Final Project Submission

Please fill out:

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1.0 BUSINESS UNDERSTANDING

1. The company wants to establish a profitable movie studio by finding which movie genres are performing well at the Box Office.
2. We want to create video content that attracts large viewership and generates more revenue thereby allowing our company to be an equal competitor in the market.

1.1 BUSINESS OBJECTIVES

1. Identify the highest grossing films in the box office movies.
2. Determine which are the common genres among the highest grossing movies
3. Analyze the correlation between office performance and movie ratings
4. Identify the most successful film studios.

2.0 DATA UNDERSTANDING

In [ ]:
```
# import relevant libraries
import pandas as pd
import sqlite3
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_squared_error
```

In [ ]:
```
# connecting to sqlite database
path = r"C:\Users\User\Documents\Moringa_labs\PHASE 2\FINAL PHASE 2 PROJECT\Phase-2---Movie-Production-Analysis-\zippedDa
conn = sqlite3.connect(path)
```

In [ ]:
```
# using pandas to read data from sqlite database
pd.read_sql("""
    SELECT *
    FROM sqlite_master
    WHERE type = "table"
""", conn)
```

Out[ ]:

	type	name	tbl_name	rootpage	sql
0	table	movie_basics	movie_basics	2	CREATE TABLE "movie_basics" (\n"movie_id" TEXT...
1	table	directors	directors	3	CREATE TABLE "directors" (\n"movie_id" TEXT,\n...
2	table	known_for	known_for	4	CREATE TABLE "known_for" (\n"person_id" TEXT,\...
3	table	movie_akas	movie_akas	5	CREATE TABLE "movie_akas" (\n"movie_id" TEXT,\...
4	table	movie_ratings	movie_ratings	6	CREATE TABLE "movie_ratings" (\n"movie_id" TEX...
5	table	persons	persons	7	CREATE TABLE "persons" (\n"person_id" TEXT,\n ...
6	table	principals	principals	8	CREATE TABLE "principals" (\n"movie_id" TEXT,\...
7	table	writers	writers	9	CREATE TABLE "writers" (\n"movie_id" TEXT,\n ...

In [ ]:
```
# reading box office csv
movie_gross_path = r"C:\Users\User\Documents\Moringa_labs\PHASE 2\FINAL PHASE 2 PROJECT\Phase-2---Movie-Production-Analys
movie_gross_df = pd.read_csv(movie_gross_path)
movie_gross_df
```

Out[ ]:

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

	title	studio	domestic_gross	foreign_gross	year
...	...	...	...	...	...
3382	The Quake	Magn.	6200.0	NaN	2018
3383	Edward II (2018 re-release)	FM	4800.0	NaN	2018
3384	El Pacto	Sony	2500.0	NaN	2018
3385	The Swan	Synergetic	2400.0	NaN	2018
3386	An Actor Prepares	Grav.	1700.0	NaN	2018

3387 rows × 5 columns

2.1 DATA EXPLORATION

2.1.0 Exploring Sqlite Database

In [ ]:
```
# Reading movie basics column
movie_basics_df = pd.read_sql("""
SELECT *
FROM movie_basics
""", conn)
```

In [ ]:
```
# reading movie ratings column
movie_ratings_df = pd.read_sql("""
SELECT *
FROM movie_ratings
""", conn)
```

2.1.1 EXploring Box office CSV

In [ ]:
```
# summary information of the df
movie_gross_df.info()
```

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

In [ ]:
```
# summary statistics of the df
movie_gross_df.describe()
```

Out[ ]:

	domestic_gross	year
count	3.359000e+03	3387.000000
mean	2.874585e+07	2013.958075
std	6.698250e+07	2.478141
min	1.000000e+02	2010.000000
25%	1.200000e+05	2012.000000
50%	1.400000e+06	2014.000000
75%	2.790000e+07	2016.000000
max	9.367000e+08	2018.000000

In [ ]:
```
# display size of df
movie_gross_df.shape
```

Out[ ]:
```
(3387, 5)
```

In [ ]:
```
# display all columns of the df
movie_gross_df.columns
```

Out[ ]:
```
Index(['title', 'studio', 'domestic_gross', 'foreign_gross', 'year'], dtype='object')
```

In [ ]:
```
# display first 5 rows
movie_gross_df.head()
```

Out[ ]:

	title	studio	domestic_gross	foreign_gross	year
0	Toy Story 3	BV	415000000.0	652000000	2010
1	Alice in Wonderland (2010)	BV	334200000.0	691300000	2010

	title	studio	domestic_gross	foreign_gross	year
2	Harry Potter and the Deathly Hallows Part 1	WB	296000000.0	664300000	2010
3	Inception	WB	292600000.0	535700000	2010
4	Shrek Forever After	P/DW	238700000.0	513900000	2010

2.2 DATA PREPARATION

2.2.1 BOX OFFICE MOVIES CSV DATA CLEANING

In [ ]:
```
# check for missing values in the df
movie_gross_df.isnull().sum()
```

Out[ ]:
```
title                0
studio               5
domestic_gross      28
foreign_gross     1350
year                 0
dtype: int64
```

In [ ]:
```
# filling missing values with unknown
movie_gross_df['studio'].fillna('unknown', inplace = True)
```

In [ ]:
```
# filling in missing values in domestic gross using median
movie_gross_df['domestic_gross'] = movie_gross_df['domestic_gross'].fillna(movie_gross_df['domestic_gross'].median())
```

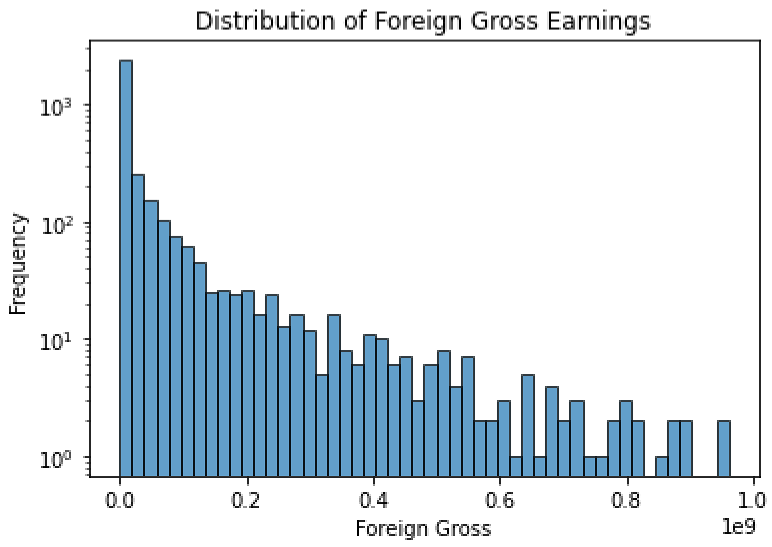
1. The data is right skewed.
2. Filling missing values with mean would get affected by outliers thus I will fill the missing values using median

In [ ]:
```
# Replace commas and convert to numeric for foreign_gross
movie_gross_df['foreign_gross'] = movie_gross_df['foreign_gross'].str.replace(',', '')

# Change the data type to float
movie_gross_df['foreign_gross'] = movie_gross_df['foreign_gross'].astype(float)

# Fill missing foreign_gross values with the median
movie_gross_df['foreign_gross'] = movie_gross_df['foreign_gross'].fillna(movie_gross_df['foreign_gross'].median())
```

In [ ]:
```
movie_gross_df.isnull().sum()
```

Out[ ]:
```
title             0
studio            0
domestic_gross    0
foreign_gross     0
year              0
dtype: int64
```

In [ ]:
```
#Plot the distribution of foreign_gross
plt.hist(movie_gross_df['foreign_gross'].dropna(), bins=50, edgecolor='k', alpha=0.7)
plt.title('Distribution of Foreign Gross Earnings')
plt.xlabel('Foreign Gross')
plt.ylabel('Frequency')
plt.yscale('log')
plt.show()
```



1. I have replaced missing values in foreign gross with median.
2. I have used log transformation to address the skewness of the histogram.

In [ ]:
```
#check for duplicates
movie_gross_duplicates = movie_gross_df.duplicated().sum()
movie_gross_duplicates
```

Out[ ]:
```
0
```

2.2.2 IM DATABASE CLEANING

In [ ]:
```
# Summary information about the df
movie_ratings_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   movie_id       73856 non-null  object 
 1   averagerating  73856 non-null  float64
 2   numvotes       73856 non-null  int64  
dtypes: float64(1), int64(1), object(1)
memory usage: 1.7+ MB
```

In [ ]:
```
# summary statistics of the dataframe
movie_ratings_df.describe()
```

Out[ ]:

	averagerating	**numvotes**
count	73856.000000	7.385600e+04
mean	6.332729	3.523662e+03
std	1.474978	3.029402e+04
min	1.000000	5.000000e+00
25%	5.500000	1.400000e+01
50%	6.500000	4.900000e+01
75%	7.400000	2.820000e+02
max	10.000000	1.841066e+06

In [ ]:
```
# size of the movie ratings dataframe
movie_ratings_df.shape
```

Out[ ]:
```
(73856, 3)
```

In [ ]:
```
# Checking Movie rating for missing values
movie_ratings_df.isnull().sum()
```

Out[ ]:
```
movie_id         0
averagerating    0
```

```
numvotes         0
dtype: int64
```

In [ ]:
```
# check for duplicates
movie_ratings_df.duplicated().sum()
```

Out[ ]:
```
0
```

1. Movie ratings has no null values
2. Movie ratings has no duplicates
3. I can go ahead and delve into movie basics to check for descriptive statistics & null values

In [ ]:
```
# summary information of the dataframe
movie_basics_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   movie_id         146144 non-null  object 
 1   primary_title    146144 non-null  object 
 2   original_title   146123 non-null  object 
 3   start_year       146144 non-null  int64  
 4   runtime_minutes  114405 non-null  float64
 5   genres           140736 non-null  object 
dtypes: float64(1), int64(1), object(4)
memory usage: 6.7+ MB
```

In [ ]:
```
# summary statistics
movie_basics_df.describe()
```

Out[ ]:

	start_year	runtime_minutes
count	146144.000000	114405.000000
mean	2014.621798	86.187247
std	2.733583	166.360590
min	2010.000000	1.000000
25%	2012.000000	70.000000
50%	2015.000000	87.000000

	start_year	runtime_minutes
75%	2017.000000	99.000000
max	2115.000000	51420.000000

In [ ]:
```
# check size of the dataframe
movie_basics_df.shape
```

Out[ ]:
```
(146144, 6)
```

In [ ]:
```
movie_basics_df.duplicated().sum()
```

Out[ ]:
```
0
```

In [ ]:
```
# checking movie basics for missing values
movie_basics_df.isnull().sum()
```

Out[ ]:
```
movie_id               0
primary_title          0
original_title        21
start_year             0
runtime_minutes    31739
genres              5408
dtype: int64
```

In [ ]:
```
# Check percentage of null values
(movie_basics_df.isnull().sum()/len(movie_basics_df))*100
```

Out[ ]:
```
movie_id            0.000000
primary_title       0.000000
original_title      0.014369
start_year          0.000000
runtime_minutes    21.717621
genres              3.700460
dtype: float64
```

1. Since original title and genre have a less significant percentage, I will opt to drop them and focus on runtime minutes
2. I will delve into runtime minutes to focus on Data Cleaning

In [ ]:
```
# dropping rows with null values
movie_basics_df = movie_basics_df.dropna(subset= ['original_title', 'genres'])
```

In [ ]:
```
# replace missing values in runtime with the median
movie_basics_df['runtime_minutes'] = movie_basics_df['runtime_minutes'].fillna(movie_basics_df['runtime_minutes'].median(
```

In [ ]:
```
movie_basics_df.isnull().sum()
```

Out[ ]:
```
movie_id           0
primary_title      0
original_title     0
start_year         0
runtime_minutes    0
genres             0
dtype: int64
```

In [ ]:
```
movie_basics_df.columns
```

Out[ ]:
```
Index(['movie_id', 'primary_title', 'original_title', 'start_year',
       'runtime_minutes', 'genres'],
      dtype='object')
```

In [ ]:
```
movie_ratings_df.columns
```

Out[ ]:
```
Index(['movie_id', 'averagerating', 'numvotes'], dtype='object')
```

In [ ]:
```
# merge movie ratings and movie basics on movie id
merged_movie_df = pd.merge(movie_ratings_df,movie_basics_df,on= 'movie_id', how= 'inner')
merged_movie_df
```

Out[ ]:

	movie_id	averagerating	numvotes	primary_title	original_title	start_year	runtime_minutes	genres
0	tt10356526	8.3	31	Laiye Je Yaarian	Laiye Je Yaarian	2019	117.0	Romance
1	tt10384606	8.9	559	Borderless	Borderless	2019	87.0	Documentary
2	tt1042974	6.4	20	Just Inès	Just Inès	2010	90.0	Drama
3	tt1043726	4.2	50352	The Legend of Hercules	The Legend of Hercules	2014	99.0	Action,Adventure,Fantasy
4	tt1060240	6.5	21	Até Onde?	Até Onde?	2011	73.0	Mystery,Thriller
...	...	...	...	...	...	...	...	...
73047	tt9805820	8.1	25	Caisa	Caisa	2018	84.0	Documentary
73048	tt9844256	7.5	24	Code Geass: Lelouch of the Rebellion -	Code Geass: Lelouch of the Rebellion	2018	120.0	Action,Animation,Sci-Fi

	movie_id	averagerating	numvotes	primary_title	original_title	start_year	runtime_minutes	genres
				Glorifi...	Episode III			
73049	tt9851050	4.7	14	Sisters	Sisters	2019	87.0	Action,Drama
73050	tt9886934	7.0	5	The Projectionist	The Projectionist	2019	81.0	Documentary
73051	tt9894098	6.3	128	Sathru	Sathru	2019	129.0	Thriller

73052 rows × 8 columns

```
In [ ]: final_merged_df = pd.merge(merged_movie_df, movie_gross_df,left_on= 'primary_title',right_on= 'title',how= 'inner')
```

```
In [ ]: #drop primary title and original title
        final_merged_df.drop(columns= ['primary_title', 'original_title'], inplace= True)
```

```
In [ ]: final_merged_df
```

Out[ ]:

	movie_id	averagerating	numvotes	start_year	runtime_minutes	genres	title	studio	domestic_gross	fo
0	tt1043726	4.2	50352	2014	99.0	Action,Adventure,Fantasy	The Legend of Hercules	LG/S	18800000.0	
1	tt1171222	5.1	8296	2013	96.0	Comedy	Baggage Claim	FoxS	21600000.0	
2	tt1181840	7.0	5494	2013	94.0	Adventure,Animation,Drama	Jack and the Cuckoo-Clock Heart	Shout!	1400000.0	
3	tt1210166	7.6	326657	2011	133.0	Biography,Drama,Sport	Moneyball	Sony	75600000.0	
4	tt1212419	6.5	87288	2010	129.0	Drama,Fantasy,Romance	Hereafter	WB	32700000.0	
...	...	...	...	...	...	...	...	...	...	
3015	tt3399916	6.3	4185	2014	107.0	Action,Adventure	The Dead Lands	Magn.	5200.0	
3016	tt3616916	6.7	28167	2015	105.0	Action,Drama,Thriller	The Wave	Magn.	177000.0	
3017	tt3748512	7.4	4977	2015	79.0	Documentary	Hitchcock/Truffaut	Cohen	260000.0	
3018	tt7008872	7.0	18768	2018	115.0	Biography,Drama	Boy Erased	Focus	6800000.0	
3019	tt7048622	7.7	11168	2017	113.0	Crime,Drama,Thriller	The Insult	Cohen	1000000.0	

3020 rows × 11 columns

In [ ]:
```
movie_basics_df.to_csv('cleaned_movie_basics_df', index = False)
movie_ratings_df.to_csv('cleaned_movie_ratings_df', index= False)
movie_gross_df.to_csv('cleaned_merged_gross_df', index = False)
final_merged_df.to_csv('cleaned_final_merged_df', index= False)
```

In [ ]: