Music Data Analysis

Albums Sales & Popularity Data Analysis

James Bond 12/18/2019

In [39]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
from sklearn.linear_model import LinearRegression
from sklearn.preprocessing import PolynomialFeatures
from sklearn.model_selection import train_test_split
```

In [131]:

```
albums = pd.read_csv("./albums.csv")
print(f"Data Shape: {week.shape}")
print(week.head())
year = pd.read_csv("./year.csv")
print(f"Data Shape: {year.shape}")
print(year.head())
```

```
Data Shape: (300600, 8)
         date  Rank              Title                              Art
ist  \
0  1955-01-01     1   Poor Little Fool                           Ricky Nel
son
1  1955-01-01     2           Patricia       Perez Prado And His Orches
tra
2  1955-01-01     3       Splish Splash                          Bobby Da
rin
3  1955-01-01     4  Hard Headed Woman  Elvis Presley With The Jordanai
res
4  1955-01-01     5               When                          Kalin Tw
ins

   Weeks on chart  year  Spotify_Popularity  Artist_Popularity
0             1.0  1955                  -1                 56
1             NaN  1955                  -1                 12
2             NaN  1955                  -1                 62
3             NaN  1955                  -1                 -1
4             NaN  1955                  -1                 24
Data Shape: (5300, 6)
   year  Rank           Artist                        Title  \
0  1960     1      Percy Faith  Theme From “A Summer Place”
1  1960     2       Jim Reeves             He’ll Have To Go
2  1960     3  Everly Brothers               Cathy’s Clown
3  1960     4   Johnny Preston                Running Bear
4  1960     5    Mark Dinning                  Teen Angel

   Spotify_Popularity  Artist_Popularity
0                  52                 52
1                  -1                 60
2                  -1                 62
3                  -1                 34
4                  -1                 22
```

First five rows of weekly popularity data set

In [133]:

```
albums.head(5)
```

Out[133]:

	id	artist_id	album_title	genre	year_of_pub	num_of_tracks	num_of_sales	rolling_stone_criti
0	1	1767	Call me Cat Moneyless That Doggies	Folk	2006	11	905193	4.
1	2	23548	Down Mare	Metal	2014	7	969122	3.
2	3	17822	Embarrassed Hungry	Latino	2000	11	522095	2.
3	4	19565	Standard Immediate Engineer Slovakia	Pop	2017	4	610116	1.
4	5	24941	Decent Distance Georgian	Black Metal	2010	8	151111	4.

First five rows of yearly data set

In [43]:

```
year.head(5)
```

Out[43]:

	year	Rank	Artist	Title	Spotify_Popularity	Artist_Popularity
0	1960	1	Percy Faith	Theme From “A Summer Place”	52	52
1	1960	2	Jim Reeves	He’ll Have To Go	-1	60
2	1960	3	Everly Brothers	Cathy’s Clown	-1	62
3	1960	4	Johnny Preston	Running Bear	-1	34
4	1960	5	Mark Dinning	Teen Angel	-1	22

In [134]:

```
print(albums.describe, year.describe)
```

```
<bound method NDFrame.describe of            id  artist_id
album_title        genre  \
0          1       1767    Call me Cat Moneyless That Doggies
Folk
1          2      23548                              Down Mare         M
etal
2          3      17822                     Embarrassed Hungry       La
tino
3          4      19565  Standard Immediate Engineer Slovakia
Pop
4          5      24941              Decent Distance Georgian  Black M
etal
...        ...        ...                                   ...
...
99995   99996      44624     Mike Pies Malay Albanian Terrible     Pop-
Rock
99996   99997      16345                                 Global         R
etro
99997   99998      32674                                   MINI         I
ndie
99998   99999      10134             Marketing Belligerent Toe
Pop
99999  100000      41286                   Lover Barbie Of Rock
Rock

       year_of_pub  num_of_tracks  num_of_sales  rolling_stone_critic
\
0             2006             11        905193                   4.0
1             2014              7        969122                   3.0
2             2000             11        522095                   2.5
3             2017              4        610116                   1.5
4             2010              8        151111                   4.5
...            ...            ...           ...                   ...
99995         2016              3        871655                   2.5
99996         2013             14        146202                   5.0
99997         2018              4        620452                   2.0
99998         2007              7        643276                   4.0
99999         2014              7        466962                   3.5

       mtv_critic  music_maniac_critic
0             1.5                  3.0
1             4.0                  5.0
2             1.0                  2.0
3             2.0                  4.0
4             2.5                  1.0
...           ...                  ...
99995         1.5                  1.0
99996         2.5                  1.0
99997         4.0                  5.0
99998         1.5                  4.0
99999         4.5                  2.5

[100000 rows x 10 columns]> <bound method NDFrame.describe of       yea
r  Rank           Artist                         Title  \
0     1960     1      Percy Faith   Theme From “A Summer Place”
1     1960     2       Jim Reeves              He’ll Have To Go
2     1960     3  Everly Brothers                  Cathy’s Clown
```

```
3     1960     4   Johnny Preston                    Running Bear
4     1960     5     Mark Dinning                      Teen Angel
...    ...   ...              ...                             ...
5295  2012    96        Kip Moore       Somethin’ ‘Bout A Truck
5296  2012    97           Miguel                           Adorn
5297  2012    98     Jason Aldean                Fly Over States
5298  2012    99   Eli Young Band  Even If It Breaks Your Heart
5299  2012   100      Linkin Park                  Burn It Down

      Spotify_Popularity  Artist_Popularity
0                     52                 52
1                     -1                 60
2                     -1                 62
3                     -1                 34
4                     -1                 22
...                  ...                ...
5295                  65                 68
5296                  64                 84
5297                  61                 78
5298                  66                 65
5299                  71                 86

[5300 rows x 6 columns]>
```

In [136]:

```
print(albums.info, year.info)
```

```
<bound method DataFrame.info of           id  artist_id
album_title       genre  \
0          1       1767    Call me Cat Moneyless That Doggies
Folk
1          2      23548                                Down Mare        M
etal
2          3      17822                     Embarrassed Hungry       La
tino
3          4      19565  Standard Immediate Engineer Slovakia
Pop
4          5      24941            Decent Distance Georgian  Black M
etal
...      ...        ...                                  ...
...
99995   99996      44624     Mike Pies Malay Albanian Terrible     Pop-
Rock
99996   99997      16345                                 Global        R
etro
99997   99998      32674                                   MINI        I
ndie
99998   99999      10134           Marketing Belligerent Toe
Pop
99999  100000      41286                   Lover Barbie Of Rock
Rock

       year_of_pub  num_of_tracks  num_of_sales  rolling_stone_critic
\
0             2006             11        905193                   4.0
1             2014              7        969122                   3.0
2             2000             11        522095                   2.5
3             2017              4        610116                   1.5
4             2010              8        151111                   4.5
...            ...            ...           ...                   ...
99995         2016              3        871655                   2.5
99996         2013             14        146202                   5.0
99997         2018              4        620452                   2.0
99998         2007              7        643276                   4.0
99999         2014              7        466962                   3.5

       mtv_critic  music_maniac_critic
0             1.5                  3.0
1             4.0                  5.0
2             1.0                  2.0
3             2.0                  4.0
4             2.5                  1.0
...           ...                  ...
99995         1.5                  1.0
99996         2.5                  1.0
99997         4.0                  5.0
99998         1.5                  4.0
99999         4.5                  2.5

[100000 rows x 10 columns]> <bound method DataFrame.info of       year
Rank           Artist                         Title  \
0     1960     1      Percy Faith   Theme From “A Summer Place”
1     1960     2       Jim Reeves              He’ll Have To Go
2     1960     3  Everly Brothers                  Cathy’s Clown
```

```
3     1960    4   Johnny Preston                  Running Bear
4     1960    5     Mark Dinning                    Teen Angel
...    ...  ...              ...                           ...
5295  2012   96        Kip Moore       Somethin’ ‘Bout A Truck
5296  2012   97           Miguel                         Adorn
5297  2012   98     Jason Aldean               Fly Over States
5298  2012   99   Eli Young Band  Even If It Breaks Your Heart
5299  2012  100      Linkin Park                  Burn It Down

      Spotify_Popularity  Artist_Popularity
0                     52                 52
1                     -1                 60
2                     -1                 62
3                     -1                 34
4                     -1                 22
...                  ...                ...
5295                  65                 68
5296                  64                 84
5297                  61                 78
5298                  66                 65
5299                  71                 86

[5300 rows x 6 columns]>
```

In [137]:

```
X = year['Spotify_Popularity'].values
y = year['Artist_Popularity'].values
```

In [140]:

```
X
```

Out[140]:

```
array([[52],
       [-1],
       [-1],
       ...,
       [61],
       [66],
       [71]])
```

In [141]:

```
X=X.reshape(-1,1)
X
```

Out[141]:

```
array([[52],
       [-1],
       [-1],
       ...,
       [61],
       [66],
       [71]])
```

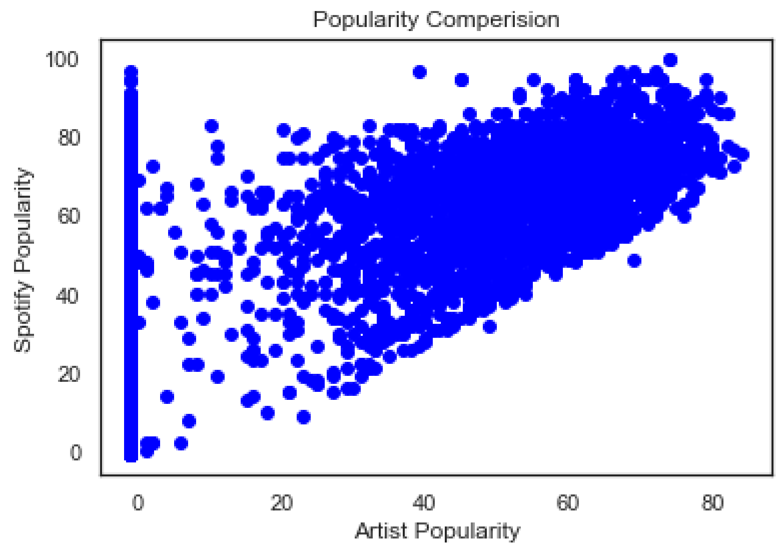
In [142]:

```
x_train, x_test, y_train, y_test = train_test_split(X,y,train_size=0.8,test_size=0.
2,random_state=100)
print(f"X_train shape {x_train.shape}")
print(f"y_train shape {y_train.shape}")
print(f"X_test shape {x_test.shape}")
print(f"y_test shape {y_test.shape}")
print(y_test)
```

```
X_train shape (4240, 1)
y_train shape (4240,)
X_test shape (1060, 1)
y_test shape (1060,)
[ 88  61  -1 ...  79 100  49]
```

In [144]:

```
%matplotlib inline
plt.scatter(x_train,y_train,color='blue')
plt.xlabel('Artist Popularity' )
plt.ylabel('Spotify Popularity')
plt.title('Popularity Comperision')
plt.show()
```



In [145]:

```
lm = LinearRegression()
lm.fit(x_train,y_train)
y_predict = lm.predict(x_test)
print(f"Train accuracy {round(lm.score(x_train,y_train)*100,2)} %")
print(f"Test accuracy {round(lm.score(x_test,y_test)*100,2)} %")
```

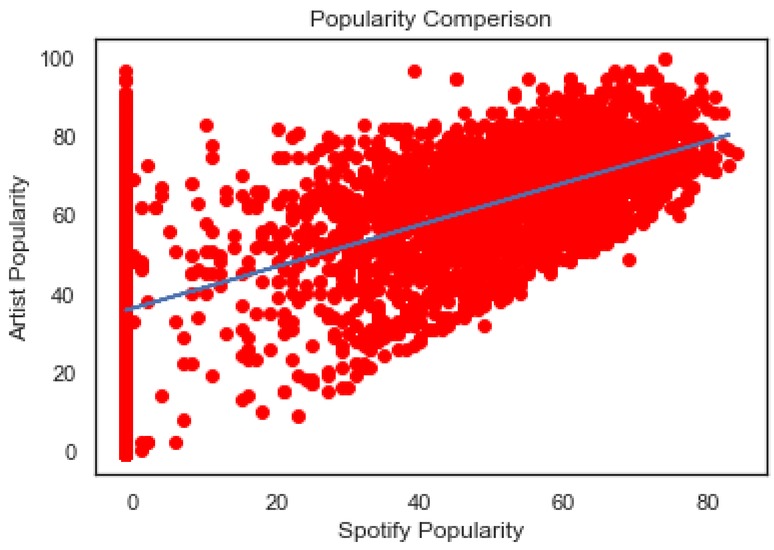
```
Train accuracy 33.88 %
Test accuracy 32.56 %
```

In [146]:

```
plt.scatter(x_train,y_train,color='red')
plt.plot(x_test,y_predict)
plt.xlabel("Spotify Popularity")
plt.ylabel("Artist Popularity")
plt.title("Popularity Comperison")
plt.plot
```

Out[146]:

```
<function matplotlib.pyplot.plot(*args, scalex=True, scaley=True, data=
None, **kwargs)>
```



In [147]:

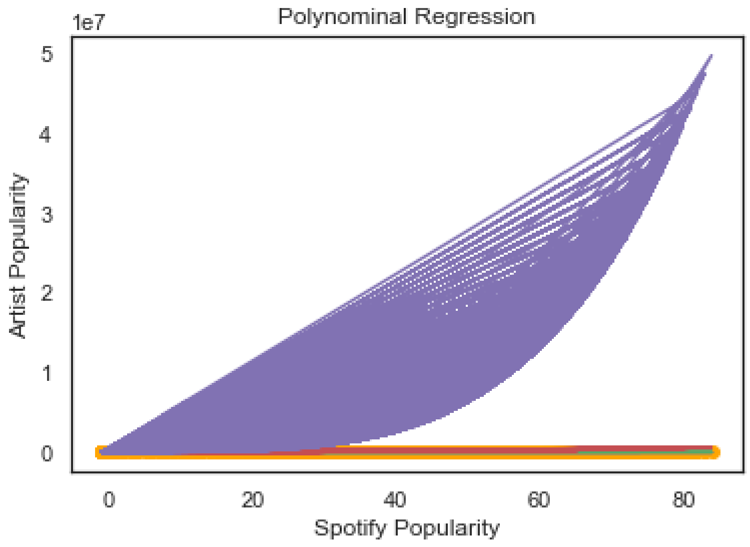
```
poly = PolynomialFeatures(degree = 4)
X_poly = poly.fit_transform(x_train)
poly.fit(X_poly,y_train)
```

Out[147]:

```
PolynomialFeatures(degree=4, include_bias=True, interaction_only=False,
                   order='C')
```

In [148]:

```
%matplotlib inline
plt.scatter(x_train,y_train,color='orange')
plt.plot(x_train, poly.fit_transform(x_train))
plt.xlabel('Spotify Popularity')
plt.ylabel('Artist Popularity')
plt.title('Polynominal Regression')
plt.show()
```



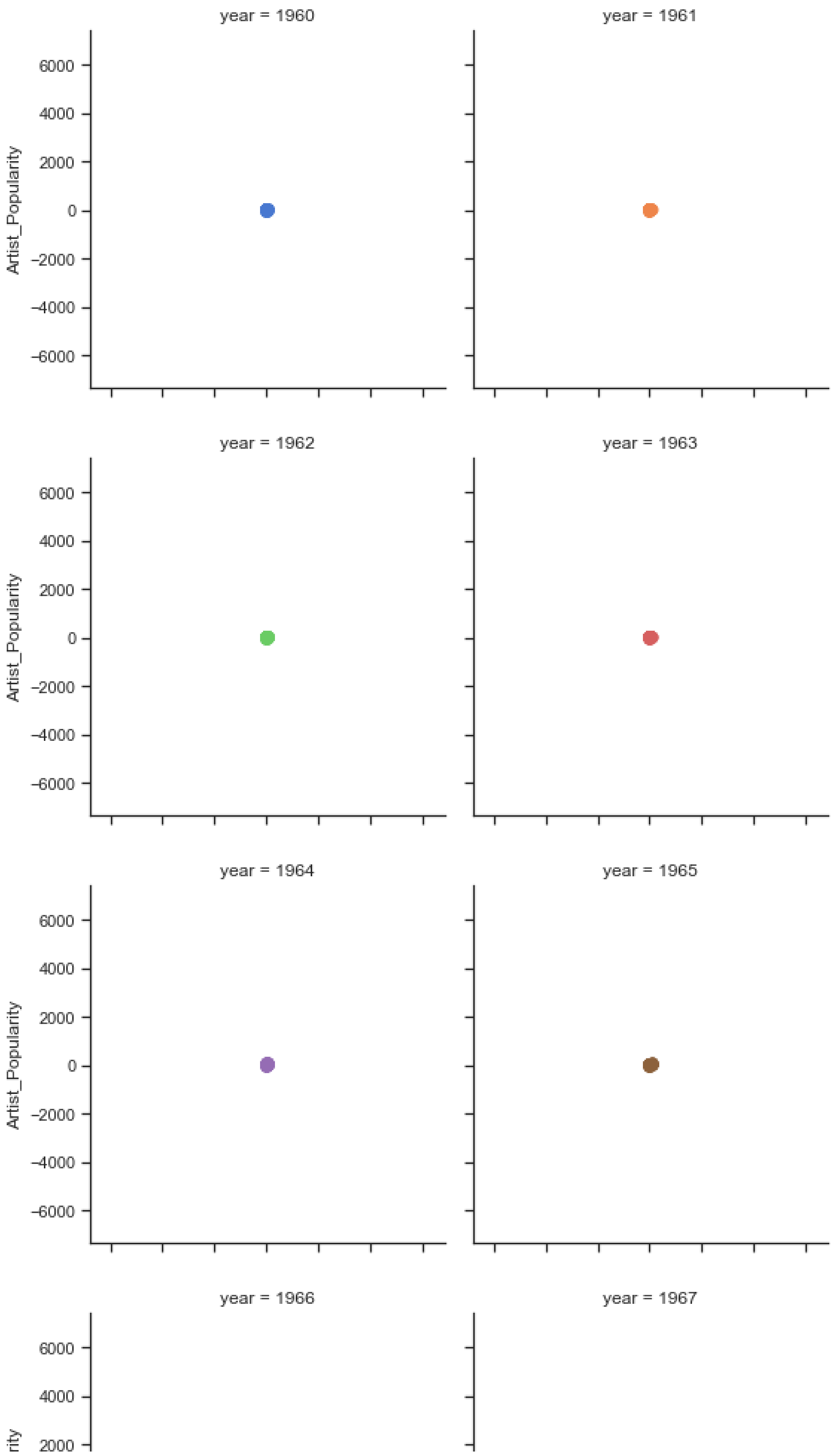
In [149]:

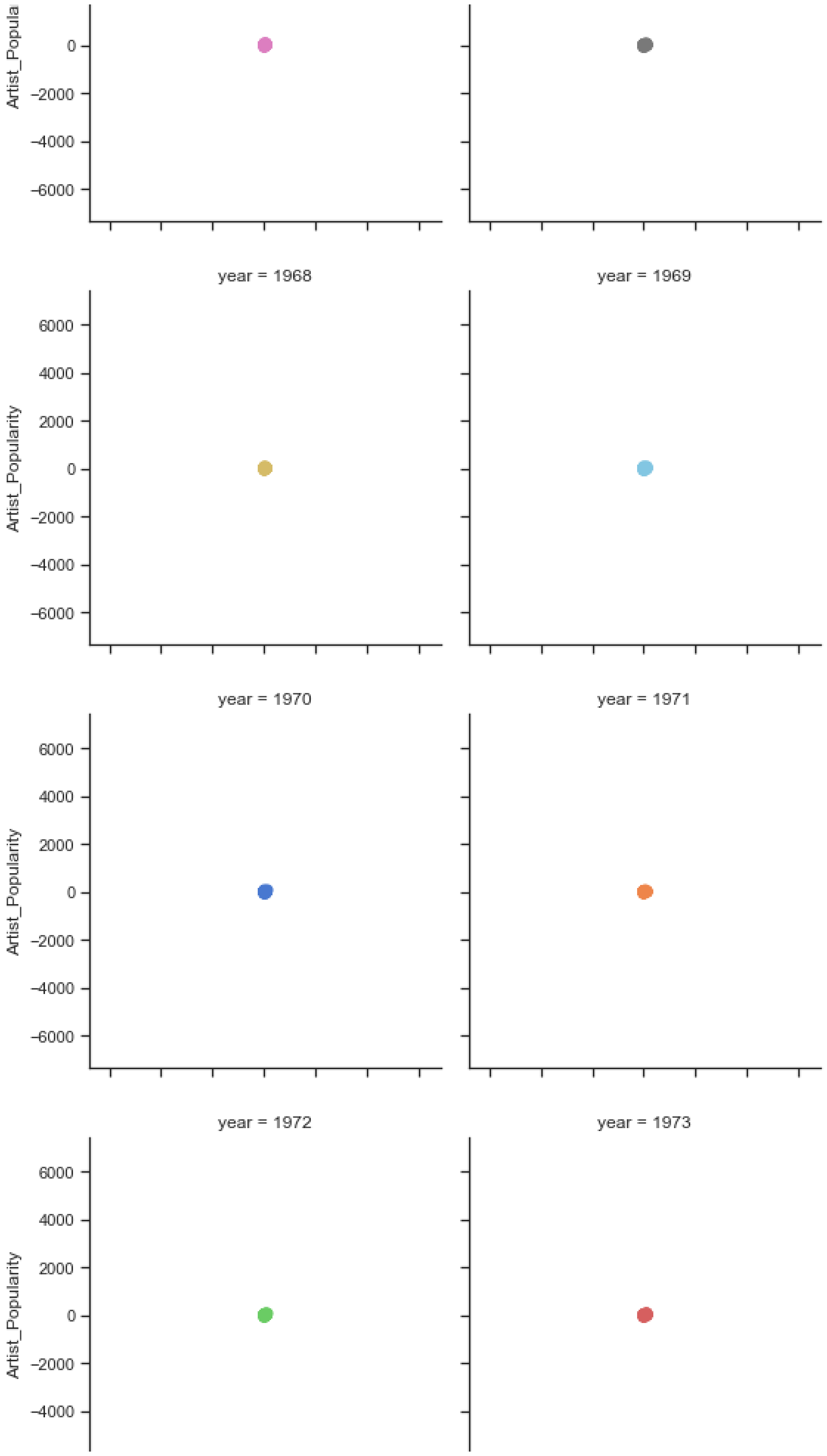
```
uniform_data = np.random.rand(10,12)
data = pd.DataFrame({'x':np.arange(1,10001),'y':np.random.normal(0,4,10000)})
year = pd.read_csv("./year.csv")
print(f"Data Shape: {year.shape}")

sns.set(style="ticks")

sns.lmplot(x="Spotify_Popularity", y="Artist_Popularity", col="year", hue="year", d
ata=year,
           col_wrap=2, ci=None, palette="muted", height=4,
           scatter_kws={"s": 50, "alpha": 1})
```

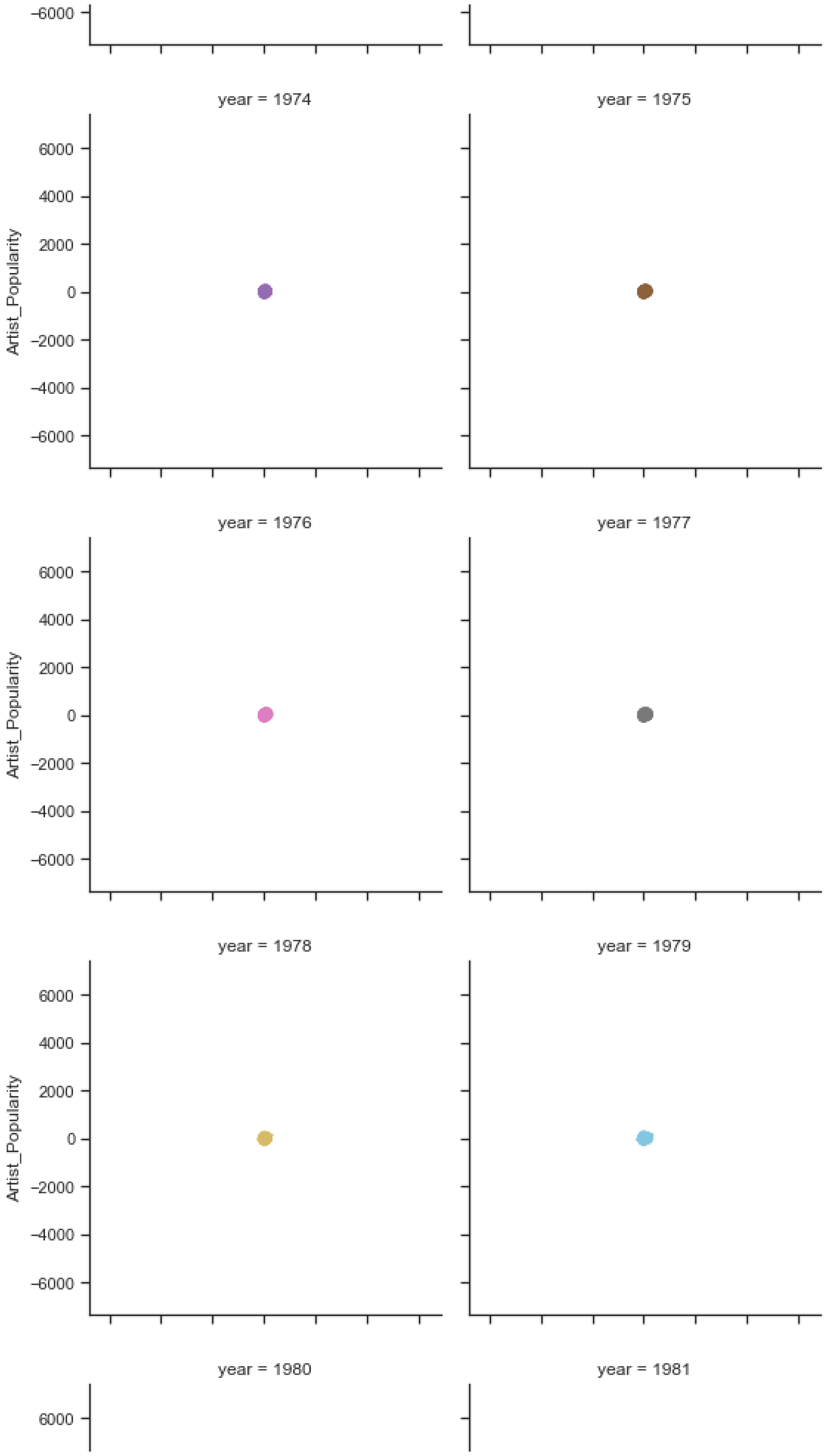
```
Data Shape: (5300, 6)
```

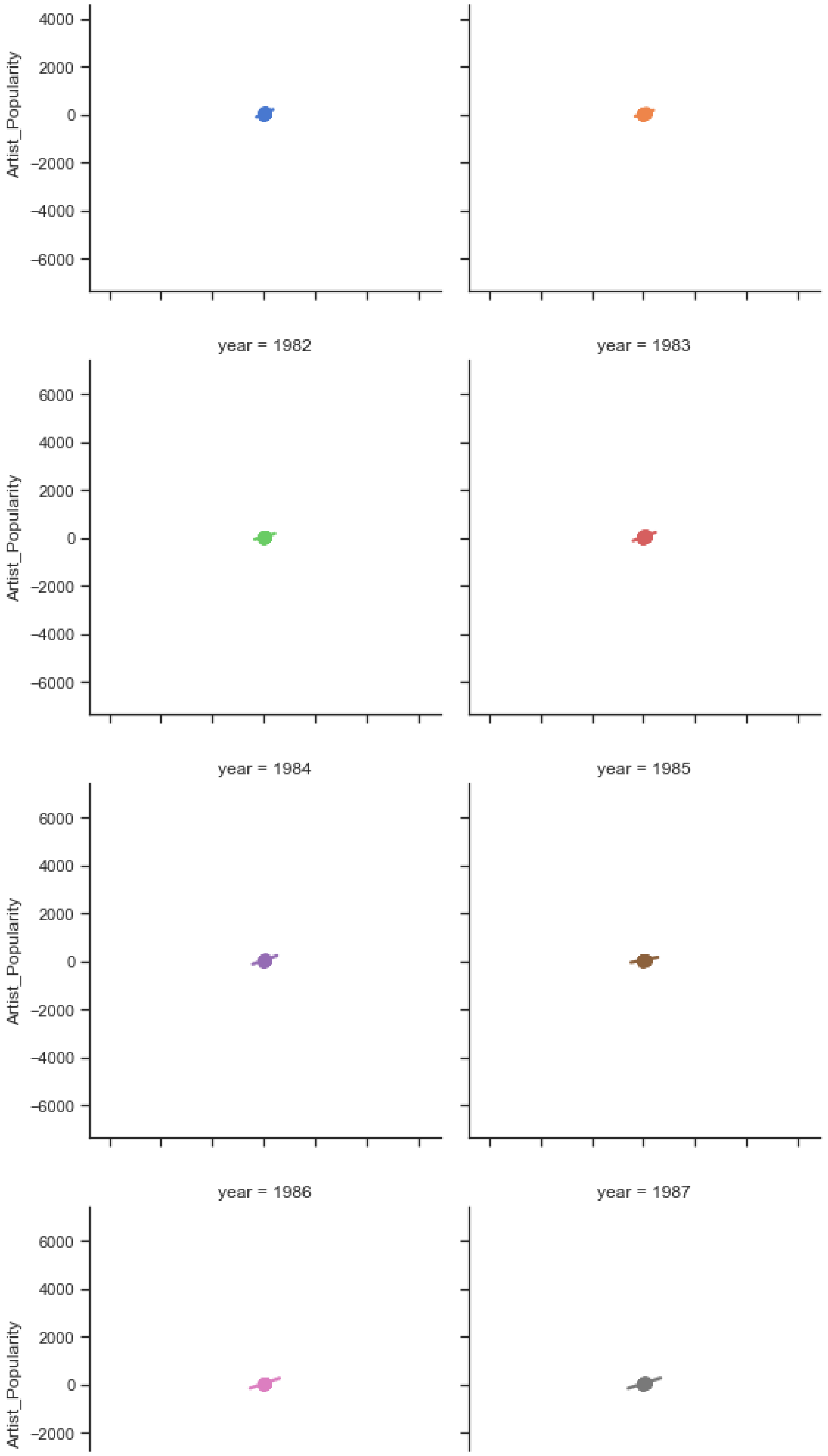
Out[149]:

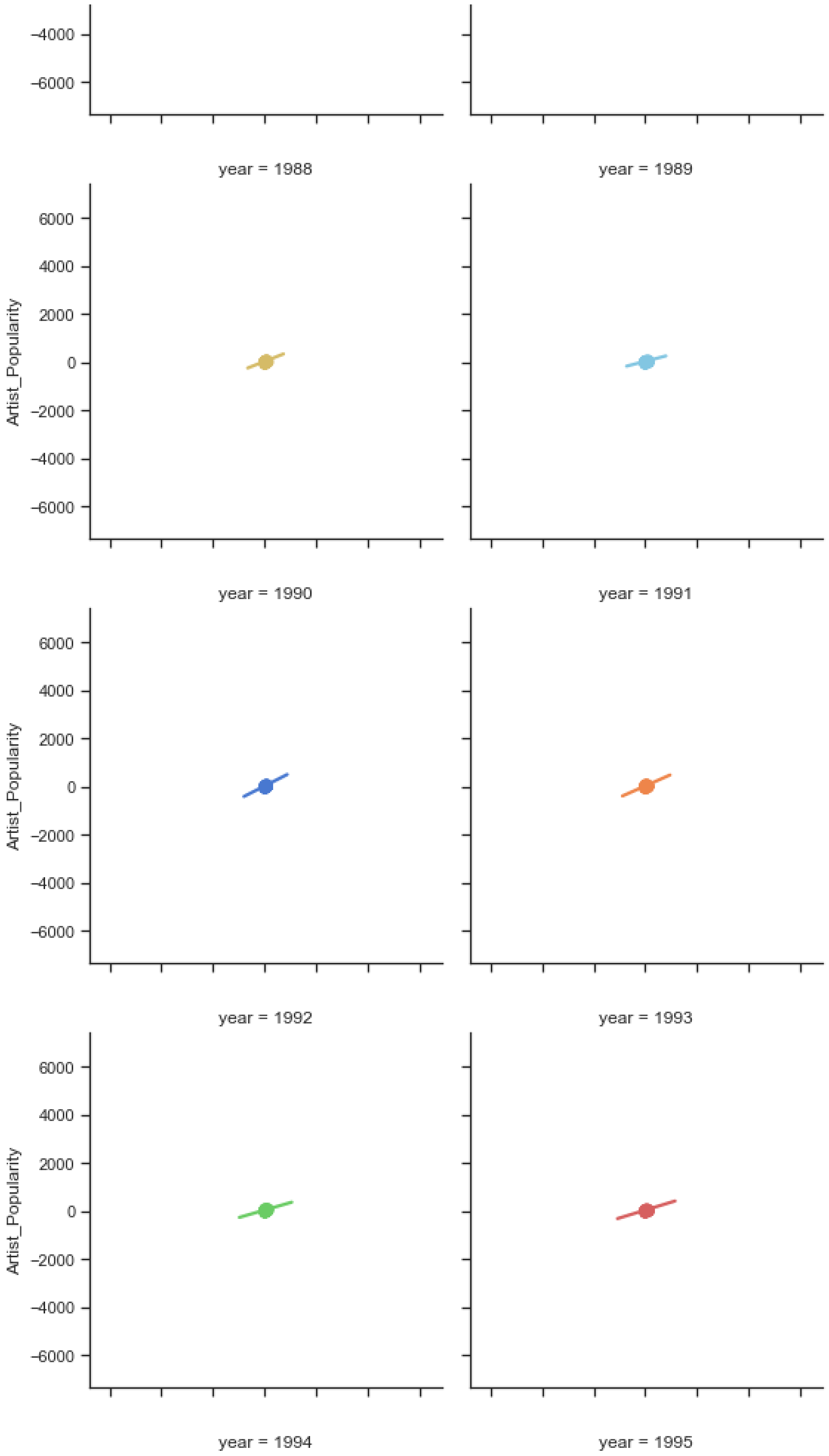
```
<seaborn.axisgrid.FacetGrid at 0x1451d8890>
```

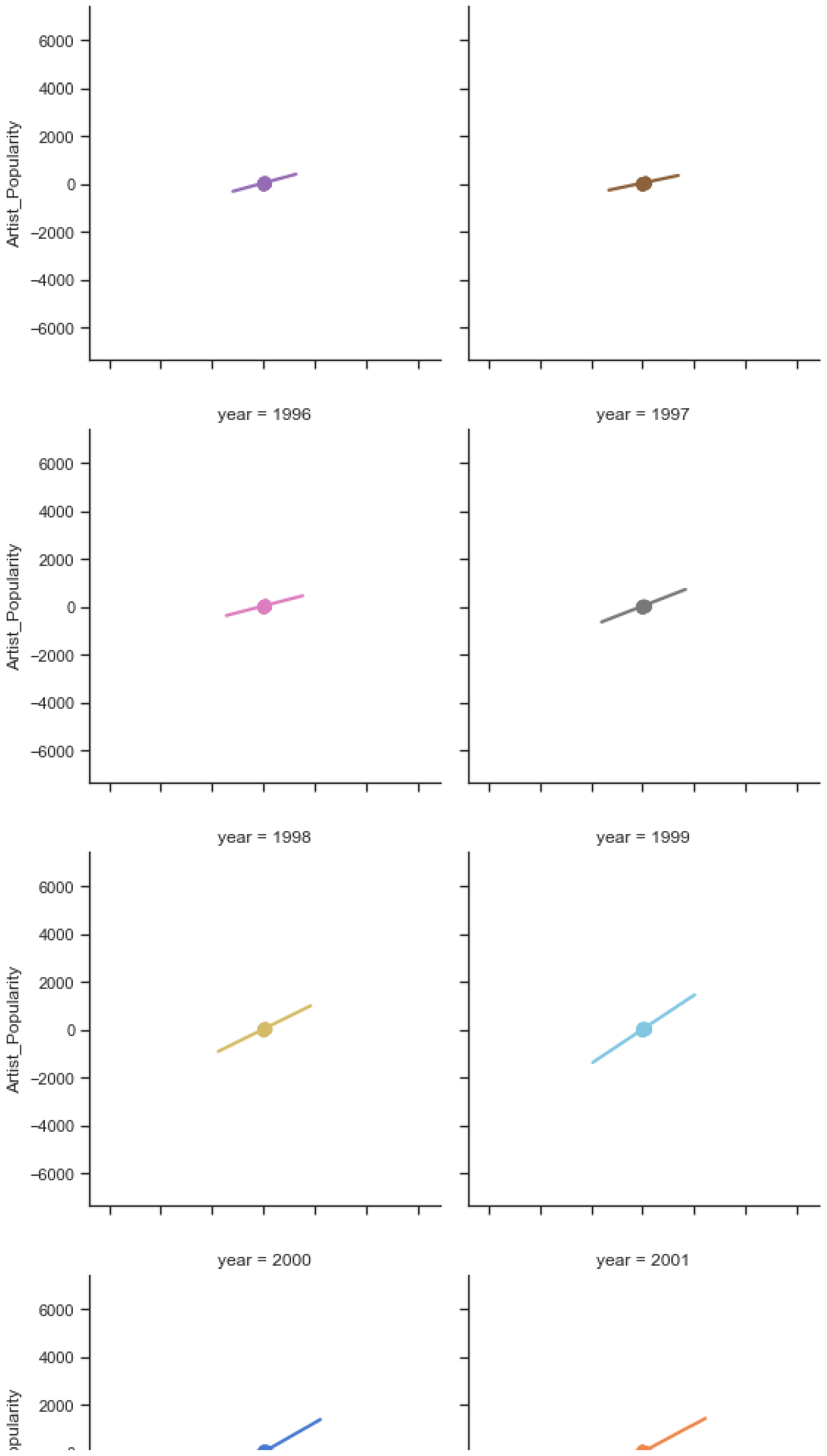

year = 1960
year = 1961
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 1962
year = 1963
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 1964
year = 1965
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 1966
year = 1967
rity
6000
4000
2000

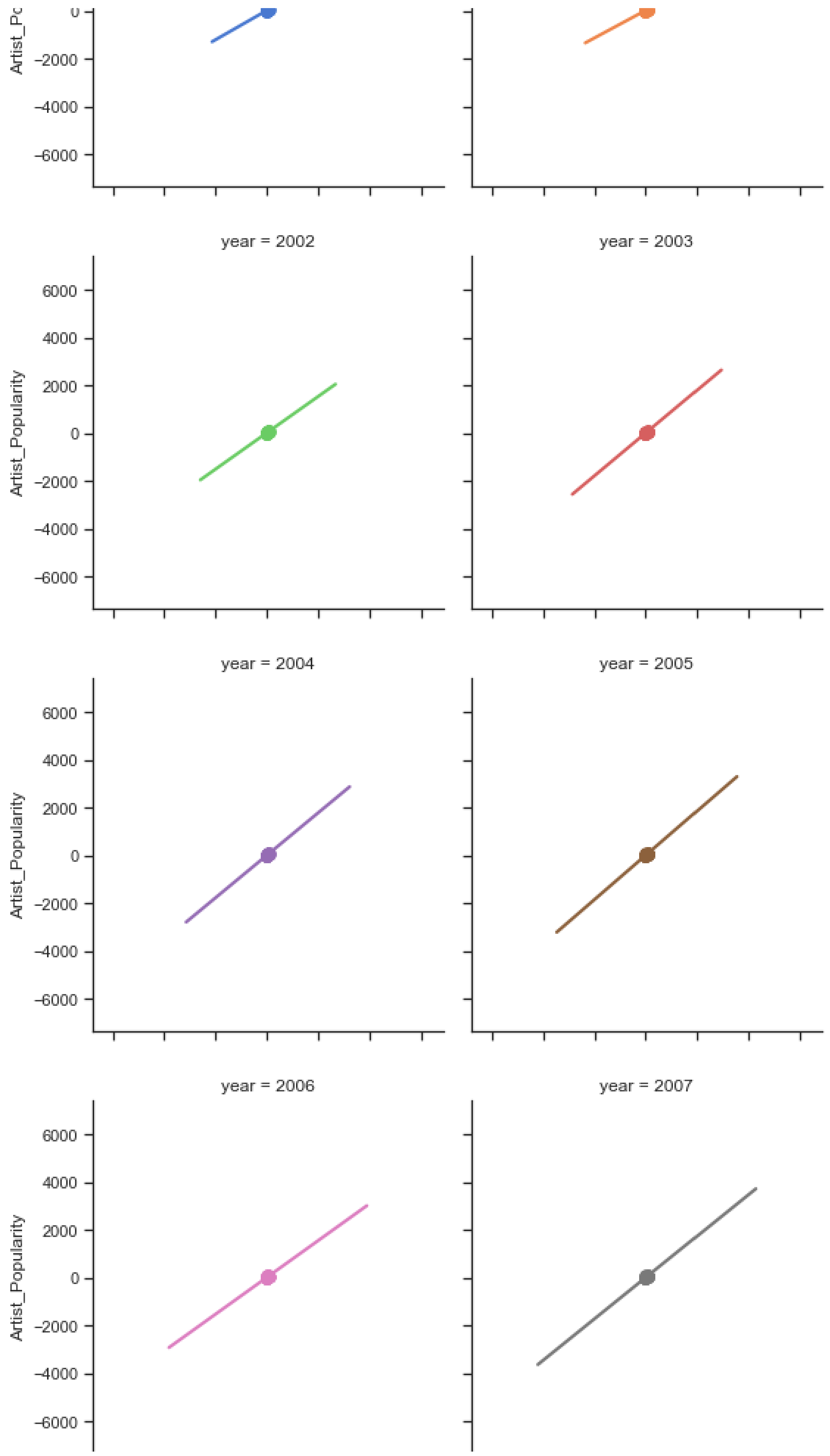

Artist_Popula
0
-2000
-4000
-6000
year = 1968
year = 1969
Artist_Popularity
6000
4000
2000
0
-2000
-4000
-6000
year = 1970
year = 1971
Artist_Popularity
6000
4000
2000
0
-2000
-4000
-6000
year = 1972
year = 1973
Artist_Popularity
6000
4000
2000
0
-2000
-4000

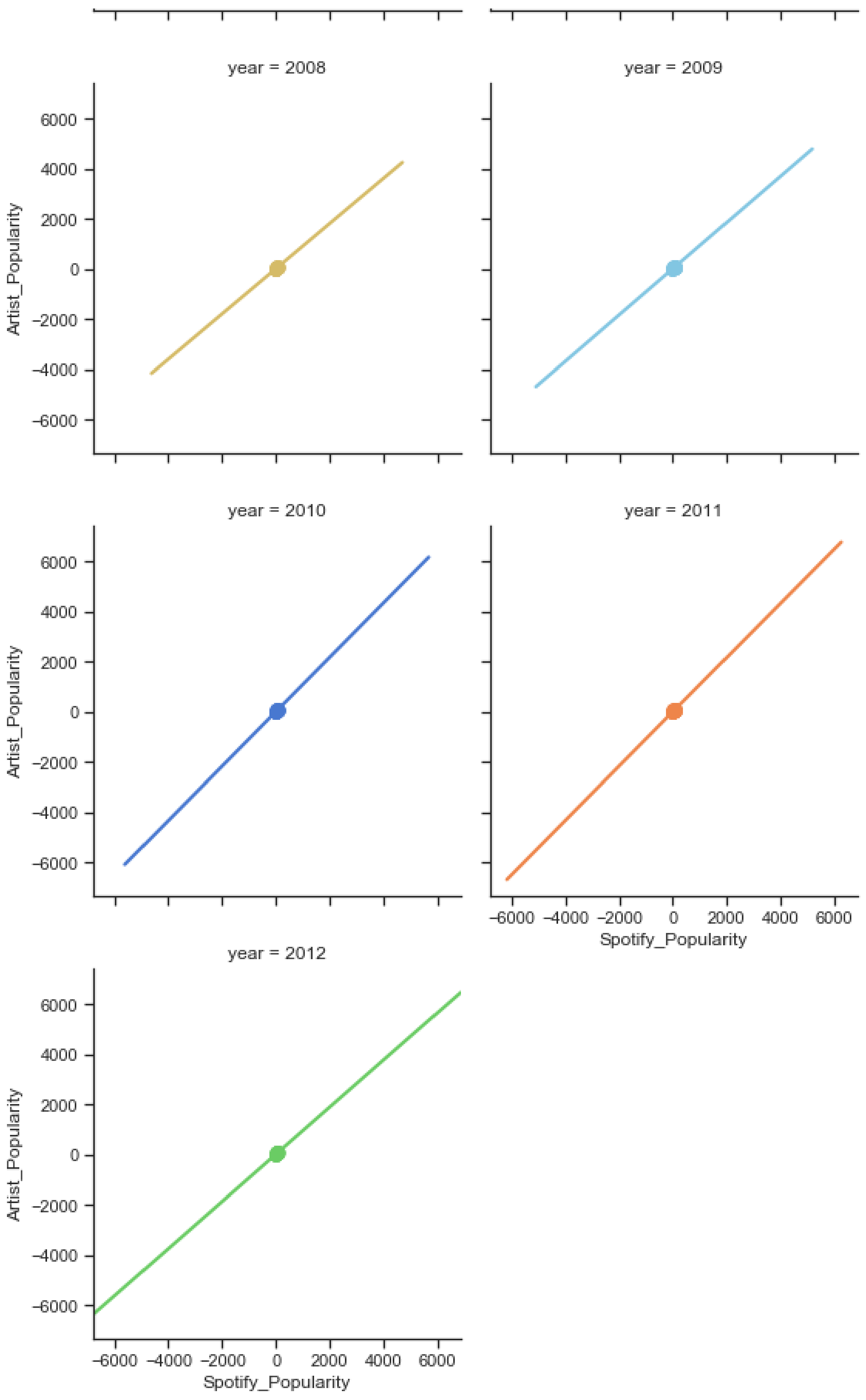

year = 1974
year = 1975
year = 1976
year = 1977
year = 1978
year = 1979
year = 1980
year = 1981
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000


Artist_Popularity
4000
2000
0
−2000
−4000
−6000
year = 1982
year = 1983
6000
year = 1984
year = 1985
year = 1986
year = 1987


-4000
-6000
year = 1988
year = 1989
Artist_Popularity
6000
4000
2000
0
-2000
-4000
-6000
year = 1990
year = 1991
year = 1992
year = 1993
year = 1994
year = 1995


Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 1996
year = 1997
year = 1998
year = 1999
year = 2000
year = 2001

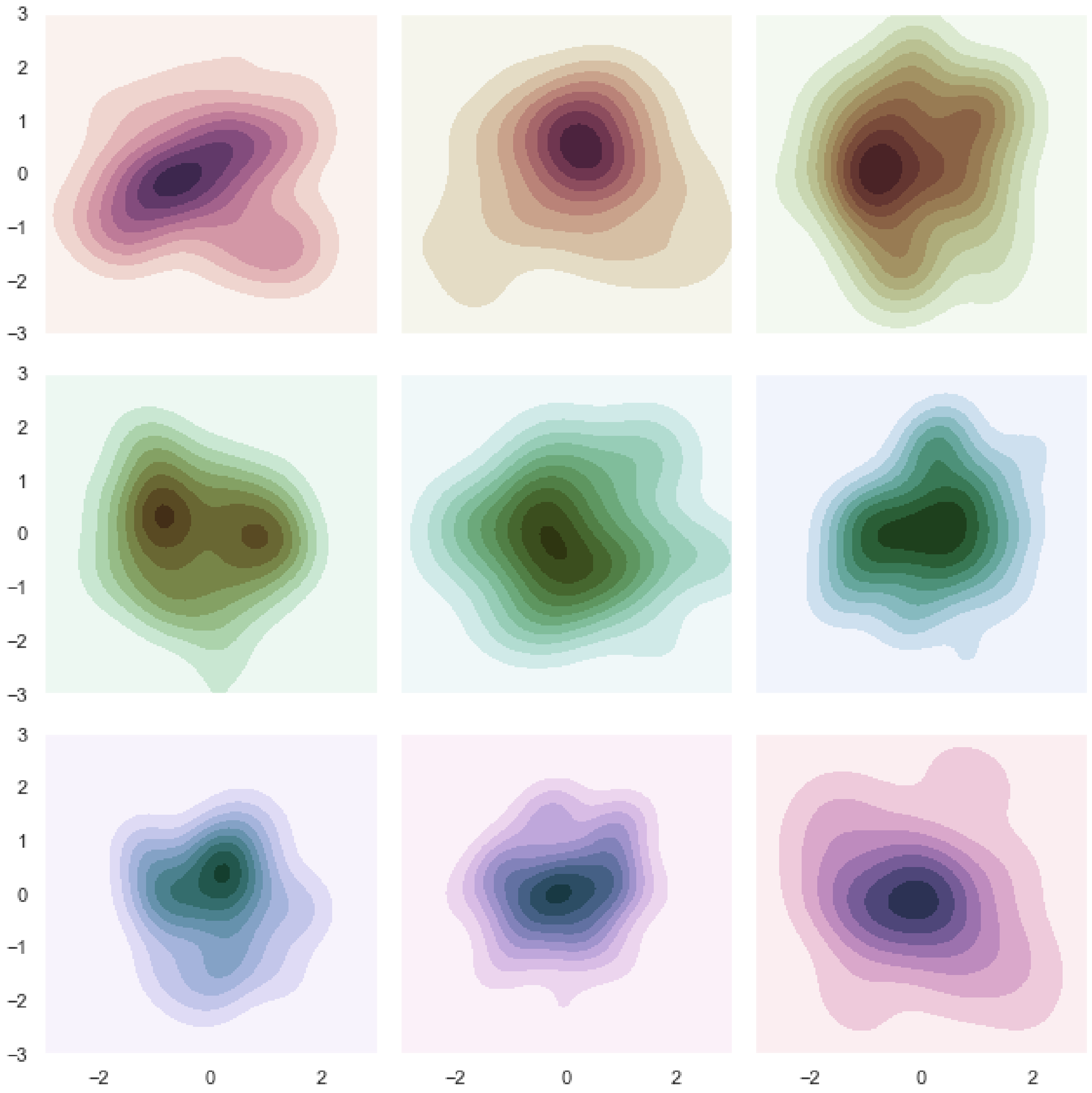

Artist_Po
0
−2000
−4000
−6000
year = 2002
year = 2003
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 2004
year = 2005
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000
year = 2006
year = 2007
Artist_Popularity
6000
4000
2000
0
−2000
−4000
−6000


year = 2008
year = 2009
year = 2010
year = 2011
year = 2012
Artist_Popularity
Spotify_Popularity
6000
4000
2000
0
−2000
−4000
−6000

In my data analysis using mathlibpot and seaborn spotify popularity and artist popularity is starting show colleration after 2005. Spotify is not old enough for 2003 however Spotify users do not show popularity to songs earlier than 2003. We have tested it 100 , 500, 1000 and 10000 random variables really breaking point year is 2005.

In [150]:

```
sns.set(style="dark")
year = np.random.RandomState(5000)

# Set up the matplotlib figure
f, axes = plt.subplots(3, 3, figsize=(9, 9), sharex=True, sharey=True)

# Rotate the starting point around the cubehelix hue circle
for ax, s in zip(axes.flat, np.linspace(0, 3, 10)):

    # Create a cubehelix colormap to use with kdeplot
    cmap = sns.cubehelix_palette(start=s, light=1, as_cmap=True)

    # Generate and plot a random bivariate dataset
    x, y = year.randn(2, 50)
    sns.kdeplot(x, y, cmap=cmap, shade=True, cut=5, ax=ax)
    ax.set(xlim=(-3, 3), ylim=(-3, 3))

f.tight_layout()
```


3
2
1
0
−1
−2
−3
−2
0
2

Also above analysis shows that majority of spotify popularity is not cover up artist popularity

In [151]:

```
albums['num_of_sales'] = albums['num_of_sales']/1000
```

In [152]:

```
albums.head(1)
```

Out[152]:

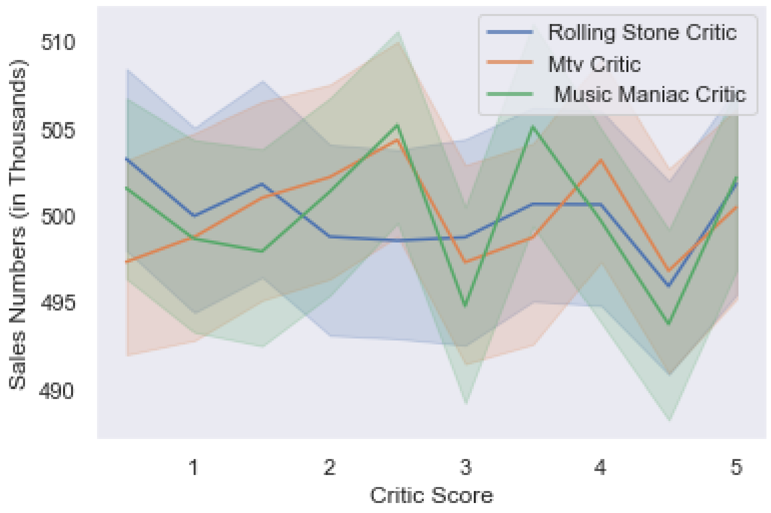
	id	artist_id	album_title	genre	year_of_pub	num_of_tracks	num_of_sales	rolling_stone_critic
0	1	1767	Call me Cat Moneyless That Doggies	Folk	2006	11	905.193	4.0

In [160]:

```
sns.lineplot(x="rolling_stone_critic", y="num_of_sales", data=albums, label="Rollin
g Stone Critic")
sns.lineplot(x="mtv_critic", y="num_of_sales", data=albums, label="Mtv Critic")
sns.lineplot(x="music_maniac_critic", y="num_of_sales", data=albums, label=" Music
 Maniac Critic")
plt.xlabel('Critic Score')
plt.ylabel('Sales Numbers (in Thousands)')
```

Out[160]:

```
Text(0, 0.5, 'Sales Numbers (in Thousands)')
```



Here is my another analysis about 3 Music Critic authorities, Rolling Stone, MTV and Music Maniac. From this analysis 3 Authorities mostly same opinion and good catch giving top critic for high sale albums. Rolling Stone seems more accurate about it. Music Maniac critics the most independent than sales numbers, MTV critics between 1 and 3 is more accurate about sales slope. Rolling Stone behaves giving bad critics by not caring of sales numbers or their album critic opinions are the farest from the reality of music market.Music Maniacs are behaving in similar line, MTV has good catch about giving low critics to lower sales number albums. This graphic tells us that the critics of these 3 authorities are matching the sales trends of the albums well.

```
In [ ]:
```