Introduction

Business problem

Our company is keen on investing in the movie industry. We have decided to create a new movie studio but do not know anything about creating movies. We are tasked with exploring the types of films currently doing the best at the box office. We must then translate those findings into actionable insights that the head of our company's new movie studio can use to help decide what type of films to create.

Project Goals

- **Examine historical box office performance across various genres, budgets, revenues and release dates.**
- **Identify key trends that contribute to a movie’s commercial success.**
- **Recommend data-driven strategies to guide the creation and marketing of new films.**

Data Understanding

The data source for this aanalysis was gotten tn.movie_budgets.csv

We will:

- Import the relevant libraries
- Load the data into a dataframe
- Explore and extract data for my analysis
- Data Visualization interpratation
- Provide Recommendations

Import libraries

In [6]:

```
import pandas as pd
import csv
import sqlite3
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import pearsonr
```

Load Data

Create a data frame named movie_budgets

In [19]:

```
movie_budgets = pd.read_csv('tn.movie_budgets.csv', index_col=0 )
movie_budgets.head()
```

Out[19]:

	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

	release_date	movie	production_budget	domestic_gross	worldwide_gross
id					
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 [23]:

```
movie_gross = pd.read_csv('bom.movie_gross.csv', index_col=0 )
movie_gross.head()
```

Out[23]:

	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

Data Cleaning

In [82]:

```
# finding missing value for movie_budgets
missing_value = movie_budgets.isna().sum()/len(movie_budgets)*100
missing_value
```

Out[82]:

```
release_date         0.0
movie                0.0
production_budget    0.0
domestic_gross       0.0
worldwide_gross      0.0
foreign_gross        0.0
profit               0.0
profit_billions      0.0
roi                  0.0
foreign_profit       0.0
domestic_profit      0.0
release_month        0.0
dtype: float64
```

In [84]:

```
# finding missing value for movie_gross
missing_value = movie_gross.isna().sum()/len(movie_gross)*100
missing_value
```

Out[84]:

```
studio             0.148104
domestic_gross     0.829384
foreign_gross     39.662322
year               0.000000
dtype: float64
```

In [86]:

```
# find duplicates for movie_budgets
movie_budgets.duplicated().sum()
```

Out[86]:

```
0
```

In [88]:

```
# find duplicates for movie_gross
movie_gross.duplicated().sum()
```

Out[88]:

```
0
```

In [33]:

```
# remove duplicates
movie_gross.drop_duplicates(keep='first', inplace=True)
```

In [35]:

```
# proof there are no more duplicates
movie_gross.duplicated().any()
```

Out[35]:

```
False
```

In [37]:

```
# Convert our strings to numeric values
currency_columns = ['worldwide_gross', 'domestic_gross' , 'production_budget']

currency_columns = ['worldwide_gross', 'domestic_gross', 'production_budget']
movie_budgets[currency_columns] = (
    movie_budgets[currency_columns]
    .replace(r'[\$,]', '', regex=True)
    .apply(pd.to_numeric))
```

In [39]:

```
# create foreign gross column

movie_budgets['foreign_gross'] = movie_budgets['worldwide_gross'] - movie_budgets['domest
ic_gross']
print(movie_budgets.head())
```

```
    release_date                                      movie  \
id
1   Dec 18, 2009                                     Avatar
2   May 20, 2011  Pirates of the Caribbean: On Stranger Tides
3    Jun 7, 2019                               Dark Phoenix
4    May 1, 2015                    Avengers: Age of Ultron
5   Dec 15, 2017          Star Wars Ep. VIII: The Last Jedi

    production_budget  domestic_gross  worldwide_gross  foreign_gross
id
1           425000000       760507625       2776345279     2015837654
2           410600000       241063875       1045663875      804600000
3           350000000        42762350        149762350      107000000
4           330600000       459005868       1403013963      944008095
5           317000000       620181382       1316721747      696540365
```

Exploratory Data Analysis

Most Profitable Movie Genres

We are looking at the most profitable movie genres of all time

In [43]:

```
# create profit column

movie_budgets['profit'] = movie_budgets['worldwide_gross'] - movie_budgets['production_bu
dget']
print(movie_budgets.head())
```

```
    release_date                                        movie  \
id
1   Dec 18, 2009                                       Avatar
2   May 20, 2011  Pirates of the Caribbean: On Stranger Tides
3    Jun 7, 2019                                 Dark Phoenix
4    May 1, 2015                      Avengers: Age of Ultron
5   Dec 15, 2017            Star Wars Ep. VIII: The Last Jedi

    production_budget  domestic_gross  worldwide_gross  foreign_gross  \
id
1           425000000       760507625       2776345279     2015837654
2           410600000       241063875       1045663875      804600000
3           350000000        42762350        149762350      107000000
4           330600000       459005868       1403013963      944008095
5           317000000       620181382       1316721747      696540365

        profit
id
1   2351345279
2    635063875
3   -200237650
4   1072413963
5    999721747
```

In [45]:

```
# top 10 most profitable movies

most_profitable = movie_budgets.sort_values(by='profit', ascending=False).head(10)
most_profitable
```

Out[45]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	foreign_gross	profit
id							
1	Dec 18, 2009	Avatar	425000000	760507625	2776345279	2015837654	2351345279
43	Dec 19, 1997	Titanic	200000000	659363944	2208208395	1548844451	2008208395
7	Apr 27, 2018	Avengers: Infinity War	300000000	678815482	2048134200	1369318718	1748134200
6	Dec 18, 2015	Star Wars Ep. VII: The Force Awakens	306000000	936662225	2053311220	1116648995	1747311220
34	Jun 12, 2015	Jurassic World	215000000	652270625	1648854864	996584239	1433854864
67	Apr 3, 2015	Furious 7	190000000	353007020	1518722794	1165715774	1328722794
27	May 4, 2012	The Avengers	225000000	623279547	1517935897	894656350	1292935897
61	Jul 15, 2011	Harry Potter and the Deathly Hallows: Part II	125000000	381193157	1341693157	960500000	1216693157
42	Feb 16, 2018	Black Panther	200000000	700059566	1348258224	648198658	1148258224
13	Jun 22, 2018	Jurassic World: Fallen Kingdom	170000000	417719760	1305772799	888053039	1135772799

In [90]:

```
# Convert the 'profit' column from millions to billions
movie_budgets['profit_billions'] = movie_budgets['profit'] / 1_000_000_000
movie_budgets
```

Out[90]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	foreign_gross	profit	profit_billions
id								
1	2009-12-18	Avatar	425000000	760507625	2776345279	2015837654	2351345279	2.351345

id	release_date	movie	production_budget	domestic_gross	worldwide_gross	foreign_gross	profit	profit_billions
2	2011-05-20	Pirates of the Caribbean: On Stranger Tides	410600000	241063875	1045663875	804600000	635063875	0.635064
3	2019-06-07	Dark Phoenix	350000000	42762350	149762350	107000000	-200237650	-0.200238
4	2015-05-01	Avengers: Age of Ultron	330600000	459005868	1403013963	944008095	1072413963	1.072414
5	2017-12-15	Star Wars Ep. VIII: The Last Jedi	317000000	620181382	1316721747	696540365	999721747	0.999722
...	...	...	...	...	...	...	...	...
78	2018-12-31	Red 11	7000	0	0	0	-7000	-0.000007
79	1999-04-02	Following	6000	48482	240495	192013	234495	0.000234
80	2005-07-13	Return to the Land of Wonders	5000	1338	1338	0	-3662	-0.000004
81	2015-09-29	A Plague So Pleasant	1400	0	0	0	-1400	-0.000001
82	2005-08-05	My Date With Drew	1100	181041	181041	0	179941	0.000180

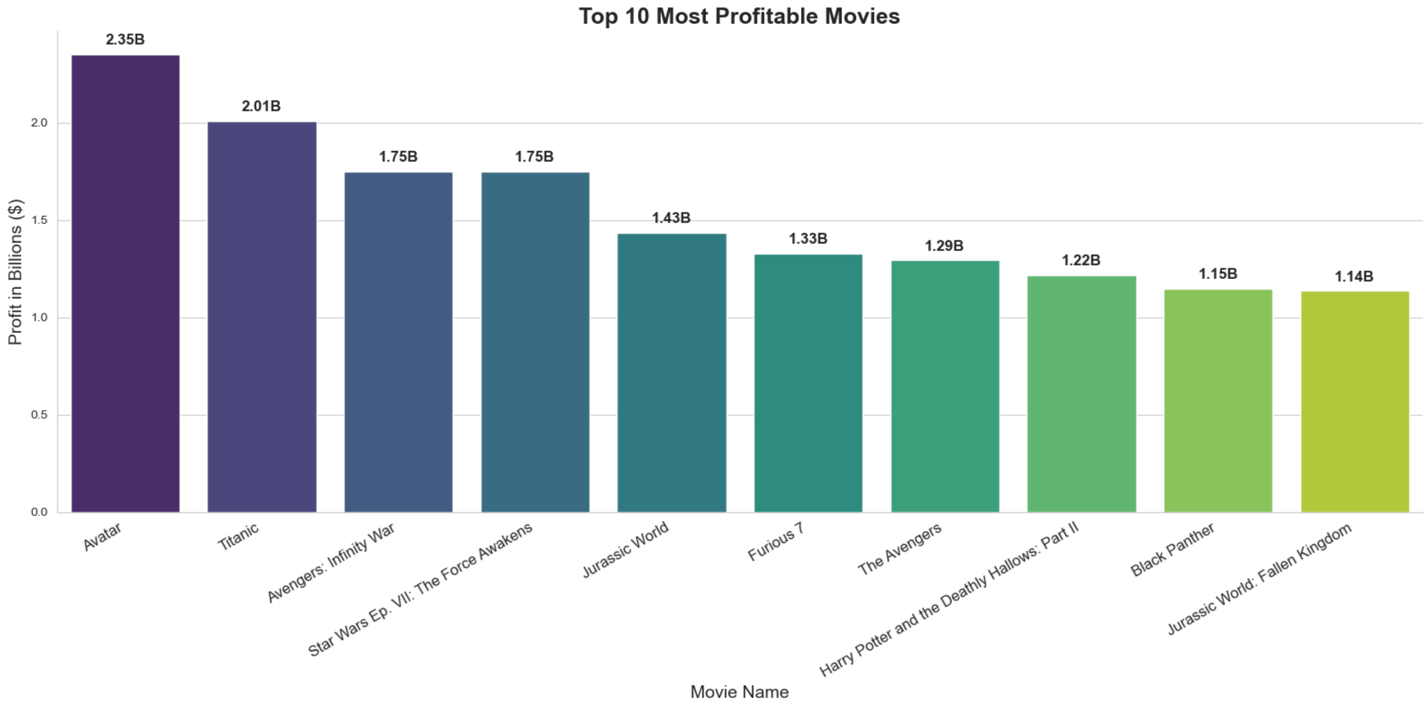
5782 rows × 12 columns

10 most profitable movies

In [106]:

```
sns.set_style("whitegrid")


plt.figure(figsize=(16, 8))


ax = sns.barplot(
    data=most_profitable,
    x="movie",
    y="profit_billions",
    hue="movie",
    palette="viridis",
    legend=False
)


for index, value in enumerate(most_profitable["profit_billions"]):
    ax.text(index, value + 0.05, f"{value:.2f}B", ha="center", fontsize=12, fontweight="bold")


plt.title("Top 10 Most Profitable Movies", fontsize=18, fontweight="bold")
plt.ylabel("Profit in Billions ($)", fontsize=14)
plt.xlabel("Movie Name", fontsize=14)


plt.xticks(rotation=30, ha="right", fontsize=12)


sns.despine()
```

```
plt.tight_layout()
plt.show()
```



