final

June 13, 2022

1 Movie Data Analysis

Microsoft Movie Studios Production Analysis by Mike Van Eaton 6/12/2022

Import needed libraries

[1]:
```
import pandas as pd
import sqlite3
import numpy as np
import seaborn as sns
import matplotlib.ticker as tkr
import matplotlib.pyplot as plt
%matplotlib inline
```

2 Data Import

[2]:
```
#reads tn budget file (csv)
tn_movie_budgets = pd.read_csv("zippedData/tn.movie_budgets.csv.gz")
tn_movie_budgets
```

[2]:
```
      id  release_date                                          movie  \
0      1  Dec 18, 2009                                         Avatar
1      2  May 20, 2011  Pirates of the Caribbean: On Stranger Tides
2      3   Jun 7, 2019                                   Dark Phoenix
3      4   May 1, 2015                Avengers: Age of Ultron
4      5  Dec 15, 2017           Star Wars Ep. VIII: The Last Jedi
…    ..           …                                             …
5777  78  Dec 31, 2018                                      Red 11
5778  79   Apr 2, 1999                                   Following
5779  80  Jul 13, 2005              Return to the Land of Wonders
5780  81  Sep 29, 2015                       A Plague So Pleasant
5781  82   Aug 5, 2005                          My Date With Drew

     production_budget domestic_gross worldwide_gross
0         $425,000,000   $760,507,625  $2,776,345,279
1         $410,600,000   $241,063,875  $1,045,663,875
2         $350,000,000    $42,762,350    $149,762,350
```

```
3         $330,600,000   $459,005,868  $1,403,013,963
4         $317,000,000   $620,181,382  $1,316,721,747
…                  …              …               …
5777             $7,000            $0              $0
5778             $6,000       $48,482        $240,495
5779             $5,000        $1,338          $1,338
5780             $1,400            $0              $0
5781             $1,100       $181,041        $181,041

[5782 rows x 6 columns]
```

[3]:
```
#unzips the SQL data, since SQLite doesn't work with zipped data.
! unzip -n zippedData/im.db.zip
```

```
Archive:  zippedData/im.db.zip
```

[4]:
```
conn = sqlite3.connect("im.db")
```

[5]:
```
#reads imdb movie basics (sql)
movie_basics = pd.read_sql("SELECT * FROM movie_basics;", conn)
movie_basics
```

[5]:
```
         movie_id                                primary_title  \
0       tt0063540                                    Sunghursh
1       tt0066787           One Day Before the Rainy Season
2       tt0069049                The Other Side of the Wind
3       tt0069204                                Sabse Bada Sukh
4       tt0100275                  The Wandering Soap Opera
…             …                                           …
146139  tt9916538                           Kuambil Lagi Hatiku
146140  tt9916622  Rodolpho Teóphilo - O Legado de um Pioneiro
146141  tt9916706                               Dankyavar Danka
146142  tt9916730                                       6 Gunn
146143  tt9916754           Chico Albuquerque - Revelações

                                original_title  start_year  \
0                                    Sunghursh        2013
1                                Ashad Ka Ek Din        2019
2                    The Other Side of the Wind        2018
3                                Sabse Bada Sukh        2018
4                         La Telenovela Errante        2017
…                                           …           …
146139                       Kuambil Lagi Hatiku        2019
146140  Rodolpho Teóphilo - O Legado de um Pioneiro        2015
146141                           Dankyavar Danka        2013
146142                                   6 Gunn        2017
146143           Chico Albuquerque - Revelações        2013
```

```
        runtime_minutes                genres
0                 175.0    Action,Crime,Drama
1                 114.0       Biography,Drama
2                 122.0                 Drama
3                   NaN          Comedy,Drama
4                  80.0  Comedy,Drama,Fantasy
…                  …                     …
146139            123.0                 Drama
146140              NaN           Documentary
146141              NaN                Comedy
146142            116.0                  None
146143              NaN           Documentary

[146144 rows x 6 columns]
```

3 Data Frame Cleaning

tn_movie_budget dataframe

[6]:
```
#check data types.  Need int for numeric columns.
tn_movie_budgets.dtypes
```

[6]:
```
id                    int64
release_date         object
movie                object
production_budget    object
domestic_gross       object
worldwide_gross      object
dtype: object
```

[7]:
```
#change release date into datetime
tn_movie_budgets['release_date'] = pd.
 ↪to_datetime(tn_movie_budgets['release_date'])
#remove $ and ,
tn_movie_budgets['domestic_gross'] = tn_movie_budgets['domestic_gross'].str.
 ↪replace('$', '', regex=True)
tn_movie_budgets['domestic_gross'] = tn_movie_budgets['domestic_gross'].str.
 ↪replace(',', '', regex=True)
#remove $ and ,
tn_movie_budgets['production_budget'] = tn_movie_budgets['production_budget'].
 ↪str.replace('$', '', regex=True)
tn_movie_budgets['production_budget'] = tn_movie_budgets['production_budget'].
 ↪str.replace(',', '', regex=True)
#remove $ and ,
```

```
tn_movie_budgets['worldwide_gross'] = tn_movie_budgets['worldwide_gross'].str.
 ↪replace('$', '', regex=True)
tn_movie_budgets['worldwide_gross'] = tn_movie_budgets['worldwide_gross'].str.
 ↪replace(',', '', regex=True)
#change data type obj to int
tn_movie_budgets['domestic_gross'] = tn_movie_budgets['domestic_gross'].
 ↪astype('int')
tn_movie_budgets['worldwide_gross'] = tn_movie_budgets['worldwide_gross'].
 ↪astype('int')
tn_movie_budgets['production_budget'] = tn_movie_budgets['production_budget'].
 ↪astype('int')

tn_movie_budgets.dtypes
```

[7]:
```
id                           int64
release_date         datetime64[ns]
movie                        object
production_budget             int64
domestic_gross                int64
worldwide_gross               int64
dtype: object
```

[8]:
```
#check for dupicates
tn_movie_budgets_dup = tn_movie_budgets[tn_movie_budgets.duplicated()]
print(len(tn_movie_budgets_dup))
```

```
0
```

[9]:
```
#cleaned df
tn_movie_budgets
```

[9]:
```
      id release_date                                          movie  \
0      1   2009-12-18                                         Avatar
1      2   2011-05-20  Pirates of the Caribbean: On Stranger Tides
2      3   2019-06-07                                   Dark Phoenix
3      4   2015-05-01                    Avengers: Age of Ultron
4      5   2017-12-15          Star Wars Ep. VIII: The Last Jedi
…    ..          …                                             …
5777  78   2018-12-31                                      Red 11
5778  79   1999-04-02                                   Following
5779  80   2005-07-13              Return to the Land of Wonders
5780  81   2015-09-29                       A Plague So Pleasant
5781  82   2005-08-05                          My Date With Drew

      production_budget  domestic_gross  worldwide_gross
0             425000000       760507625       2776345279
1             410600000       241063875       1045663875
```

```
2              350000000        42762350        149762350
3              330600000       459005868       1403013963
4              317000000       620181382       1316721747
…                    …               …                …
5777                7000               0                0
5778                6000           48482           240495
5779                5000            1338             1338
5780                1400               0                0
5781                1100          181041           181041

[5782 rows x 6 columns]
```

movie_basics dataframe

[10]:
```
#check data types. All data types appropriate for analysis
movie_basics.dtypes
```

[10]:
```
movie_id            object
primary_title       object
original_title      object
start_year           int64
runtime_minutes    float64
genres              object
dtype: object
```

[11]:
```
#Check for missing data
movie_basics.isna().sum()
```

[11]:
```
movie_id               0
primary_title          0
original_title        21
start_year             0
runtime_minutes    31739
genres              5408
dtype: int64
```

[12]:
```
#Drop missing data.  No way to generally guess at genres, runtime, or original␣
 ↪title.
movie_basics = movie_basics.dropna()
movie_basics.isna().sum()
```

[12]:
```
movie_id           0
primary_title      0
original_title     0
start_year         0
runtime_minutes    0
genres             0
```

```
dtype: int64
```

[13]:
```
#No missing infor, data types correct.
movie_basics.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 112232 entries, 0 to 146139
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype
---  ------           --------------   -----
 0   movie_id         112232 non-null  object
 1   primary_title    112232 non-null  object
 2   original_title   112232 non-null  object
 3   start_year       112232 non-null  int64
 4   runtime_minutes  112232 non-null  float64
 5   genres           112232 non-null  object
dtypes: float64(1), int64(1), object(4)
memory usage: 6.0+ MB
```

[14]:
```
#need to turn entires into lists in order to explode.
movie_basics['genres']
```

[14]:
```
0           Action,Crime,Drama
1              Biography,Drama
2                        Drama
4          Comedy,Drama,Fantasy
5                       Comedy
                   …
146134              Documentary
146135                    Drama
146136              Documentary
146137          Drama,Thriller
146139                    Drama
Name: genres, Length: 112232, dtype: object
```

[15]:
```
#turn off chained
pd.options.mode.chained_assignment = None
#genre entries are lists that need to be exploded
movie_basics['genres'] = movie_basics['genres'].str.split(',')
movie_basics
```

[15]:
```
          movie_id                                    primary_title  \
0       tt0063540                                        Sunghursh
1       tt0066787                One Day Before the Rainy Season
2       tt0069049                     The Other Side of the Wind
4       tt0100275                       The Wandering Soap Opera
5       tt0111414                                        A Thin Life
```

```
…           …                                                  …
146134  tt9916160                                        Drømmeland
146135  tt9916170                                      The Rehearsal
146136  tt9916186  Illenau - die Geschichte einer ehemaligen Heil…
146137  tt9916190                                         Safeguard
146139  tt9916538                                 Kuambil Lagi Hatiku

                                        original_title  start_year  \
0                                            Sunghursh        2013
1                                       Ashad Ka Ek Din        2019
2                           The Other Side of the Wind        2018
4                                La Telenovela Errante        2017
5                                          A Thin Life        2018
…                                                  …           …
146134                                     Drømmeland        2019
146135                                       O Ensaio        2019
146136  Illenau - die Geschichte einer ehemaligen Heil…        2017
146137                                     Safeguard        2019
146139                           Kuambil Lagi Hatiku        2019

        runtime_minutes                    genres
0                 175.0    [Action, Crime, Drama]
1                 114.0        [Biography, Drama]
2                 122.0                   [Drama]
4                  80.0  [Comedy, Drama, Fantasy]
5                  75.0                   [Comedy]
…                     …                       …
146134             72.0             [Documentary]
146135             51.0                   [Drama]
146136             84.0             [Documentary]
146137             90.0         [Drama, Thriller]
146139            123.0                   [Drama]

[112232 rows x 6 columns]
```

[16]:
```
#each entry has one genre now
movie_basics = movie_basics.explode('genres',ignore_index = 'false')
```

[17]:
```
#check for duplicates
movie_basics_dup = movie_basics[movie_basics.duplicated()]
print(len(movie_basics_dup))
```

```
0
```

[18]:
```
#Cleaned data frame
movie_basics
```

[18]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action
1	tt0063540	Sunghursh	Sunghursh	2013	175.0	Crime
2	tt0063540	Sunghursh	Sunghursh	2013	175.0	Drama
3	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography
4	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Drama
…	…	…	…	…	…	…
193726	tt9916170	The Rehearsal	O Ensaio	2019	51.0	Drama
193727	tt9916186	Illenau - die Geschichte einer ehemaligen Heil…	Illenau - die Geschichte einer ehemaligen Heil…	2017	84.0	Documentary
193728	tt9916190	Safeguard	Safeguard	2019	90.0	Drama
193729	tt9916190	Safeguard	Safeguard	2019	90.0	Thriller
193730	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama

[193731 rows x 6 columns]

Combine Tables

[19]:
```
#merge tables
master_list=pd.merge(movie_basics,tn_movie_budgets, left_on='primary_title',␣
 ↪right_on='movie')
master_list
```

[19]:
```
       movie_id  primary_title original_title  start_year  runtime_minutes  \
0     tt0249516    Foodfight!     Foodfight!        2012             91.0
1     tt0249516    Foodfight!     Foodfight!        2012             91.0
2     tt0249516    Foodfight!     Foodfight!        2012             91.0
3     tt0337692   On the Road    On the Road        2012            124.0
4     tt0337692   On the Road    On the Road        2012            124.0
…           …             …              …         …                …
7199  tt9607270  The Blue Bird  The Blue Bird        2015             84.0
7200  tt9805168        Traitor        Traitor        2015            110.0
7201  tt9805168        Traitor        Traitor        2015            110.0
7202  tt9805168        Traitor        Traitor        2015            110.0
7203  tt9844102            Ray            Ray        2018            111.0

         genres  id release_date          movie  production_budget  \
0        Action  26   2012-12-31     Foodfight!           45000000
1     Animation  26   2012-12-31     Foodfight!           45000000
2        Comedy  26   2012-12-31     Foodfight!           45000000
3     Adventure  17   2013-03-22    On the Road           25000000
4         Drama  17   2013-03-22    On the Road           25000000
…         …  ..           …              …                …
7199      Drama  71   1976-01-01  The Blue Bird            1200000
7200     Action  25   2008-08-27        Traitor           22000000
7201      Drama  25   2008-08-27        Traitor           22000000
7202    Romance  25   2008-08-27        Traitor           22000000
7203      Crime   8   2004-10-29            Ray           40000000

      domestic_gross  worldwide_gross
0                  0            73706
1                  0            73706
2                  0            73706
3             720828          9313302
4             720828          9313302
…                …                …
7199          887000           887000
7200        23530831         27882226
7201        23530831         27882226
7202        23530831         27882226
7203        75305995        124823094

[7204 rows x 12 columns]
```

[20]:
```
#add world wide profit column
master_list['worldwide_profit'] = master_list['worldwide_gross'] -␣
 ↪master_list['production_budget']
#add domestic profit column
master_list['domestic_profit'] = master_list['domestic_gross'] -␣
 ↪master_list['production_budget']
```

[21]:
```
#add release month column
master_list['release_month'] = master_list['release_date'].dt.month
```

[22]:
```
#labels the release month with a season
def season_release (row):
   if row['release_month'] <= 2 :
      return 'winter'
   if row['release_month'] == 3 :
      return 'spring'
   if row['release_month'] == 4 :
      return 'spring'
   if row['release_month'] == 5:
      return 'spring'
   if row['release_month']  == 6:
      return 'summer'
   if row['release_month'] == 7:
      return 'summer'
   if row['release_month'] == 8:
      return 'summer'
   if row['release_month'] == 9 :
      return 'fall'
   if row['release_month'] == 10 :
      return 'fall'
   if row['release_month'] == 11 :
      return 'fall'
   if row['release_month'] == 12:
      return 'winter'
   return 'Other'
```

[23]:
```
#Add season column
master_list['season_release'] = master_list.apply (lambda row:␣
 ↪season_release(row), axis=1)
master_list
```

[23]:

	movie_id	primary_title	original_title	start_year	runtime_minutes	\
0	tt0249516	Foodfight!	Foodfight!	2012	91.0	
1	tt0249516	Foodfight!	Foodfight!	2012	91.0	
2	tt0249516	Foodfight!	Foodfight!	2012	91.0	
3	tt0337692	On the Road	On the Road	2012	124.0	
4	tt0337692	On the Road	On the Road	2012	124.0	
…	…	…	…	…	…	
7199	tt9607270	The Blue Bird	The Blue Bird	2015	84.0	
7200	tt9805168	Traitor	Traitor	2015	110.0	
7201	tt9805168	Traitor	Traitor	2015	110.0	
7202	tt9805168	Traitor	Traitor	2015	110.0	
7203	tt9844102	Ray	Ray	2018	111.0	

```
         genres  id release_date          movie  production_budget  \
0        Action  26   2012-12-31     Foodfight!           45000000
1     Animation  26   2012-12-31     Foodfight!           45000000
2        Comedy  26   2012-12-31     Foodfight!           45000000
3     Adventure  17   2013-03-22    On the Road           25000000
4         Drama  17   2013-03-22    On the Road           25000000
…           …  ..          …              …                  …
7199      Drama  71   1976-01-01  The Blue Bird            1200000
7200     Action  25   2008-08-27        Traitor           22000000
7201      Drama  25   2008-08-27        Traitor           22000000
7202    Romance  25   2008-08-27        Traitor           22000000
7203      Crime   8   2004-10-29            Ray           40000000

      domestic_gross  worldwide_gross  worldwide_profit  domestic_profit  \
0                  0            73706         -44926294        -45000000
1                  0            73706         -44926294        -45000000
2                  0            73706         -44926294        -45000000
3             720828          9313302         -15686698        -24279172
4             720828          9313302         -15686698        -24279172
…                …                …                …                …
7199          887000           887000           -313000          -313000
7200        23530831         27882226           5882226          1530831
7201        23530831         27882226           5882226          1530831
7202        23530831         27882226           5882226          1530831
7203        75305995        124823094          84823094         35305995

      release_month season_release
0                12         winter
1                12         winter
2                12         winter
3                 3         spring
4                 3         spring
…               …              …
7199              1         winter
7200              8         summer
7201              8         summer
7202              8         summer
7203             10           fall

[7204 rows x 16 columns]
```

[24]:
```
#Determine how many data points are associated with each genre
master_list['genres'].value_counts()
```

[24]:
```
Drama          1641
Comedy          793
Action          647
```

```
Thriller        544
Adventure       469
Documentary     452
Horror          381
Crime           379
Romance         350
Biography       247
Mystery         233
Sci-Fi          212
Family          189
Fantasy         184
Animation       137
History          90
Music            84
Sport            70
War              48
Musical          28
Western          18
News              7
Reality-TV        1
Name: genres, dtype: int64
```

[25]:
```
#creat a df of the value counts
genre_vc = pd.DataFrame(master_list['genres'].value_counts())
#add index so genre becomes a useable column
genre_vc.reset_index(inplace=True)
#label columns
genre_vc.columns = ['genres','counts']
#merge master list and valuecounts
master_list = master_list.merge(genre_vc,on='genres')
#filter df to use genres with at least 200  data entries
master_list = master_list[master_list.counts>=200]
```

[26]:
```
#Check new list for genres with more than 200 data entries for analysis
master_list['genres'].value_counts()
```

[26]:
```
Drama          1641
Comedy          793
Action          647
Thriller        544
Adventure       469
Documentary     452
Horror          381
Crime           379
Romance         350
Biography       247
Mystery         233
```

```
Sci-Fi          212
Name: genres, dtype: int64
```

[27]:
```
#Creat column worldwide profit per minute of run time
master_list['profit per min (w)'] = master_list['worldwide_profit']/
 ↪master_list['runtime_minutes']
#Creat column domestic profit per minute of run time
master_list['profit per min (d)'] = master_list['domestic_profit']/
 ↪master_list['runtime_minutes']
```

[28]:
```
#Check final merged dataframe
master_list
```

[28]:
```
       movie_id                primary_title               original_title  \
0     tt0249516                   Foodfight!                   Foodfight!
1     tt0365907  A Walk Among the Tombstones  A Walk Among the Tombstones
2     tt0369610               Jurassic World               Jurassic World
3     tt0401729                  John Carter                  John Carter
4     tt0403935               Action Jackson               Action Jackson
…         …                          …                           …
6669  tt7349662               BlacKkKlansman               BlacKkKlansman
6670  tt7388562     Paul, Apostle of Christ     Paul, Apostle of Christ
6671  tt7809816                     Henry V                      Henry V
6672  tt8266310        Blinded by the Light        Blinded by the Light
6673  tt9024106                   Unplanned                    Unplanned

      start_year  runtime_minutes     genres  id release_date  \
0           2012             91.0     Action  26   2012-12-31
1           2014            114.0     Action  67   2014-09-19
2           2015            124.0     Action  34   2015-06-12
3           2012            132.0     Action  14   2012-03-09
4           2014            144.0     Action   8   1988-02-12
…          …               …         …  ..          …
6669        2018            135.0  Biography  21   2018-08-10
6670        2018            108.0  Biography  95   2018-03-23
6671        2018            122.0  Biography  91   1989-11-08
6672        2019            117.0  Biography  64   2019-08-14
6673        2019            106.0  Biography  33   2019-03-29

                          movie  production_budget  domestic_gross  \
0                   Foodfight!           45000000               0
1     A Walk Among the Tombstones           28000000        26017685
2                 Jurassic World          215000000       652270625
3                    John Carter          275000000        73058679
4                 Action Jackson            7000000        20257000
…                            …                  …               …
6669              BlacKkKlansman           15000000        49275340
```

```
6670      Paul, Apostle of Christ            5000000        17547999
6671                      Henry V            9000000        10161099
6672         Blinded by the Light           15000000               0
6673                    Unplanned            6000000        18107621

      worldwide_gross  worldwide_profit  domestic_profit  release_month  \
0               73706         -44926294        -45000000             12
1            62108587          34108587         -1982315              9
2          1648854864        1433854864        437270625              6
3           282778100           7778100       -201941321              3
4            20257000          13257000         13257000              2
…                …                 …                …              …
6669         93017335          78017335         34275340              8
6670         25529498          20529498         12547999              3
6671         10176701           1176701          1161099             11
6672                0         -15000000        -15000000              8
6673         18107621          12107621         12107621              3

     season_release  counts  profit per min (w)  profit per min (d)
0            winter     647       -4.936955e+05       -4.945055e+05
1              fall     647        2.991981e+05       -1.738873e+04
2            summer     647        1.156335e+07        3.526376e+06
3            spring     647        5.892500e+04       -1.529858e+06
4            winter     647        9.206250e+04        9.206250e+04
…             …      …                 …                 …
6669         summer     247        5.779062e+05        2.538914e+05
6670         spring     247        1.900879e+05        1.161852e+05
6671           fall     247        9.645090e+03        9.517205e+03
6672         summer     247       -1.282051e+05       -1.282051e+05
6673         spring     247        1.142228e+05        1.142228e+05

[6348 rows x 19 columns]
```

4 Graphs

[29]:
```
#color palette for seasons
hue_colors = {'spring': '#ffbb00',
              'summer': '#f65314',
              'fall': '#7cbb00',
              'winter': '#00a1f1'}
#color paletter for genres
hue_colors_genres = {'Adventure' : '#73b761',
                     'Sci-Fi' : '#4A588A',
                     'Action' : '#ECC846',
                     'Comedy' : '#CD4C46',
                     'Thriller' : '#71AEF2',
```

```
                    'Adventure' : '#8D6FD1',
                    'Mystery' : '#EE9E64',
                    'Horror' : '#95DABB',
                    'Crime' : '#A43B76',
                    'Documentary' : '#EC5A96',
                    'Biography' : '#438FFF'}
;
```

[29]:
```
''
```

[30]:
```
#Worldwide average profit by season
season_gross_ww = master_list.groupby(['season_release']).
 ↪mean(['worldwide_profit']).sort_values(by='worldwide_profit',ascending=0)
season_gross_ww.reset_index(inplace=True)

season_gross_ww
```

[30]:

	season_release	start_year	runtime_minutes	id	production_budget	\
0	summer	2013.923435	98.967377	53.179760	4.080127e+07	
1	spring	2014.082421	99.068899	49.675467	4.157913e+07	
2	fall	2013.909574	101.445626	48.330378	3.076141e+07	
3	winter	2014.166146	101.298563	53.412867	2.948981e+07	

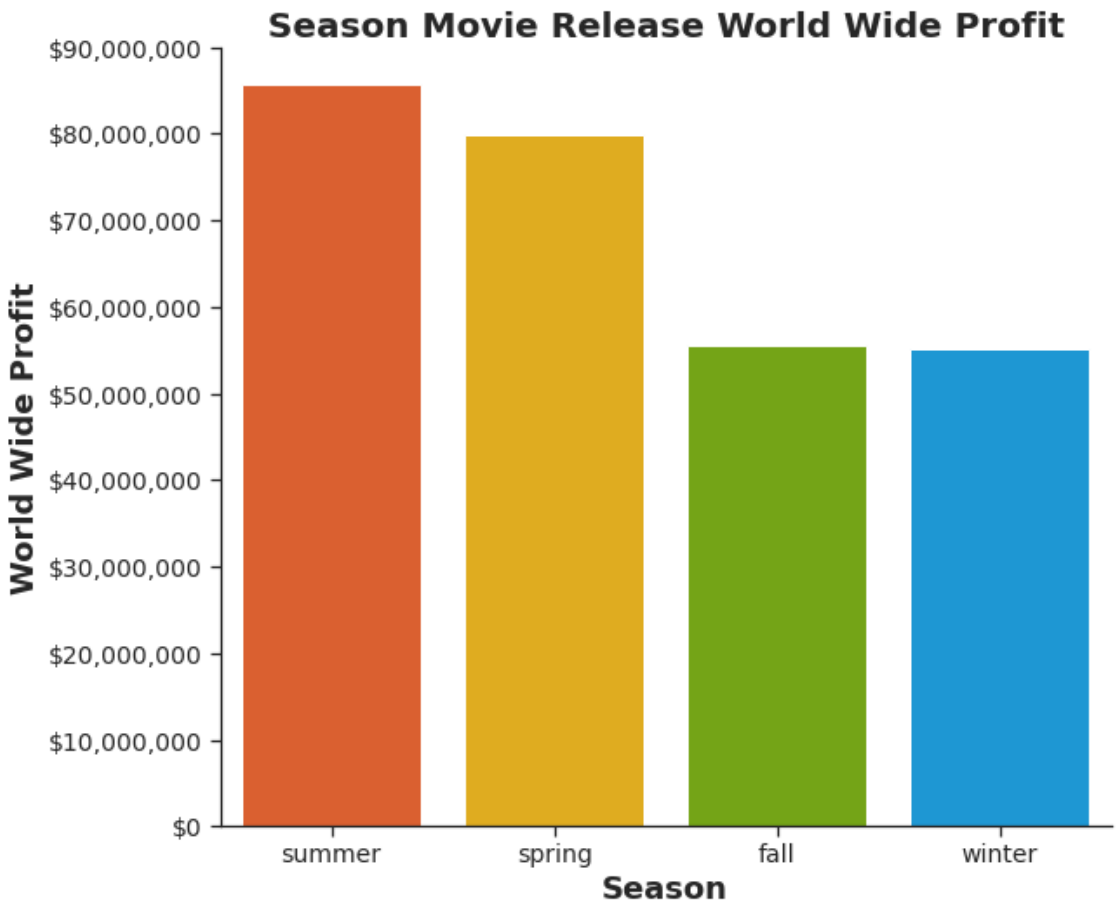
	domestic_gross	worldwide_gross	worldwide_profit	domestic_profit	\
0	5.215842e+07	1.265966e+08	8.579529e+07	1.135715e+07	
1	4.866738e+07	1.215134e+08	7.993425e+07	7.088250e+06	
2	3.508837e+07	8.632152e+07	5.556011e+07	4.326960e+06	
3	3.818214e+07	8.462240e+07	5.513259e+07	8.692330e+06	

	release_month	counts	profit per min (w)	profit per min (d)
0	7.007324	778.012650	9.438555e+05	139171.644253
1	3.925950	782.378622	1.158681e+06	131403.798431
2	9.963357	799.384161	5.855828e+05	48402.344665
3	6.420362	809.442224	6.048966e+05	87838.135416

[31]:
```
#set axis and color scheme
sns.set(style="ticks")

#define chart
season_ww = sns.catplot(x="season_release", y="worldwide_profit",
                data=season_gross_ww, kind="bar", palette = hue_colors,
                height=7, aspect=1.1, legend=False)

#modify individual font size of elements
plt.xlabel('Season', fontsize=18, weight='bold');
plt.ylabel('World Wide Profit', fontsize=18, weight='bold');
plt.title('Season Movie Release World Wide Profit', fontsize=20,weight='bold')
```

```
plt.ylim(0,90000000)
plt.tick_params(axis='both', which='major', labelsize=14)
#change axis format to dollars
for ax in season_ww.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
;
```

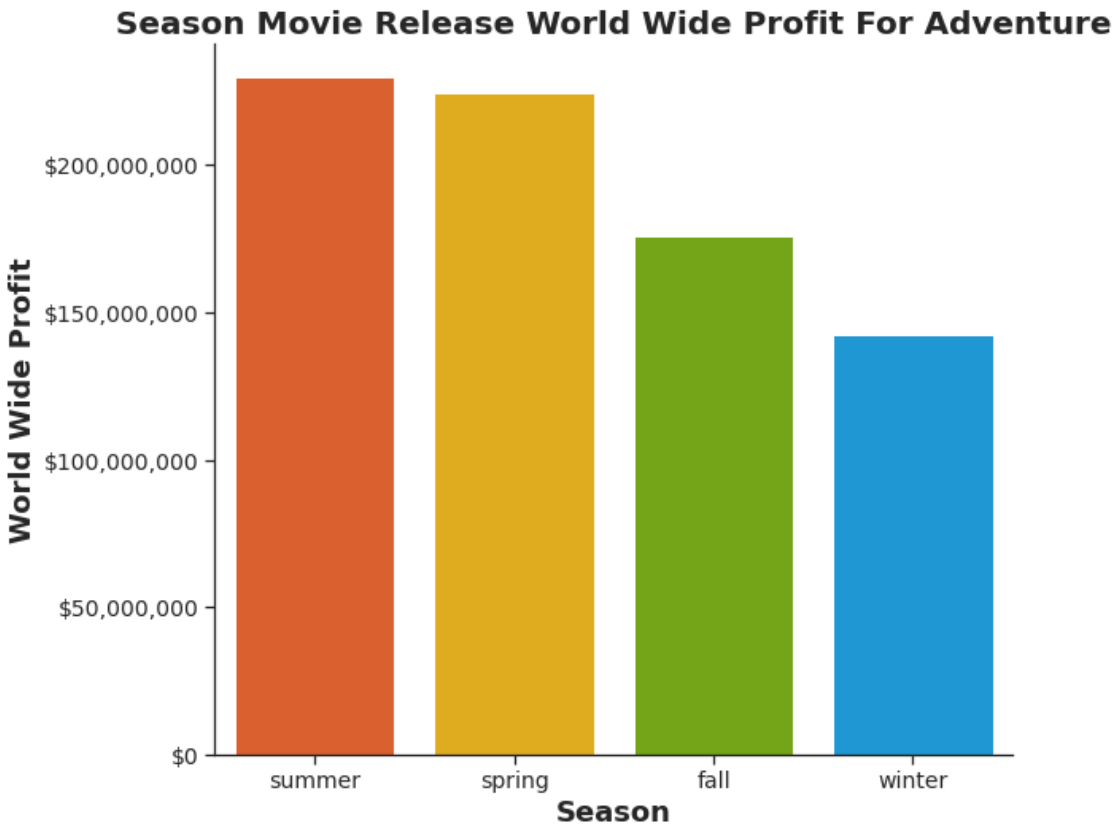
[31]: ''



[32]:
```
#world wide profit by season for adventure

#Adventure profits only
adventure = master_list[master_list['genres'] == 'Adventure']
#Worldwide average profit by season
adv_season_gross_ww = adventure.groupby(['season_release']).
 ↪mean(['worldwide_profit']).sort_values(by='worldwide_profit',ascending=0)
adv_season_gross_ww.reset_index(inplace=True)
```

```
#set axis and color scheme
sns.set(style="ticks")

#define chart
adventure_ww = sns.catplot(x="season_release", y="worldwide_profit",
                data=adv_season_gross_ww, kind="bar", palette = hue_colors,
                height=7, aspect=1.1, legend=False)

#modify individual font size of elements
plt.xlabel('Season', fontsize=18, weight='bold');
plt.ylabel('World Wide Profit', fontsize=18, weight='bold');
plt.title('Season Movie Release World Wide Profit For Adventure',␣
 ↪fontsize=20,weight='bold')
#plt.ylim(0,90000000)
plt.tick_params(axis='both', which='major', labelsize=14)
#change axis format to dollars
for ax in adventure_ww.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
;
```

[32]: ''



[33]:
```
adv_season_gross_ww
```

[33]:

	season_release	start_year	runtime_minutes	id	production_budget	domestic_gross	worldwide_gross	worldwide_profit	domestic_profit	release_month	counts	profit per min (w)	profit per min (d)
0	summer	2014.059701	105.440299	52.671642	9.608022e+07	1.162719e+08	3.256985e+08	2.296183e+08	2.019171e+07	6.850746	469.0	2.136784e+06	226526.282291
1	spring	2014.495935	108.943089	47.203252	1.087715e+08	1.191788e+08	3.328885e+08	2.241170e+08	1.040737e+07	3.975610	469.0	1.875475e+06	59405.170478
2	fall	2014.262626	105.050505	46.101010	8.049488e+07	8.843296e+07	2.563770e+08	1.758821e+08	7.938078e+06	10.252525	469.0	1.520401e+06	17240.489951
3	winter	2014.451327	105.814159	49.504425	6.543035e+07	7.886530e+07	2.076910e+08	1.422607e+08	1.343494e+07	6.840708	469.0	1.422158e+06	175040.193231

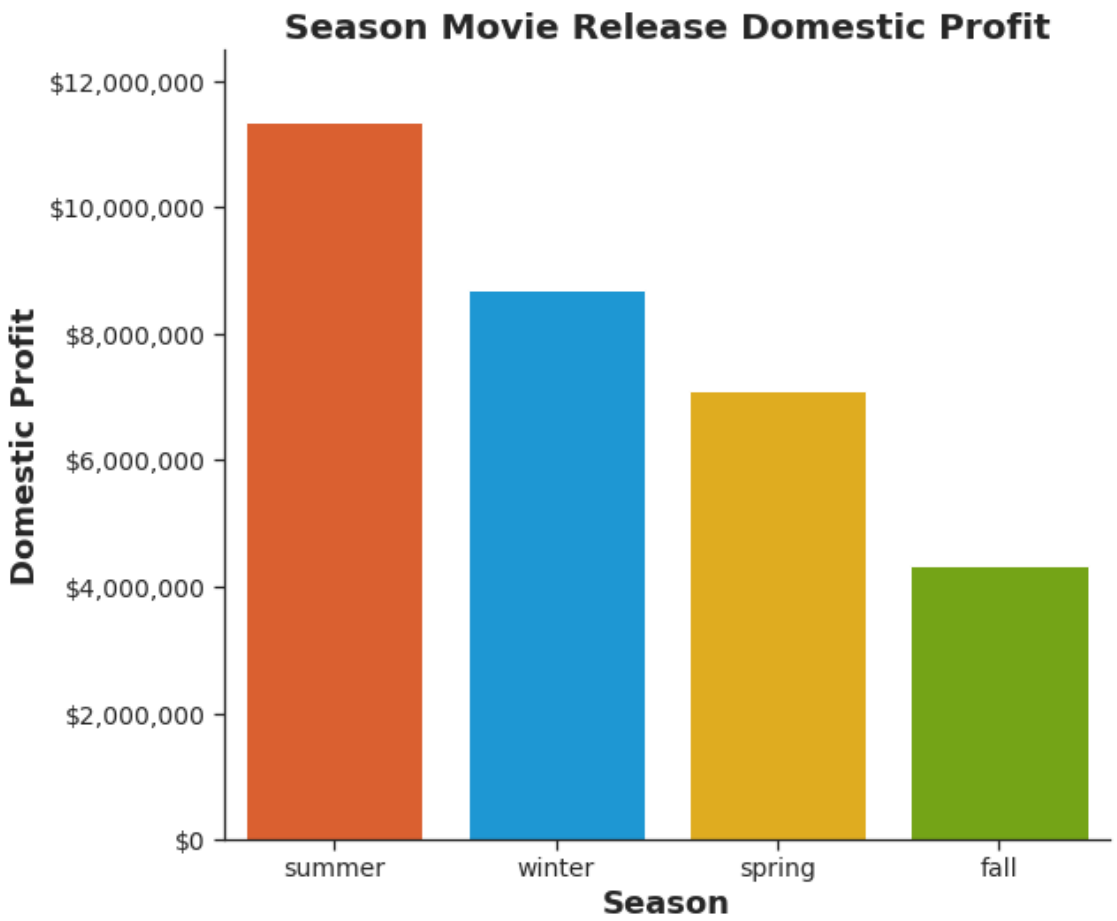
[34]:
```
#domestic average profit by season
season_gross_dom = season_gross_ww.groupby(['season_release']).
 ↪mean(['domestic_profit']).sort_values(by='domestic_profit',ascending=0)
season_gross_dom.reset_index(inplace=True)

season_gross_dom
```

[34]:

	season_release	start_year	runtime_minutes	id	production_budget	domestic_gross	worldwide_gross	worldwide_profit	domestic_profit	release_month	counts	profit per min (w)	profit per min (d)
0	summer	2013.923435	98.967377	53.179760	4.080127e+07	5.215842e+07	1.265966e+08	8.579529e+07	1.135715e+07	7.007324	778.012650	9.438555e+05	139171.644253
1	winter	2014.166146	101.298563	53.412867	2.948981e+07	3.818214e+07	8.462240e+07	5.513259e+07	8.692330e+06	6.420362	809.442224	6.048966e+05	87838.135416
2	spring	2014.082421	99.068899	49.675467	4.157913e+07	4.866738e+07	1.215134e+08	7.993425e+07	7.088250e+06	3.925950	782.378622	1.158681e+06	131403.798431
3	fall	2013.909574	101.445626	48.330378	3.076141e+07	3.508837e+07	8.632152e+07	5.556011e+07	4.326960e+06	9.963357	799.384161	5.855828e+05	48402.344665

[35]:
```
#set axis and color scheme
sns.set(style="ticks")

#define chart
season_gross_dom = sns.catplot(x="season_release", y="domestic_profit",
                data=season_gross_dom, kind="bar", palette = hue_colors,
                height=7, aspect=1.1, legend=False)

#modify individual font size of elements
plt.xlabel('Season', fontsize=18, weight='bold');
plt.ylabel('Domestic Profit', fontsize=18, weight='bold');
plt.title('Season Movie Release Domestic Profit', fontsize=20,weight='bold')
plt.ylim(0, 12500000)
plt.tick_params(axis='both', which='major', labelsize=14)
#change axis format to dollars
for ax in season_gross_dom.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
;
```

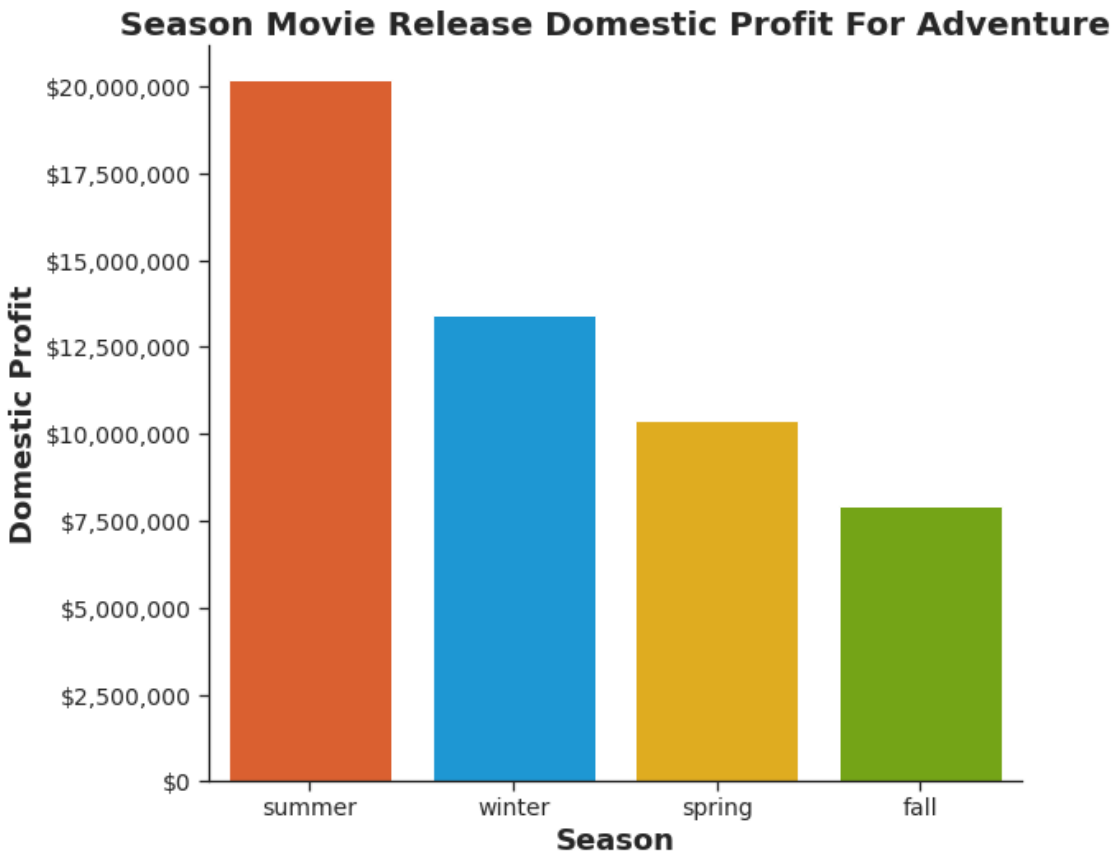
[35]:
```
''
```



[36]:
```
#domestic profit by season for adventure

#Adventure profits only
adventure = master_list[master_list['genres'] == 'Adventure']
#domestic average profit by season
adv_season_gross_dom = adventure.groupby(['season_release']).
 ↪mean(['domestic_profit']).sort_values(by='domestic_profit',ascending=0)
adv_season_gross_dom.reset_index(inplace=True)

#set axis and color scheme
sns.set(style="ticks")

#define chart
adventure_dom = sns.catplot(x="season_release", y="domestic_profit",
                data=adv_season_gross_dom, kind="bar", palette = hue_colors,
                height=7, aspect=1.1, legend=False)

#modify individual font size of elements
```

```
plt.xlabel('Season', fontsize=18, weight='bold');
plt.ylabel('Domestic Profit', fontsize=18, weight='bold');
plt.title('Season Movie Release Domestic Profit For Adventure',␣
 ↪fontsize=20,weight='bold')
#plt.ylim(0,90000000)
plt.tick_params(axis='both', which='major', labelsize=14)
#change axis format to dollars
for ax in adventure_dom.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
;
```

[36]:
```
''
```



[37]:
```
adv_season_gross_dom
```

[37]:

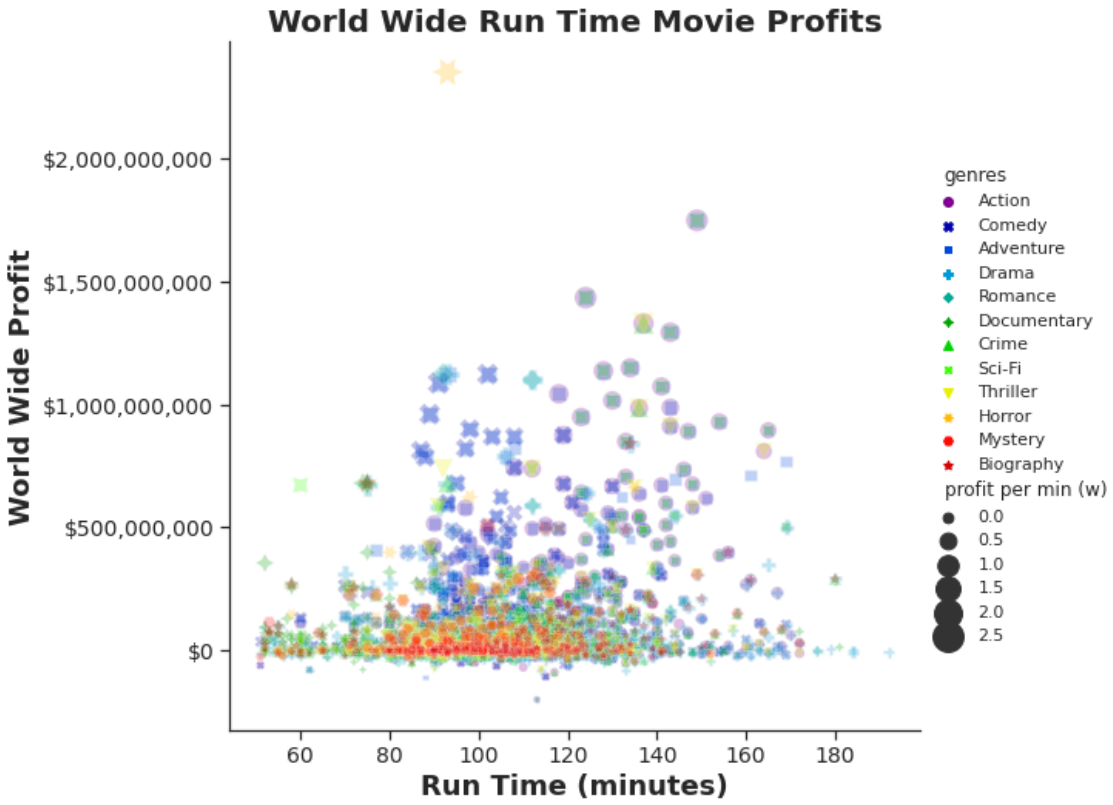
	season_release	start_year	runtime_minutes	id	production_budget	\
0	summer	2014.059701	105.440299	52.671642	9.608022e+07	
1	winter	2014.451327	105.814159	49.504425	6.543035e+07	
2	spring	2014.495935	108.943089	47.203252	1.087715e+08	

```
3          fall  2014.262626       105.050505  46.101010       8.049488e+07

   domestic_gross  worldwide_gross  worldwide_profit  domestic_profit  \
0    1.162719e+08     3.256985e+08      2.296183e+08     2.019171e+07
1    7.886530e+07     2.076910e+08      1.422607e+08     1.343494e+07
2    1.191788e+08     3.328885e+08      2.241170e+08     1.040737e+07
3    8.843296e+07     2.563770e+08      1.758821e+08     7.938078e+06

   release_month  counts  profit per min (w)  profit per min (d)
0       6.850746   469.0        2.136784e+06       226526.282291
1       6.840708   469.0        1.422158e+06       175040.193231
2       3.975610   469.0        1.875475e+06        59405.170478
3      10.252525   469.0        1.520401e+06        17240.489951
```

[38]:
```
#Remove outliers
run_time = master_list[(master_list['runtime_minutes'] > 50) &␣
 ↪(master_list['runtime_minutes'] < 200)]
```

[39]:
```
#Worldwide average profit by runtime

#set axis and color scheme
sns.set(style="ticks")

# Plot worldwide profit against run time with runtime per minute sizing the␣
 ↪data size
ww_rt = sns.relplot(x="runtime_minutes", y="worldwide_profit", hue="genres",␣
 ↪size="profit per min (w)",
            sizes=(20, 400), alpha=.25, palette="nipy_spectral", style="genres",
            height=7, data=run_time);

#modify individual font size of elements
plt.xlabel('Run Time (minutes)', fontsize=18, weight='bold');
plt.ylabel('World Wide Profit', fontsize=18, weight='bold');
plt.title('World Wide Run Time Movie Profits', fontsize=20,weight='bold')
plt.ylim()
plt.tick_params(axis='both', which='major', labelsize=14)

#change axis format to dollars
for ax in ww_rt.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
    #ax.xaxis.set_major_formatter(tkr.FuncFormatter(lambda x, p: f'{x}: Is that␣
 ↪your best'))
;
```

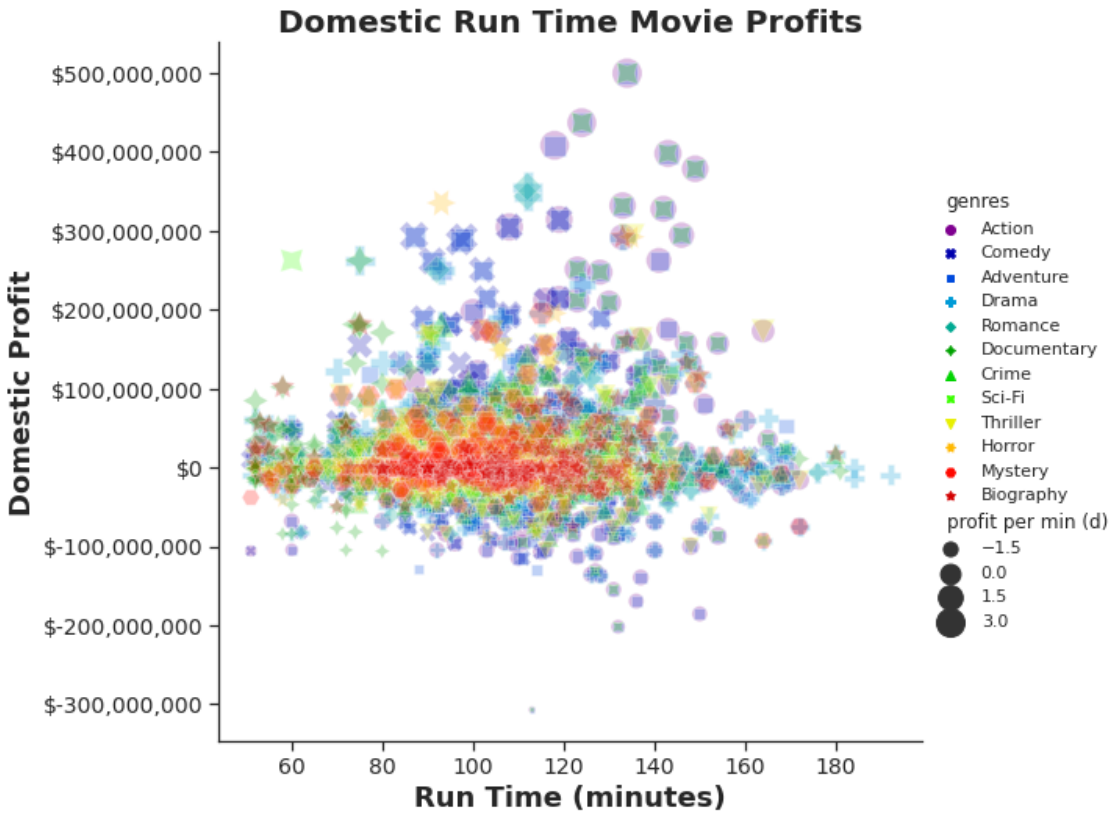
[39]:
```
''
```



[40]:
```
#domestic average profit by runtime

#set axis and color scheme
sns.set(style="ticks")

# Plot worldwide profit against run time with runtime per minute sizing the␣
 ↪data size
ww_rt = sns.relplot(x="runtime_minutes", y="domestic_profit", hue="genres",␣
 ↪size="profit per min (d)",
            sizes=(20, 400), alpha=.25, palette="nipy_spectral", style="genres",
            height=7, data=run_time);

#modify individual font size of elements
plt.xlabel('Run Time (minutes)', fontsize=18, weight='bold');
plt.ylabel('Domestic Profit', fontsize=18, weight='bold');
plt.title('Domestic Run Time Movie Profits', fontsize=20,weight='bold')
plt.ylim()
plt.tick_params(axis='both', which='major', labelsize=14)

#change axis format to dollars
for ax in ww_rt.axes.flat:
```

```
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
↪0f}'))
    #ax.xaxis.set_major_formatter(tkr.FuncFormatter(lambda x, p: f'{x}: Is that␣
↪your best'))
;
```

[40]:
```
''
```



[41]:
```
#Worldwide average profit by genres

top_10_gross_ww = master_list.groupby(['genres']).mean(['worldwide_profit']).
↪sort_values(by='worldwide_profit',ascending=0).head(5)
top_10_gross_ww.reset_index(inplace=True)

top_10_gross_ww
```

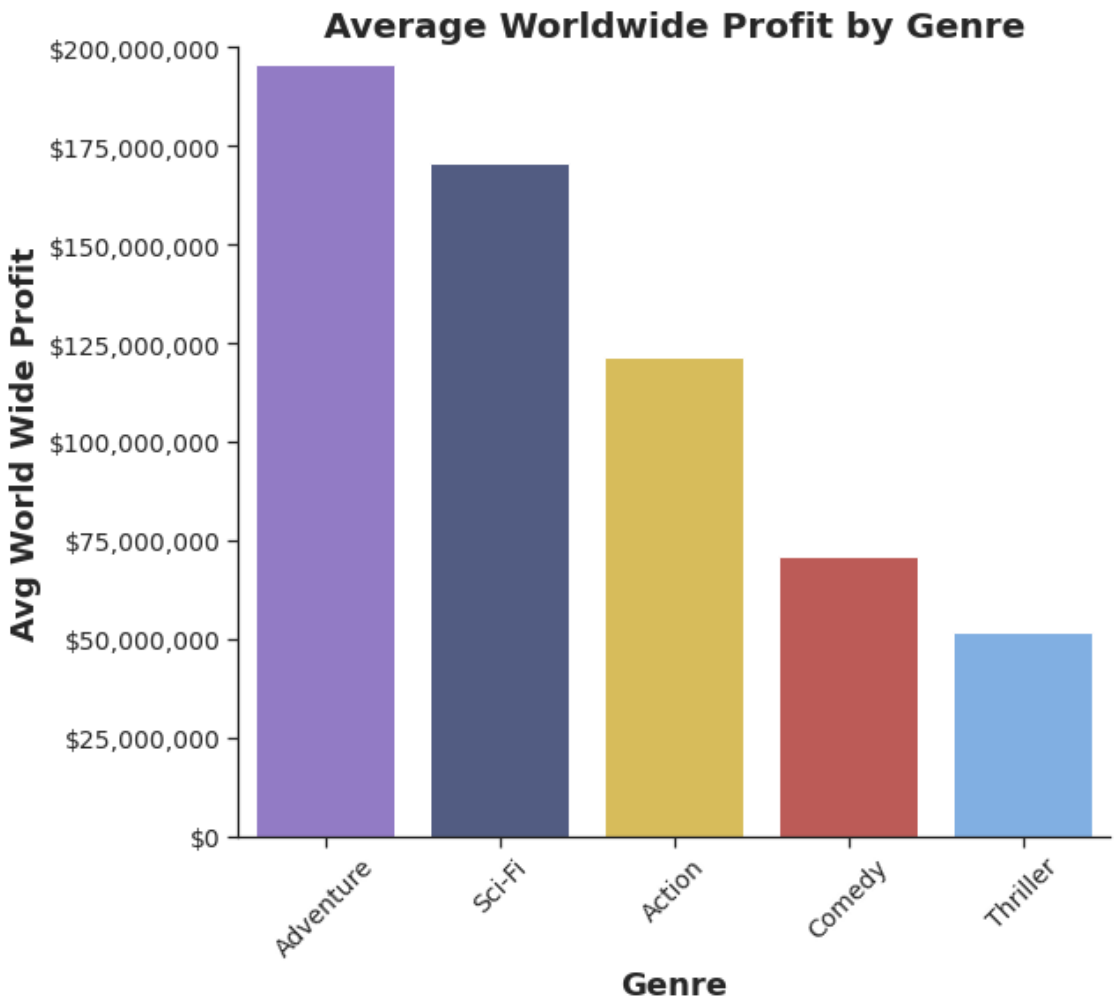
[41]:

	genres	start_year	runtime_minutes	id	production_budget	\
0	Adventure	2014.311301	106.366738	49.087420	8.873404e+07	
1	Sci-Fi	2014.419811	107.169811	52.849057	6.772153e+07	
2	Action	2014.114374	109.323029	49.967543	6.484782e+07	
3	Comedy	2013.754098	100.307692	51.358134	3.338566e+07	

```
4   Thriller  2013.981618       100.601103  52.630515       2.728592e+07

   domestic_gross  worldwide_gross  worldwide_profit  domestic_profit  \
0    1.021452e+08     2.845187e+08      1.957847e+08     1.341112e+07
1    8.877626e+07     2.383115e+08      1.705900e+08     2.105473e+07
2    6.954402e+07     1.865388e+08      1.216909e+08     4.696204e+06
3    4.686716e+07     1.042646e+08      7.087896e+07     1.348150e+07
4    3.228398e+07     7.915914e+07      5.187322e+07     4.998063e+06

   release_month  counts  profit per min (w)  profit per min (d)
0       6.812367   469.0        1.765962e+06       126114.516282
1       6.707547   212.0        1.415339e+06       181773.691984
2       6.692427   647.0        1.012103e+06        21039.006876
3       6.849937   793.0        7.279614e+05       142661.151246
4       6.878676   544.0        6.542001e+05        84308.194803
```

[42]:
```
#set axis and color scheme
sns.set(style="ticks")


# Plot worldwide profit against run time with runtime per minute sizing the␣
 ↪data size
genre_ww = sns.catplot(x="genres", y="worldwide_profit",
                data=top_10_gross_ww, kind="bar",palette =hue_colors_genres,
                height=7, aspect=1.1)

#modify individual font size of elements
plt.xlabel('Genre', fontsize=18, weight='bold')
plt.xticks(rotation=45)
;
plt.ylabel('Avg World Wide Profit', fontsize=18, weight='bold');
plt.title('Average Worldwide Profit by Genre', fontsize=20,weight='bold')
plt.ylim(0, 200000000)
plt.tick_params(axis='both', which='major', labelsize=14)

#change axis format to dollars
for ax in genre_ww.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
    #ax.xaxis.set_major_formatter(tkr.FuncFormatter(lambda x, p: f'{x}: Is that␣
 ↪your best'))
;
```

[42]:
```
''
```



[43]:
```
#domestic average profit by genres

top_10_gross_dom = master_list.groupby(['genres']).mean(['domestic_profit']).
 ↪sort_values(by='domestic_profit',ascending=0).head(5)
top_10_gross_dom.reset_index(inplace=True)

top_10_gross_dom
```

[43]:

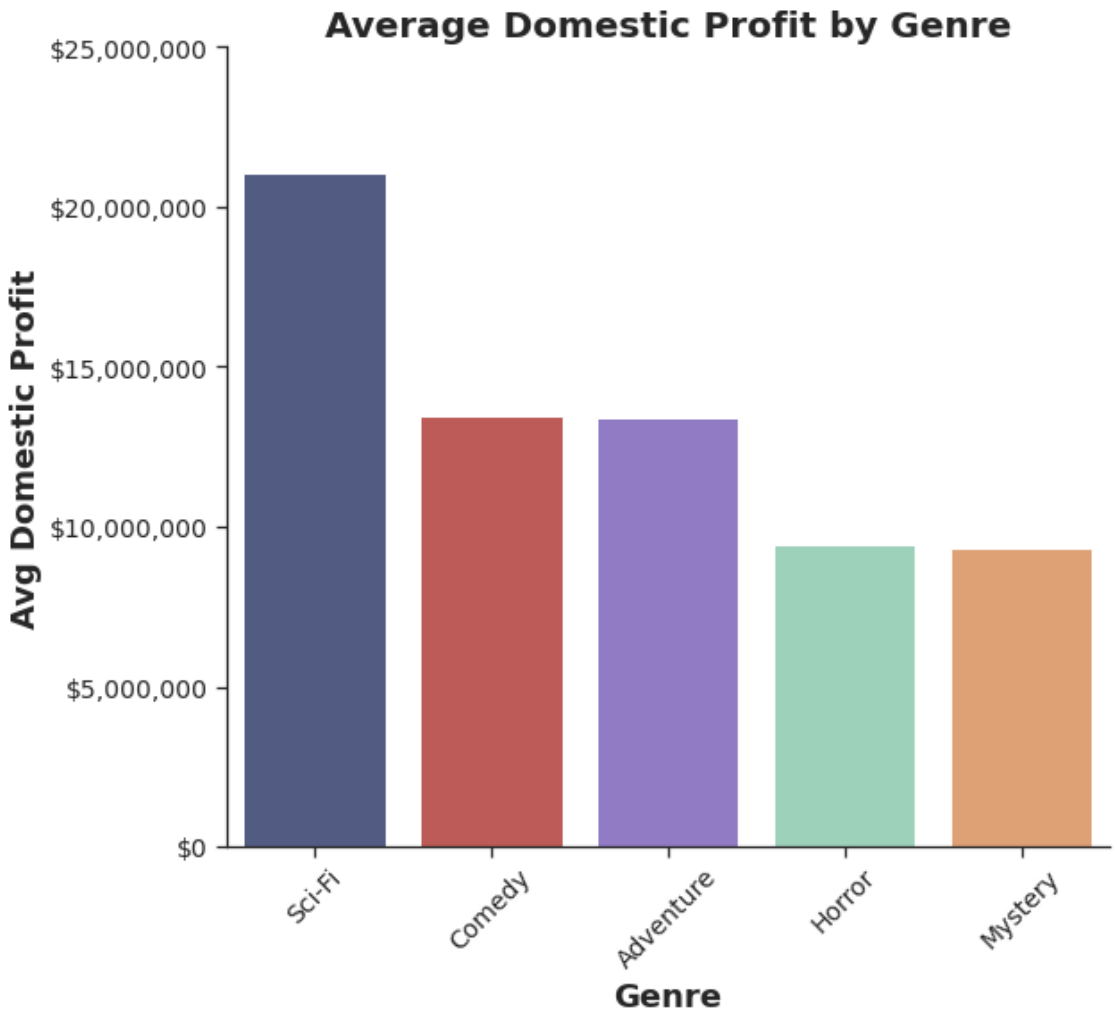
	genres	start_year	runtime_minutes	id	production_budget	\
0	Sci-Fi	2014.419811	107.169811	52.849057	6.772153e+07	
1	Comedy	2013.754098	100.307692	51.358134	3.338566e+07	
2	Adventure	2014.311301	106.366738	49.087420	8.873404e+07	
3	Horror	2014.010499	93.989501	53.590551	1.818058e+07	
4	Mystery	2013.969957	100.806867	53.635193	2.183933e+07	

	domestic_gross	worldwide_gross	worldwide_profit	domestic_profit	\

```
0    8.877626e+07     2.383115e+08      1.705900e+08     2.105473e+07
1    4.686716e+07     1.042646e+08      7.087896e+07     1.348150e+07
2    1.021452e+08     2.845187e+08      1.957847e+08     1.341112e+07
3    2.760341e+07     6.263707e+07      4.445649e+07     9.422829e+06
4    3.119254e+07     6.900329e+07      4.716395e+07     9.353207e+06

   release_month  counts  profit per min (w)  profit per min (d)
0       6.707547   212.0        1.415339e+06       181773.691984
1       6.849937   793.0        7.279614e+05       142661.151246
2       6.812367   469.0        1.765962e+06       126114.516282
3       6.855643   381.0        4.611572e+05        77122.093859
4       6.742489   233.0        4.548617e+05        93614.474392
```

[44]:
```
#set axis and color scheme
sns.set(style="ticks")


# Plot worldwide profit against run time with runtime per minute sizing the␣
 ↪data size
genre_dom = sns.catplot(x="genres", y="domestic_profit",
                data=top_10_gross_dom, kind="bar",palette =hue_colors_genres,
                height=7, aspect=1.1)

#modify individual font size of elements
plt.xlabel('Genre', fontsize=18, weight='bold')
plt.xticks(rotation=45)
;
plt.ylabel('Avg Domestic Profit', fontsize=18, weight='bold');
plt.title('Average Domestic Profit by Genre', fontsize=20,weight='bold')
plt.ylim(0, 25000000)
plt.tick_params(axis='both', which='major', labelsize=14)

#change axis format to dollars
for ax in genre_dom.axes.flat:
    ax.yaxis.set_major_formatter(tkr.FuncFormatter(lambda y, p: '$' + f'{y:,.
 ↪0f}'))
    #ax.xaxis.set_major_formatter(tkr.FuncFormatter(lambda x, p: f'{x}: Is that␣
 ↪your best'))
;
```

[44]:
```
''
```



[47]:
```
#close connection
conn.close()
```