Overview

Your company would like to start a movie studio and is asking us to recommend the best way foward. The main objective of this project is to produce three actionable recommendations for your company to take into consideration. With these recommendations your company can create their own *successful* movie studio.

Data

The data is sourced from various movie data websites online:

> - Box Office Mojo
> - Format: csv
> - IMDB
> - Format: Database
> - The Numbers
> - Format: csv

We joined all the relevant data as tables into the IMDB database in the exploratory notebook for easier access and analysis.

Methods

This project utilizes python for exploratory data analysis and python along with SQL for interacting with the data in the databases.

In [1]:
```
# import neeeded libraries
import pandas as pd
import sqlite3
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
```

Load in the data.

In [2]:
```
# open connection to the database
conn = sqlite3.connect('../zippedData/im.db')
```

In [3]:
```
# take a look at the tables in the database
pd.read_sql("""

SELECT name
FROM sqlite_master
WHERE type = "table"

""", conn)
```

Out[3]:

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

The database includes 10 tables with movie data that will be very helpful in our analysis.

Average Profit Percentage by Genres

In [4]:
```
basics_budgets = pd.read_sql("""

SELECT *
FROM movie_basics AS m
JOIN tn_movie_budgets AS t
        ON m.primary_title = t.movie
GROUP BY genres

""", conn)

# splits genres values by the comma to create list
basics_budgets['genres'] = basics_budgets['genres'].str.split(',')

# for each movie creates a record for each genre
basics_budgets = basics_budgets.explode('genres')

# change worldwide gross column to type int
basics_budgets['worldwide_gross'] = basics_budgets['worldwide_gross'].replace('[\$,]', '', regex=True).astype(int)
basics_budgets['production_budget'] = basics_budgets['production_budget'].replace('[\$,]', '', regex=True).astype(int)
basics_budgets['avg_profit_perc'] = basics_budgets['worldwide_gross'] / basics_budgets['production_budget']

# group by genres and select profit for that genre
genre_by_profit = basics_budgets.groupby('genres')['avg_profit_perc'].mean().sort_values(ascending = False).to_frame()
genre_by_profit = genre_by_profit.reset_index()
```

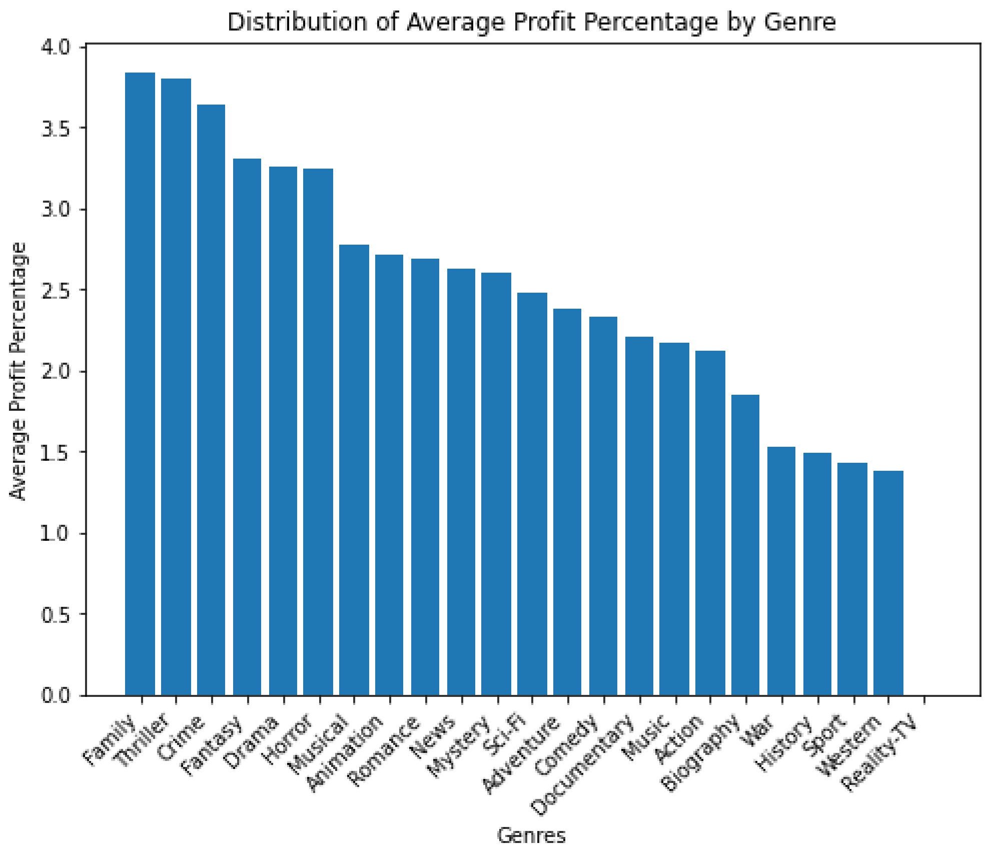
In [5]:
```
genre_by_profit
```

Out[5]:

	genres	avg_profit_perc
0	Family	3.831503
1	Thriller	3.796146
2	Crime	3.641379
3	Fantasy	3.309361
4	Drama	3.250494
5	Horror	3.246080
6	Musical	2.778568
7	Animation	2.707194
8	Romance	2.690754
9	News	2.626353
10	Mystery	2.601289
11	Sci-Fi	2.480757
12	Adventure	2.379146
13	Comedy	2.330956
14	Documentary	2.210761
15	Music	2.169902
16	Action	2.121148
17	Biography	1.849864
18	War	1.532461
19	History	1.491212
20	Sport	1.425385
21	Western	1.384453
22	Reality-TV	0.000000

In [6]:

```
# Create figure
fig, ax = plt.subplots(figsize = (8,6))

# Create the line plot
# sns.lineplot(data=genre_by_profit, ax = ax)
plt.bar(data = genre_by_profit, x =genre_by_profit['genres'], height=genre_by_profit['avg_profit_perc'])
# Set the x-axis tick positions and labels
plt.xticks(range(len(genre_by_profit['genres'])), genre_by_profit['genres'], rotation=45, ha='right')

# Add labels and title
plt.xlabel('Genres')
plt.ylabel('Average Profit Percentage')
plt.title('Distribution of Average Profit Percentage by Genre')


# Show the plot
plt.show()
```



Popular Directors, Writers and Actors

In [7]:
```
# get top directors
directors = pd.read_sql("""

WITH RECURSIVE split(genre, str) AS (
    SELECT '', genres || ',' FROM movie_basics
    UNION ALL SELECT
    substr(str, 0, instr(str, ',')),
    substr(str, instr(str, ',')+1)
    FROM split WHERE str!=''
)
SELECT DISTINCT
            p.primary_name AS director,
            AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
                        AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
FROM split
JOIN movie_basics AS m
    ON instr(genres, genre) > 0

JOIN directors AS d
    ON m.movie_id = d.movie_id
JOIN persons AS p
    ON d.person_id = p.person_id
JOIN tn_movie_budgets AS t
    ON t.movie = m.primary_title

WHERE genre!='' AND genre = "Family"
GROUP BY director
ORDER BY average_profit_perc DESC
LIMIT 10

""", conn)
directors
```

Out[7]:

	director	average_profit_perc
0	Karthik Chandan	124.277880
1	Brandon Camp	63.119120
2	Jesse Rose	19.534452
3	Adam Sputh	19.534452
4	Stephen Chbosky	15.230236
5	Nelson Venkatesan	12.848163
6	Jon Erwin	12.229174
7	Andrew Erwin	12.229174
8	Ravi Punj	11.041042
9	Michael Scordakis	10.884333

In [8]:

```
# get top writers
writers = pd.read_sql("""

WITH RECURSIVE split(genre, str) AS (
    SELECT '', genres || ',' FROM movie_basics
    UNION ALL SELECT
    substr(str, 0, instr(str, ',')),
    substr(str, instr(str, ',')+1)
    FROM split WHERE str!=''
)

SELECT DISTINCT
            p.primary_name AS writer,
            AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
                        AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
FROM split
JOIN movie_basics AS m
    ON instr(genres, genre) > 0

JOIN writers AS w
    ON m.movie_id = w.movie_id
JOIN persons AS p
    ON w.person_id = p.person_id
JOIN tn_movie_budgets AS t
    ON t.movie = m.primary_title

WHERE genre!='' AND genre = "Family"
GROUP BY writer
ORDER BY average_profit_perc DESC
LIMIT 10
""", conn)
writers
```

Out[8]:

	writer	average_profit_perc
0	Joe Camp	63.119120
1	Brandon Camp	63.119120
2	Steve Conrad	15.230236
3	R.J. Palacio	15.230236
4	Jack Thorne	15.230236
5	Sankar Dass	12.848163

	writer	average_profit_perc
6	Nelson Venkatesan	12.848163
7	Jon Erwin	12.229174
8	Brent McCorkle	12.229174
9	Bart Millard	12.229174