Conclusion: The most profitable genre is Action Sci-Fi

Return on Investment(ROI)

We are looking at the movies with highest return on investments

```
In [110]:
```

```
# Calculate ROI

movie_budgets["roi"] = (movie_budgets["profit"] / movie_budgets["production_budget"])

# Show top 5 movies by ROI
print(movie_budgets.sort_values("roi", ascending=False).head())
```

```
   release_date                     movie  production_budget  domestic_gross  \
id
46   1972-06-30               Deep Throat              25000        45000000
14   1980-03-21                   Mad Max             200000         8750000
93   2009-09-25        Paranormal Activity             450000       107918810
80   2015-07-10               The Gallows             100000        22764410
7    1999-07-14  The Blair Witch Project             600000       140539099

    worldwide_gross  foreign_gross     profit  profit_billions          roi  \
id
46         45000000              0   44975000         0.044975  1799.000000
14         99750000       91000000   99550000         0.099550   497.750000
93        194183034       86264224  193733034         0.193733   430.517853
80         41656474       18892064   41556474         0.041556   415.564740
7         248300000      107760901  247700000         0.247700   412.833333

    foreign_profit  domestic_profit  release_month
id
46          -25000         44975000              6
14        90800000          8550000              3
93        85814224        107468810              9
80        18792064         22664410              7
7        107160901        139939099              7
```

Visualisation

Conclusion: high ROI means strong audience interest and/or repeat viewing or great marketing while low ROI means poor reception, low audience engagement or poor marketing

Analysing between foreign and domestic audience trends

We are analysing the most profitable audience

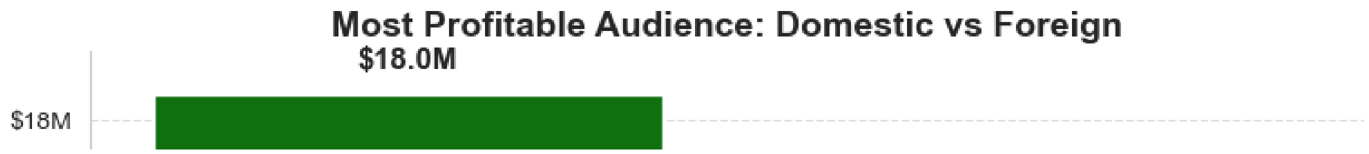
In [115]:

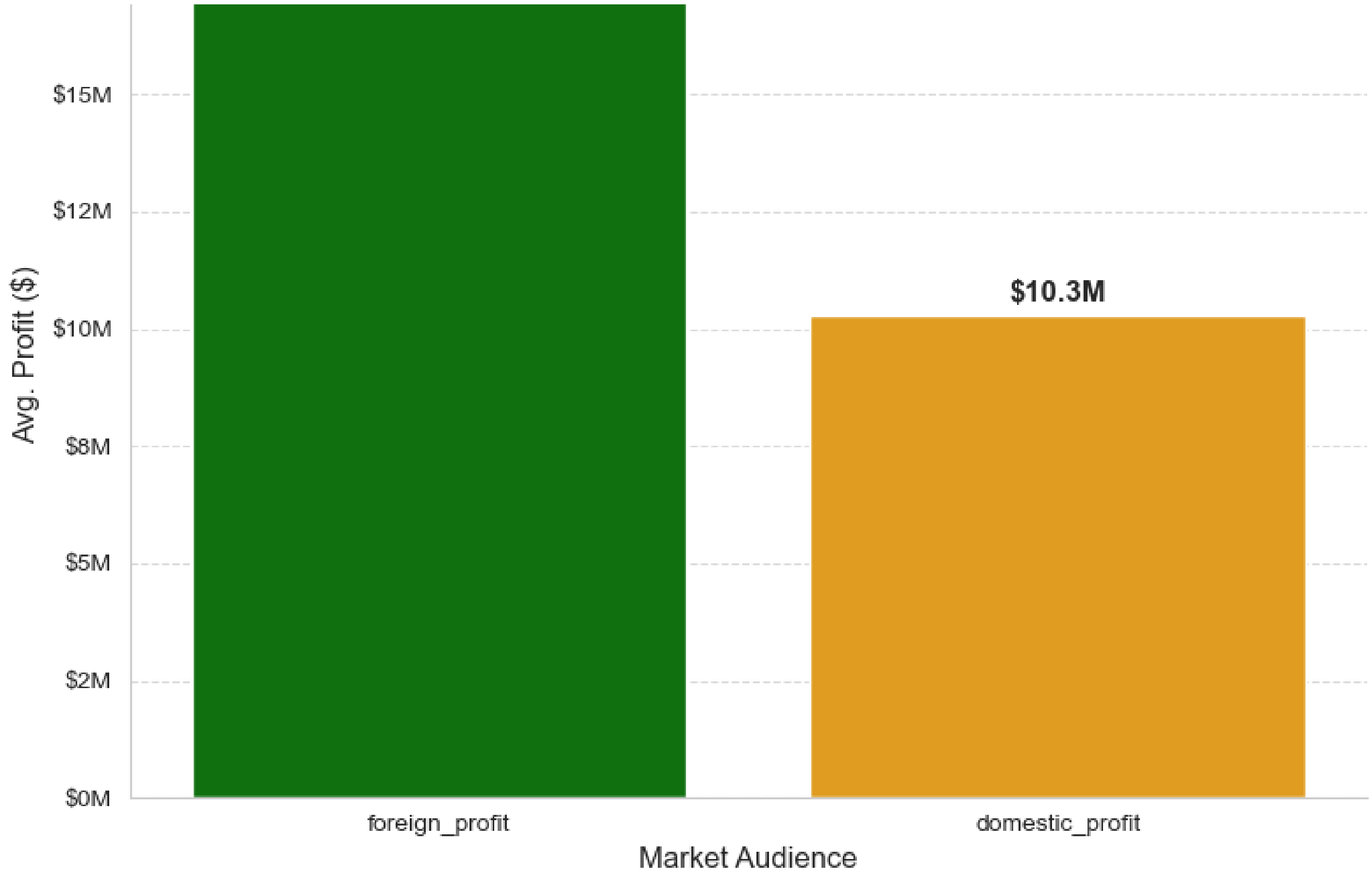
```
#analyzing between foreign and domestic audience trends, the most profitable audience
#foreign profit margin
movie_budgets['foreign_profit'] = movie_budgets['foreign_gross'] - movie_budgets['production_budget']
movie_budgets['domestic_profit'] = movie_budgets['domestic_gross'] - movie_budgets['production_budget']

# Compare Average Foreign and Domestic Profit
profit_comparison = movie_budgets[["foreign_profit", "domestic_profit"]].mean()
# Display Profit Comparison Values
print(profit_comparison)
```

```
foreign_profit     1.802638e+07
domestic_profit    1.028557e+07
dtype: float64
```

In [123]:

```
sns.set_style("whitegrid")


plt.figure(figsize=(8,6))


ax = sns.barplot(
    data=profit_comparison.reset_index(),
    x="index",
    y=0,
    hue="index",
    palette=["green", "orange"],
    legend=False
)


for index, value in enumerate(profit_comparison.values):
    ax.text(index, value + 0.03 * value, f"${value/1e6:,.1f}M", ha="center", fontsize=12, fontweight="bold")


plt.xlabel("Market Audience", fontsize=12)
plt.ylabel("Avg. Profit ($)", fontsize=12)
plt.title("Most Profitable Audience: Domestic vs Foreign", fontsize=14, fontweight="bold")


ax.yaxis.set_major_formatter(mtick.FuncFormatter(lambda x, _: f"${x/1e6:,.0f}M"))


plt.grid(axis="y", linestyle="--", alpha=0.7)


sns.despine()


plt.tight_layout()
plt.show()
```





Conclusion: Foreign markets are more profitable than domostic markets. This is because foreign profit is significantly higher than domestic profit. This means movies make more money internationally

Relase Month vs Revenue

We are analysing how the month a movie is released affects revenue

In [65]:

```
# Convert release_date to datetime and extract month
movie_budgets['release_date'] = pd.to_datetime(movie_budgets['release_date'])
movie_budgets['release_month'] = movie_budgets['release_date'].dt.month

# Group by month and calculate mean revenue
monthly_revenue = movie_budgets.groupby('release_month')['worldwide_gross'].mean().reset
_index()
monthly_revenue
```

Out[65]:

	release_month	worldwide_gross
0	1	4.656382e+07
1	2	7.154453e+07
2	3	8.063337e+07
3	4	5.992026e+07
4	5	1.622680e+08
5	6	1.425230e+08
6	7	1.409636e+08
7	8	6.097841e+07
8	9	4.669369e+07
9	10	4.946456e+07
10	11	1.357416e+08

	release_month	worldwide_gross
11	12	1.016932e+08

In [67]:

```
# Arrange worldwide_gross in descending order
monthly_revenue = monthly_revenue.sort_values(by='worldwide_gross',ascending=False)
monthly_revenue
```

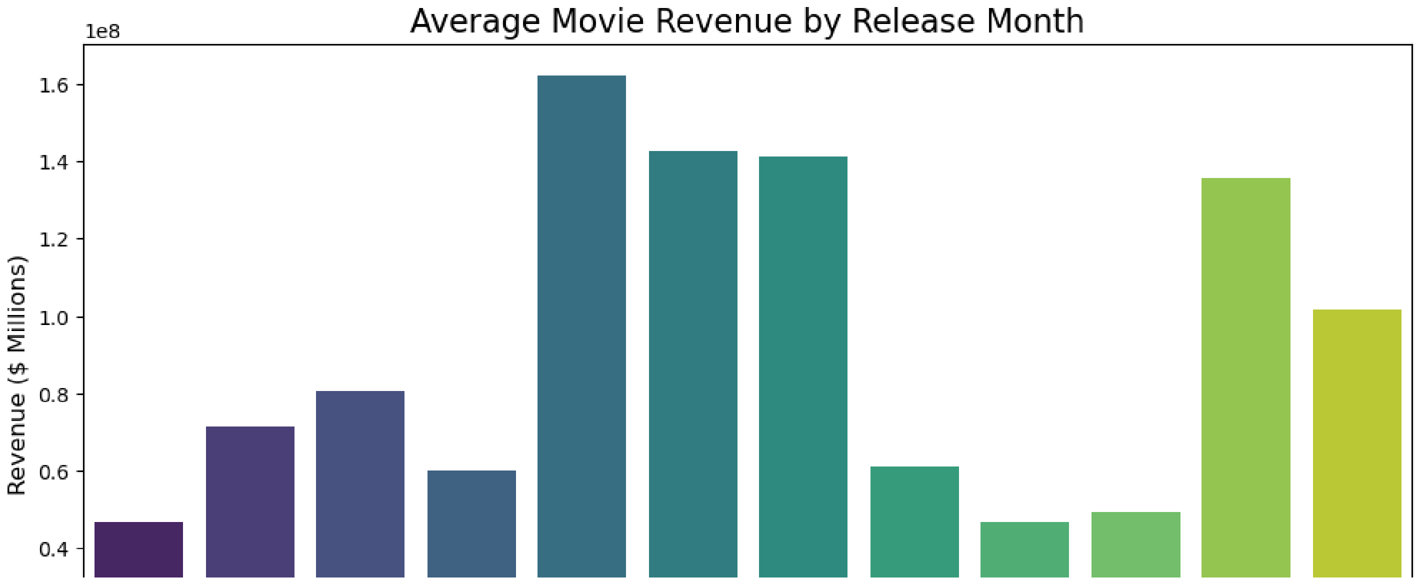
Out[67]:

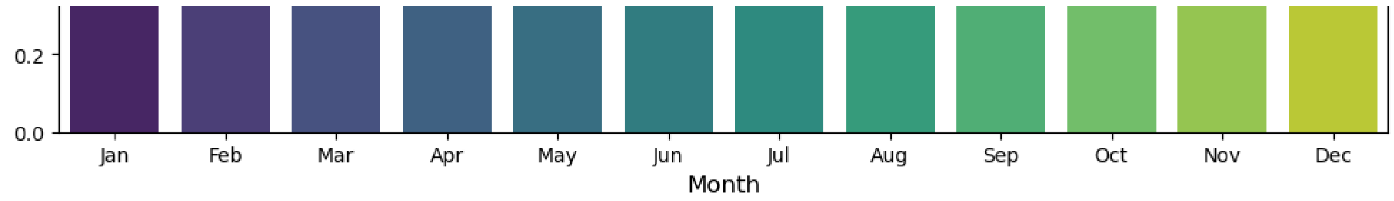
	release_month	worldwide_gross
4	5	1.622680e+08
5	6	1.425230e+08
6	7	1.409636e+08
10	11	1.357416e+08
11	12	1.016932e+08
2	3	8.063337e+07
1	2	7.154453e+07
7	8	6.097841e+07
3	4	5.992026e+07
9	10	4.946456e+07
8	9	4.669369e+07
0	1	4.656382e+07

In [69]:

```
# visualise
plt.figure(figsize=(12, 6))
sns.barplot(data=monthly_revenue, x='release_month', y='worldwide_gross', palette='viridis')
plt.title("Average Movie Revenue by Release Month", fontsize=16)
plt.xlabel("Month", fontsize=12)
plt.ylabel("Revenue ($ Millions)", fontsize=12)
plt.xticks(ticks=range(12), labels=['Jan','Feb','Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec'])
plt.show()
```

```
C:\Users\USER\AppData\Local\Temp\ipykernel_8336\1610366053.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False` for the same effect.

  sns.barplot(data=monthly_revenue, x='release_month', y='worldwide_gross', palette='viridis')
```





Conclusion: Movies do well in summer and holiday seasons which are May to July and November to December respectively

Correlation Between Budget and Revenue

We are analysing the correlation betweer production_budget and worldwide_grossrevenue

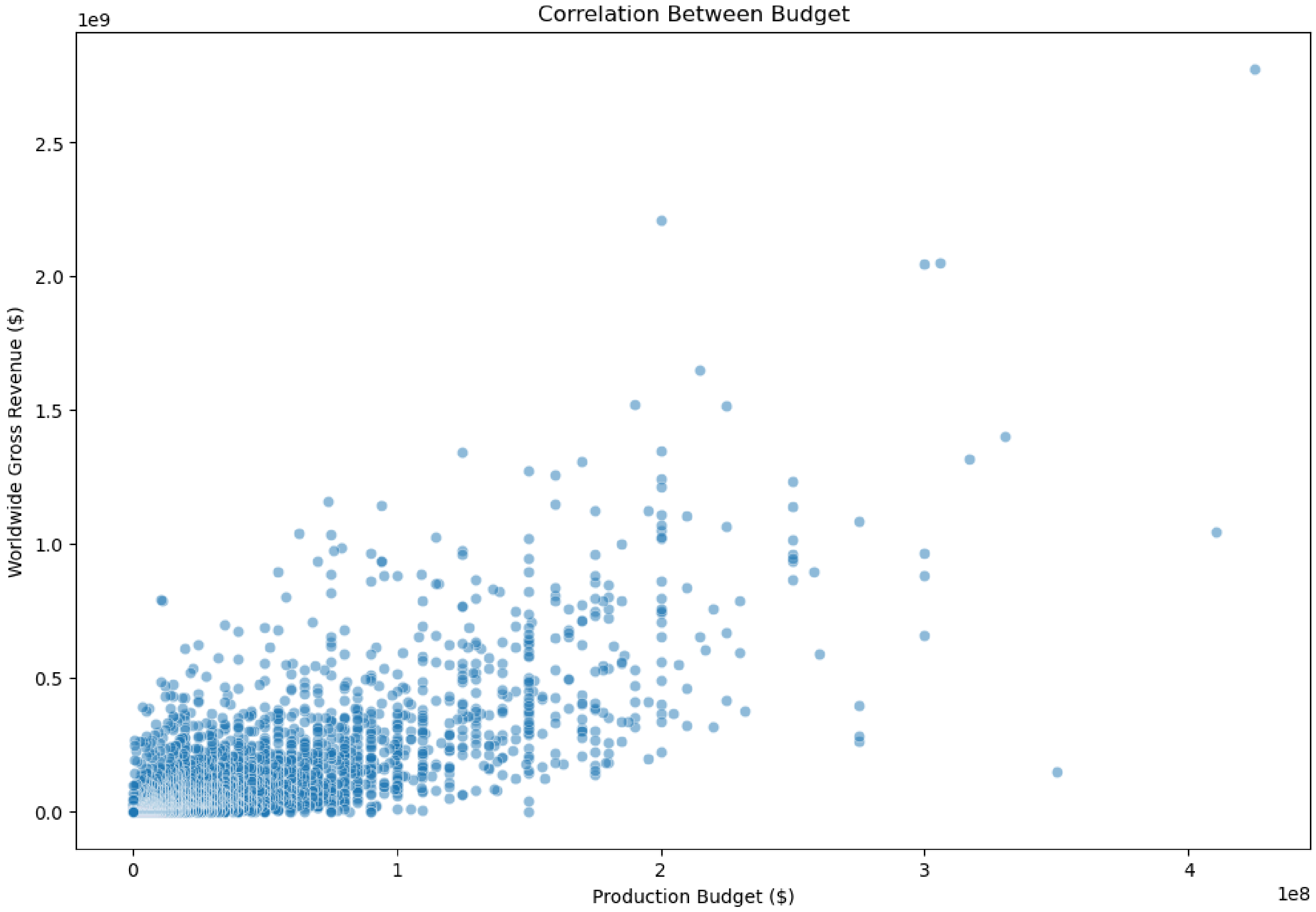
In [73]:

```
# Analyze correlation between Production Budget and Worldwide Gross Revenue
correlation_coefficient, p_value = pearsonr(movie_budgets["production_budget"], movie_bud
gets["worldwide_gross"])
print(f"Correlation Coefficient (R-value): {correlation_coefficient}")

# Scatter plot to visualize correlation
plt.figure(figsize=(12,8))
sns.scatterplot(x=movie_budgets["production_budget"], y=movie_budgets["worldwide_gross"],
alpha=0.5)
plt.xlabel("Production Budget ($)")
plt.ylabel("Worldwide Gross Revenue ($)")
plt.title("Correlation Between Budget")
```

```
Correlation Coefficient (R-value): 0.7483059765694755
```

Out[73]:

```
Text(0.5, 1.0, 'Correlation Between Budget')
```



Conclusion: Higher budgets may lead to higher revenue. However, it can be affected by other factors like marketing, release time and audience reception.

marketing, release time and audience reception

CONCLUSION

We have explored the movie industry and provided insights for our company interested in launching a new movie studio.

- **We identified that Action / Sci-Fi are the most profitable genres.**
- **The company should look into creating movies with more foreign appeal**
- **The company must have enough budget to handle production and marketing, this is because high budget films give good returns but must factor good marketing and release timings.**
- **The best time to release movies is during holidays and summers and we should also avoid releasing movies alongside popular block busters.**

In [ ]: