In [4]:
```
#import the requisite libraries. Pandas and matplotlib
#assign the file imdb.title.basics.csv.gz to a variable and read the CSV file in pandas
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
df = pd.read_csv('imdb.title.basics.csv.gz')
df
```

Out[4]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	NaN

In [5]:
```
# Get an overall view of the title basics file and the number of null values present
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 146144 entries, 0 to 146143
Data columns (total 6 columns):
 #   Column           Non-Null Count   Dtype  
---  ------           --------------   -----  
 0   tconst           146144 non-null  object 
 1   primary_title    146143 non-null  object 
 2   original_title   146122 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 [6]:
```
#Checking summation of null values in the title basics file
df.isna().sum()
```

Out[6]:
```
tconst                0
primary_title         1
original_title       22
start_year            0
runtime_minutes    31739
genres              5408
dtype: int64
```

In [7]:
```
#Check for duplicates in the title basics file
duplicates = df[df.duplicated()]
print(len(duplicates))
duplicates.head()
```

```
0
```

Out[7]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres

In [8]:
```
#Work out the mean of runtime_minutes to obtain the values to replace the missing values with
print(df['runtime_minutes'].mean())
```

```
86.18724706088021
```

In [65]:
```
#Replace the null values in the runtime_minutes column with the mean of runtimes
df['runtime_minutes'] = df['runtime_minutes'].fillna(value = df['runtime_minutes'].mean())
df.isna().sum()
```

Out[65]:
```
tconst              0
primary_title       1
original_title     22
start_year          0
runtime_minutes     0
genres              0
dtype: int64
```

In [63]:
```
#Calculate the mean to confirm the value has changed significantly after filling the null values
print(df['runtime_minutes'].mean())
```

```
86.18724706088021
```

In [66]:
```
#Fill the null values in the genres folder with the mode and confirm if
df['genres'] = df['genres'].fillna(value = df['genres'].mode()[0])
df.isna().sum()
```

Out[66]:
```
tconst              0
primary_title       1
original_title     22
start_year          0
runtime_minutes     0
genres              0
dtype: int64
```

In [11]:
```
#Display and review the cleaned data
df
```

Out[11]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres
0	tt0063540	Sunghursh	Sunghursh	2013	175.0	Action,Crime,Drama
1	tt0066787	One Day Before the Rainy Season	Ashad Ka Ek Din	2019	114.0	Biography,Drama
2	tt0069049	The Other Side of the Wind	The Other Side of the Wind	2018	122.0	Drama
3	tt0069204	Sabse Bada Sukh	Sabse Bada Sukh	2018	NaN	Comedy,Drama
4	tt0100275	The Wandering Soap Opera	La Telenovela Errante	2017	80.0	Comedy,Drama,Fantasy
...	...	...	...	...	...	...
146139	tt9916538	Kuambil Lagi Hatiku	Kuambil Lagi Hatiku	2019	123.0	Drama
146140	tt9916622	Rodolpho Teóphilo - O Legado de um Pioneiro	Rodolpho Teóphilo - O Legado de um Pioneiro	2015	NaN	Documentary
146141	tt9916706	Dankyavar Danka	Dankyavar Danka	2013	NaN	Comedy
146142	tt9916730	6 Gunn	6 Gunn	2017	116.0	Documentary
146143	tt9916754	Chico Albuquerque - Revelações	Chico Albuquerque - Revelações	2013	NaN	Documentary

146144 rows × 6 columns

In [12]:
```
#Assign the movie_gross csv document to a variable and display the contents
df1 = pd.read_csv('bom.movie_gross.csv.gz')
df1
```

Out[12]:

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

In [13]:
```
#Check the number of null values in the movie_gross data
df1.isna().sum()
```

Out[13]:
```
title               0
studio              5
domestic_gross     28
foreign_gross    1350
year                0
dtype: int64
```

In [14]:
```
#Display the details of the movie_gross data and number and data type of the variables
df1.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 [15]:
```
#Check for special characters in the movie_gross data columns. This is to find out why the forein data type
#float or integer
for col in df1.columns:
     print(col, '\n', df1[col].value_counts(normalize=True).head(), '\n\n')
```

```
title
 title
Bluebeard               0.000590
Before We Go            0.000295
Knock Knock             0.000295
Kindergarten Teacher    0.000295
Welcome to Leith        0.000295
Name: proportion, dtype: float64


studio
 studio
IFC      0.049083
Uni.     0.043465
WB       0.041396
Fox      0.040213
Magn.    0.040213
Name: proportion, dtype: float64


domestic_gross
 domestic_gross
1100000.0    0.009527
1000000.0    0.008931
1300000.0    0.008931
1200000.0    0.007443
1400000.0    0.006847
Name: proportion, dtype: float64


foreign_gross
 foreign_gross
1200000    0.011291
1100000    0.006873
4200000    0.005891
1900000    0.005891
1300000    0.005400
Name: proportion, dtype: float64


year
 year
2015    0.132861
2016    0.128727
2012    0.118099
2011    0.117803
2014    0.116622
Name: proportion, dtype: float64
```

In [16]:
```
#Fill the null values in the domestic gross column of the movie_gross data with the the mean
df1['domestic_gross'] = df1['domestic_gross'].fillna(value = df1['domestic_gross'].mean())
df1.isna().sum()
```

Out[16]:
```
title               0
studio              5
domestic_gross      0
foreign_gross     1350
year                0
dtype: int64
```

In [17]:
```
# Fill the null values in the foreign gross column with the median of the data
# The error below shows that we have comma character in one number "1,131.6", causing the column to be label
# I attempted to replace this character with a blank using the formula below but i failed
#df1['foreign_gross'] = df1['foreign_gross'].str.replace(',', '')

df1['foreign_gross'] = df1['foreign_gross'].fillna(value = df1['foreign_gross'].median())
df1.isna().sum()
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\nanops.py:786, in nanmedian(values, axis, skipna, mask)
    785 try:
--> 786     values = values.astype("f8")
    787 except ValueError as err:
    788     # e.g. "could not convert string to float: 'a'"

ValueError: could not convert string to float: '1,131.6'

The above exception was the direct cause of the following exception:

TypeError                                 Traceback (most recent call last)
Cell In[17], line 5
      1 #
      2 #df1['foreign_gross'] = df1['foreign_gross'].str.replace(',', '')
----> 5 df1['foreign_gross'] = df1['foreign_gross'].fillna(value = df1['foreign_gross'].median())
      6 df1.isna().sum()

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\generic.py:11623, in NDFrame._add_numeric_operations.<locals>.median(self, axis, skipna, numeric_only, **kwargs)
  11606 @doc(
  11607     _num_doc,
  11608     desc="Return the median of the values over the requested axis.",
   (...)
  11621     **kwargs,
  11622 ):
> 11623     return NDFrame.median(self, axis, skipna, numeric_only, **kwargs)

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\generic.py:11212, in NDFrame.median(self, axis, skipna, numeric_only, **kwargs)
  11205 def median(
  11206     self,
  11207     axis: Axis | None = 0,
   (...)
  11210     **kwargs,
  11211 ) -> Series | float:
> 11212     return self._stat_function(
  11213         "median", nanops.nanmedian, axis, skipna, numeric_only, **kwargs
  11214     )

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\generic.py:11158, in NDFrame._stat_function(self, name, func, axis, skipna, numeric_only, **kwargs)
  11154     nv.validate_stat_func((), kwargs, fname=name)
  11156 validate_bool_kwarg(skipna, "skipna", none_allowed=False)
> 11158 return self._reduce(
  11159     func, name=name, axis=axis, skipna=skipna, numeric_only=numeric_only
  11160 )

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\series.py:4670, in Series._reduce(self, op, name, axis, skipna, numeric_only, filter_type, **kwds)
   4665     raise TypeError(
   4666         f"Series.{name} does not allow {kwd_name}={numeric_only} "
   4667         "with non-numeric dtypes."
   4668     )
   4669 with np.errstate(all="ignore"):
-> 4670     return op(delegate, skipna=skipna, **kwds)

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\nanops.py:158, in bottleneck_switch.__call__.<locals>.f(values, axis, skipna, **kwds)
    156         result = alt(values, axis=axis, skipna=skipna, **kwds)
    157 else:
--> 158     result = alt(values, axis=axis, skipna=skipna, **kwds)
    160 return result

File ~\AppData\Local\anaconda3\Lib\site-packages\pandas\core\nanops.py:789, in nanmedian(values, axis, skipna, mask)
    786         values = values.astype("f8")
    787     except ValueError as err:
    788         # e.g. "could not convert string to float: 'a'"
--> 789         raise TypeError(str(err)) from err
    790 if mask is not None:
    791     values[mask] = np.nan

TypeError: could not convert string to float: '1,131.6'
```

In [18]:
```
#drop the remaining 5 rows showing null values on the studio column
df1 = df1.dropna()
df1.isna().sum()
```

Out[18]:
```
title            0
studio           0
domestic_gross   0
foreign_gross    0
year             0
dtype: int64
```

In [19]:
```
#display the details of the movie gross data to ensure the clean up of data is complete
df1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 2033 entries, 0 to 3353
Data columns (total 5 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   title           2033 non-null   object 
 1   studio          2033 non-null   object 
 2   domestic_gross  2033 non-null   float64
 3   foreign_gross   2033 non-null   object 
 4   year            2033 non-null   int64  
dtypes: float64(1), int64(1), object(3)
memory usage: 95.3+ KB
```

In [21]:
```
#Assign a variable to the 3rd data set, the title ratings and display the data
df2 = pd.read_csv('imdb.title.ratings.csv.gz')
df2
```

Out[21]:

	tconst	averagerating	numvotes
0	tt10356526	8.3	31
1	tt10384606	8.9	559
2	tt1042974	6.4	20
3	tt1043726	4.2	50352
4	tt1060240	6.5	21
...	...	...	...
73851	tt9805820	8.1	25
73852	tt9844256	7.5	24
73853	tt9851050	4.7	14
73854	tt9886934	7.0	5
73855	tt9894098	6.3	128

73856 rows × 3 columns

In [22]:
```
#Display the details of the data to check the data types of the columns and the number of null values presen
df2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 73856 entries, 0 to 73855
Data columns (total 3 columns):
 #   Column         Non-Null Count  Dtype  
---  ------         --------------  -----  
 0   tconst         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
```