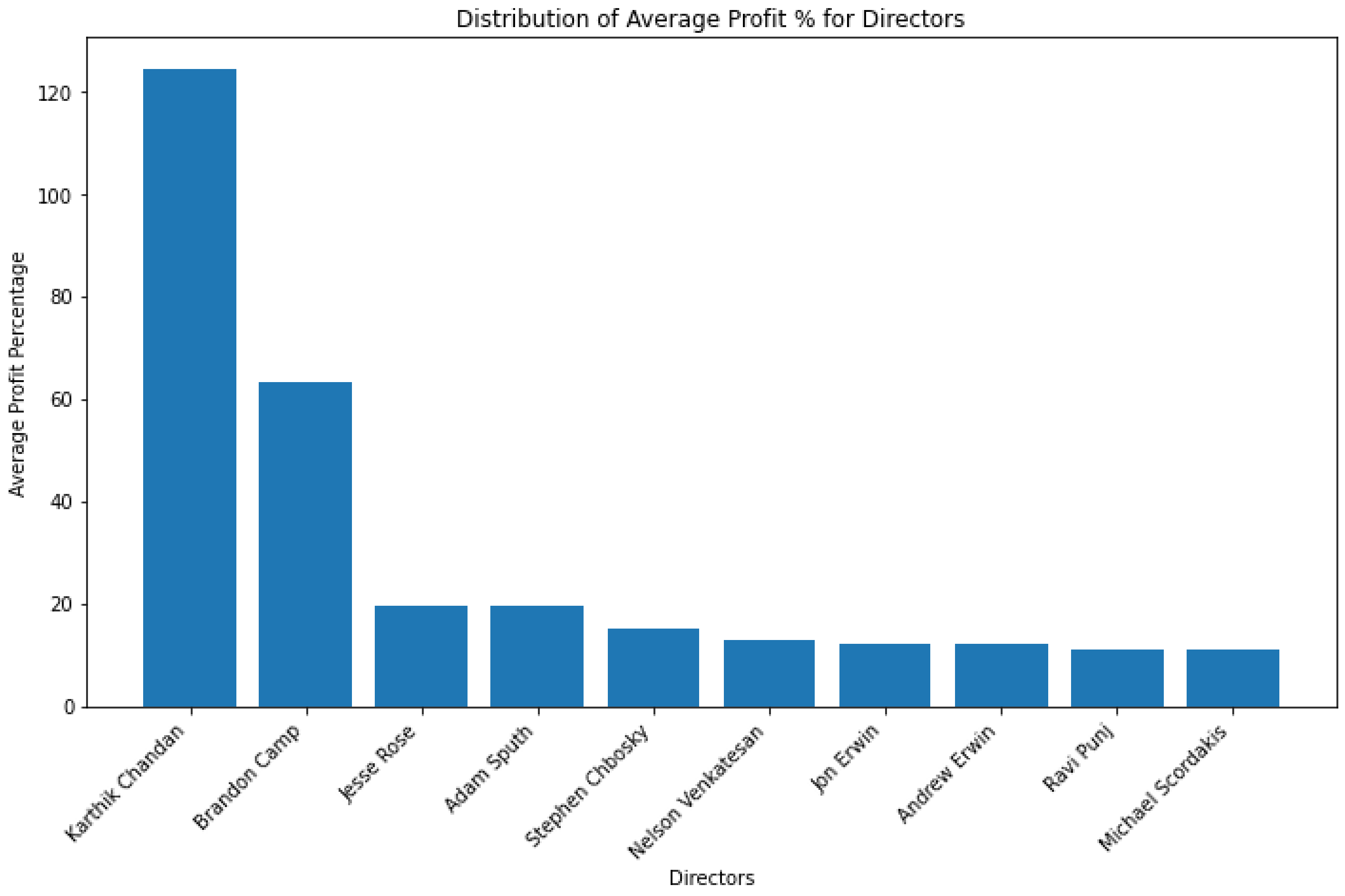
In [9]:
```
# get top actors
actors = pd.read_sql("""

SELECT p.primary_name AS actor,
            AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
                        AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
FROM persons AS p
   JOIN known_for AS k
      ON p.person_id = k.person_id
   JOIN movie_basics AS m
      ON k.movie_id = m.movie_id
   JOIN tn_movie_budgets AS t
      ON m.primary_title = t.movie
WHERE primary_profession LIKE '%actor%' AND
            genres LIKE '%Family%'
GROUP BY actor
ORDER BY average_profit_perc DESC
LIMIT 10

""", conn)
actors
```

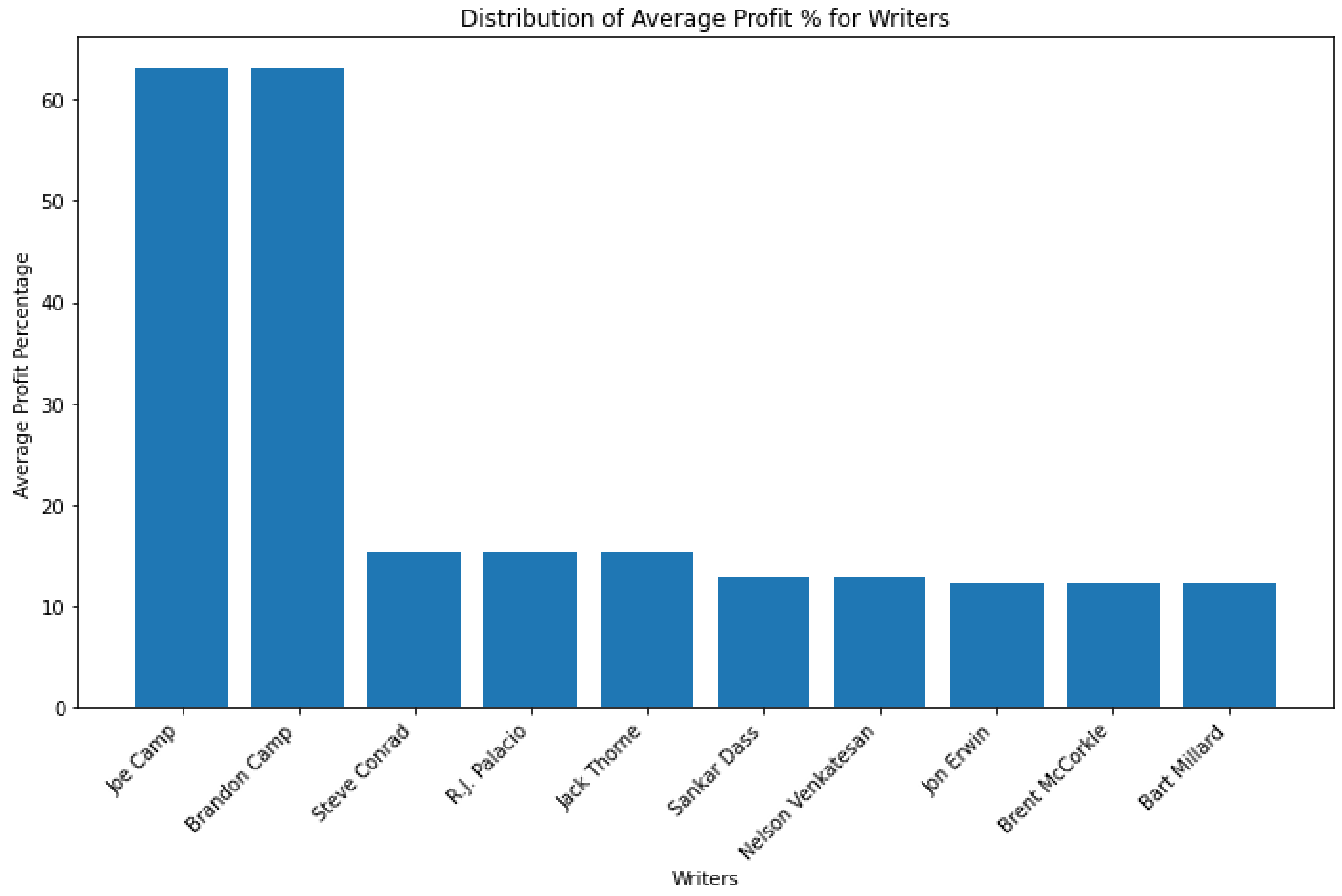
Out[9]:

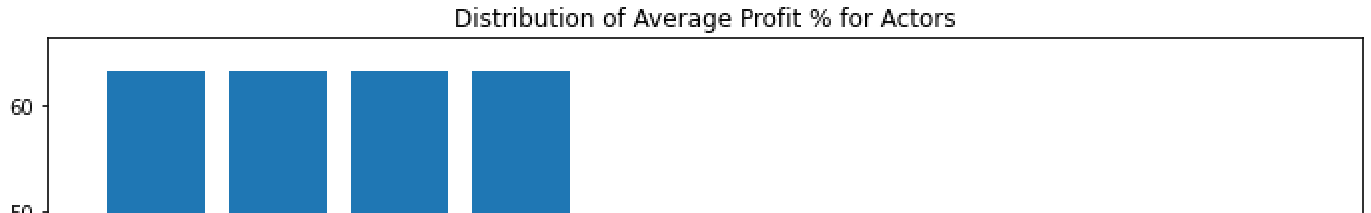
	actor	average_profit_perc
0	Will Rothhaar	63.119120
1	Kevin Randolph	63.119120
2	Gralen Bryant Banks	63.119120
3	Brandon Camp	63.119120
4	Jesse Rose	19.534452
5	Tim DeLaughter	15.230236
6	Sean Ryan Fox	15.230236
7	Noah Jupe	15.230236
8	Michael Towns	15.230236
9	Mandy Patinkin	15.230236

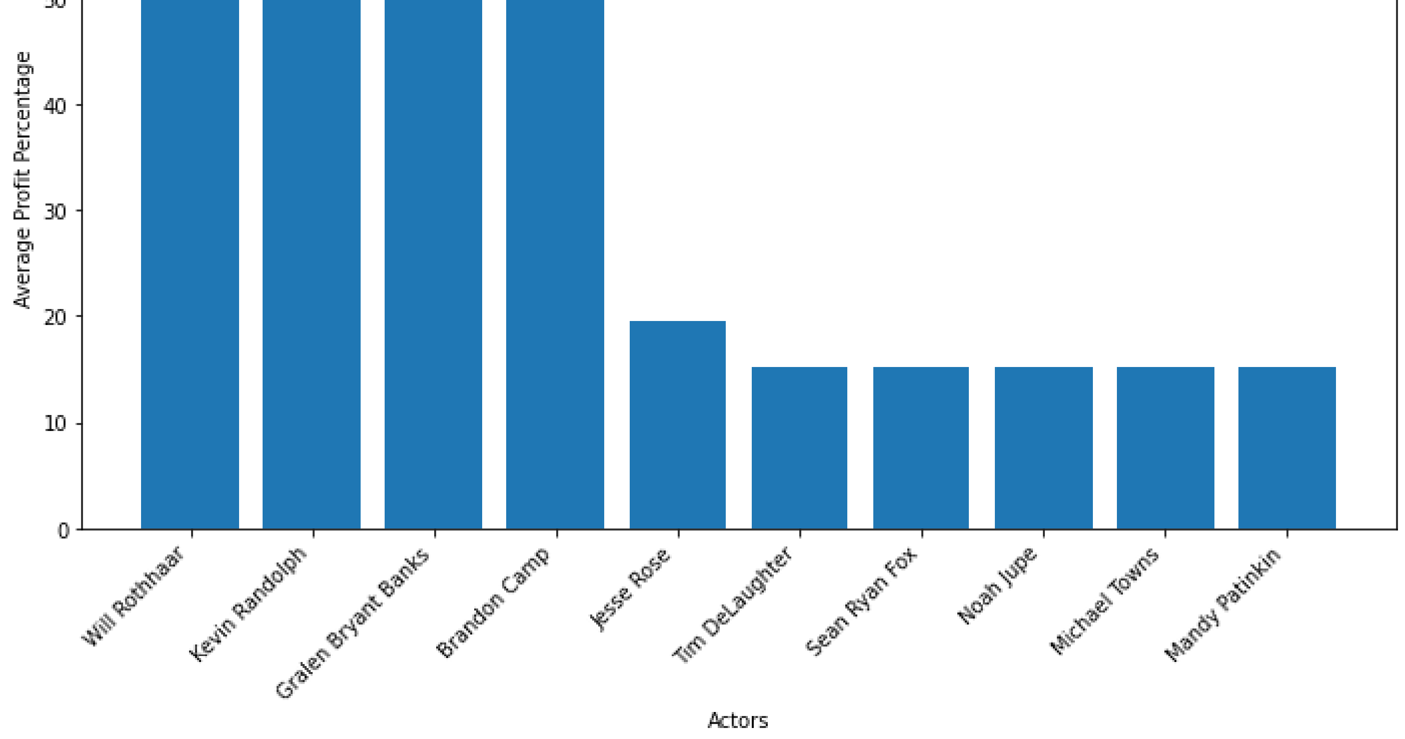
In [10]:
```
fig, (ax1, ax2, ax3) = plt.subplots(nrows=3, ncols=1, figsize=(10, 20))

# Histogram for directors
ax1.bar(data=directors, x=directors['director'], height=directors['average_profit_perc'])
ax1.set_xticks(range(len(directors['director'])))
ax1.set_xticklabels(directors['director'], rotation=45, ha='right')
ax1.set_xlabel('Directors')
ax1.set_ylabel('Average Profit Percentage')
ax1.set_title('Distribution of Average Profit % for Directors')

# Histogram for writers
ax2.bar(data=writers, x=writers['writer'], height=writers['average_profit_perc'])
ax2.set_xticks(range(len(writers['writer'])))
```

```
ax2.set_xticklabels(writers['writer'], rotation=45, ha='right')
ax2.set_xlabel('Writers')
ax2.set_ylabel('Average Profit Percentage')
ax2.set_title('Distribution of Average Profit % for Writers')

# Histogram for actors
ax3.bar(data=actors, x=actors['actor'], height=actors['average_profit_perc'])
ax3.set_xticks(range(len(actors['actor'])))
ax3.set_xticklabels(actors['actor'], rotation=45, ha='right')
ax3.set_xlabel('Actors')
ax3.set_ylabel('Average Profit Percentage')
ax3.set_title('Distribution of Average Profit % for Actors')

# Adjust spacing between subplots
plt.tight_layout()

# Show the plot
plt.show()
```


Distribution of Average Profit % for Directors
Average Profit Percentage
0
20
40
60
80
100
120
Karthik Chandan
Brandon Camp
Jesse Rose
Adam Sputh
Stephen Chbosky
Nelson Venkatesan
Jon Erwin
Andrew Erwin
Ravi Punj
Michael Scordakis
Directors


Distribution of Average Profit % for Writers
Average Profit Percentage
0
10
20
30
40
50
60
Joe Camp
Brandon Camp
Steve Conrad
R.J. Palacio
Jack Thorne
Sankar Dass
Nelson Venkatesan
Jon Erwin
Brent McCorkle
Bart Millard
Writers


Distribution of Average Profit % for Actors
60
50



Industry Profitiablilty and Budget by Year

grouping by year and looking at some profitability metrics

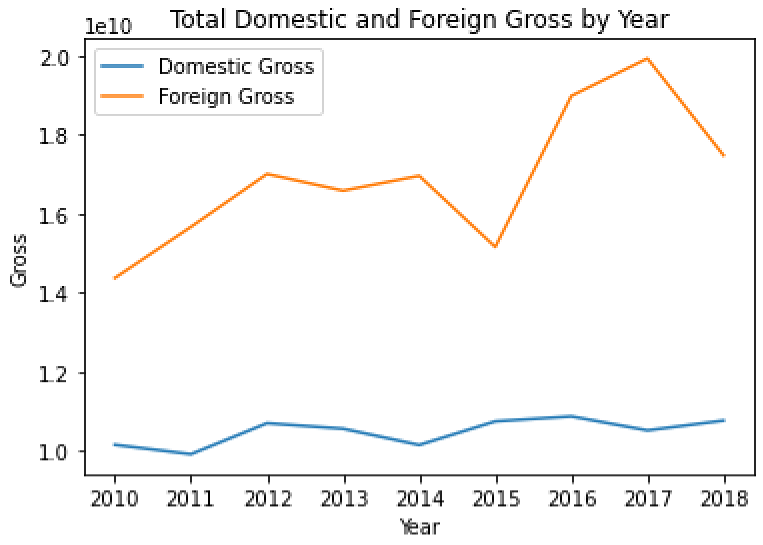
In [11]:
```
box_office_mojo_groupby_year = pd.read_sql("""

SELECT year,
       SUM(domestic_gross) AS total_domestic_gross,
       SUM(foreign_gross) AS total_foreign_gross
FROM box_office_mojo
GROUP BY year

""", conn)

box_office_mojo_groupby_year
```

Out[11]:

	year	total_domestic_gross	total_foreign_gross
0	2010	1.015274e+10	1.436937e+10
1	2011	9.915690e+09	1.566287e+10
2	2012	1.069786e+10	1.700298e+10
3	2013	1.055885e+10	1.658024e+10
4	2014	1.014798e+10	1.695667e+10
5	2015	1.074487e+10	1.515435e+10
6	2016	1.086969e+10	1.898139e+10
7	2017	1.051677e+10	1.992893e+10
8	2018	1.076436e+10	1.747449e+10

In [12]:
```
# Plot the data as a line graph
plt.plot(box_office_mojo_groupby_year['year'], box_office_mojo_groupby_year['total_domestic_gross'], label='Domestic Gross')
plt.plot(box_office_mojo_groupby_year['year'], box_office_mojo_groupby_year['total_foreign_gross'], label='Foreign Gross')

# Set the labels and title
```

```
plt.xlabel('Year')
plt.ylabel('Gross')
plt.title('Total Domestic and Foreign Gross by Year')

# Add a legend
plt.legend()

# Display the plot
plt.show()
```



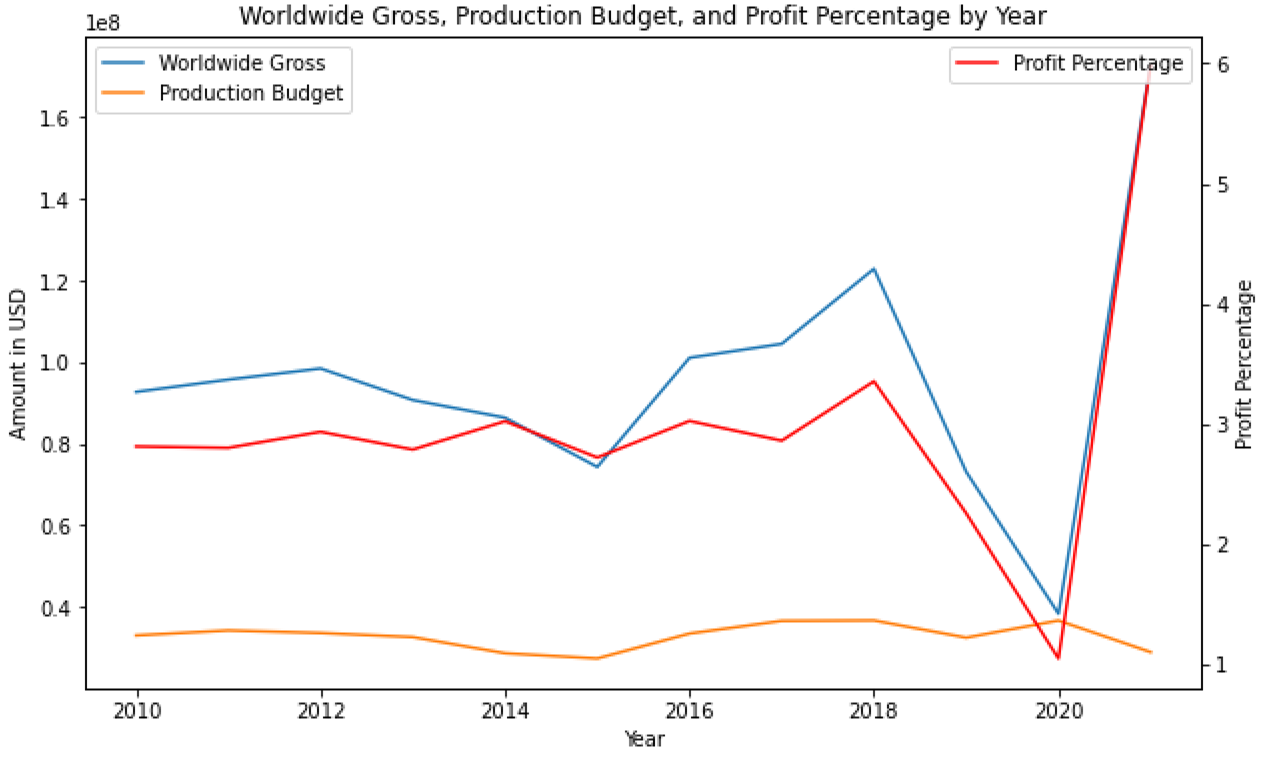
In [13]:
```
movie_basics_groupby_year = pd.read_sql("""

SELECT m.start_year,
            COUNT(m.genres) AS genre_count,
            AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) AS average_worldwide_gross,
            AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_production_budget,
            AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
            AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
FROM movie_basics AS m
JOIN tn_movie_budgets AS t
      ON m.primary_title = t.movie
GROUP BY m.start_year

""", conn)

movie_basics_groupby_year
```

Out[13]:

	start_year	genre_count	average_worldwide_gross	average_production_budget	average_profit_perc
0	2010	352	9.266885e+07	3.296624e+07	2.811023
1	2011	393	9.568334e+07	3.417800e+07	2.799559
2	2012	378	9.840677e+07	3.355199e+07	2.932963
3	2013	395	9.066837e+07	3.255225e+07	2.785318
4	2014	458	8.635058e+07	2.858423e+07	3.020917
5	2015	457	7.426570e+07	2.731386e+07	2.718975
6	2016	394	1.010288e+08	3.341628e+07	3.023340
7	2017	367	1.044480e+08	3.652808e+07	2.859390
8	2018	343	1.228439e+08	3.663125e+07	3.353528
9	2019	185	7.307353e+07	3.241184e+07	2.254532
10	2020	15	3.829639e+07	3.661250e+07	1.045992

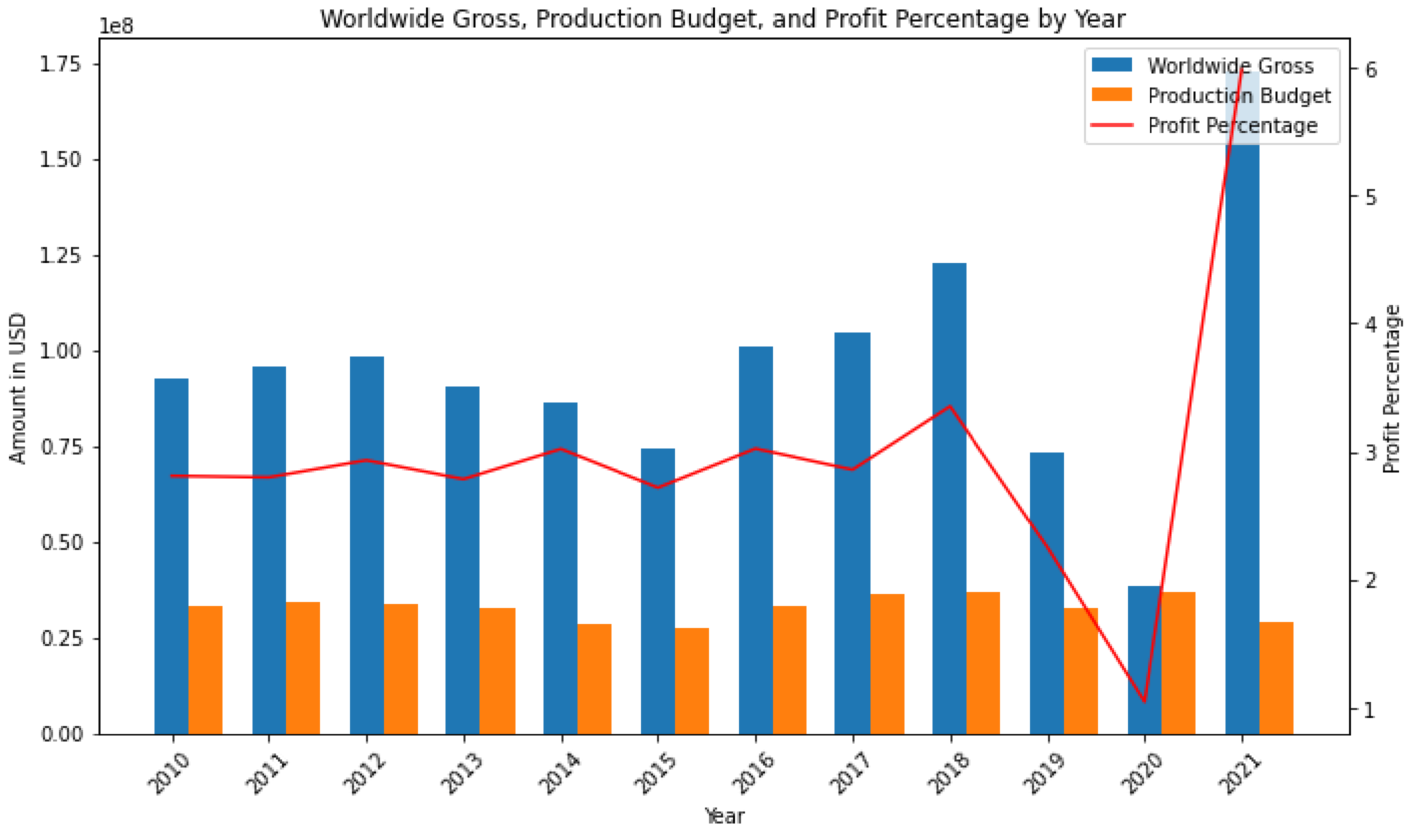
	start_year	genre_count	average_worldwide_gross	average_production_budget	average_profit_perc
11	2021	6	1.727129e+08	2.886487e+07	5.983497

