1 Microsoft Movie Maker Project

By: Ferdinand Beaman

- Student pace: part time
- Scheduled project review date/time: ?
- Instructor name: Abhineet Kulkarni
- Blog post URL: ?

1.1 Project Goal

The goal of this project is to inform Microsoft of what factors will help their first movie a success.

1.1.1 Data Source and Exploration

The data I used came primarily from imdb.com (https://www.imdb.com/) and the-numbers.com (https://www.the-numbers.com/). These websites have information about:

- titles, both domestic and international
- release dates
- cast and crew
- runtime
- budgets
- and gross ticket sales, both domestic and international

Sifting through this data, I believe that I'm able to demonstrate that an animated sci-fi adventure directed by Ryan Coogler would be a project with enormous potential in terms of "return on investment".

In [1]:

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

executed in 5.26s, finished 10:23:46 2022-03-22

In [2]:

```python
#Grabbing the data
csv_files = glob("./zippedData/*.csv.gz")
csv_files

csv_files_dict = {}
for filename in csv_files:
        filename_cleaned = os.path.basename(filename).replace(".csv", "
        filename_df = pd.read_csv(filename, index_col=0)
        csv_files_dict[filename_cleaned] = filename_df
```

executed in 2.83s, finished 10:23:49 2022-03-22

(Since my primary goal is to see what movies are profitable and not necessarily what makes movies well-reviewed, I'm ignoring the ratings-related tsv files).

In [3]:

```
#Just listing the files I have access to.
csv_files_dict.keys()
```

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Out[3]:

```
dict_keys(['imdb_title_crew_gz', 'tmdb_movies_gz', 'imdb_title_akas_gz',
'imdb_title_ratings_gz', 'imdb_name_basics_gz', 'imdb_title_basics_gz',
'tn_movie_budgets_gz', 'bom_movie_gross_gz', 'imdb_title_principals_gz'])
```

After sifting through, "tn_movie_budgets_gz" (from the-numbers.com) seemed like a good baseline. It is where I'll be getting my worldwide gross, budgets, and release date.

2 Lining the numbers up

The data from "the-numbers" unsurprisingly has all of the numerical data I need to build everything off of. But it's not ready just yet.

So in this section, we turn those raw figures into something more useful

In [4]:

```
#Starting with "the-numbers"
numbers = csv_files_dict["tn_movie_budgets_gz"]
numbers
```

executed in 10ms, finished 10:23:49 2022-03-22

Out[4]:

	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
...	...	...	...	...	...

The next step was to convert certain information into integers...

In [5]:

```
#Making a dedicated "year" column
numbers["year"] = numbers["release_date"].map(lambda x: x[slice(7,12)])

#Turning budget and gross into integers
numbers["budget"] = numbers["production_budget"].map(lambda x: x.replac

numbers["world_gross"] = numbers["worldwide_gross"].map(lambda x: x.rep
```

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... so I can create two new columns: "Net profit" and "ROI", created by subtracting and dividing the world_gross and budget columns respectively.

In [6]:

```
numbers["net_profit"] = numbers["world_gross"] - numbers["budget"]
numbers["roi"] = numbers["world_gross"] / numbers["budget"]
```

executed in 4ms, finished 10:23:49 2022-03-22

I should also make sure that there are no duplicate entries in my data.

In [7]:

```
#Movies are often rebooted years later. So different years are ignored.
numbers.drop_duplicates(subset=["movie", "year"])
```

executed in 15ms, finished 10:23:49 2022-03-22

Out[7]:

	release_date	movie	production_budget	domestic_gross	worldwide_gross	year
id						
1	Dec 18, 2009	Avatar	$425,000,000	$760,507,625	$2,776,345,279	200
2	May 20, 2011	Pirates of the Caribbean: On Stranger Tides	$410,600,000	$241,063,875	$1,045,663,875	201
3	Jun 7, 2019	Dark Phoenix	$350,000,000	$42,762,350	$149,762,350	201
4	May 1, 2015	Avengers: Age of Ultron	$330,600,000	$459,005,868	$1,403,013,963	201

In [8]:

```
#Whittling down to the relevant columns
data1 = numbers[["movie", "year", "budget", "world_gross", "net_profit"
data1
```

executed in 9ms, finished 10:23:49 2022-03-22

Out[8]:

	movie	year	budget	world_gross	net_profit	roi
id						
1	Avatar	2009	425000000	2776345279	2351345279	6.532577
2	Pirates of the Caribbean: On Stranger Tides	2011	410600000	1045663875	635063875	2.546673
3	Dark Phoenix	2019	350000000	149762350	-200237650	0.427892
4	Avengers: Age of Ultron	2015	330600000	1403013963	1072413963	4.243841
5	Star Wars Ep. VIII: The Last Jedi	2017	317000000	1316721747	999721747	4.153696
...	...	...	...	...	...	...
78	Red 11	2018	7000	0	-7000	0.000000
79	Following	1999	6000	240495	234495	40.082500
80	Return to the Land of Wonders	2005	5000	1338	-3662	0.267600

2.1 Getting the genre information

What kind of movie should someone make? When asked this question, I would bet that most people's first instinct is to assume that the answer is a genre.

First, a snag: each file that contained genre data (tmdb_movies_gz and imdb_title_basics_gz) had *two* columns for the movies' names.

So, using the "Saw" movies as a test...

In [9]:

```
#Titles on imdb
imdb_titles = csv_files_dict["imdb_title_basics_gz"]
imdb_titles[imdb_titles["original_title"].fillna(value="?").str.startsw
```

executed in 57ms, finished 10:23:49 2022-03-22

Out[9]:

	primary_title	original_title	start_year	runtime_minutes	genres
tconst					
tt1477076	Saw 3D: The Final Chapter	Saw 3D	2010	90.0	Crime,Horror,Mystery
tt2582064	Saw - La mécanique de l'extrême	Saw - La mécanique de l'extrême	2012	NaN	Documentary

In [10]:

```
#Titles on tmdb
tmdb_movies = csv_files_dict["tmdb_movies_gz"]
tmdb_movies[tmdb_movies["original_title"].str.startswith("Saw ")]
```

executed in 15ms, finished 10:23:49 2022-03-22

Out[10]:

	genre_ids	id	original_language	original_title	popularity	release_date	title	vo
14	[27, 80]	41439	en	Saw 3D	20.37	2010-10-28	Saw: The Final Chapter	

In [11]:

```
#Comparing to the dataframe I created from The Numbers
saw_movies = data1[data1["movie"].str.startswith("Saw 3D")]
saw_movies
```

executed in 7ms, finished 10:23:49 2022-03-22

Out[11]:

	movie	year	budget	world_gross	net_profit	roi
id						
79	Saw 3D	2010	17000000	133735284	116735284	7.866781

...you can see that the "original_title" column from both tmdb and imdb match with what I have from the-numbers.

Conveniently, IMDB already has its genres in readable English instead of coded IDs. So I performed an inner merge between IMDB's data and mine.

In [12]:

```
imdb_titles = imdb_titles.rename(columns={'original_title': 'movie'})
data1_imdb_interim = data1.merge(imdb_titles, how='inner', on="movie")
#dropping more unnecessary columns
data1_imdb = data1_imdb_interim.drop(["primary_title", "start_year"], a
data1_imdb
```

executed in 56ms, finished 10:23:49 2022-03-22

Out[12]:

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
0	Pirates of the Caribbean: On Stranger Tides	2011	410600000	1045663875	635063875	2.546673	136.0	Acti
1	Dark Phoenix	2019	350000000	149762350	-200237650	0.427892	113.0	Ac
2	Avengers: Age of Ultron	2015	330600000	1403013963	1072413963	4.243841	141.0	Ac
3	Avengers: Infinity War	2018	300000000	2048134200	1748134200	6.827114	149.0	Ac

2.1.1 Narrowing my scope

Some movies are going to be too old or too small for our purposes.

In both cases it's somewhat arbitrary where lines should be drawn.

For age, I just looked year by year and used my best judgment. (I also asked one person for an opinion; she landed on the year after I did). So is the year that has "127 Hours", "The Social Network" and "Inception" close enough to be considered relevant? What about "Drive", "Limitless", and "Captain America" (the *first* one)? Those are 2010 and 2011. Maybe, maybe not.

But 2012 has "The Avengers". I still see critics and friends say "ever since the Avengers" in the same way they say "ever since The Matrix". That right there feels like the start of an era to me. The Dark knight trilogy came to an end that year too, and the age of Christopher Nolan dominating the culture has the feel of yesteryear. All in all, 2012 seems good enough to me.

For size (budget), I start with the knowledge that "The Blair Witch Project" famously made more money compared to its budget than any other movie in history. Adjusting for inflation, about a half-million was spent to produce it. So $500,000 was my first attempt at a lower bound.

In [13]:

```
#Dropping old movies
new_data = data1_imdb[data1_imdb["year"] > 2011].drop_duplicates(subset
```

executed in 4ms, finished 10:23:49 2022-03-22

In [14]:

```python
#Dropping small-budget movies
df = new_data[new_data["budget"] >= 500000]
df.tail(15)
```

executed in 7ms, finished 10:23:49 2022-03-22

Out[14]:

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
3353	Detention of the Dead	2013	500000	1778	-498222	0.003556	87.0	Acti
3354	Higher Power	2018	500000	528	-499472	0.001056	93.0	
3357	Enter Nowhere	2012	500000	0	-500000	0.000000	90.0	
3358	Girls Gone Dead	2012	500000	0	-500000	0.000000	104.0	
3359	The Outrageous Sophie Tucker	2015	500000	0	-500000	0.000000	96.0	
3360	Subconscious	2015	500000	0	-500000	0.000000	72.0	
3362	Roadside	2015	500000	0	-500000	0.000000	90.0	
3363	Diamond Ruff	2014	500000	0	-500000	0.000000	82.0	
3364	Love in the Time of Monsters	2015	500000	0	-500000	0.000000	97.0	
3365	El rey de Najayo	2012	500000	0	-500000	0.000000	101.0	
3366	Fight to the Finish	2015	500000	0	-500000	0.000000	94.0	
3367	Bucky and the Squirrels	2013	500000	0	-500000	0.000000	82.0	
3370	Alleluia! The Devil's Carnival	2015	500000	0	-500000	0.000000	97.0	
3371	The Sound and the Shadow	2014	500000	0	-500000	0.000000	90.0	C
3372	Rodeo Girl	2015	500000	0	-500000	0.000000	108.0	

Wow. That's a lot of movies that didn't amount to anything. Let's raise the lower bound to $700,000.

In [15]:

```
df = new_data[new_data["budget"] >= 700000]
df.tail(10)
```

executed in 8ms, finished 10:23:49 2022-03-22

Out[15]:

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
3268	Le bonheur d'Elza	2015	900000	0	-900000	0.000000	78.0	
3271	Windsor Drive	2015	850000	3256	-846744	0.003831	90.0	
3273	Not Cool	2014	800000	35688	-764312	0.044610	93.0	Come
3274	Kill List	2012	800000	462206	-337794	0.577758	95.0	(
3275	Vessel	2015	800000	0	-800000	0.000000	NaN	
3280	Safety Not Guaranteed	2012	750000	4422318	3672318	5.896424	86.0	Come
3281	The Innkeepers	2012	750000	1011535	261535	1.348713	101.0	Dr
3283	Destiny	2014	750000	450	-749550	0.000600	NaN	
3288	Columbus	2017	700000	1110511	410511	1.586444	127.0	
3291	Walter	2015	700000	0	-700000	0.000000	NaN	

At least there are movies here that made their money back. So 700,000 it is.

One last thing: Tmdb did have language information. I may find this useful later in case there are big directors in foreign markets I need to account for.

(Note from the future: I didn't)

In [16]:

```
#Isolating the language column
#tmdb_lang = tmdb_movies.drop(["id", "genre_ids", "popularity", "releas
#tmdb_lang
```

executed in 1ms, finished 10:23:49 2022-03-22

In [17]:

```
#Merging, dropping duplicates
#df1 = df.merge(tmdb_lang, how='left', on="movie")
#df2 = df1.drop_duplicates(subset = ["movie", "year"])
#df2.shape
```

executed in 1ms, finished 10:23:49 2022-03-22

2.2 Making genre columns

This was a little hard to do since I forgot about the "set()" function. Meaning I had to skim the 1300 movies by hand and write down every genre I found.

No big deal.

In [18]:

```python
#Creating the list of genres...
genres = ['Action',
 'Adventure',
 'Animation',
 'Biography',
 'Comedy',
 'Crime',
 'Documentary',
 'Drama',
 'Family',
 'Fantasy',
 'History',
 'Horror',
 'Music',
 'Musical',
 'Mystery',
 'Romance',
 'Sci-Fi',
 'Sport',
 'Thriller',
 'War',
 'Western']
#...and making empty columns for each, with default values set to zero.
for x in genres:
    df[x] = 0
df
```

executed in 21ms, finished 10:23:49 2022-03-22

```
<ipython-input-18-44d6e27939d1>:25: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy)
  df[x] = 0
```

Out[18]:

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
1	Dark Phoenix	2019	350000000	149762350	-200237650	0.427892	113.0	.
2	Avengers: Age of Ultron	2015	330600000	1403013963	1072413963	4.243841	141.0	.
3	Avengers: Infinity War	2018	300000000	2048134200	1748134200	6.827114	149.0	.
4	Justice League	2017	300000000	655945209	355945209	2.186484	120.0	Ac
5	Spectre	2015	300000000	879620923	579620923	2.932070	148.0	A
...	...	...	...	...	...	...	...	...

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
3280	Safety Not Guaranteed	2012	750000	4422318	3672318	5.896424	86.0	Co
3281	The Innkeepers	2012	750000	1011535	261535	1.348713	101.0	
3283	Destiny	2014	750000	450	-749550	0.000600	NaN	
3288	Columbus	2017	700000	1110511	410511	1.586444	127.0	
3291	Walter	2015	700000	0	-700000	0.000000	NaN	

1300 rows × 29 columns

In [19]:

```python
#A function to automate the process of labeling a movie with its genre.
def is_genre(genre):
    df.loc[(df.genres.str.contains(genre)), genre]=1
    return df
```

executed in 2ms, finished 10:23:49 2022-03-22

I will not pretend to know why, but I have to turn all my NaN genre's into dummy data as well.

In [20]:

```python
#The above function won't function with NaNs... for some reason
df["genres"].fillna(value = "?", inplace = True)
```

executed in 4ms, finished 10:23:49 2022-03-22

```
/Users/ferdi/opt/anaconda3/envs/learn-env/lib/python3.8/site-packages/pan
das/core/series.py:4517: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  return super().fillna(
```

In [21]:

```
#Creating my dataframe
for x in genres:
    is_genre(x)
df
```

executed in 33ms, finished 10:23:49 2022-03-22

```
/Users/ferdi/opt/anaconda3/envs/learn-env/lib/python3.8/site-packages/pan
das/core/indexing.py:1765: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: https://pandas.pydata.org/pandas-do
cs/stable/user_guide/indexing.html#returning-a-view-versus-a-copy (http
s://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#returni
ng-a-view-versus-a-copy)
  isetter(loc, value)
```

Out[21]:

	movie	year	budget	world_gross	net_profit	roi	runtime_minutes	
1	Dark Phoenix	2019	350000000	149762350	-200237650	0.427892	113.0	
2	Avengers: Age of Ultron	2015	330600000	1403013963	1072413963	4.243841	141.0	
3	Avengers: Infinity War	2018	300000000	2048134200	1748134200	6.827114	149.0	
4	Justice League	2017	300000000	655945209	355945209	2.186484	120.0	Ac
5	Spectre	2015	300000000	879620923	579620923	2.932070	148.0	A
...	...	...	...	...	...	...	...	
3280	Safety Not Guaranteed	2012	750000	4422318	3672318	5.896424	86.0	Cc
3281	The Innkeepers	2012	750000	1011535	261535	1.348713	101.0	
3283	Destiny	2014	750000	450	-749550	0.000600	NaN	
3288	Columbus	2017	700000	1110511	410511	1.586444	127.0	
3291	Walter	2015	700000	0	-700000	0.000000	NaN	

1300 rows × 29 columns

Voila

2.3 Getting the Directors

Directors make or break a movie more than any actor. In my opinion.

To get the directors matched with their movies, however, requires a bit of work.

In [22]:

```
#The dataset that contains the actual names of the directors
imdb_name = csv_files_dict["imdb_name_basics_gz"]
#Separating directors from other professions
directors = imdb_name[imdb_name["primary_profession"].fillna(value="?")
#Making what seems like everyone's IDs a column I can interact with
directors.reset_index(inplace = True)
directors
```

executed in 248ms, finished 10:23:49 2022-03-22

Out[22]:

	nconst	primary_name	birth_year	death_year	primary_professio
0	nm0062879	Ruel S. Bayani	NaN	NaN	director,production_manager,miscellane
1	nm0064023	Bryan Beasley	NaN	NaN	director,producer,w
2	nm0066163	Arnaud Bedouët	NaN	NaN	actor,writer,dire
3	nm0066268	Steve Mitchell Beebe	NaN	NaN	editorial_department,director,ec
4	nm0068170	Dylan Bell	NaN	NaN	director,actor,produ
...	...	...	...	...	
146028	nm9971456	Zheng Wei	NaN	NaN	dire
146029	nm9978371	Zach Campbell	NaN	NaN	actor,cinematographer,assistant_dire
146030	nm9980896	Rama Narayanan	NaN	NaN	director,w
146031	nm9981679	Samir Eshra	NaN	NaN	director,writer,cinematograp
146032	nm9993380	Pegasus Envoyé	NaN	NaN	director,actor,w

146033 rows × 6 columns

But there aren't any movies written here. Just title IDs.

Title IDs are only directly associated with their titles in another file.

In [23]:

```
#The dataset that matches title_id to the actual title
titles_all = csv_files_dict["imdb_title_akas_gz"]
#Filtering out titles given to foreign releases, dropping irrelevant co
titles = titles_all[titles_all["is_original_title"] ==
                    1.0].drop(["region", "language", "types", "attribut
                               "is_original_title", "ordering"], axis =
```

executed in 13ms, finished 10:23:49 2022-03-22

In [24]:

```
titles.head(5)
```

executed in 6ms, finished 10:23:49 2022-03-22

Out[24]:

	title
title_id	
tt0369610	Jurassic World
tt0401729	John Carter
tt10010134	Versailles Rediscovered - The Sun King's Vanis...
tt10027708	Miguelito - Canto a Borinquen
tt10050722	Thing I Don't Get

The index column there is actually the IDs of the movies.

In [25]:

```
#This dataset pairs a director's ID with a movie's ID
crew = csv_files_dict["imdb_title_crew_gz"]
crew
```

executed in 6ms, finished 10:23:49 2022-03-22

Out[25]:

	directors	writers
tconst		
tt0285252	nm0899854	nm0899854
tt0438973	NaN	nm0175726,nm1802864
tt0462036	nm1940585	nm1940585
tt0835418	nm0151540	nm0310087,nm0841532
tt0878654	nm0089502,nm2291498,nm2292011	nm0284943
...	...	...
tt8999974	nm10122357	nm10122357
tt9001390	nm6711477	nm6711477
tt9001494	nm10123242,nm10123248	NaN

So these three datasets have one piece of a puzzle each. One has a director's ID with their movie's ID. One has a movie's ID matched with its title. And the other has a director's ID matched with their name.

So they need to come together.

In [26]:

```
#Creating a dictionary which will allow me to map IDs to Directors
keys = directors["nconst"]
values = directors["primary_name"]
direct_dict = dict(zip(keys, values))
direct_dict
```

executed in 44ms, finished 10:23:49 2022-03-22

Out[26]:

```
{'nm0062879': 'Ruel S. Bayani',
 'nm0064023': 'Bryan Beasley',
 'nm0066163': 'Arnaud Bedouët',
 'nm0066268': 'Steve Mitchell Beebe',
 'nm0068170': 'Dylan Bell',
 'nm0068874': 'Hava Kohav Beller',
 'nm0070482': 'Joel Bender',
 'nm0070822': 'Terry Benedict',
 'nm0075049': 'Urban Bergsten',
 'nm0075666': 'Joe Berlinger',
 'nm0077067': 'Jamie Bernstein',
 'nm0080787': 'Dusty Bias',
 'nm0081133': 'Adrienne Biddle',
 'nm0081516': 'Ric Esther Bienstock',
 'nm0081702': 'Claudio Bigagli',
 'nm0082154': 'Miro Bilbrough',
 'nm0083767': 'Fernando Birri',
 'nm0085316': 'James Black',
 'nm0086051': 'Bob Blagden',
```

Mapping this dictionary onto the other dataframe will lose any movies with multiple directors.

At first I thought movies with multiple directors were rare, but then I remembered that...

In [27]:

```
#First look at the output of this cell. Then run this cell again.
#It feels like I coded my first magic trick.
crew.loc["tt4154756"]
```

executed in 15ms, finished 10:23:49 2022-03-22

Out[27]:

```
directors                                  nm0751577,nm0751648
writers      nm1321655,nm1321656,nm0498278,nm0456158,nm0800...
Name: tt4154756, dtype: object
```

....The Russo *brothers* co-directed "Avengers: Infinity War" and "Avengers: Endgame".

Maybe you've heard of them, considering these movies account for 40% of the top 5 highest grossing films of all time.

So I have to add one additional Key:Value pair by hand.

In [28]:

```
direct_dict["nm0751577,nm0751648"] = "The Russos"
```

executed in 1ms, finished 10:23:49 2022-03-22

In [29]:

```
#And now we can proceed with overriding IDs with names
crew["directors"] = crew["directors"].map(direct_dict)
```

executed in 184ms, finished 10:23:50 2022-03-22

In [30]:

```python
#Making a column for merging purposes
crew["movie"] = crew.index
crew.head()
```

executed in 6ms, finished 10:23:50 2022-03-22

Out[30]:

	directors	writers	movie
tconst			
tt0285252	Tony Vitale	nm0899854	tt0285252
tt0438973	NaN	nm0175726,nm1802864	tt0438973
tt0462036	Bill Haley	nm1940585	tt0462036
tt0835418	Jay Chandrasekhar	nm0310087,nm0841532	tt0835418
tt0878654	NaN	nm0284943	tt0878654

In [31]:

```python
#Making a column for merging purposes
titles["title_id"] = titles.index
titles.head()
```

executed in 5ms, finished 10:23:50 2022-03-22

Out[31]:

	title	title_id
title_id		
tt0369610	Jurassic World	tt0369610
tt0401729	John Carter	tt0401729
tt10010134	Versailles Rediscovered - The Sun King's Vanis...	tt10010134
tt10027708	Miguelito - Canto a Borinquen	tt10027708
tt10050722	Thing I Don't Get	tt10050722

In [32]:

```python
#Creating a dictionary that will map titles to title IDs,
#like what was done with directors
keys = titles["title_id"]
values = titles["title"]
title_dict = dict(zip(keys, values))
title_dict
```

executed in 24ms, finished 10:23:50 2022-03-22

Out[32]:

```
{'tt0369610': 'Jurassic World',
 'tt0401729': 'John Carter',
 'tt10010134': "Versailles Rediscovered - The Sun King's Vanished Palac
e",
 'tt10027708': 'Miguelito - Canto a Borinquen',
 'tt10050722': "Thing I Don't Get",
 'tt10121294': 'This Jelly Doughnut Feeling',
 'tt1014759': 'Alice in Wonderland',
 'tt10214198': 'Gou yan kan ren xin',
 'tt10225354': 'Volviendo a Casa',
 'tt10225420': 'El Universo En Que Te Amé',
 'tt10308634': 'My First Client',
 'tt10351180': 'BadBoy',
 'tt10379338': 'Guys Night Out',
 'tt10446418': 'Icon',
 'tt1179034': 'From Paris with Love',
 'tt1182315': 'Negro Buenos Aires',
 'tt1194173': 'The Bourne Legacy',
 'tt1210047': 'Snatched!',
```

In [33]:

```python
#Mapping just like before
crew["movie"] = crew["movie"].map(title_dict)
crew.head()
```

executed in 48ms, finished 10:23:50 2022-03-22

Out[33]:

	directors	writers	movie
tconst			
tt0285252	Tony Vitale	nm0899854	Life's a Beach
tt0438973	NaN	nm0175726,nm1802864	NaN
tt0462036	Bill Haley	nm1940585	NaN
tt0835418	Jay Chandrasekhar	nm0310087,nm0841532	The Babymakers
tt0878654	NaN	nm0284943	Bulletface

And just to be absolutely sure it all worked out I tested this:

In [34]:

```
crew[crew["movie"].fillna(value="?").str.contains("Avengers")]
```

executed in 70ms, finished 10:23:50 2022-03-22

Out[34]:

	directors	writers	movie
tconst			
tt2395427	Joss Whedon	nm0923736,nm0498278,nm0456158,nm0800209,nm4160687	Avengers: Age of Ultron
tt4154756	The Russos	nm1321655,nm1321656,nm0498278,nm0456158,nm0800...	Avengers: Infinity War
tt4154796	The Russos	nm1321655,nm1321656,nm0498278,nm0456158,nm4160687	Avengers: Endgame
tt0848228	Joss Whedon	nm0923736,nm0672015	The Avengers

Great. Now to zip it all together...

In [35]:

```
df2 = df.merge(crew, how='left', on="movie").drop_duplicates(subset=["m
```

executed in 30ms, finished 10:23:50 2022-03-22

...and rearrange things a bit so the most important stuff is in the front.

In [36]:

```
df2 = df2[['movie','directors','budget', 'world_gross', 'net_profit',
 'roi', 'runtime_minutes', 'year', 'genres', 'Action','Adventure',
 'Animation', 'Biography', 'Comedy','Crime', 'Documentary', 'Drama', 'F
 'Fantasy', 'History', 'Horror', 'Music', 'Musical', 'Mystery', 'Romanc
 'Sci-Fi', 'Sport', 'Thriller', 'War', 'Western']]
df2
```

executed in 16ms, finished 10:23:50 2022-03-22

Out[36]:

	movie	directors	budget	world_gross	net_profit	roi	runtime_minutes
0	Dark Phoenix	Simon Kinberg	350000000	149762350	-200237650	0.427892	113.0
1	Avengers: Age of Ultron	Joss Whedon	330600000	1403013963	1072413963	4.243841	141.0
2	Avengers: Infinity War	The Russos	300000000	2048134200	1748134200	6.827114	149.0
3	Justice League	Zack Snyder	300000000	655945209	355945209	2.186484	120.0
4	Spectre	Sam Mendes	300000000	879620923	579620923	2.932070	148.0

2.4 Outliers

Look at this.

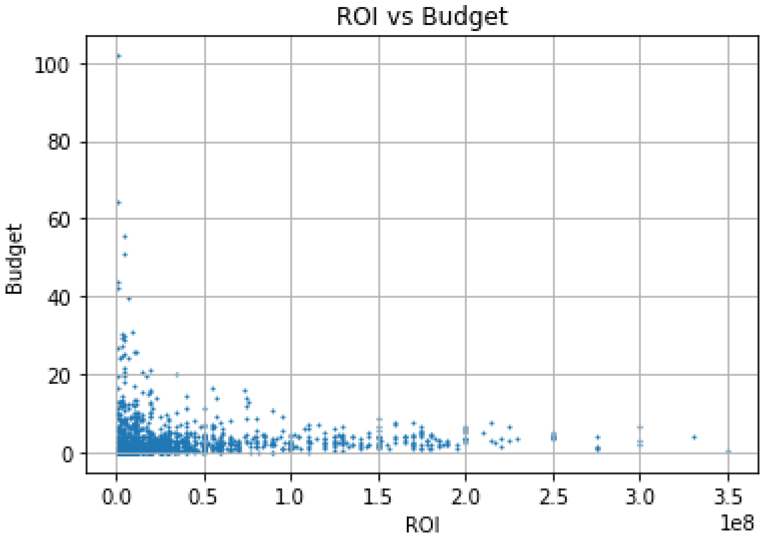
In [37]:

```
#ROI vs Budget
plt.title("ROI vs Budget")
plt.xlabel("ROI")
plt.ylabel("Budget")

plt.grid()

plt.scatter(df2["budget"], df2["roi"], s=1)
plt.show()
```

executed in 106ms, finished 10:23:50 2022-03-22



Somehow, a movie made over 100 times its money back, despite it having a budget of at least 700,000 dollars.

In [38]:

```
#The highest returns on investment?
df2.sort_values("roi", ascending=False).head(15)
```

executed in 14ms, finished 10:23:50 2022-03-22

Out[38]:

	movie	directors	budget	world_gross	net_profit	roi	runtime_minutes
1364	The Devil Inside	William Brent Bell	1000000	101759490	100759490	101.759490	NaN
1366	Unfriended	Levan Gabriadze	1000000	64364198	63364198	64.364198	83.0
1091	Split	Lawrence Côté-Collins	5000000	278964806	273964806	55.792961	90.0
1090	Get Out	NaN	5000000	255367951	250367951	51.073590	104.0
1319	Moonlight	Barry Jenkins	1500000	65245512	63745512	43.497008	111.0
1368	Chernobyl Diaries	Bradley Parker	1000000	42411721	41411721	42.411721	86.0
1066	Annabelle	John R. Leonetti	6500000	256862920	250362920	39.517372	99.0
994	Dangal	Nitesh Tiwari	9500000	294654618	285154618	31.016276	161.0
1211	The Purge	James DeMonaco	3000000	91266581	88266581	30.422194	85.0
1096	Lights Out	David F. Sandberg	5000000	148806510	143806510	29.761302	NaN
1212	Sinister	Scott Derrickson	3000000	87727807	84727807	29.242602	110.0
1100	Paranormal Activity 4	NaN	5000000	142817992	137817992	28.563598	88.0
1189	Truth or Dare	Robert Heath	3500000	95127344	91627344	27.179241	96.0
1367	You're Next	Adam Wingard	1000000	26887177	25887177	26.887177	95.0
880	The Fault in Our Stars	Josh Boone	12000000	307166834	295166834	25.597236	126.0

15 rows × 30 columns

Impressive, but those at the extreme ends will mess with our means too much.

In [39]:

```
df2["roi"].describe()
```

executed in 6ms, finished 10:23:50 2022-03-22

Out[39]:

```
count    1300.000000
mean        3.340278
std         5.862164
min         0.000000
25%         0.479576
50%         1.898908
75%         3.943571
max       101.759490
Name: roi, dtype: float64
```

Since the data is very much not a normal distribution, I don't know the best way to really define an outlier. The early-high school approach of "3rd quartile + IQR" feels really inappropriate. It would discount any movies that made more than 7.4 times their budget and that is...

In [40]:

```
print("There are " + str(len(df2)) + " total movies in our sample")
print("And there are " + str(len(df2[df2["roi"] >= 7.4])) + " movies th
print("So " + str(100*(len(df2[df2["roi"] >= 7.4])/(len(df2)))) + " per
```

executed in 3ms, finished 10:23:50 2022-03-22

```
There are 1300 total movies in our sample
And there are 130 movies that made 7.4 times their money back
So 10.0 percent of movies cross this threshold
```

10% is far too high. Instead, I'm going to cut off any movies more than 3 standard deviations away from the mean: those making 20.9263 times its budget

In [41]:

```
print("There are " + str(len(df2[df2["roi"] >= 20.9263])) + " movies th
print("That's " + str(100*(len(df2[df2["roi"] >= 20.9263])/(len(df2))))
```

executed in 3ms, finished 10:23:50 2022-03-22

```
There are 22 movies that made roughly 21 times their money back
That's 1.6923076923076923 percent of movies cross this threshold
```

Much better. Finally I have my dataset.

In [42]:

```
base_df = df2[df2["roi"] < 20.9263]
```

executed in 2ms, finished 10:23:50 2022-03-22

3 Results

It's results time! First, let's see if there is any strong evidence that Microsoft should pump more money in to see greater proportionate returns.

3.0.1 Budget

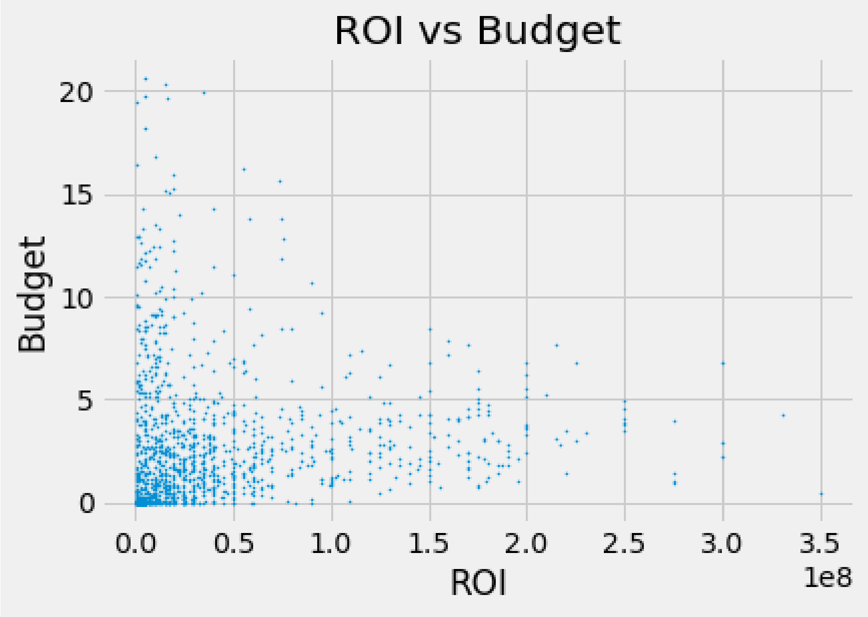
In [43]:

```
#Visualizing my new dataset
plt.style.use("fivethirtyeight")
plt.grid(axis='both')
plt.title("ROI vs Budget")
plt.xlabel("ROI")
plt.ylabel("Budget")

plt.grid()

plt.scatter(base_df["budget"], base_df["roi"], s=1)
plt.show()
```

executed in 87ms, finished 10:23:50 2022-03-22



In [44]:

```
#Correlation Coefficient
base_df['roi'].corr(base_df['budget'])
```

executed in 4ms, finished 10:23:50 2022-03-22

Out[44]:

```
0.07451109058574067
```

It doesn't seem that way at all. I suppose putting money in just means you see the same size slice of that money come back. At least that means all the money it costs to pay VFX artists to do a good job instead of a rushjob could come back around in the end.

3.0.2 Runtime

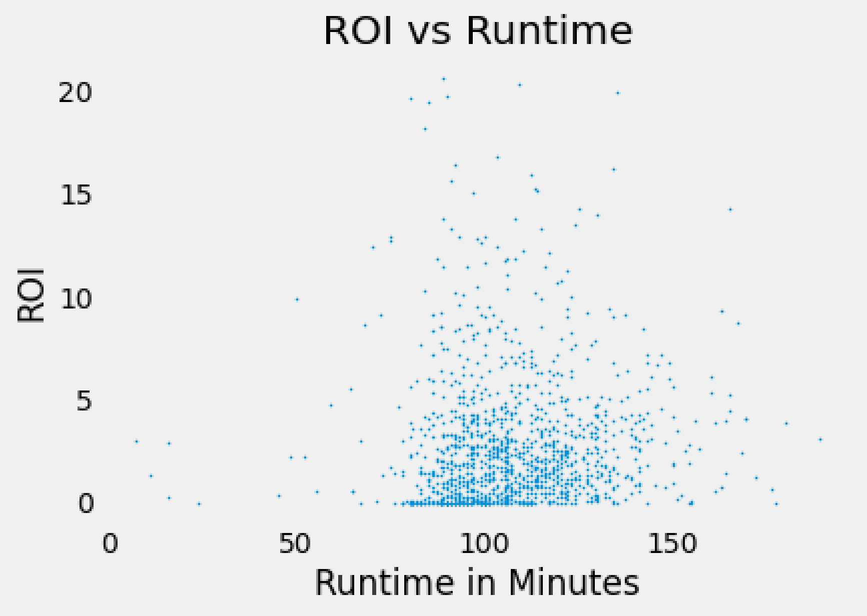
Since I have the data, I might as well check to see if movie length happens to have anything interesting to say.

In [45]:

```
plt.style.use("fivethirtyeight")
plt.grid(axis="both")
plt.title("ROI vs Runtime")
plt.xlabel("Runtime in Minutes")
plt.ylabel("ROI")


plt.scatter(base_df["runtime_minutes"], base_df["roi"], s=1)
plt.show()
```

executed in 67ms, finished 10:23:50 2022-03-22



In [46]:

```
#Correlation Coefficient
base_df['roi'].corr(base_df['runtime_minutes'])
```

executed in 3ms, finished 10:23:50 2022-03-22

Out[46]:

```
0.05742816069088249
```

As it turns out, it does not. Not unless Microsoft was somehow in any danger of making a 30 minute movie.

3.0.3 Directors

The sample size for each director is low at this stage. So I will try and account for the effect one outlier may have on their resume moving forward.

In [47]:

```
#Net Profit Mean
base_df.groupby("directors").mean().sort_values("net_profit", ascending
```

executed in 16ms, finished 10:23:50 2022-03-22

Out[47]:

	budget	world_gross	net_profit	roi	runtime_minutes	year	Action
directors							
Joss Whedon	277800000.0	1.460475e+09	1.182675e+09	5.495112	142.0	2013.5	˙
Adam Green	150000000.0	1.272470e+09	1.122470e+09	8.483133	93.0	2013.0	(
The Russos	240000000.0	1.300869e+09	1.060869e+09	5.196585	144.0	2016.0	˙
Sam Mendes	250000000.0	9.950740e+08	7.450740e+08	4.242352	145.5	2013.5	˙
Tim Miller	58000000.0	8.010256e+08	7.430256e+08	13.810786	108.0	2016.0	˙

5 rows × 27 columns

Some recognizable names in there.

In [48]:

```
#ROI Median
base_df.groupby("directors").median().sort_values("roi", ascending = Fa
```

executed in 16ms, finished 10:23:50 2022-03-22

Out[48]:

	budget	world_gross	net_profit	roi	runtime_minutes	year	Action
directors							
Andy Muschietti	35000000.0	697457969.0	662457969.0	19.927371	135.0	2017.0	0.
Adam Robitel	10000000.0	167885588.0	157885588.0	16.788559	103.0	2018.0	0.
Stephen Susco	1000000.0	16434588.0	15434588.0	16.434588	92.0	2018.0	0.
Sam Taylor-Johnson	40000000.0	570998101.0	530998101.0	14.274953	125.0	2015.0	0.
Peter Farrelly	23000000.0	322034439.0	299034439.0	14.001497	130.0	2018.0	0.

I've never heard of any of these guys. Odd.

In [49]:

```
#Mean ROI
base_df.groupby("directors").mean().sort_values("roi", ascending = Fals
```

executed in 15ms, finished 10:23:50 2022-03-22

Out[49]:

	budget	world_gross	net_profit	roi	runtime_minutes	year	Action
directors							
Andy Muschietti	35000000.0	697457969.0	662457969.0	19.927371	135.0	2017.0	0.0
Adam Robitel	10000000.0	167885588.0	157885588.0	16.788559	103.0	2018.0	0.0
Stephen Susco	1000000.0	16434588.0	15434588.0	16.434588	92.0	2018.0	0.0
Sam Taylor-Johnson	40000000.0	570998101.0	530998101.0	14.274953	125.0	2015.0	0.0
Peter Farrelly	23000000.0	322034439.0	299034439.0	14.001497	130.0	2018.0	0.0

5 rows × 27 columns

Awkward. The top 5 directors by both mean and median ROI are the same 5 people and are all in the same order. It turns out that's because each of them have only one movie to their name, and it's a movie that they were lucky enough to have do well.

For Microsoft's first foray into the movie business, I'm going to look only for people with a bit of a track record.

In [50]:

```
#Just directors with 3 or more movies under their belt over the last de
top_direct = base_df.groupby('directors').filter(lambda x: len(x) > 2)
```

executed in 49ms, finished 10:23:50 2022-03-22

In [51]:

```
#Let's try this one more time
#ROI Median
top_direct.groupby("directors").median().sort_values("roi", ascending =
```

executed in 21ms, finished 10:23:50 2022-03-22

Out[51]:

	budget	world_gross	net_profit	roi	runtime_minutes	year	Action
directors							
John Madden	10000000.0	9.038431e+07	80384306.0	9.038431	124.0	2015.0	0
Richard Linklater	4000000.0	2.325193e+07	20251930.0	7.750643	109.0	2013.0	0
Christopher Landon	9000000.0	6.417950e+07	55179495.0	7.131055	93.0	2015.0	0
Ryan Coogler	37000000.0	1.735676e+08	136567581.0	6.741291	85.0	2015.0	0
Genndy Tartakovsky	80000000.0	4.695003e+08	389500298.0	5.868754	91.0	2015.0	0

In [52]:

```
#ROI Mean
top_direct.groupby("directors").mean().sort_values("roi", ascending = F
```

executed in 16ms, finished 10:23:50 2022-03-22

Out[52]:

	budget	world_gross	net_profit	roi	runtime_minutes	year
directors						
Ryan Coogler	7.930000e+07	5.131252e+08	4.338252e+08	10.310637	98.666667	2015.333333
Christopher Landon	9.666667e+06	5.687973e+07	4.721307e+07	8.783005	92.333333	2016.000000
Richard Linklater	4.333333e+06	3.021065e+07	2.587732e+07	7.917800	124.333333	2013.000000
John Madden	1.266667e+07	7.758124e+07	6.491457e+07	7.643759	126.000000	2014.333333
Morten Tyldum	4.341667e+07	1.833896e+08	1.399730e+08	7.258602	108.666667	2014.000000
Nicholas Stoller	2.766667e+07	1.471086e+08	1.194420e+08	6.737985	104.333333	2014.000000
Wes Ball	5.200000e+07	3.082549e+08	2.562549e+08	6.564872	129.000000	2015.666667
Genndy Tartakovsky	7.666667e+07	4.583620e+08	3.816954e+08	6.143562	92.333333	2015.000000
Bryan Singer	1.570000e+08	5.957683e+08	4.387683e+08	6.018380	131.000000	2015.250000
The Russos	2.400000e+08	1.300869e+09	1.060869e+09	5.196585	144.000000	2016.000000
Rob Cohen	2.633333e+07	3.993079e+07	1.359746e+07	5.045590	98.333333	2015.000000
David O. Russell	3.675000e+07	1.488901e+08	1.121401e+08	4.848867	120.000000	2013.750000
Francis Lawrence	1.210000e+08	6.065955e+08	4.855955e+08	4.739211	136.500000	2015.000000
Kenneth Branagh	7.000000e+07	3.372838e+08	2.672838e+08	4.701995	123.000000	2015.333333
Rawson Marshall Thurber	7.066667e+07	2.630422e+08	1.923755e+08	4.671699	106.333333	2015.666667

15 rows × 27 columns

That list looks promising. I'll delve into that a little more in a moment.

3.0.4 Genres

The samples for each genre are usually fairly large, so the mean will be a bit more of a useful number to use than I had with directors. There are a couple of genres that the samples are low on though, like Westerns.

No matter what, I could use a sortable DataFrame just for genres. I could have used the transpose() function but went with the following approach instead.

In [53]:

```
#Preparing lists of the data that my DF's columns will be populated wit
#Mean and median ROI and net profits, as well as # of movies per genre
g_roi_mean = []
g_roi_median = []
g_net_mean = []
g_net_median = []
g_count = []
#Filling those lists
for genre in genres:
    g_roi_mean.append(base_df[base_df[genre] == 1]["roi"].mean())
    g_roi_median.append(base_df[base_df[genre] == 1]["roi"].median())
    g_net_mean.append(base_df[base_df[genre] == 1]["net_profit"].mean()
    g_net_median.append(base_df[base_df[genre] == 1]["net_profit"].medi
    g_count.append(len(base_df[base_df[genre] ==1]))
```

executed in 40ms, finished 10:23:50 2022-03-22

In [54]:

```
#Birthing the genre DataFrame
df_g = pd.DataFrame()
df_g["genre"] = genres
df_g["count"] = g_count
df_g["roi_mean"] = g_roi_mean
df_g["roi_median"] = g_roi_median
df_g["net_mean"] = g_net_mean
df_g["net_median"] = g_net_median
#Some not-so-well-educated guesses for some numbers I can consider
df_g["roixroi"] = df_g["roi_mean"]*df_g["roi_median"]
df_g["roisxnet_mean"] = df_g["roixroi"]*df_g["net_mean"]
df_g["roisxnet_median"] = df_g["roixroi"]*df_g["net_median"]
```

executed in 6ms, finished 10:23:50 2022-03-22

In [55]:

```
df_g
```

executed in 9ms, finished 10:23:50 2022-03-22

Out[55]:

	genre	count	roi_mean	roi_median	net_mean	net_median	roixroi	roisxn
0	Action	364	2.563720	2.098471	1.590534e+08	49100635.5	5.379891	8.5
1	Adventure	299	2.991108	2.433886	2.264624e+08	110859554.0	7.280017	1.6
2	Animation	85	3.467539	2.753201	2.389442e+08	151091610.0	9.546831	2.2
3	Biography	129	3.032131	1.753397	4.927148e+07	11187026.0	5.316530	2.6
4	Comedy	398	3.123753	2.464386	9.106072e+07	28527406.0	7.698134	7.0
5	Crime	204	2.014780	1.326145	3.771083e+07	6199163.0	2.671891	1.0
6	Documentary	47	2.844449	1.498421	2.557194e+07	3015686.0	4.262180	1.0
7	Drama	633	2.551275	1.474799	4.033740e+07	5733666.0	3.762619	1.5
8	Family	67	2.617101	2.029438	1.261528e+08	30401882.0	5.311244	6.7
9	Fantasy	95	2.778872	2.036885	1.543628e+08	46209222.0	5.660242	8.7

By the way, before the outliers were removed, Horror movies had a stunning mean ROI of over 6. Now they're a more believable 3.5.

And look at Musicals! They sport surprisingly high ROI (mean and median), but have only 8 representatives. Even the lowly Western genre has them beat by number of appearances on the big screen. I guess Disney doesn't make them like they used to.

3.1 Zeroing In

To determine the best genres, I ignored those with fewer than 30 movies left in my sample (Musical, Western, and War). I then looked at their ROIs, even using the product of mean and median ROI to at least give me some way of comparing/weighing both numbers at once. The genres that stood head and shoulders above the rest here were *Animation, Sci-Fi, Comedy, and Adventure*. If I included net profit in that product, then *Action and Fantasy* sneak in too.

To quote (https://tvtropes.org/pmwiki/pmwiki.php/Creator/BradBird#:~:text=%22It's%20not%20a%20genre!,c Brad Bird (director of The Incredibles (https://en.wikipedia.org/wiki/The_Incredibles)), animation is not truly a genre but a medium. So for animated movies, I'm really judging their fertility versus live action. The results? Their average ROI is 3.5 while the average ROI in general over this sample is 2.7 (just 78.7% as good). A devastatingly strong case for Animation.

In [56]:

```
#Isolating animated movies' and live action movies'
live_mean_roi = base_df[base_df["Animation"] == 0]["roi"].mean()
ani_mean_roi = base_df[base_df["Animation"] == 1]["roi"].mean()
```

executed in 3ms, finished 10:23:50 2022-03-22

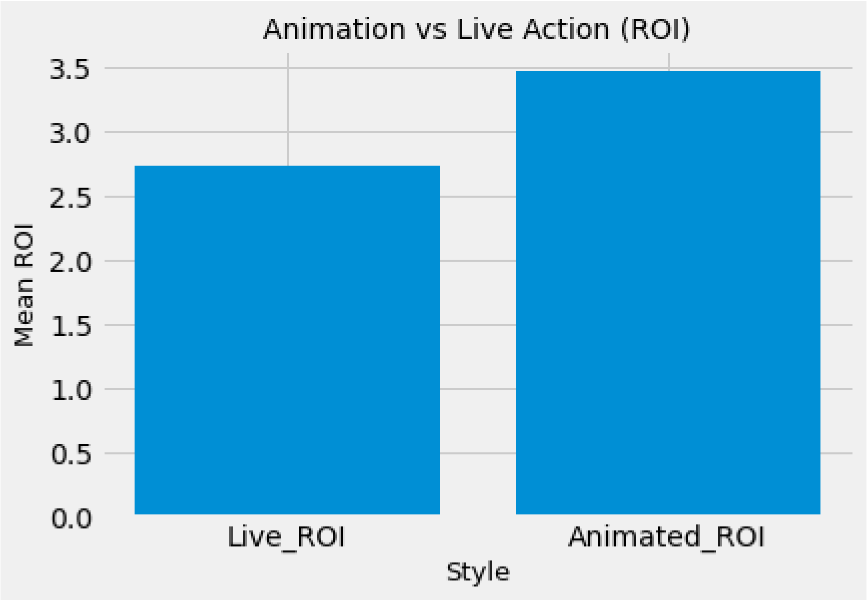
In [57]:

```
#Creating a bar plot to show how well each type of movie does
plt.xlabel("Style", fontsize=13)
plt.ylabel("Mean ROI", fontsize=13)
plt.title("Animation vs Live Action (ROI)", fontsize=14)
plt.bar(["Live_ROI", "Animated_ROI"], [live_mean_roi, ani_mean_roi])
```

executed in 74ms, finished 10:23:50 2022-03-22

Out[57]:

```
<BarContainer object of 2 artists>
```



For directors, it seemed a little inappropriate to multiply their mean and median output, since everyone in this truncated sample has exactly three movies to their name (effectively squaring the median movie's effect on the data). But using either that approach or just selecting names that appeared in the top 15 of both lists, 6 directors stood out: Christopher Landon, Genndy Tartakovsky, John Madden, Richard Linklater, Ryan Coogler, and Wes Ball.

I also decided to make an executive decision to additionally include the Russos. They were just shy of qualifying for the above list, while having directed 2 of the 3 highest grossing movies of all time. Their association with the Marvel brand could be both a blessing and a curse, but Endgame+Infinity War are bona fide cultural touchstones at this point.

In [58]:

```
#Just the finalists
top7 = top_direct[top_direct["directors"].isin(["Ryan Coogler", "Richar
           "Genndy Tartakovsky", "Christopher Landon", "Wes Ball", "John
top7
```

executed in 14ms, finished 10:23:50 2022-03-22

Out[58]:

	movie	directors	budget	world_gross	net_profit	roi	runtime_minutes
2	Avengers: Infinity War	The Russos	300000000	2048134200	1748134200	6.827114	149.0
9	Captain America: Civil War	The Russos	250000000	1140069413	890069413	4.560278	147.0
27	Black Panther	Ryan Coogler	200000000	1348258224	1148258224	6.741291	134.0
70	Captain America: The Winter Soldier	The Russos	170000000	714401889	544401889	4.202364	136.0
212	Hotel Transylvania	Genndy Tartakovsky	85000000	378505812	293505812	4.453010	91.0
222	Hotel Transylvania 2	Genndy Tartakovsky	80000000	469500298	389500298	5.868754	89.0
263	Hotel Transylvania 3: Summer Vacation	Genndy Tartakovsky	65000000	527079962	462079962	8.108922	97.0
279	Maze Runner: The Scorch Trials	Wes Ball	61000000	310566162	249566162	5.091249	131.0
281	Maze Runner: The Death Cure	Wes Ball	61000000	265878536	204878536	4.358665	143.0
461	Creed	Ryan Coogler	37000000	173567581	136567581	4.691016	77.0
504	The Maze Runner	Wes Ball	34000000	348319861	314319861	10.244702	113.0
763	Miss Sloane	John Madden	18000000	7719630	-10280370	0.428868	132.0
835	Scouts Guide to the Zombie Apocalypse	Christopher Landon	15000000	15554855	554855	1.036990	93.0

	movie	directors	budget	world_gross	net_profit	roi	runtime_minutes
929	The Best Exotic Marigold Hotel	John Madden	10000000	134639780	124639780	13.463978	124.0
936	The Second Best Exotic Marigold Hotel	John Madden	10000000	90384306	80384306	9.038431	122.0
999	Happy Death Day 2U	Christopher Landon	9000000	64179495	55179495	7.131055	100.0
1075	Bernie	Richard Linklater	6000000	10106975	4106975	1.684496	99.0
1103	Paranormal Activity: The Marked Ones	Christopher Landon	5000000	90904854	85904854	18.180971	84.0
1166	Boyhood	Richard Linklater	4000000	57273049	53273049	14.318262	165.0
1214	Before Midnight	Richard Linklater	3000000	23251930	20251930	7.750643	109.0
1410	Fruitvale Station	Ryan Coogler	900000	17549645	16649645	19.499606	85.0

21 rows × 30 columns

How much experience do these men have with the genres we care about most? And what kinds of movies are the known for?

Christopher Landon has 1 Comedy Action movie. But he specializes in the Horror genre.

Genndy Tartakovsky has 3 Animated Comedies, 1 of which was labeled an Adventure. Those 3 are what he's known for: The Hotel Transylvania series. Which barely average a Rotten Tomatoes score over 50%.

John Madden has 2 Comedies. His movies are relatively obscure, with both of his larger movies seeing most of their success in the UK and only having had limited release in the USA.

Richard Linklater has 1 Comedy. I haven't heard of any of his most recent output As such, I don't know how confident I'd be to let him helm something else.

The Russos have 3 Sci-Fi Adventure Action movies. They have far and away the most success, but given the unparalleled momentum they were able to piggyback on from the Marvel supergiant it's possible they can be considered untested with new material.

Wes Ball has 3 Sci-Fi Action movies. These are all from the Maze Runner series. "Young-adult post-apocalyptic movies" carry with them a miserable stigma in the general public nowadays.

Ryan Coogler has 1 Sci-Fi Action Adventure. Amazingly, he has no obvious blemishes on his record. Black Panther, Creed, and Fruitvale Station are all generally well-regarded (even though I personally don't like Black Panther), span different genres, and each of them star the popular Michael B. Jordan. If he can bring this superstar in for the project, we have seeds for success.

(Creed, the successor to the Rocky franchise, is somehow categorized as a Horror movie. However, it seems to be the only Horror movie in the wrong place. Phew. I guess its genre ID was a typo.)

4 In conclusion,

I would first recommend that Microsoft prioritize making an Animated movie. Even though the directors I looked at are successful, their samples are very limited and thus harder to trust to put as the primary concern. Across nearly 100 animated movies, the trend of animation outperforming live action seems robust.

The samples for the various genres are also large and seemingly trustworthy. So I'd next prioritize making sure the movie is a Sci Fi Adventure. Comedy and Action are valuable suggestions, but not needed.

Finally, I would reach out to Ryan Coogler. If he turns it down, then I would ask the Russos the same question. If that fails, I would make an offer to Genndy Tartakovski (the only director on the short list to make even one animated film). But since Family movies like Genndy's have mediocre performances, if it came down to him, ask him to lean away from that.