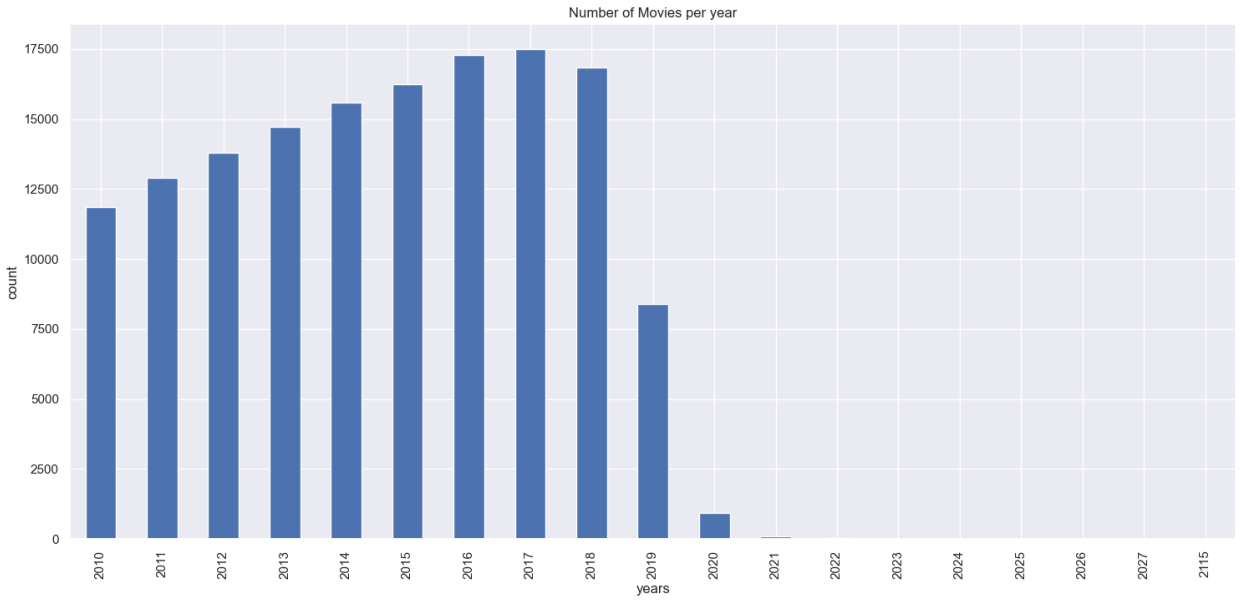
In [26]:
```
#Intall pandasql to enable you  to work with sql within the pandas dataframe
!pip install pandasql
```

```
Requirement already satisfied: pandasql in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages (0.
7.3)
Requirement already satisfied: numpy in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages (from
pandasql) (1.24.3)
Requirement already satisfied: pandas in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages (from
pandasql) (2.0.3)
Requirement already satisfied: sqlalchemy in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages
(from pandasql) (1.4.39)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\users\chelangat\appdata\local\anaconda3\lib\sit
e-packages (from pandas->pandasql) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages
(from pandas->pandasql) (2022.7)
Requirement already satisfied: tzdata>=2022.1 in c:\users\chelangat\appdata\local\anaconda3\lib\site-packag
es (from pandas->pandasql) (2023.3)
Requirement already satisfied: greenlet!=0.4.17 in c:\users\chelangat\appdata\local\anaconda3\lib\site-pack
ages (from sqlalchemy->pandasql) (2.0.1)
Requirement already satisfied: six>=1.5 in c:\users\chelangat\appdata\local\anaconda3\lib\site-packages (fr
om python-dateutil>=2.8.2->pandas->pandasql) (1.16.0)
```

In [27]:
```
#import pandas sql as sqldf
from pandasql import sqldf
```

In [28]:
```
#Pass a global variables to avoid doing this everytime we need to use an object
pysqldf = lambda q: sqldf(q, globals())
```

In [67]:
```
#plot the number of movies that have been created over the years to observe the trend in the industry
q = """
SELECT start_year, Count(*) AS n_movies
FROM df
GROUP BY start_year
HAVING n_movies > 0
;"""

movie_genres_by_year_df = pysqldf(q)


fig, axes = plt.subplots(nrows =1, ncols = 1, figsize = (18,8))
movie_genres_by_year_df.set_index('start_year')['n_movies'].plot(kind='bar',ax=axes)
axes.set_title('Number of Movies per year')
axes.set_xlabel('years')
axes.set_ylabel('count');
```



In [113]:
```
#Join the three tables (title basics, movie gross and the title ratings), and assign the new table a variable
#Display the table
q1 = """
SELECT *
FROM df
INNER JOIN df1
ON df.primary_title = df1.title
INNER JOIN df2
USING (tconst);
"""

title_basics_join_movie_gross = pysqldf(q1)
title_basics_join_movie_gross
```

Out[113]:

	tconst	primary_title	original_title	start_year	runtime_minutes	genres	title	studio	domestic_gross
0	tt0315642	Wazir	Wazir	2016	103.0	Action,Crime,Drama	Wazir	Relbig.	1100000.0
1	tt0337692	On the Road	On the Road	2012	124.0	Adventure,Drama,Romance	On the Road	IFC	744000.0
2	tt0359950	The Secret Life of Walter Mitty	The Secret Life of Walter Mitty	2013	114.0	Adventure,Comedy,Drama	The Secret Life of Walter Mitty	Fox	58200000.0
3	tt0365907	A Walk Among the Tombstones	A Walk Among the Tombstones	2014	114.0	Action,Crime,Drama	A Walk Among the Tombstones	Uni.	26300000.0
4	tt0369610	Jurassic World	Jurassic World	2015	124.0	Action,Adventure,Sci-Fi	Jurassic World	Uni.	652300000.0
...	...	...	...	...	...	...	...	...	..
3019	tt9392532	Neighbors	Neighbors	2018	90.0	Comedy,Drama	Neighbors	Uni.	150200000.0
3020	tt9447594	The Gambler	The Gambler	2019	121.0	Action,Sci-Fi,Thriller	The Gambler	Par.	33700000.0
3021	tt9816988	Gold	Tala	2019	NaN	Drama	Gold	Wein.	7200000.0
3022	tt9851050	Sisters	Sisters	2019	NaN	Action,Drama	Sisters	Uni.	87000000.0
3023	tt9906218	Unstoppable	Unstoppable	2019	84.0	Documentary	Unstoppable	Fox	81600000.0