In [14]:
```
df = movie_basics_groupby_year

# Set the figure size
fig, ax1 = plt.subplots(figsize=(10, 6))

# Plot the worldwide gross and production budget on the first y-axis
ax1.plot(df['start_year'], df['average_worldwide_gross'], label='Worldwide Gross')
ax1.plot(df['start_year'], df['average_production_budget'], label='Production Budget')
ax1.set_xlabel('Year')
ax1.set_ylabel('Amount in USD')

# Create a secondary y-axis for profit percentage
ax2 = ax1.twinx()
ax2.plot(df['start_year'], df['average_profit_perc'], color='red', label='Profit Percentage')
ax2.set_ylabel('Profit Percentage')

# Set the title
plt.title('Worldwide Gross, Production Budget, and Profit Percentage by Year')

# Add legends for both y-axes
ax1.legend(loc='upper left')
ax2.legend(loc='upper right')

# Display the plot
plt.show()
```



In [15]:
```
df = movie_basics_groupby_year

# Set the figure size
fig, ax1 = plt.subplots(figsize=(10, 6))

# Plot the worldwide gross and production budget as side-by-side bars
bar_width = 0.35
year = df['start_year']
gross = df['average_worldwide_gross']
```

```
budget = df['average_production_budget']

ax1.bar(year, gross, width=bar_width, label='Worldwide Gross')
ax1.bar(year + bar_width, budget, width=bar_width, label='Production Budget')

# Create a secondary y-axis for profit percentage
ax2 = ax1.twinx()
ax2.plot(year, df['average_profit_perc'], color='red', label='Profit Percentage')

# Set the labels and title
ax1.set_xlabel('Year')
ax1.set_ylabel('Amount in USD')
ax2.set_ylabel('Profit Percentage')
plt.title('Worldwide Gross, Production Budget, and Profit Percentage by Year')

## Combine the legends for both axes
handles1, labels1 = ax1.get_legend_handles_labels()
handles2, labels2 = ax2.get_legend_handles_labels()
combined_handles = handles1 + handles2
combined_labels = labels1 + labels2
ax1.legend(combined_handles, combined_labels, loc='upper right')

# Set the x-axis tick labels
ax1.set_xticks(year)
ax1.set_xticklabels(year, rotation=45)

# Adjust the layout to prevent overlapping of labels
plt.tight_layout()

# Display the plot
plt.show()
```



In [16]:
```
movie_basics_groupby_year['average_production_budget'].mean()
```

Out[16]:
```
32800949.866458755
```

Profit by Month

group profit and budget totals by Month and graph

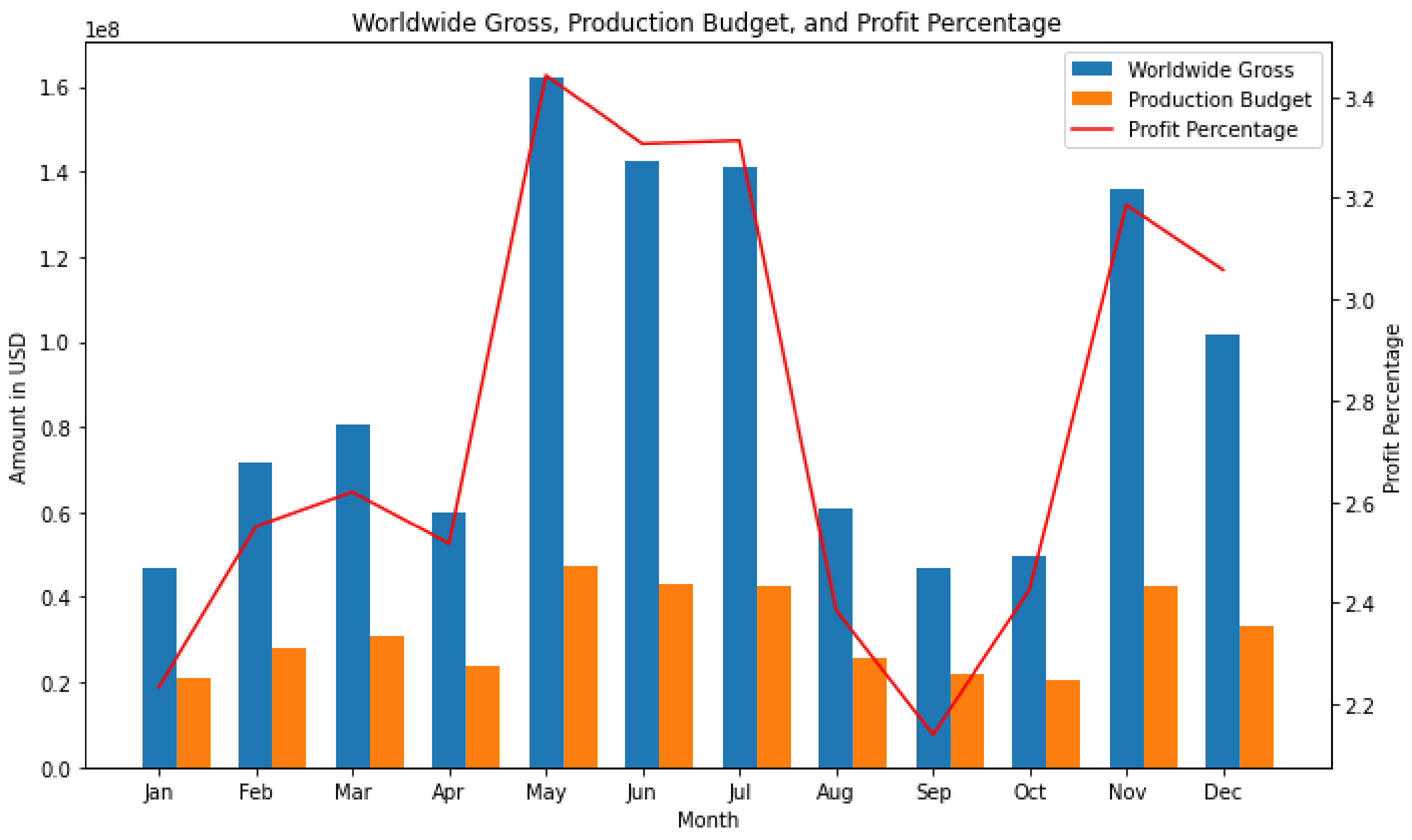
In [17]:
```
# Execute the SQL query and retrieve the results into a DataFrame
movie_basics_groupby_month = pd.read_sql("""
  SELECT substr(t.release_date, 1, 3) AS month,
    AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) AS average_worldwide_gross,
    AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_production_budget,
    AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
          AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
  FROM tn_movie_budgets AS t
  GROUP BY month
  ORDER BY CASE month
    WHEN 'Jan' THEN 1
    WHEN 'Feb' THEN 2
    WHEN 'Mar' THEN 3
    WHEN 'Apr' THEN 4
    WHEN 'May' THEN 5
    WHEN 'Jun' THEN 6
    WHEN 'Jul' THEN 7
    WHEN 'Aug' THEN 8
    WHEN 'Sep' THEN 9
    WHEN 'Oct' THEN 10       WHEN 'Nov' THEN 11
    WHEN 'Dec' THEN 12
    ELSE 999
  END;
""", conn)

movie_basics_groupby_month
```

Out[17]:

	month	average_worldwide_gross	average_production_budget	average_profit_perc
0	Jan	4.656382e+07	2.084349e+07	2.233974
1	Feb	7.154453e+07	2.804642e+07	2.550933
2	Mar	8.063337e+07	3.078208e+07	2.619491
3	Apr	5.992026e+07	2.380283e+07	2.517359
4	May	1.622680e+08	4.713520e+07	3.442608
5	Jun	1.425230e+08	4.309912e+07	3.306866
6	Jul	1.409636e+08	4.254616e+07	3.313193
7	Aug	6.097841e+07	2.555609e+07	2.386061
8	Sep	4.669369e+07	2.181290e+07	2.140645
9	Oct	4.946456e+07	2.039266e+07	2.425606
10	Nov	1.357416e+08	4.260006e+07	3.186419
11	Dec	1.016932e+08	3.325161e+07	3.058294

In [18]:
```
import numpy as np
df = movie_basics_groupby_month

# Set the figure size
fig, ax1 = plt.subplots(figsize=(10, 6))

# Plot the worldwide gross and production budget as side-by-side bars
bar_width = 0.35
month = np.arange(len(df['month']))
gross = df['average_worldwide_gross']
budget = df['average_production_budget']
```

```
ax1.bar(month, gross, width=bar_width, label='Worldwide Gross')
ax1.bar(month + bar_width, budget, width=bar_width, label='Production Budget')

# Create a secondary y-axis for profit percentage
ax2 = ax1.twinx()
ax2.plot(month, df['average_profit_perc'], color='red', label='Profit Percentage')

# Set the labels and title
ax1.set_xlabel('Month')
ax1.set_ylabel('Amount in USD')
ax2.set_ylabel('Profit Percentage')
plt.title('Worldwide Gross, Production Budget, and Profit Percentage')

# Set the x-axis tick labels
ax1.set_xticks(month)
ax1.set_xticklabels(df['month'])


# Combine the legends for both axes
handles1, labels1 = ax1.get_legend_handles_labels()
handles2, labels2 = ax2.get_legend_handles_labels()
combined_handles = handles1 + handles2
combined_labels = labels1 + labels2
ax1.legend(combined_handles, combined_labels, loc='upper right')

# Adjust the layout to prevent overlapping of labels
plt.tight_layout()

# Display the plot
plt.show()
```



It appears that worldwide movie Gross Revenue surges twice during the year: May-June-Jul and Nov-Dec, corresponding to the early summer months and the holiday season

Profit by Month of Year, only for movies with "Family" as one of the genres

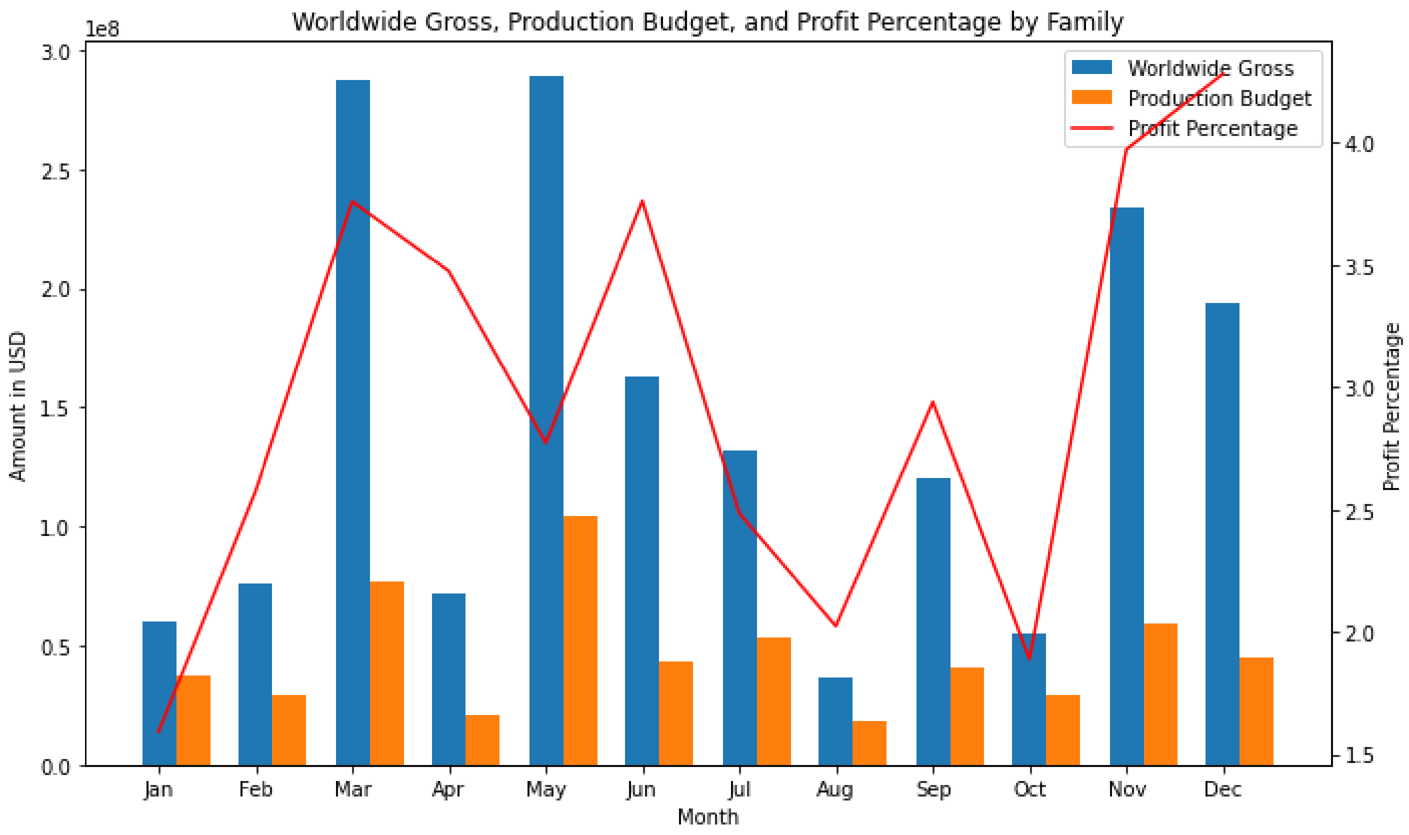
In [19]:
```
# Execute the SQL query and retrieve the results into a DataFrame
movie_basics_groupby_month_family = pd.read_sql("""
  SELECT substr(t.release_date, 1, 3) AS month,
     AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) AS average_worldwide_gross,
     AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_production_budget,
     AVG(CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
           AVG(CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS average_profit_perc
  FROM tn_movie_budgets AS t
  JOIN movie_basics AS m
     ON t.movie = m.primary_title
  WHERE m.genres LIKE '%Family%'
  GROUP BY month
  ORDER BY CASE month
     WHEN 'Jan' THEN 1
     WHEN 'Feb' THEN 2
     WHEN 'Mar' THEN 3
     WHEN 'Apr' THEN 4
     WHEN 'May' THEN 5
     WHEN 'Jun' THEN 6
     WHEN 'Jul' THEN 7
     WHEN 'Aug' THEN 8
     WHEN 'Sep' THEN 9
     WHEN 'Oct' THEN 10     WHEN 'Nov' THEN 11
     WHEN 'Dec' THEN 12
     ELSE 999
  END;
""", conn)

movie_basics_groupby_month_family
```

Out[19]:

	month	average_worldwide_gross	average_production_budget	average_profit_perc
0	Jan	6.016560e+07	3.777778e+07	1.592619
1	Feb	7.584884e+07	2.944785e+07	2.575700
2	Mar	2.878402e+08	7.656464e+07	3.759440
3	Apr	7.142240e+07	2.055714e+07	3.474335
4	May	2.894731e+08	1.043818e+08	2.773214
5	Jun	1.630996e+08	4.335714e+07	3.761769
6	Jul	1.321625e+08	5.318750e+07	2.484841
7	Aug	3.647679e+07	1.802500e+07	2.023678
8	Sep	1.206408e+08	4.103333e+07	2.940069
9	Oct	5.496249e+07	2.908250e+07	1.889882
10	Nov	2.339154e+08	5.886316e+07	3.973885
11	Dec	1.937831e+08	4.526994e+07	4.280612

In [20]:
```
import numpy as np
df = movie_basics_groupby_month_family

# Set the figure size
fig, ax1 = plt.subplots(figsize=(10, 6))

# Plot the worldwide gross and production budget as side-by-side bars
bar_width = 0.35
month = np.arange(len(df['month']))
gross = df['average_worldwide_gross']
budget = df['average_production_budget']
```

```
ax1.bar(month, gross, width=bar_width, label='Worldwide Gross')
ax1.bar(month + bar_width, budget, width=bar_width, label='Production Budget')

# Create a secondary y-axis for profit percentage
ax2 = ax1.twinx()
ax2.plot(month, df['average_profit_perc'], color='red', label='Profit Percentage')

# Set the labels and title
ax1.set_xlabel('Month')
ax1.set_ylabel('Amount in USD')
ax2.set_ylabel('Profit Percentage')
plt.title('Worldwide Gross, Production Budget, and Profit Percentage by Family')

# Set the x-axis tick labels
ax1.set_xticks(month)
ax1.set_xticklabels(df['month'])

# Combine the legends for both axes
handles1, labels1 = ax1.get_legend_handles_labels()
handles2, labels2 = ax2.get_legend_handles_labels()
combined_handles = handles1 + handles2
combined_labels = labels1 + labels2
ax1.legend(combined_handles, combined_labels, loc='upper right')

# Adjust the layout to prevent overlapping of labels
plt.tight_layout()

# Display the plot
plt.show()
```



Histogram: distribution of Movie runtimes

In [21]:
```
df = pd.read_sql("""

SELECT runtime_minutes,
       (CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) AS worldwide_gross,
       (CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS production_budget,
       (CAST(REPLACE(REPLACE(t.worldwide_gross, '$', ''), ',', '') AS INT)) /
               (CAST(REPLACE(REPLACE(t.production_budget, '$', ''), ',', '') AS INT)) AS profit_perc
   FROM tn_movie_budgets AS t
   JOIN movie_basics AS m
       ON t.movie = m.primary_title

""", conn)

df
```

Out[21]:

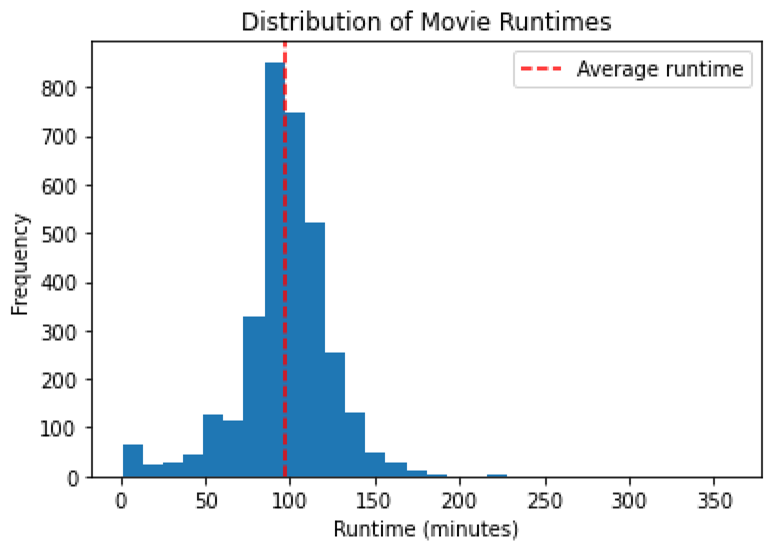
	runtime_minutes	worldwide_gross	production_budget	profit_perc
0	93.0	2776345279	425000000	6
1	136.0	1045663875	410600000	2
2	113.0	149762350	350000000	0
3	141.0	1403013963	330600000	4
4	149.0	2048134200	300000000	6
...	...	...	...	...
3810	93.0	94596	10000	9
3811	NaN	527	10000	0
3812	95.0	4584	9000	0
3813	77.0	0	7000	0
3814	76.0	0	1400	0

3815 rows × 4 columns

In [22]:

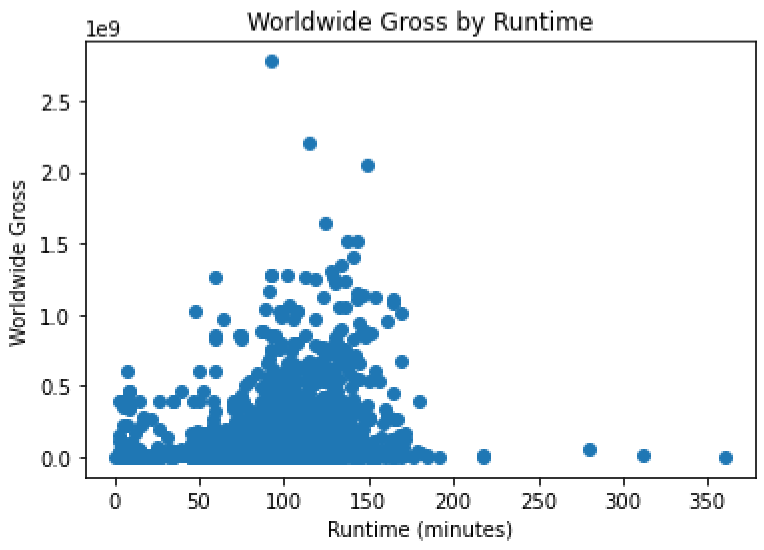
```
# Create a histogram
plt.hist(df['runtime_minutes'], bins=30)
plt.axvline(df['runtime_minutes'].mean(), color='red', linestyle='--', label = 'Average runtime')
plt.xlabel('Runtime (minutes)')
plt.ylabel('Frequency')
plt.title('Distribution of Movie Runtimes')
plt.legend()
plt.show()
```

```
/Users/nechamaborisute/anaconda3/envs/learn-env/lib/python3.8/site-packages/numpy/lib/histograms.py:839: RuntimeWarning: inva
lid value encountered in greater_equal
  keep = (tmp_a >= first_edge)
/Users/nechamaborisute/anaconda3/envs/learn-env/lib/python3.8/site-packages/numpy/lib/histograms.py:840: RuntimeWarning: inva
lid value encountered in less_equal
  keep &= (tmp_a <= last_edge)
```



Gross Revenue by Runtime

In [23]:
```
# Create a scatter plot
plt.scatter(df['runtime_minutes'], df['worldwide_gross'])
plt.xlabel('Runtime (minutes)')
plt.ylabel('Worldwide Gross')
plt.title('Worldwide Gross by Runtime')
plt.show()
```



In [24]:
```
df['runtime_minutes'].mean()
```

Out[24]:
```
97.20462740384616
```

In [25]:
```
df['runtime_minutes'].median()
```

Out[25]:
```
98.0
```

Average Runtime is about 100 minutes and so is the median. That is indicative of a strong recommendation.

TOP COUNT BY STUDIO

In [26]:
```
pd.read_sql("""
    SELECT COUNT(title) AS total_count, studio,  production_budget, worldwide_gross
    FROM box_office_mojo AS b
    JOIN tn_movie_budgets AS t
```

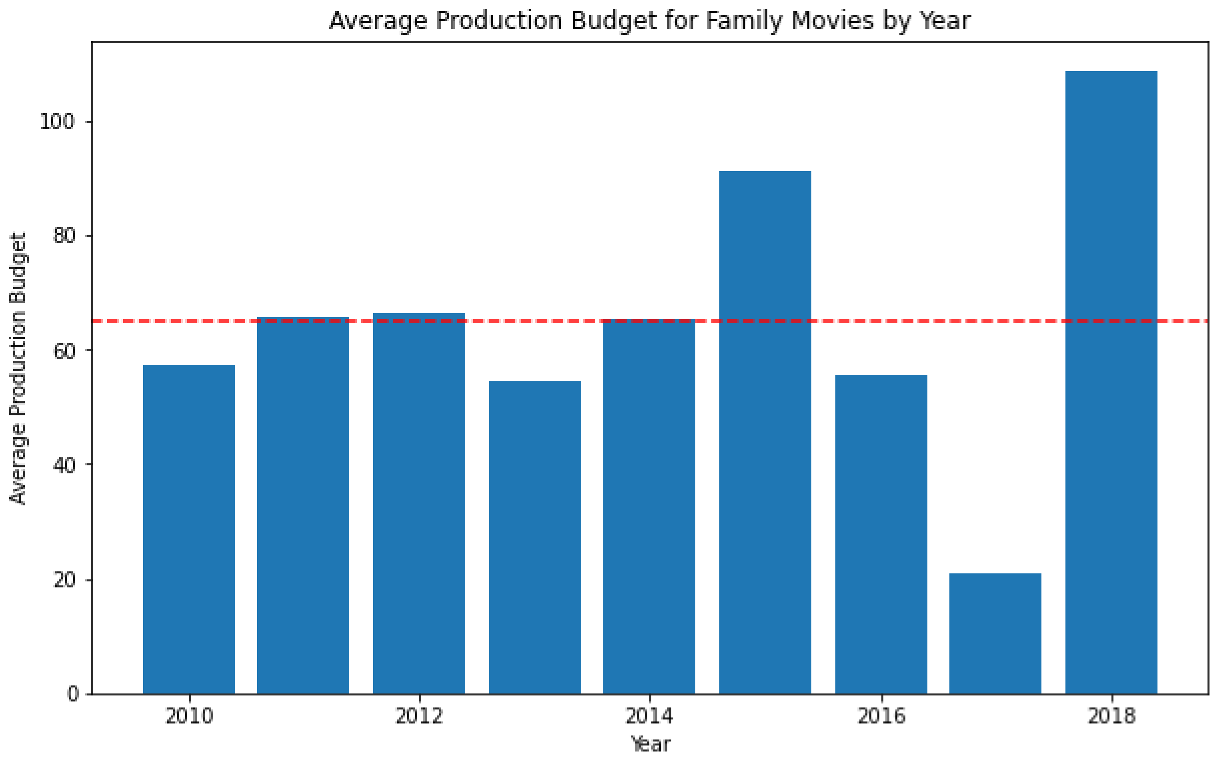
```
        ON b.title = t.movie

    GROUP BY studio
    ORDER BY total_count DESC
    LIMIT 25
""", conn)
```

Out[26]:

	total_count	studio	production_budget	worldwide_gross
0	117	Uni.	$69,000,000	$543,464,573
1	108	Fox	$155,000,000	$418,186,950
2	100	WB	$160,000,000	$835,524,642
3	74	Sony	$40,000,000	$351,774,938
4	72	Par.	$170,000,000	$621,156,389
5	70	BV	$200,000,000	$1,068,879,522
6	54	LGF	$82,000,000	$268,268,174
7	38	Wein.	$1,000,000	$16,566,240
8	36	WB (NL)	$95,000,000	$294,680,778
9	36	FoxS	$13,000,000	$331,266,710
10	36	Focus	$20,000,000	$67,950,723
11	27	LG/S	$40,000,000	$169,590,606
12	25	SGem	$57,500,000	$295,874,190
13	24	SPC	$15,000,000	$34,247,816
14	24	Rela.	$42,000,000	$8,514,325
15	21	ORF	$70,000,000	$65,409,046
16	17	IFC	$4,900,000	$23,347,461
17	15	TriS	$40,000,000	$72,295,262
18	15	STX	$20,000,000	$180,998,716
19	15	RAtt.	$13,000,000	$23,014,027
20	14	Magn.	$5,600,000	$18,527,766
21	11	Sum.	$68,000,000	$706,102,828
22	11	A24	$5,000,000	$31,149,251
23	10	P/DW	$165,000,000	$756,244,673
24	9	CBS	$24,000,000	$35,792,945

In [27]:

```
df = pd.read_sql("""
WITH RECURSIVE split(genre, str) AS (
    SELECT '', genres || ',' FROM movie_basics
    UNION ALL SELECT
    substr(str, 0, instr(str, ',')),
    substr(str, instr(str, ',')+1)
    FROM split WHERE str!=''
)
SELECT AVG(CAST(REPLACE(production_budget, '$', '') AS INTEGER)) AS avg_production_budget,
              worldwide_gross,
              year
FROM split
JOIN movie_basics AS m ON instr(genres, genre) > 0
JOIN tn_movie_budgets AS t ON m.primary_title = t.movie
JOIN box_office_mojo AS b ON b.title = t.movie
WHERE genre ='Family'
GROUP BY year
ORDER BY year;
""", conn)


fig, ax = plt.subplots(figsize=(10, 6))

plt.bar(x = df['year'], height = df['avg_production_budget'])
plt.axhline(df['avg_production_budget'].mean(), color='red', linestyle='--')
plt.xlabel('Year')
plt.ylabel('Average Production Budget')
plt.title('Average Production Budget for Family Movies by Year')
plt.show()
```

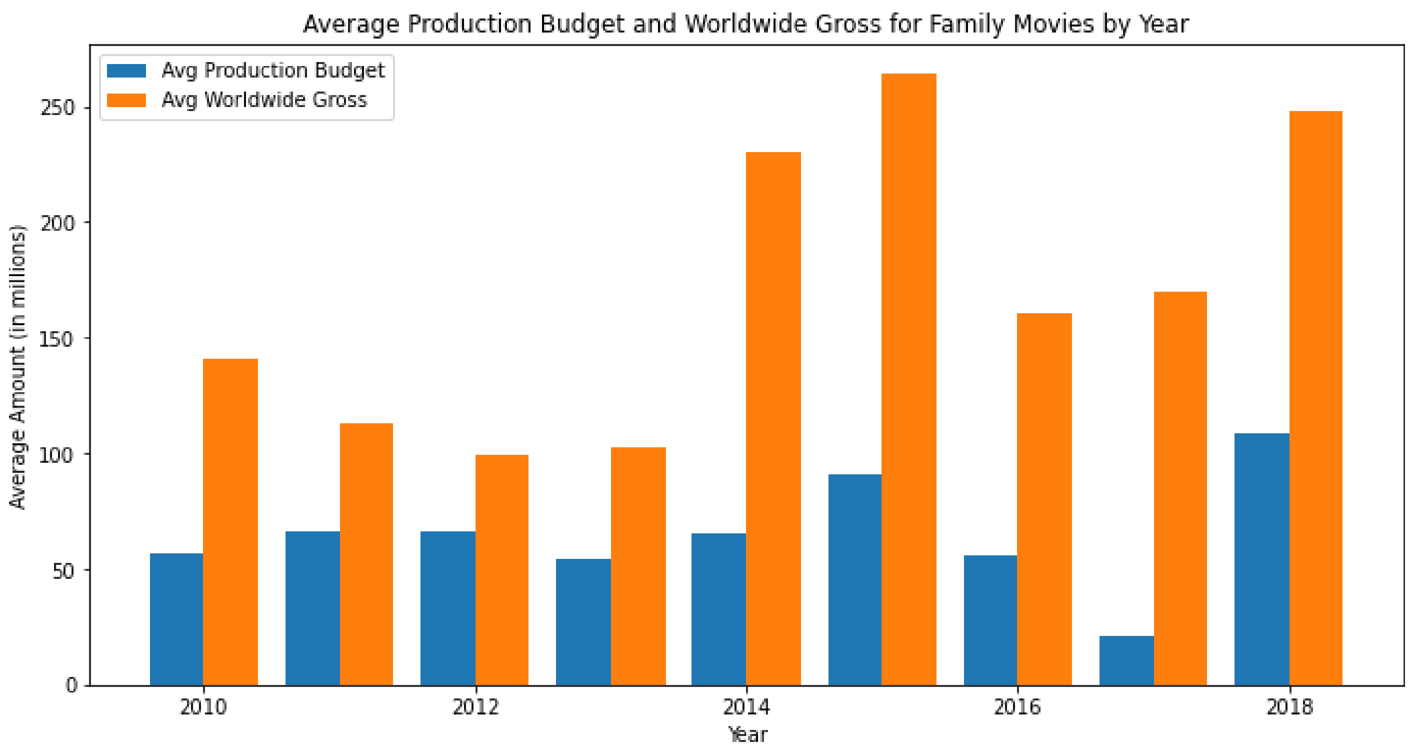


In [28]:
```
df['avg_production_budget'].mean()
```

Out[28]:
```
65.00117845117845
```

AVERAGE PRODUCTION BUDGETS AND WORLDWIDE GROSS COMPARISONS

In [29]:
```
df = pd.read_sql("""
WITH RECURSIVE split(genre, str) AS (
   SELECT '', genres || ',' FROM movie_basics
   UNION ALL SELECT
   substr(str, 0, instr(str, ',')),
   substr(str, instr(str, ',')+1)
   FROM split WHERE str!=''
)
SELECT AVG(CAST(REPLACE(production_budget, '$', '') AS INTEGER)) AS avg_production_budget,
      AVG(CAST(REPLACE(worldwide_gross, '$', '') AS INTEGER)) AS avg_worldwide_gross,
      year
FROM split
JOIN movie_basics AS m ON instr(genres, genre) > 0
JOIN tn_movie_budgets AS t ON m.primary_title = t.movie
JOIN box_office_mojo AS b ON b.title = t.movie
WHERE genre ='Family'
GROUP BY year
ORDER BY year;

""", conn)

# Plotting the data
plt.figure(figsize=(12, 6))

# Double bar graph
plt.bar(df['year'] - 0.2, df['avg_production_budget'], width=0.4, label='Avg Production Budget')
plt.bar(df['year'] + 0.2, df['avg_worldwide_gross'], width=0.4, label='Avg Worldwide Gross' )

plt.xlabel('Year')
plt.ylabel('Average Amount (in millions)')
plt.title('Average Production Budget and Worldwide Gross for Family Movies by Year')
plt.legend()
plt.show()
```



In [30]:
```
pd.read_sql("""
WITH RECURSIVE split(genre, str) AS (
   SELECT '', genres || ',' FROM movie_basics
   UNION ALL SELECT
   substr(str, 0, instr(str, ',')),
   substr(str, instr(str, ',')+1)
   FROM split WHERE str!=''
)
SELECT studio,
      COUNT(studio) AS total_movies,
      AVG(CAST(REPLACE(production_budget, '$', '') AS INTEGER)) AS avg_production_budget,
      AVG(CAST(REPLACE(worldwide_gross, '$', '') AS INTEGER)) AS avg_worldwide_gross
FROM (
   SELECT studio,
         CAST(REPLACE(production_budget, '$', '') AS INTEGER) AS production_budget,
         CAST(REPLACE(worldwide_gross, '$', '') AS INTEGER) AS worldwide_gross
   FROM split
   JOIN movie_basics AS m ON instr(genres, genre) > 0
   JOIN tn_movie_budgets AS t ON m.primary_title = t.movie
```

```
    JOIN box_office_mojo AS b ON b.title = t.movie
    WHERE genre ='Family'
) AS filtered_data
GROUP BY studio
ORDER BY total_movies DESC;



""", conn)
#NEED TO FIX MOVIE COUNT // SORT NOT WORKING ANYMORE
```

Out[30]:

	studio	total_movies	avg_production_budget	avg_worldwide_gross
0	Fox	105859	54.941176	135.176471
1	BV	105859	107.470588	232.058824
2	Sony	43589	55.142857	244.142857
3	WB	31135	101.600000	213.800000
4	Uni.	24908	47.250000	301.000000
5	LGF	24908	15.250000	95.750000
6	Par.	18681	118.000000	187.666667
7	TriS	12454	15.500000	60.000000
8	MNE	12454	32.500000	23.000000
9	Wein.	6227	8.000000	68.000000
10	WB (NL)	6227	250.000000	1.000000
11	W/Dim.	6227	55.000000	258.000000
12	Viv.	6227	3.000000	3.000000
13	Sum.	6227	35.000000	39.000000
14	Studio 8	6227	51.000000	99.000000
15	SPC	6227	13.000000	11.000000
16	Rela.	6227	13.000000	42.000000
17	ORF	6227	10.000000	4.000000
18	Free	6227	90.000000	20.000000
19	FoxS	6227	17.000000	7.000000
20	Focus	6227	15.000000	59.000000
21	Eros	6227	10.000000	18.000000

In [31]:

```
# close connection to database
conn.close()
```

Results

> Genre: Family
>
> Release date period: Holidays (November - December)
>
> Director, Writer, Actor: Brandon Camp

> Runtime for movie: 1 hour 40 minutes
>
> Production Budget: $65 Million