08
6	Documentary	4586909.52	16356465.71	20320595.81	15733686.29

	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
7	Drama	29713567.94	40308823.51	86434153.23	56720585.30
8	Family	74175324.68	90405208.36	221209669.44	147034344.77
9	Fantasy	90816222.07	91436305.47	264125704.54	173309482.47
10	History	39875000.00	55629164.93	116698033.96	76823033.96
11	Horror	21265274.23	38370353.99	83872439.85	62607165.62
12	Music	18280002.22	40663761.31	86969873.44	68689871.22
13	Mystery	26928915.09	43730092.18	102412699.58	75483784.49
14	Romance	22655000.09	38759542.08	77757967.34	55102967.25
15	Sci-Fi	102600000.03	141090297.65	387790263.06	285190263.04
16	Singing	73006250.00	136402399.50	358938989.88	285932739.88
17	Sport	24785185.19	37425999.67	48901150.70	24115965.52
18	Thriller	36593899.52	51212708.88	132880251.42	96286351.90
19	War	27593750.00	25278345.50	59763013.56	32169263.56
20	Western	61033333.33	63729964.67	134439442.89	73406109.56

I'll add a ROI (return on investment column) which will be (profitability / budget_final) * 100

In [29]:
```
genre_numbers['roi_%'] = (genre_numbers['profitability'] / genre_numbers['budget_final'
```

In [30]:
```
genre_numbers
```

Out[30]:

	genre	budget_final	domestic_gross	worldwide_gross_final	profitability	roi_%
0	Action	85857217.86	98583883.77	267789354.40	181932136.54	2.12
1	Adventure	111359365.09	134049026.22	376202117.43	264842752.34	2.38
2	Animation	101782608.70	147567057.25	403221263.11	301438654.41	2.96
3	Biography	28255905.71	47558662.94	95339849.15	67083943.44	2.37
4	Comedy	44362157.58	66533610.71	148853000.94	104490843.36	2.36
5	Crime	35279359.61	43382116.07	92288669.69	57009310.08	1.62
6	Documentary	4586909.52	16356465.71	20320595.81	15733686.29	3.43
7	Drama	29713567.94	40308823.51	86434153.23	56720585.30	1.91
8	Family	74175324.68	90405208.36	221209669.44	147034344.77	1.98
9	Fantasy	90816222.07	91436305.47	264125704.54	173309482.47	1.91
10	History	39875000.00	55629164.93	116698033.96	76823033.96	1.93
11	Horror	21265274.23	38370353.99	83872439.85	62607165.62	2.94
12	Music	18280002.22	40663761.31	86969873.44	68689871.22	3.76
13	Mystery	26928915.09	43730092.18	102412699.58	75483784.49	2.80

	genre	budget_final	domestic_gross	worldwide_gross_final	profitability	roi_%
14	Romance	22655000.09	38759542.08	77757967.34	55102967.25	2.43
15	Sci-Fi	102600000.03	141090297.65	387790263.06	285190263.04	2.78
16	Singing	73006250.00	136402399.50	358938989.88	285932739.88	3.92
17	Sport	24785185.19	37425999.67	48901150.70	24115965.52	0.97
18	Thriller	36593899.52	51212708.88	132880251.42	96286351.90	2.63
19	War	27593750.00	25278345.50	59763013.56	32169263.56	1.17
20	Western	61033333.33	63729964.67	134439442.89	73406109.56	1.20

Visualizing genre_numbers Dataframe

First I'll visualize worldwide_gross_final

In [31]:
```
worldwide_gross = genre_numbers[['genre', 'worldwide_gross_final']]
```

In [32]:
```
worldwide_gross.sort_values('worldwide_gross_final', ascending=False)
```

Out[32]:

	genre	worldwide_gross_final
2	Animation	403221263.11
15	Sci-Fi	387790263.06
1	Adventure	376202117.43
16	Singing	358938989.88
0	Action	267789354.40
9	Fantasy	264125704.54
8	Family	221209669.44
4	Comedy	148853000.94
20	Western	134439442.89
18	Thriller	132880251.42
10	History	116698033.96
13	Mystery	102412699.58
3	Biography	95339849.15
5	Crime	92288669.69
12	Music	86969873.44
7	Drama	86434153.23
11	Horror	83872439.85
14	Romance	77757967.34
19	War	59763013.56

	genre	worldwide_gross_final
17	Sport	48901150.70
6	Documentary	20320595.81

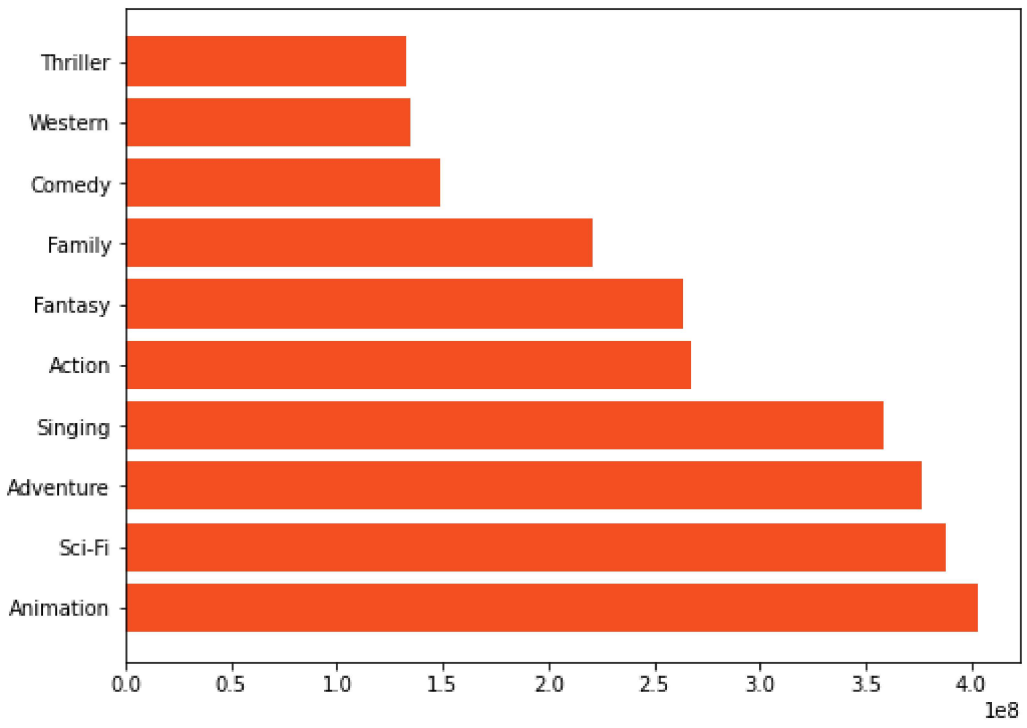
Visualize the top 10 genres by worldwide gross

In [33]:
```
# top 10 genres by worldwide gross
ww_top_10 = worldwide_gross.nlargest(10, columns='worldwide_gross_final')
print(ww_top_10)
```

```
        genre  worldwide_gross_final
2   Animation           403221263.11
15     Sci-Fi           387790263.06
1   Adventure           376202117.43
16    Singing           358938989.88
0      Action           267789354.40
9     Fantasy           264125704.54
8      Family           221209669.44
4      Comedy           148853000.94
20    Western           134439442.89
18   Thriller           132880251.42
```

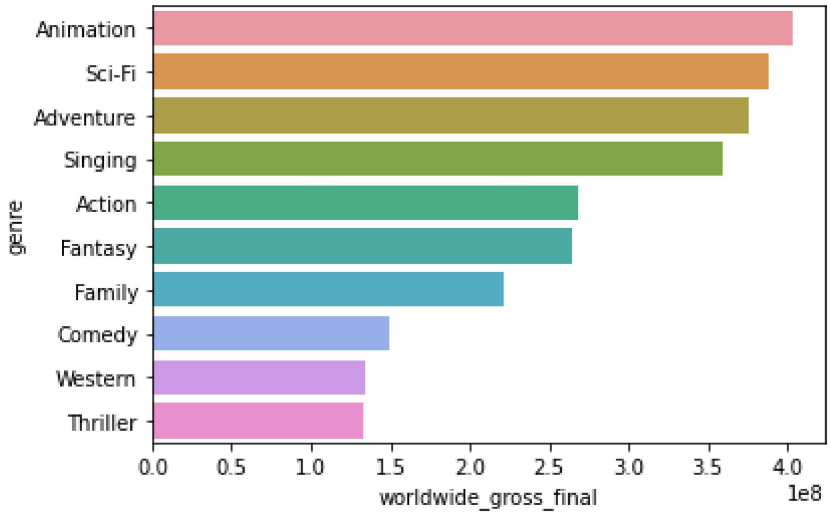
In [34]:
```
# plotting those values in a horizontal bar chart
fig, ax = plt.subplots(figsize=(8,6))

# horizontal bar chart
ax.barh(y=ww_top_10['genre'], width=ww_top_10['worldwide_gross_final']);
```



In [35]:
```
# Plotting it with seaborn
```

In [36]:
```
sns.barplot(data=ww_top_10, y='genre', x='worldwide_gross_final', orient='h');
```



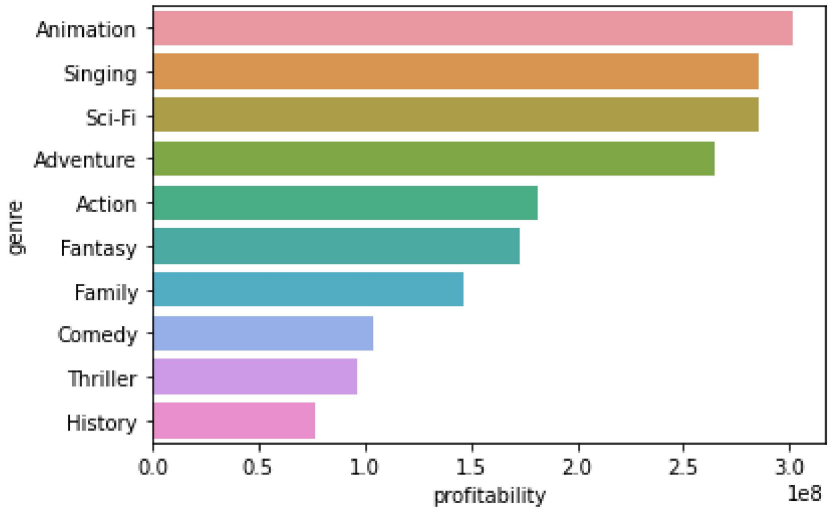
Next is profitability

In [37]:
```
profit_top_10 = genre_numbers[['genre', 'profitability']].nlargest(10,'profitability')
profit_top_10
```

Out[37]:

	genre	profitability
2	Animation	301438654.41
16	Singing	285932739.88
15	Sci-Fi	285190263.04
1	Adventure	264842752.34
0	Action	181932136.54
9	Fantasy	173309482.47
8	Family	147034344.77
4	Comedy	104490843.36
18	Thriller	96286351.90
10	History	76823033.96

In [38]:
```
# Plotting a horizontal bar chart
sns.barplot(data=profit_top_10, y='genre', x='profitability', orient='h');
```



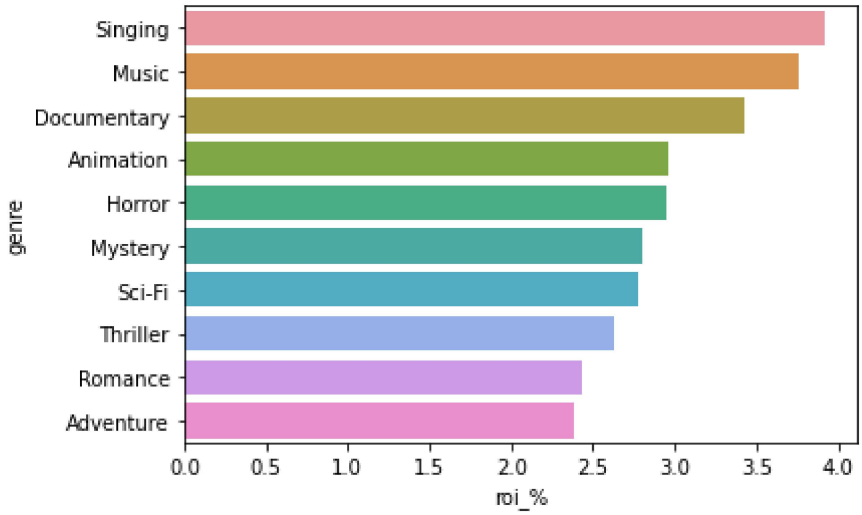
Next Plotting Return on Investment

In [39]:
```
roi_top_10 = genre_numbers[['genre', 'roi_%']].nlargest(10,'roi_%')
roi_top_10
```

Out[39]:

	genre	roi_%
16	Singing	3.92
12	Music	3.76
6	Documentary	3.43
2	Animation	2.96
11	Horror	2.94
13	Mystery	2.80
15	Sci-Fi	2.78
18	Thriller	2.63
14	Romance	2.43
1	Adventure	2.38

In [40]:
```
# Plotting on a horizontal bar chart
sns.barplot(data=roi_top_10, y='genre', x='roi_%', orient='h');
```



In [41]:
```
# this will show the number of observations for each genre
genre_numbers_count = df_all_filtered.groupby('genre').count().reset_index()
genre_numbers_count.sort_values('movie_id', ascending=False)
```

Out[41]:

	genre	movie_id	budget_final	domestic_gross	worldwide_gross_final	profitability
7	Drama	572	572	572	572	572
4	Comedy	452	452	452	452	452
0	Action	381	381	381	381	381
1	Adventure	315	315	315	315	315
18	Thriller	209	209	209	209	209
5	Crime	191	191	191	191	191
14	Romance	162	162	162	162	162
11	Horror	130	130	130	130	130
15	Sci-Fi	113	113	113	113	113
9	Fantasy	111	111	111	111	111
13	Mystery	106	106	106	106	106
3	Biography	105	105	105	105	105
2	Animation	92	92	92	92	92
8	Family	77	77	77	77	77
12	Music	45	45	45	45	45
10	History	28	28	28	28	28
17	Sport	27	27	27	27	27
6	Documentary	21	21	21	21	21
19	War	16	16	16	16	16
20	Western	9	9	9	9	9
16	Singing	8	8	8	8	8

NOTE: A sample size of less than 30 may be too small for significant results. I'll create a new dataframe without genres with less than 30 observations

I'll get a list of the genres with less than 30 observations and then remove them from the df_all_filtered dataframe. From there I'll group the dataframe again and find the mean of each genre.

In [42]:
```
small_genres = genre_numbers_count.loc[genre_numbers_count['movie_id'] < 30]['genre'].v
```

In [43]:
```
# make the small_genres array a list
small_genres = list(small_genres)
small_genres
```

Out[43]:
```
['Documentary', 'History', 'Singing', 'Sport', 'War', 'Western']
```

In [44]:
```
'Documentary' in small_genres
```

Out[44]:
```
True
```

In [45]:
```
df_all_filtered
```

Out[45]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
0	tt0249516	Action	65000000.00	0	73706.00	-64926294.00
1	tt0249516	Animation	65000000.00	0	73706.00	-64926294.00
2	tt0249516	Comedy	65000000.00	0	73706.00	-64926294.00
3	tt0359950	Adventure	90000000.00	58236838	188133322.00	98133322.00
4	tt0359950	Comedy	90000000.00	58236838	188133322.00	98133322.00
...	...	...	...	...	...	...
3308	tt7784604	Mystery	10000000.00	44069456	80239658.00	70239658.00
3309	tt7959026	Crime	50000000.00	103804407	174804407.00	124804407.00
3310	tt7959026	Drama	50000000.00	103804407	174804407.00	124804407.00
3311	tt7959026	Thriller	50000000.00	103804407	174804407.00	124804407.00
3312	tt8632862	Documentary	5000000.00	6352306	6653715.00	1653715.00

3170 rows × 6 columns

In [46]:
```
# I'll filter the df_all_filtered dataset without the small_genres
df_all_most_genres = df_all_filtered.loc[~(df_all_filtered['genre'].isin(small_genres))
```

In [47]:
```
# Now to find mean of the genres in new dataframe
most_genres = df_all_most_genres.groupby('genre').mean().reset_index()
```

In [48]:
```
# add roi_% column to new dataframe
most_genres['roi_%'] = (most_genres['profitability'] / most_genres['budget_final'])
```

In [49]:
```
most_genres
```

Out[49]:

	genre	budget_final	domestic_gross	worldwide_gross_final	profitability	roi_%
0	Action	85857217.86	98583883.77	267789354.40	181932136.54	2.12
1	Adventure	111359365.09	134049026.22	376202117.43	264842752.34	2.38
2	Animation	101782608.70	147567057.25	403221263.11	301438654.41	2.96
3	Biography	28255905.71	47558662.94	95339849.15	67083943.44	2.37
4	Comedy	44362157.58	66533610.71	148853000.94	104490843.36	2.36
5	Crime	35279359.61	43382116.07	92288669.69	57009310.08	1.62
6	Drama	29713567.94	40308823.51	86434153.23	56720585.30	1.91
7	Family	74175324.68	90405208.36	221209669.44	147034344.77	1.98
8	Fantasy	90816222.07	91436305.47	264125704.54	173309482.47	1.91
9	Horror	21265274.23	38370353.99	83872439.85	62607165.62	2.94
10	Music	18280002.22	40663761.31	86969873.44	68689871.22	3.76
11	Mystery	26928915.09	43730092.18	102412699.58	75483784.49	2.80
12	Romance	22655000.09	38759542.08	77757967.34	55102967.25	2.43
13	Sci-Fi	102600000.03	141090297.65	387790263.06	285190263.04	2.78
14	Thriller	36593899.52	51212708.88	132880251.42	96286351.90	2.63

Redo Visualizing Worldwide Gross

In [50]:
```
new_worldwide_gross = most_genres[['genre', 'worldwide_gross_final']].nlargest(10, colu
new_worldwide_gross
```

Out[50]:

	genre	worldwide_gross_final
2	Animation	403221263.11
13	Sci-Fi	387790263.06
1	Adventure	376202117.43
0	Action	267789354.40
8	Fantasy	264125704.54
7	Family	221209669.44
4	Comedy	148853000.94
14	Thriller	132880251.42
11	Mystery	102412699.58
3	Biography	95339849.15

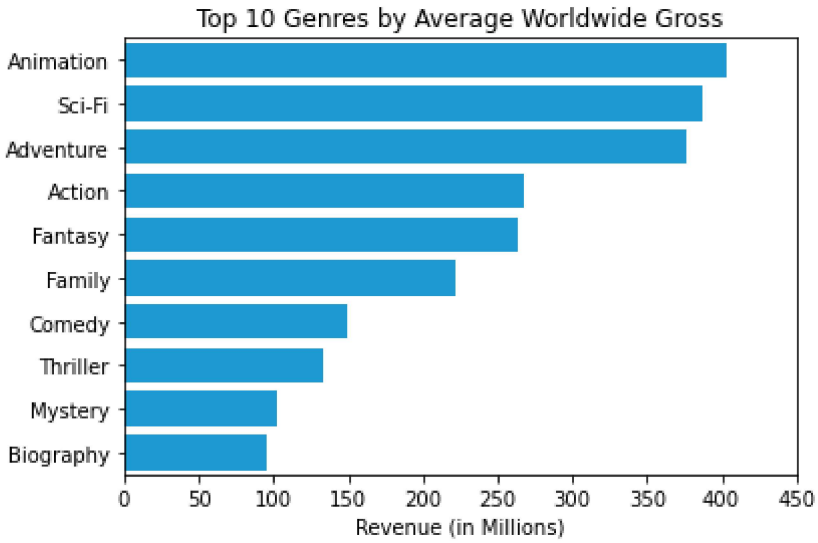
In [51]:
```
# plotting on a horizontal bar
plot = sns.barplot(data=new_worldwide_gross, y='genre', x='worldwide_gross_final', orie

# title and axis labels
plot.set_title("Top 10 Genres by Average Worldwide Gross")
```

```
plot.set_xlabel("Revenue (in Millions)")
plot.set_ylabel("")

# This changes the tick labels to show in millions (ex. 50,000,000 -> 50)
x_tick_labels = ['{:,.0f}'.format(x) for x in plot.get_xticks()/1000000]
plot.set_xticks(plot.get_xticks().tolist())
plot.set_xticklabels(x_tick_labels);

# save plot as jpg
plt.savefig('../Images/Top 10 Genres by Worldwide Gross.jpg', dpi=400, bbox_inches='tig
```



Redo Visualization for Profitability

In [52]:
```
profit_top_10 = most_genres[['genre', 'profitability']].nlargest(10,'profitability')
profit_top_10
```

Out[52]:

	genre	profitability
2	Animation	301438654.41
13	Sci-Fi	285190263.04
1	Adventure	264842752.34
0	Action	181932136.54
8	Fantasy	173309482.47
7	Family	147034344.77
4	Comedy	104490843.36
14	Thriller	96286351.90
11	Mystery	75483784.49
10	Music	68689871.22

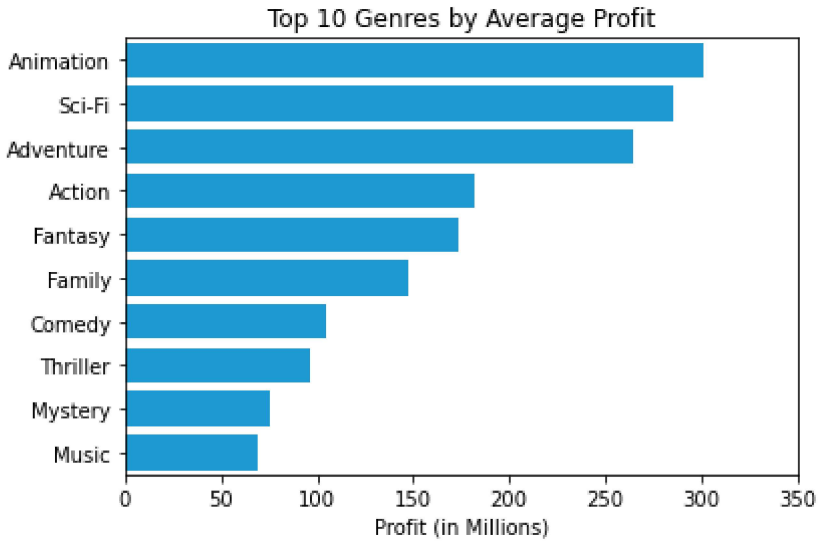
In [53]:
```
# Plotting a horizontal bar chart
plot = sns.barplot(data=profit_top_10, y='genre', x='profitability', orient='h', color=

# title and axis labels
plot.set_title("Top 10 Genres by Average Profit")
```

```
plot.set_xlabel("Profit (in Millions)")
plot.set_ylabel("")

# This changes the tick labels to show in millions (ex. 50,000,000 -> 50)
x_tick_labels = ['{:,.0f}'.format(x) for x in plot.get_xticks()/1000000]
plot.set_xticks(plot.get_xticks().tolist())
plot.set_xticklabels(x_tick_labels);

# save plot as jpg
plt.savefig('../Images/Top 10 Genres by Average Profit.jpg', dpi=400, bbox_inches='tigh
```



Redo Visualization for ROI

In [54]:
```
roi_top_10 = most_genres[['genre', 'roi_%']].nlargest(10,'roi_%')
roi_top_10
```

Out[54]:

	genre	roi_%
10	Music	3.76
2	Animation	2.96
9	Horror	2.94
11	Mystery	2.80
13	Sci-Fi	2.78
14	Thriller	2.63
12	Romance	2.43
1	Adventure	2.38
3	Biography	2.37
4	Comedy	2.36

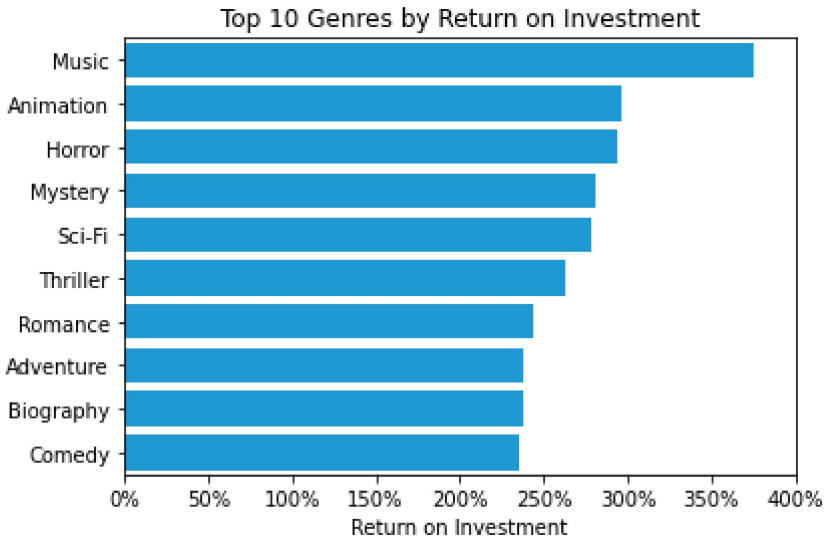
In [55]:
```
# Plotting on a horizontal bar chart
plot = sns.barplot(data=roi_top_10, y='genre', x='roi_%', orient='h', color='#00A4EF');

# title and axis labels
plot.set_title("Top 10 Genres by Return on Investment")
```

```
plot.set_xlabel("Return on Investment")
plot.set_ylabel('')

# This changes the tick labels to show in millions (ex. 50,000,000 -> 50)
x_tick_labels = ['{:,.0f}'.format(x) + '%' for x in plot.get_xticks()*100]
plot.set_xticks(plot.get_xticks().tolist())
plot.set_xticklabels(x_tick_labels);

# save plot as jpg
plt.savefig("../Images/Top 10 Genres by Return on Investment.jpg", dpi=400, bbox_inches
```



Visualizing a Cat Plot with Top 10 Genres that have over 30 observations

In [56]:
```
df_all_most_genres
```

Out[56]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
0	tt0249516	Action	65000000.00	0	73706.00	-64926294.00
1	tt0249516	Animation	65000000.00	0	73706.00	-64926294.00
2	tt0249516	Comedy	65000000.00	0	73706.00	-64926294.00
3	tt0359950	Adventure	90000000.00	58236838	188133322.00	98133322.00
4	tt0359950	Comedy	90000000.00	58236838	188133322.00	98133322.00
...	...	...	...	...	...	...
3307	tt7784604	Horror	10000000.00	44069456	80239658.00	70239658.00
3308	tt7784604	Mystery	10000000.00	44069456	80239658.00	70239658.00
3309	tt7959026	Crime	50000000.00	103804407	174804407.00	124804407.00
3310	tt7959026	Drama	50000000.00	103804407	174804407.00	124804407.00
3311	tt7959026	Thriller	50000000.00	103804407	174804407.00	124804407.00

3061 rows × 6 columns

In [57]:
```
# I'll grab list of top 10 genres by worldwide gross
```

```
ww_top_10_genres = list(ww_top_10['genre'])
ww_top_10_genres
```

Out[57]:
```
['Animation',
 'Sci-Fi',
 'Adventure',
 'Singing',
 'Action',
 'Fantasy',
 'Family',
 'Comedy',
 'Western',
 'Thriller']
```

In [58]:
```
# now I'll filter data frame by only these genres
df_all_most_genres.loc[df_all_most_genres['genre'].isin(ww_top_10_genres)]
```

Out[58]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability
0	tt0249516	Action	65000000.00	0	73706.00	-64926294.00
1	tt0249516	Animation	65000000.00	0	73706.00	-64926294.00
2	tt0249516	Comedy	65000000.00	0	73706.00	-64926294.00
3	tt0359950	Adventure	90000000.00	58236838	188133322.00	98133322.00
4	tt0359950	Comedy	90000000.00	58236838	188133322.00	98133322.00
...	...	...	...	...	...	...
3300	tt7424200	Animation	10000000.00	29790236	28646544.00	18646544.00
3301	tt7424200	Comedy	10000000.00	29790236	28646544.00	18646544.00
3303	tt7690670	Action	16000000.00	20537137	20545116.00	4545116.00
3305	tt7690670	Thriller	16000000.00	20537137	20545116.00	4545116.00
3311	tt7959026	Thriller	50000000.00	103804407	174804407.00	124804407.00

1750 rows × 6 columns

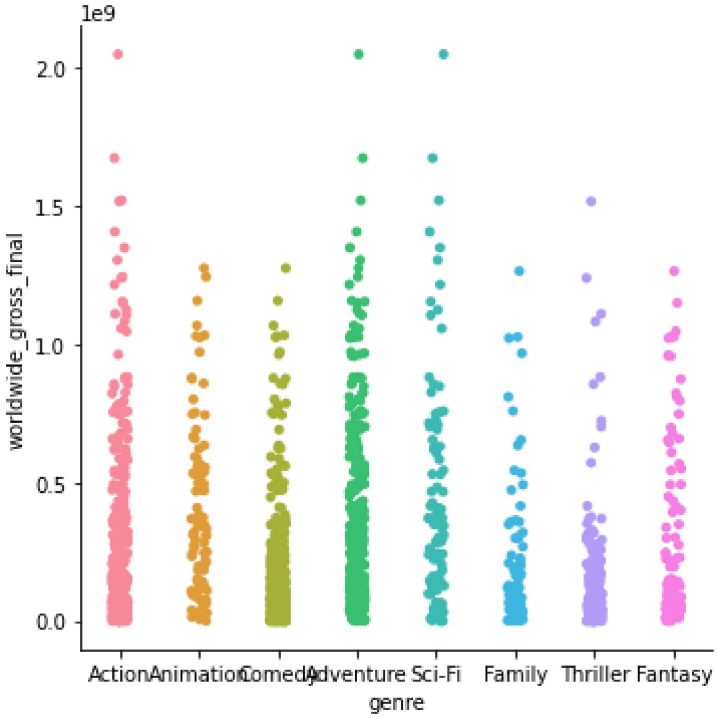
In [59]:
```
df_all_most_genres.loc[df_all_most_genres['worldwide_gross_final'] == 0]
```

Out[59]:

	movie_id	genre	budget_final	domestic_gross	worldwide_gross_final	profitability

In [60]:
```
# Cat plot of top 10 genres by average worldwide gross
# save data frame to variable
data = df_all_most_genres.loc[df_all_most_genres['genre'].isin(ww_top_10_genres)]

# Cat plot
plot = sns.catplot(data=data, x='genre', y='worldwide_gross_final')
```



It is a great visual of the distribution of the values for the genres, but it does not look like it will be a valuable visual for our presentation based on our audience