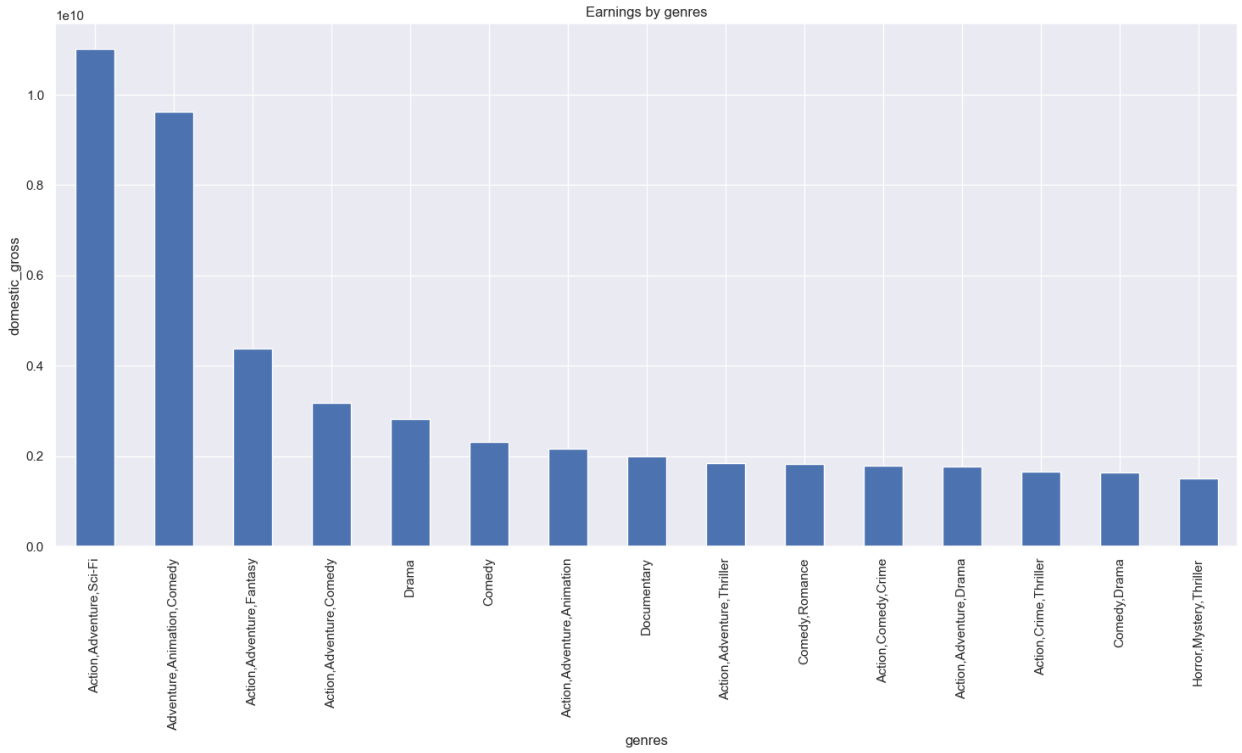
3024 rows × 13 columns

In [30]:
```
# Display the top domestic gross, the average rating and the number of votes of the top 10 earning movies
q2 = """
SELECT title, domestic_gross,averagerating, numvotes
FROM df
INNER JOIN df1
ON df.primary_title = df1.title
INNER JOIN df2
USING (tconst)
ORDER BY numvotes DESC
LIMIT 10;
"""

top_10_movies_by_earnings = pysqldf(q2)
top_10_movies_by_earnings
```

Out[30]:

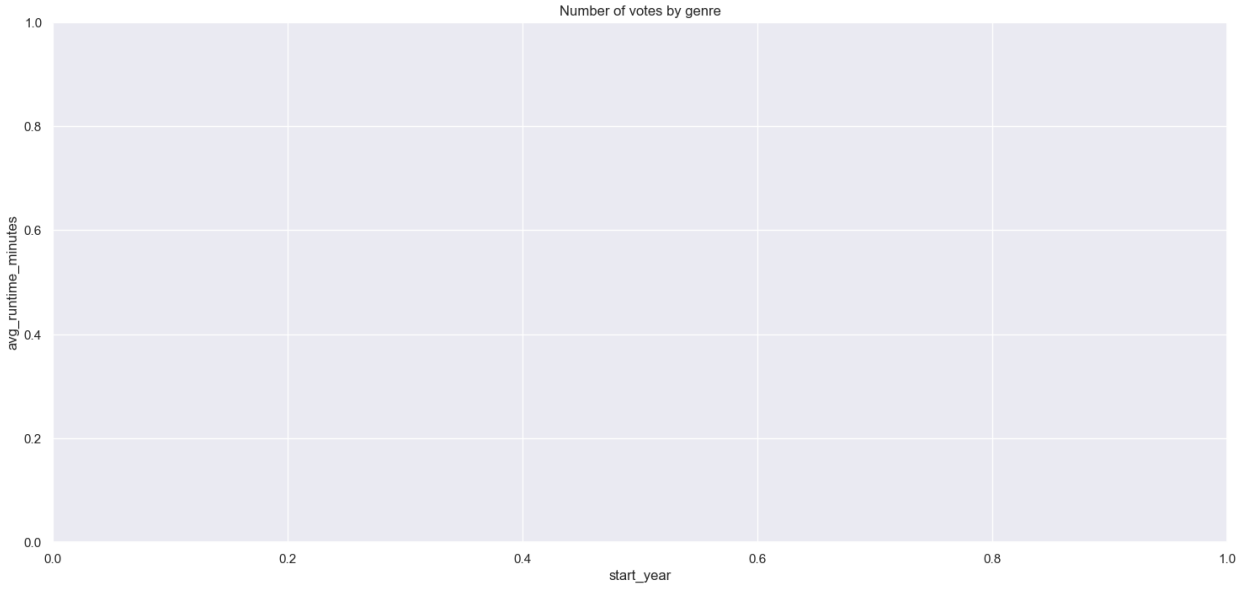
	title	domestic_gross	averagerating	numvotes
0	Inception	292600000.0	8.8	1841066
1	The Dark Knight Rises	448100000.0	8.4	1387769
2	Interstellar	188000000.0	8.6	1299334
3	Django Unchained	162800000.0	8.4	1211405
4	The Wolf of Wall Street	116900000.0	8.2	1035358
5	Shutter Island	128000000.0	8.1	1005960
6	Guardians of the Galaxy	333200000.0	8.1	948394
7	Deadpool	363100000.0	8.0	820847
8	The Hunger Games	408000000.0	7.2	795227
9	Mad Max: Fury Road	153600000.0	8.1	780910

In [68]:
```
#Plot the genres by the total domestic gross earned and limit the entries to the top 15 items
q3 = """
SELECT genres, SUM (domestic_gross) AS total_domestic_gross
FROM df
INNER JOIN df1
ON df.primary_title = df1.title
INNER JOIN df2
USING (tconst)
GROUP BY genres
ORDER BY total_domestic_gross DESC
LIMIT 15;
"""

earnings_by_genres_df = pysqldf(q3)

fig, axes = plt.subplots(nrows = 1, ncols = 1, figsize= (18,8))
earnings_by_genres_df.set_index('genres')['total_domestic_gross'].plot(kind = 'bar', ax = axes)
axes.set_title('Earnings by genres')
axes.set_xlabel('genres')
axes.set_ylabel('domestic_gross');
```



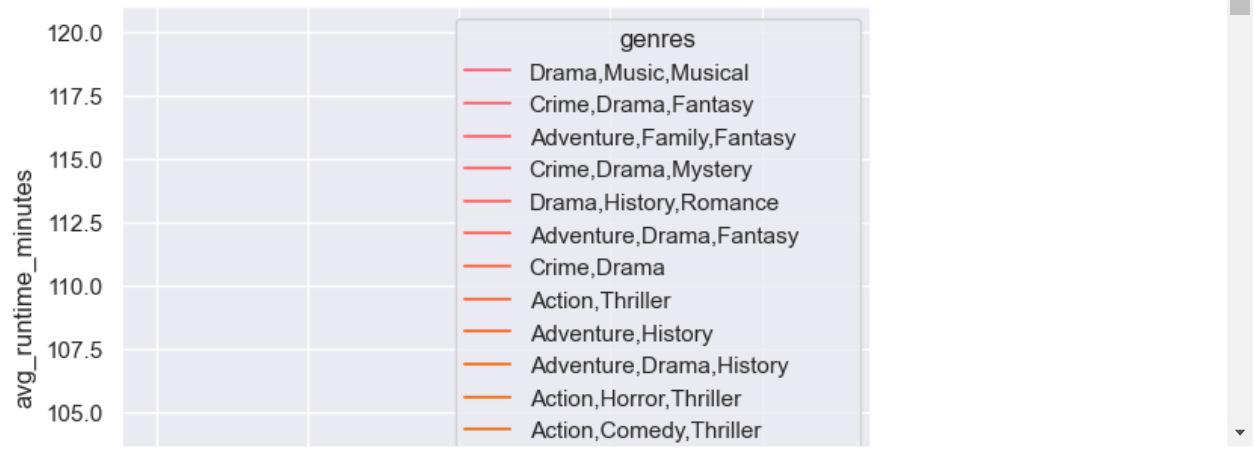
In [33]:
```
#import seaborn
import seaborn as sns
```

In [62]:
```
#plot a line graph to view the trends of various genres over the years
q4 = """
SELECT genres, start_year, AVG (runtime_minutes) AS avg_runtime_minutes, AVG(averagerating) AS avg_rating
FROM df
INNER JOIN df1
ON df.primary_title = df1.title
INNER JOIN df2
USING (tconst)
GROUP BY genres
HAVING avg_runtime_minutes BETWEEN 100 AND 120
ORDER BY avg_runtime_minutes DESC
;
"""

avg_runtime_minutes_genres_df = pysqldf(q4)

fig, axes = plt.subplots(nrows = 1, ncols = 1, figsize= (18,8))
avg_runtime_minutes_genres_df.set_index('start_year')['avg_runtime_minutes'].plot
axes.set_title('Number of votes by genre')
axes.set_xlabel('start_year')
axes.set_ylabel('avg_runtime_minutes');
```



In [53]:
```
#Since the above failed I tried to use seaborn to plot line graph to show the trends of genres over the years
#the variable genres_by_years by number of votes
sns.set_theme(style = 'darkgrid')
sns.lineplot(x='start_year', y = 'avg_runtime_minutes', hue = 'genres', data = genres_by_years_numvotes_df)
```

Out[53]: <Axes: xlabel='start_year', ylabel='avg_runtime_minutes'>



In [ ]: