

```
import pandas as pd
df = pd.read_csv("macrodata.CSV", encoding='latin-1', engine =
'python')
df.head()
```

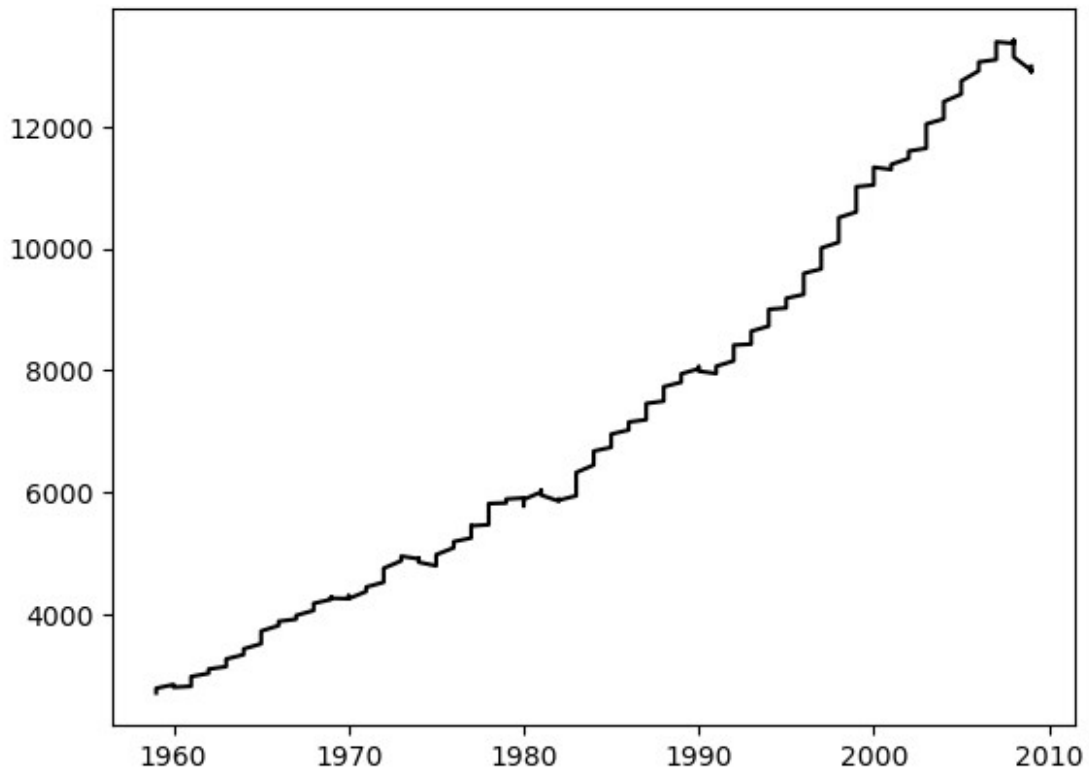
	year	quarter	realgdp	realcons	realinv	realgovt	realdpi
cpi \							
0	1959	1	2710.349	1707.4	286.898	470.045	1886.9
28.98							
1	1959	2	2778.801	1733.7	310.859	481.301	1919.7
29.15							
2	1959	3	2775.488	1751.8	289.226	491.260	1916.4
29.35							
3	1959	4	2785.204	1753.7	299.356	484.052	1931.3
29.37							
4	1960	1	2847.699	1770.5	331.722	462.199	1955.5
29.54							

	m1	tbilrate	unemp	pop	infl	realint
0	139.7	2.82	5.8	177.146	0.00	0.00
1	141.7	3.08	5.1	177.830	2.34	0.74
2	140.5	3.82	5.3	178.657	2.74	1.09
3	140.0	4.33	5.6	179.386	0.27	4.06
4	139.6	3.50	5.2	180.007	2.31	1.19

```
import matplotlib.pyplot as plt
df["year"].unique()
array([1959, 1960, 1961, 1962, 1963, 1964, 1965, 1966, 1967, 1968,
1969,
       1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979,
1980,
       1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990,
1991,
       1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001,
2002,
       2003, 2004, 2005, 2006, 2007, 2008, 2009], dtype=int64)
```

Wykres GDP w latach

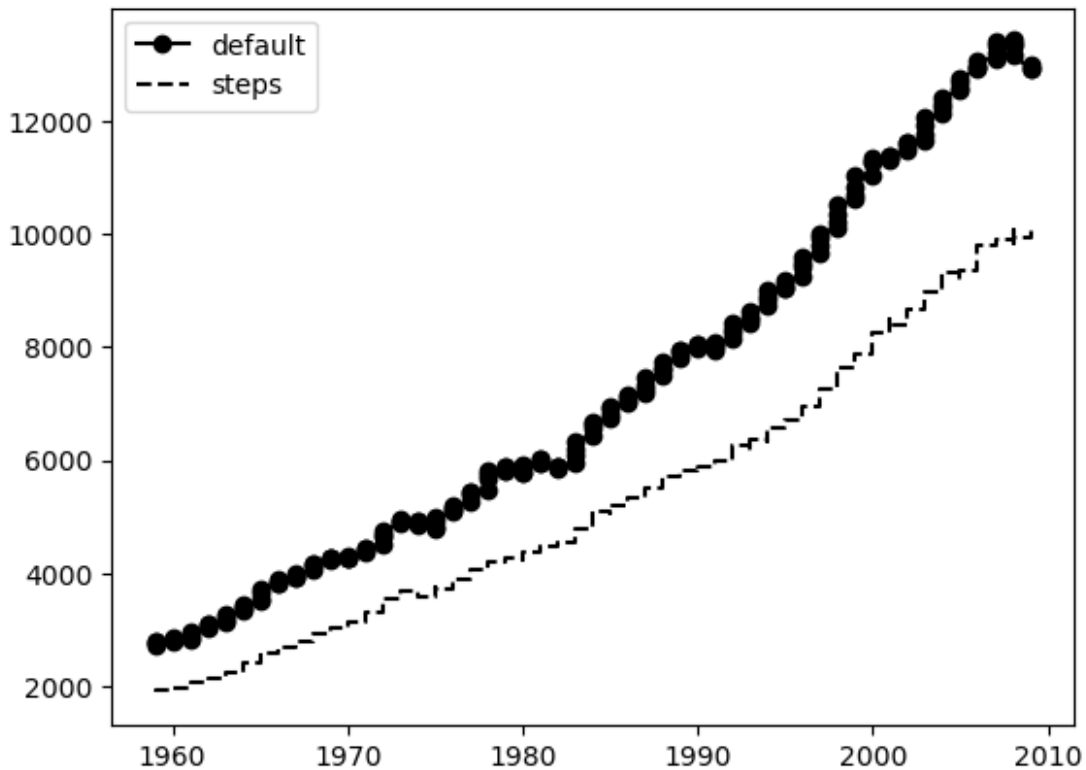
```
plt.plot(df["year"], df["realgdp"], 'k-')
[<matplotlib.lines.Line2D at 0x1e03d8cca90>]
```



Inny styl wykresu

```
plt.plot(df["year"], df["realgdp"], 'ko-', label="default")
plt.plot(df["year"], df["realdpi"], 'k--', drawstyle='steps-post',
label="steps")
plt.legend()
```

<matplotlib.legend.Legend at 0x1e03f15a5c0>



Grupy wykresów (rozmiar x, rozmiar y, identyfikator)

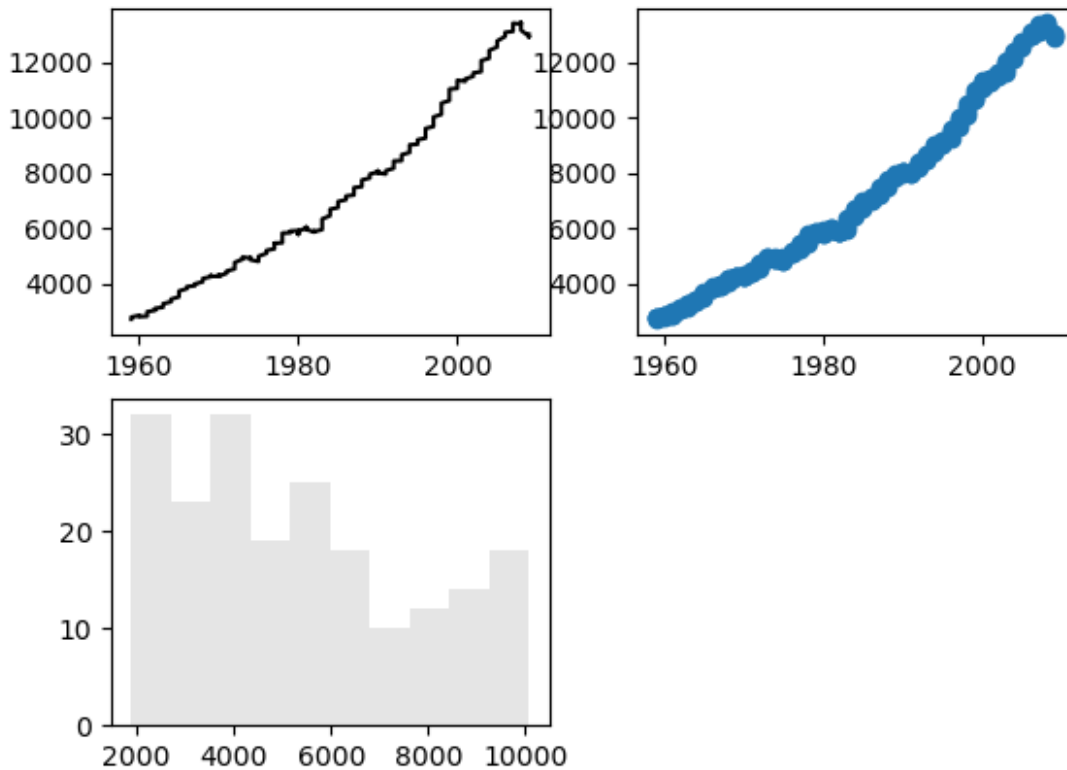
```
fig = plt.figure()

ax1 = fig.add_subplot(2,2,1)
ax1.plot(df["year"], df["realgdp"], 'k-')

ax2 = fig.add_subplot(2,2,2)
ax2.scatter(df["year"], df["realgdp"])

ax3 = fig.add_subplot(2,2,3)
ax3.hist(df["realdpi"], bins = 10, color = 'k', alpha=0.1)

(array([32., 23., 32., 19., 25., 18., 10., 12., 14., 18.]),
 array([ 1886.9 ,  2705.96,  3525.02,  4344.08,  5163.14,  5982.2 ,
         6801.26,  7620.32,  8439.38,  9258.44, 10077.5 ]),
 <BarContainer object of 10 artists>)
```

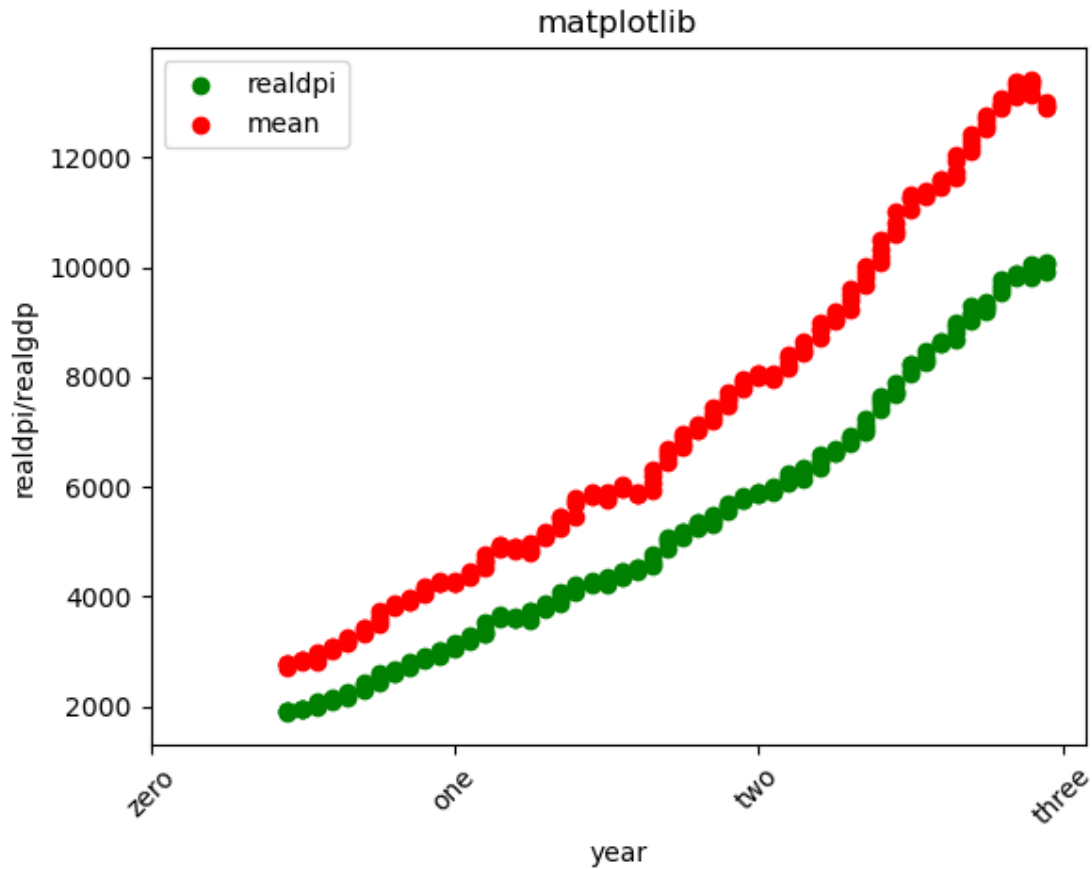


Legenda i etykiety osi

```
fig = plt.figure()
ax = fig.add_subplot(1, 1, 1)

ax.scatter(df["year"], df["realdpi"], color='g', label="realdpi")
ax.scatter(df["year"], df["realgdp"], color='r', label="mean")
ax.set_xticks([1950, 1970, 1990, 2010])
ax.set_xticklabels(['zero', 'one', 'two', 'three'], rotation=45,
fontsize='medium')
ax.set_title('matplotlib')
ax.set_xlabel('year')
ax.set_ylabel('realdpi/realgdp')
ax.legend(loc='best')

plt.savefig('figure.png', dpi=400, bbox_inches='tight')
```



Zapis do pliku (ścieżka, dpi, ucinanie białych fragmentów wokół obrazu) Zapis musi być wykonany przed wyświetleniem, inaczej obraz będzie pusty - (wyświetlenie czyści wykres)

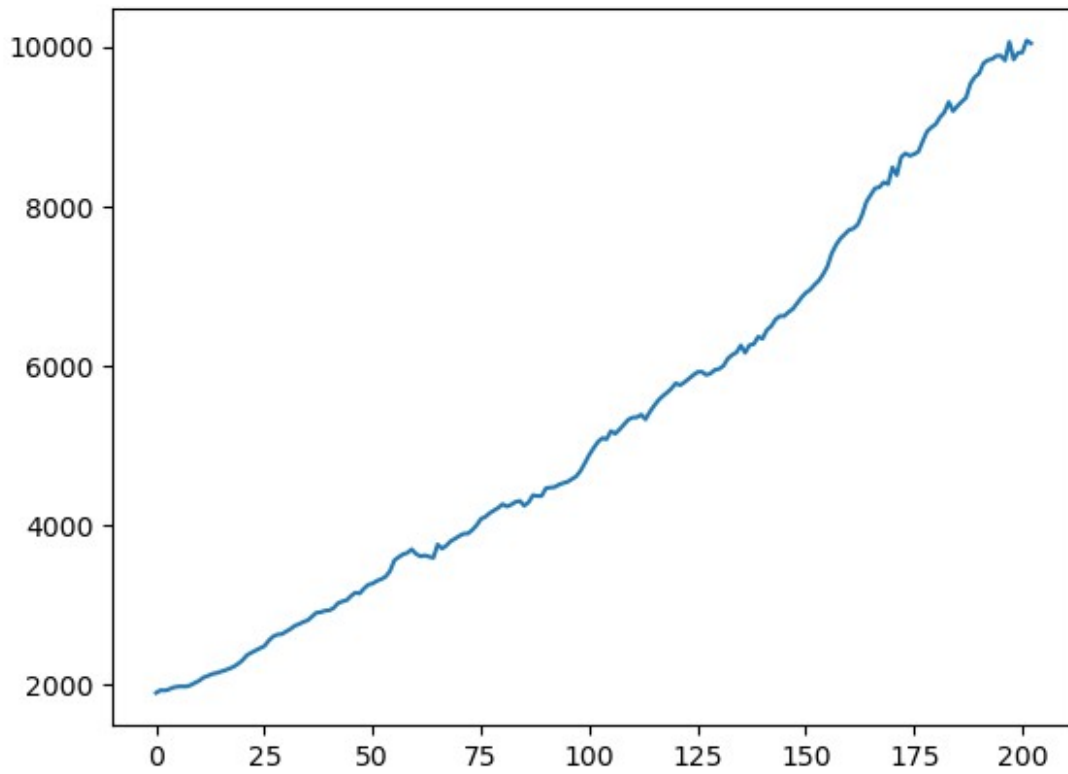
```
plt.savefig('figure.png', dpi=400, bbox_inches='tight')
```

<Figure size 640x480 with 0 Axes>

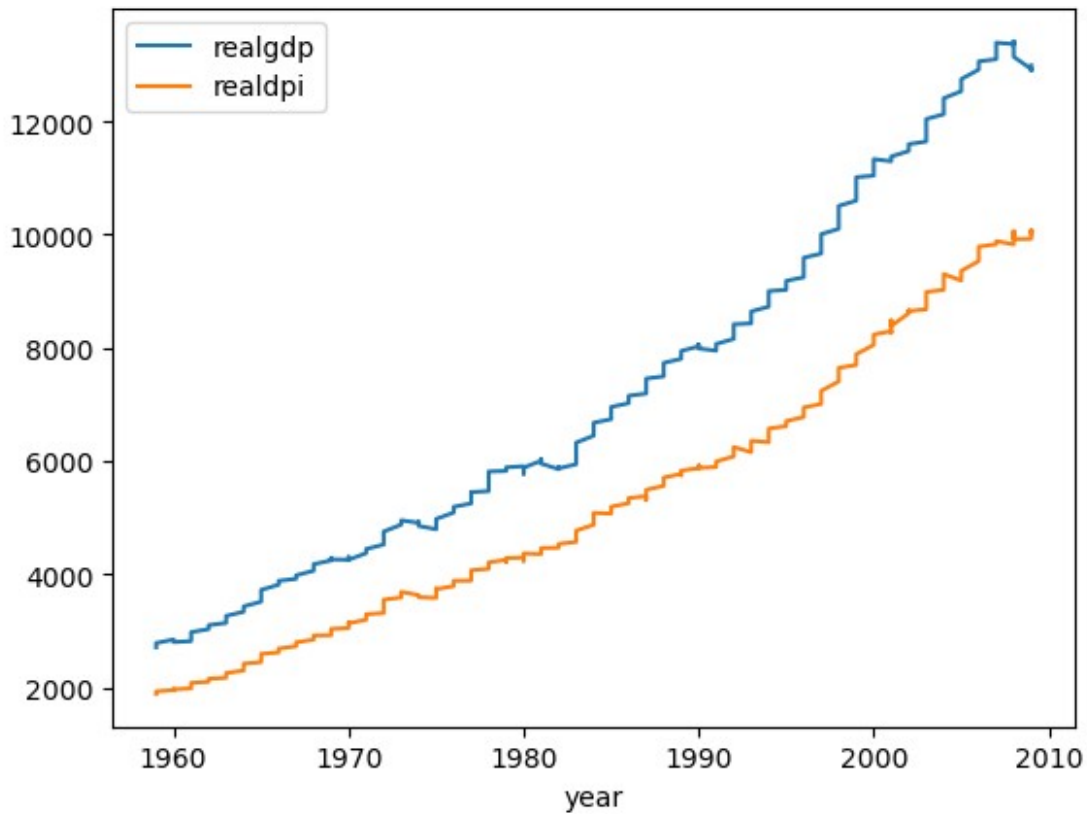
Wykresy pandas

```
figure = pd.Series(df["realdpi"])
figure.plot()
```

<Axes: >

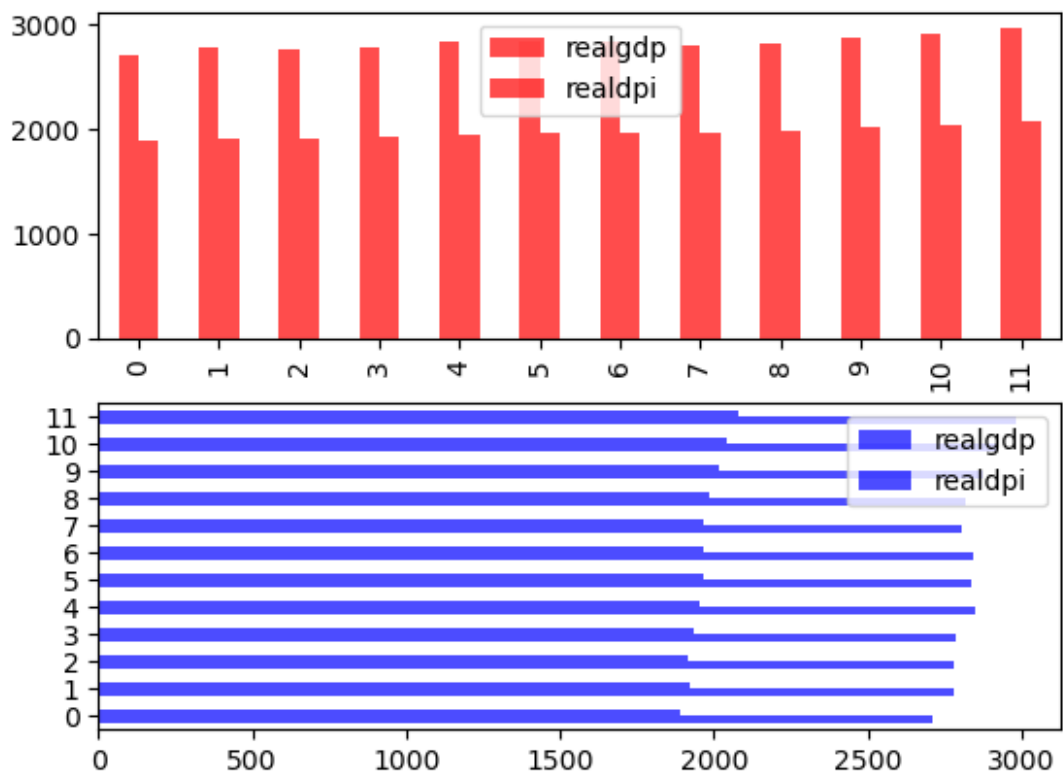


```
d4 = df[["realgdp", "realdpi", "year"]]
figure = d4
figure.plot(x = "year")
<Axes: xlabel='year'>
```



Wykresy kolumnowe

```
fig, axes = plt.subplots(2, 1)
d5 = d4[d4["year"] < 1962]
d5 = d5[["realgdp", "realdpi"]]
data = d5
data.plot.bar(ax=axes[0], color='r', alpha=0.7) #rysowanie w pionie
data.plot.barh(ax=axes[1], color='b', alpha=0.7) #rysowanie w poziomie
<Axes: >
```



Seaborn

```
import seaborn as sbn
```

```
d7 = df
```

```
d7 = d7[d7["year"] == 1960]
```

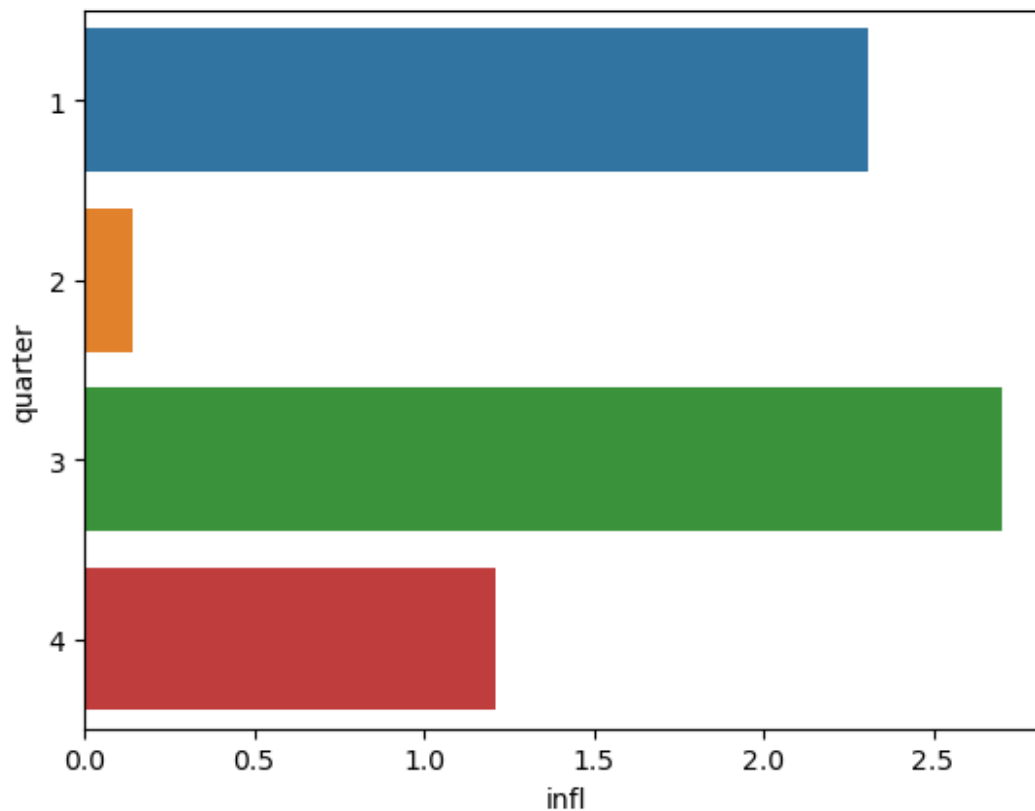
```
d7
```

	year	quarter	realgdp	realcons	realinv	realgovt	realdpi
cpi \							
4	1960	1	2847.699	1770.5	331.722	462.199	1955.5
29.54							
5	1960	2	2834.390	1792.9	298.152	460.400	1966.1
29.55							
6	1960	3	2839.022	1785.8	296.375	474.676	1967.8
29.75							
7	1960	4	2802.616	1788.2	259.764	476.434	1966.6
29.84							

	m1	tbilrate	unemp	pop	infl	realint
4	139.6	3.50	5.2	180.007	2.31	1.19
5	140.2	2.68	5.2	180.671	0.14	2.55
6	140.9	2.36	5.6	181.528	2.70	-0.34
7	141.1	2.29	6.3	182.287	1.21	1.08

```
sbn.barplot(x='infl', y='quarter', data=d7, orient='h')
```

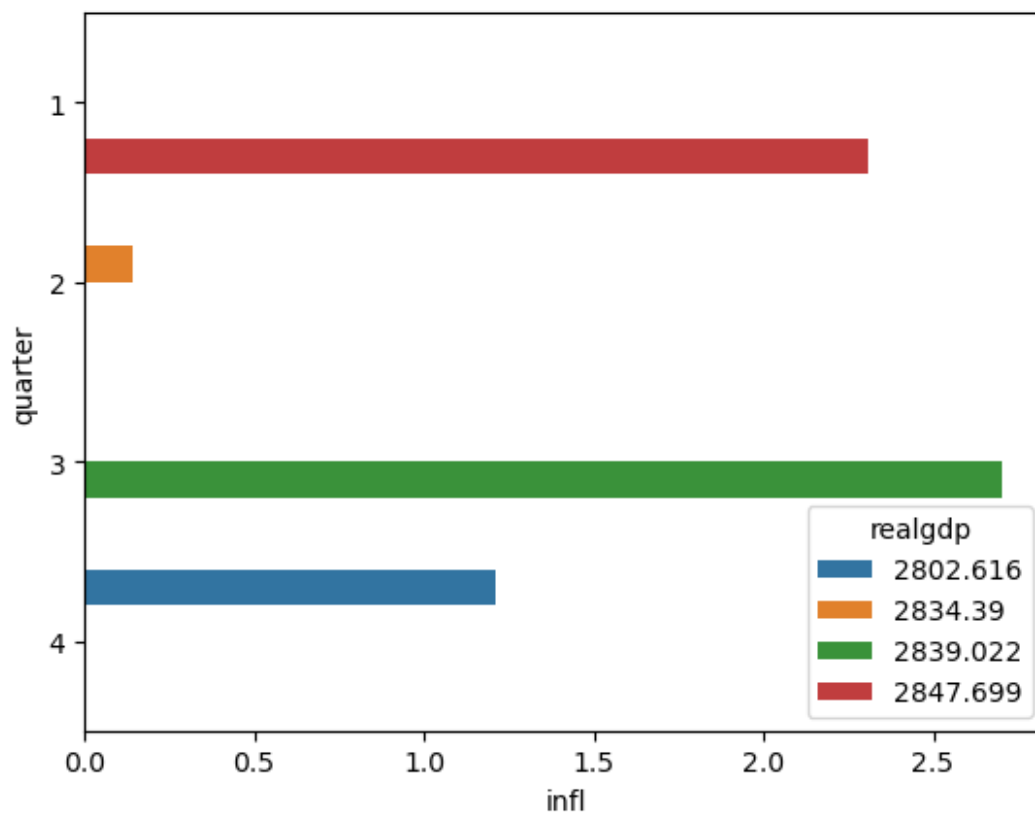
```
<Axes: xlabel='infl', ylabel='quarter'>
```

Dodanie nowej wartości katerycznej hue

```
sbn.barplot(x='infl', y='quarter', hue='realgdp', data=d7, orient='h')
```

```
<Axes: xlabel='infl', ylabel='quarter'>
```



Histogram

```
d8 = df["realgdp"]
```

```
d8
```

```
0      2710.349
```

```
1      2778.801
```

```
2      2775.488
```

```
3      2785.204
```

```
4      2847.699
```

```
...
```

```
198    13324.600
```

```
199    13141.920
```

```
200    12925.410
```

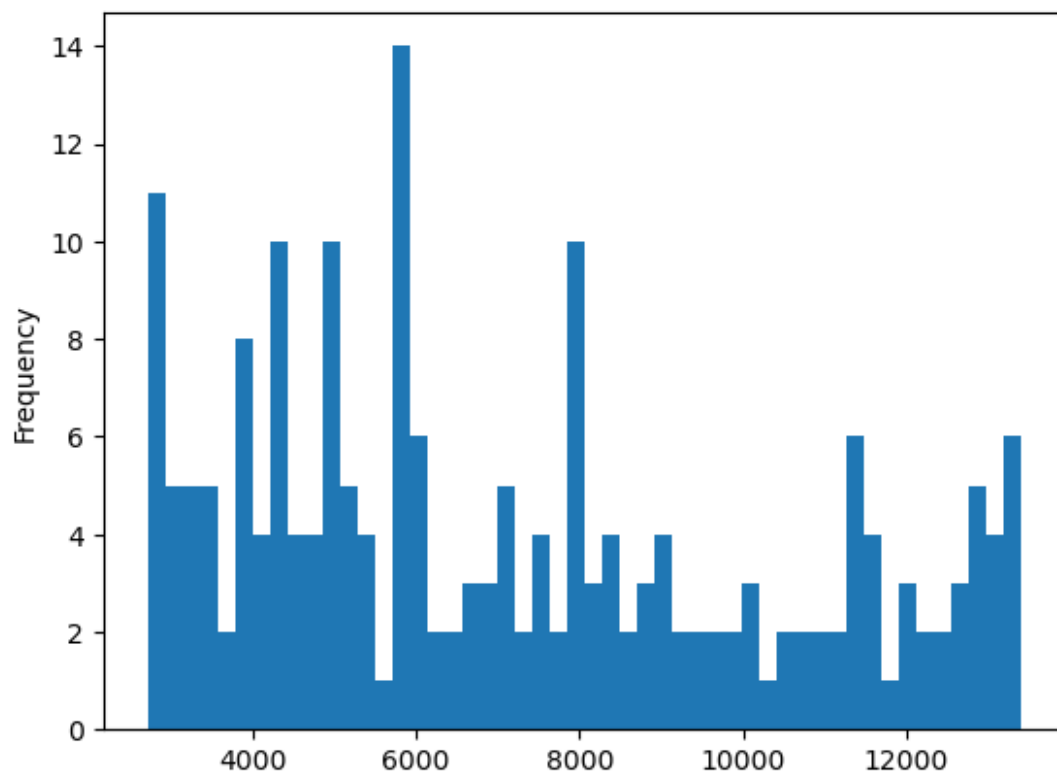
```
201    12901.504
```

```
202    12990.341
```

```
Name: realgdp, Length: 203, dtype: float64
```

```
d8.plot.hist(bins=50)
```

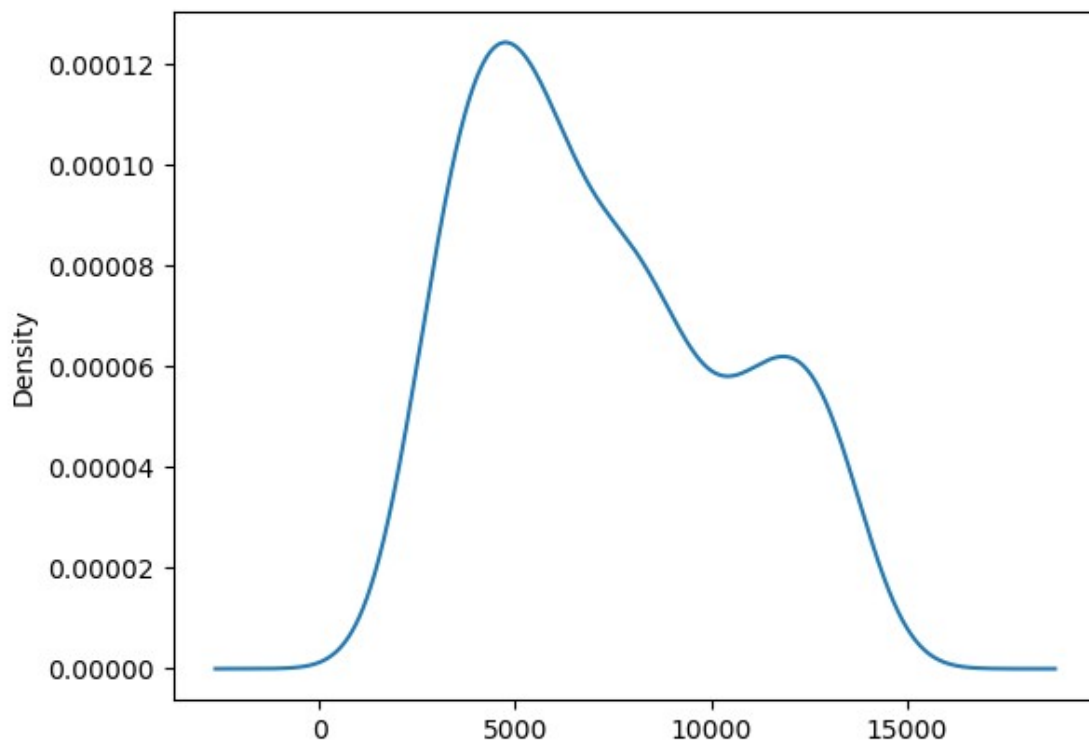
```
<Axes: ylabel='Frequency'>
```



Wykres gęstości - wykres prawdopodobieństwa obserwowanych danych

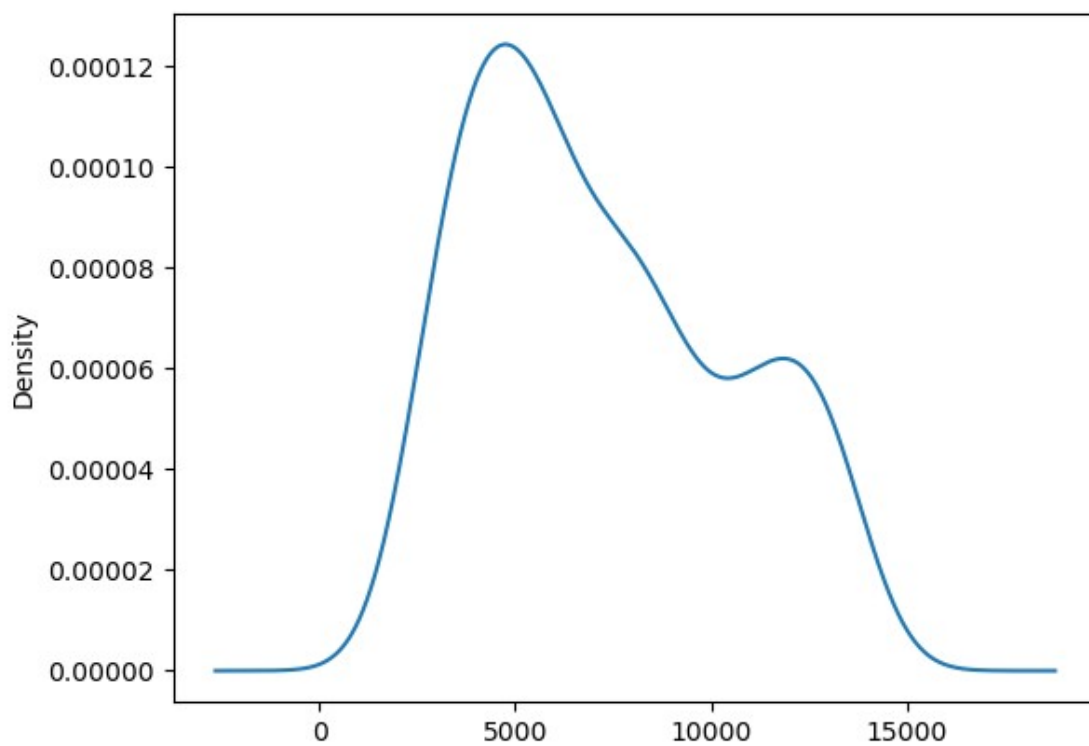
```
d8.plot.kde()
```

```
<Axes: ylabel='Density'>
```

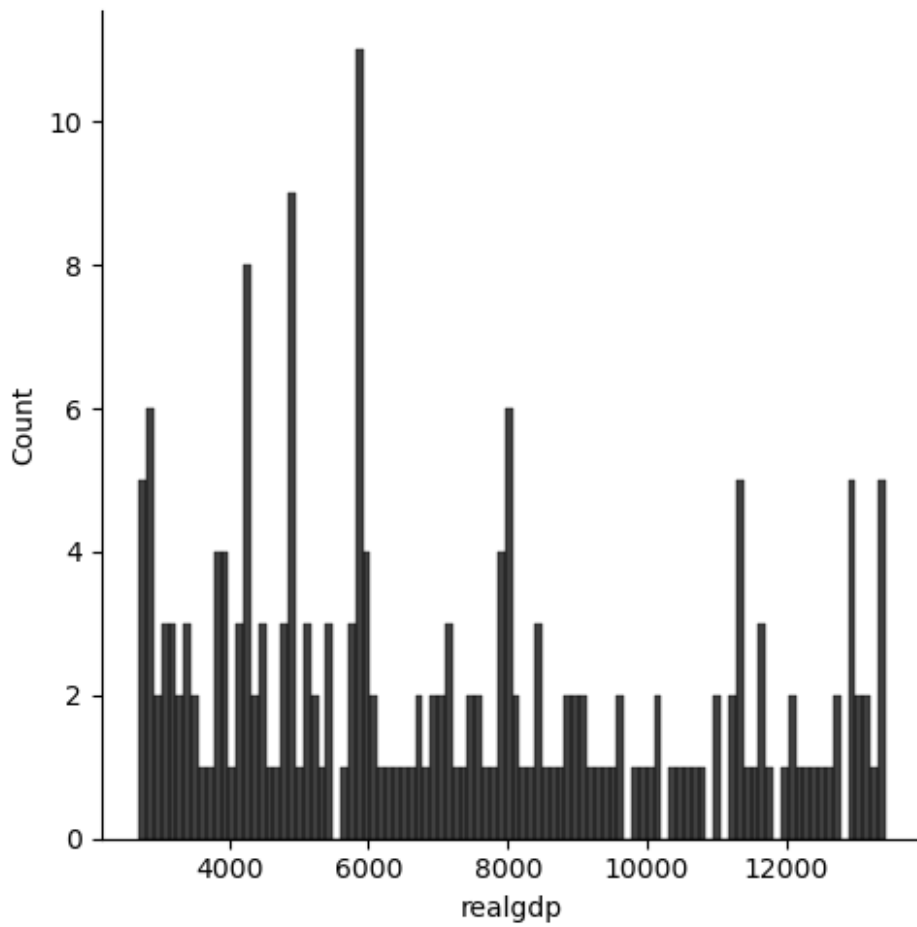


```
d8.plot.density()
```

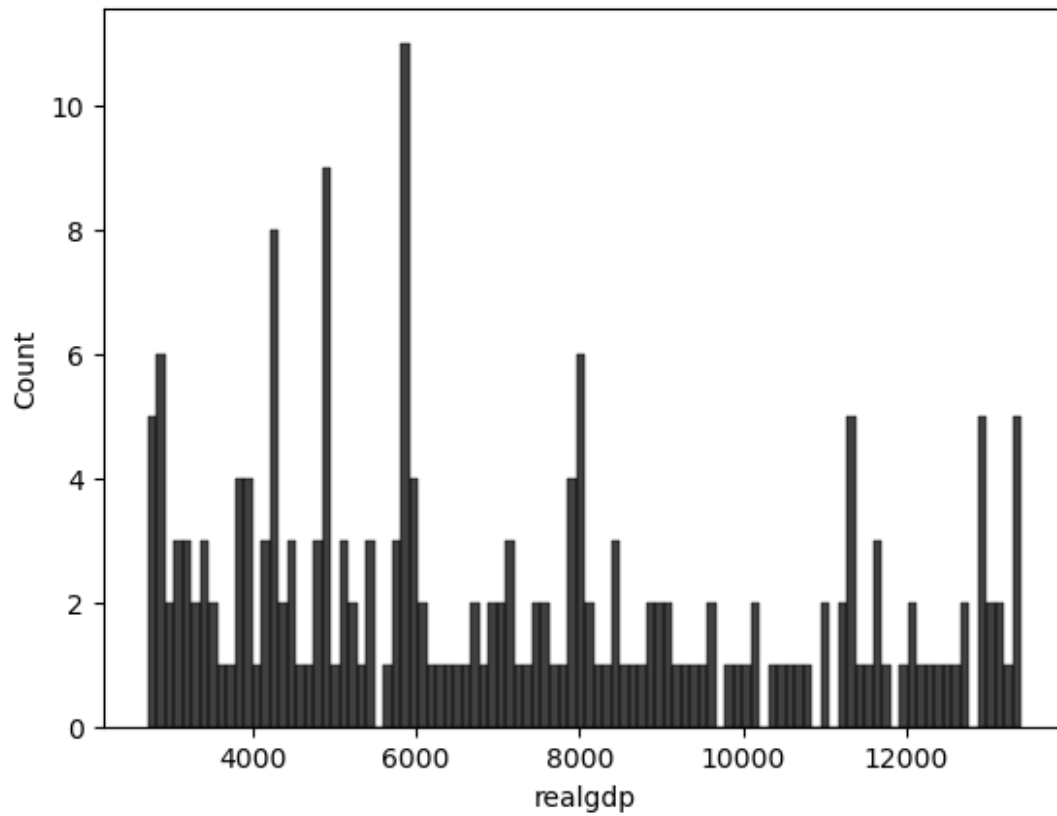
```
<Axes: ylabel='Density'>
```



```
sbn.displot(d8, bins=100, color='k')  
<seaborn.axisgrid.FacetGrid at 0x1e041a56110>
```

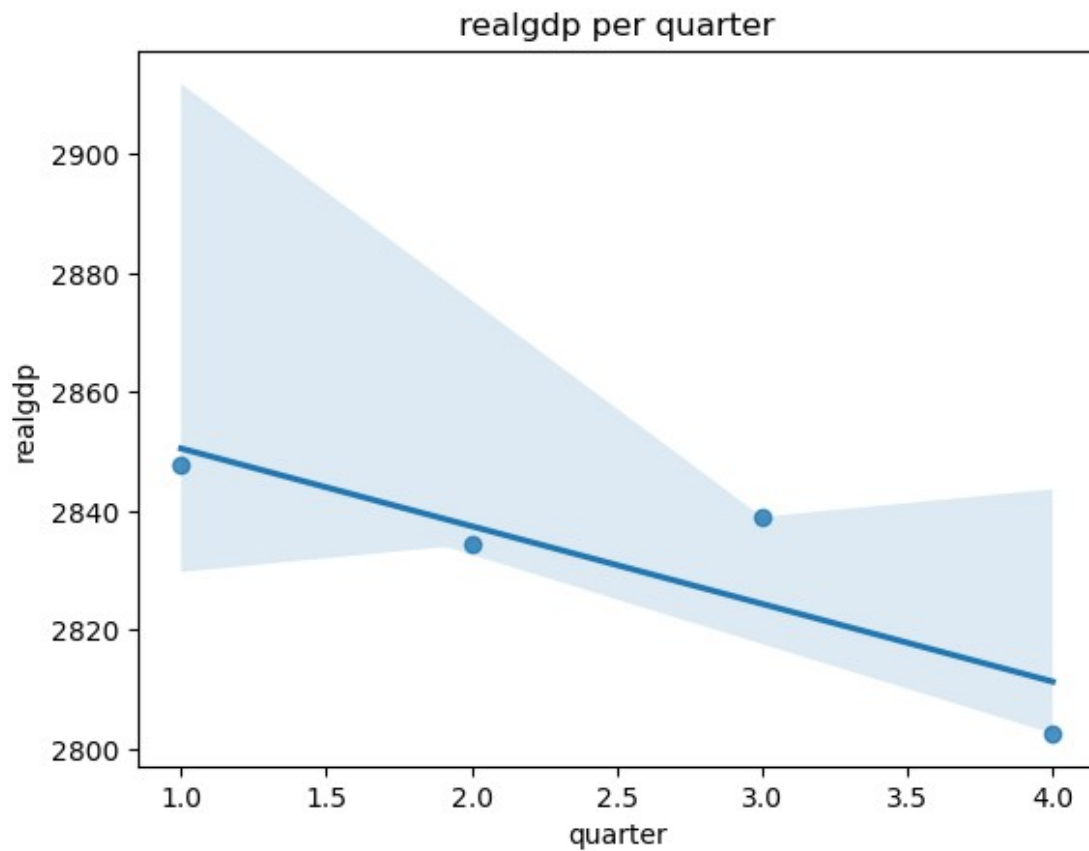


```
sbn.histplot(d8, bins=100, color='k')  
<Axes: xlabel='realgdp', ylabel='Count'>
```



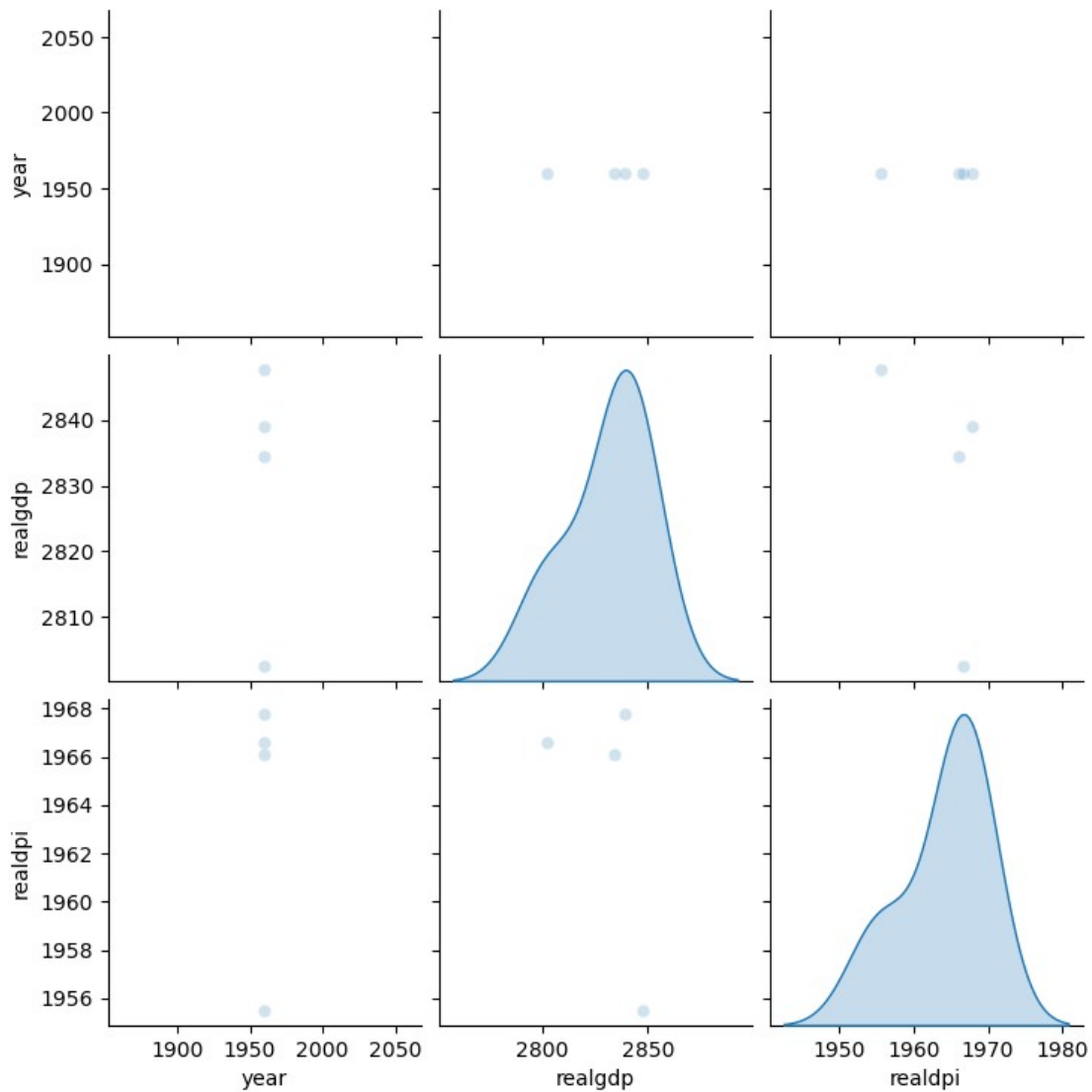
Wykresy punktowe i bitowe

```
sbn.regplot(x='quarter', y='realgdp', data=d7)
plt.title('realgdp per quarter'.format('quarter', 'realgdp'))
Text(0.5, 1.0, 'realgdp per quarter')
```



```
sbn.pairplot(d7[["year","realgdp","realdpi"]], diag_kind='kde',  
plot_kws={'alpha': 0.2})
```

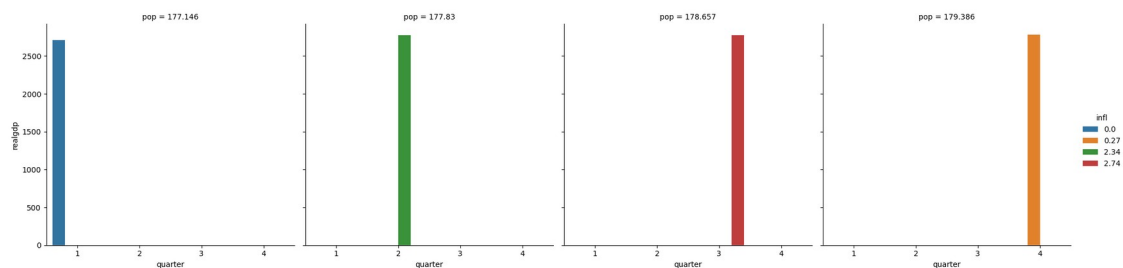
<seaborn.axisgrid.PairGrid at 0x1e0440b50f0>



Dane kateryczne

```
sbn.catplot(x='quarter', y='realgdp', hue='infl', col='pop',
kind='bar', data=d8)
#danymi kategoryzujacymi jest pop
```

<seaborn.axisgrid.FacetGrid at 0x1e0557a38b0>



Siatka aspektów

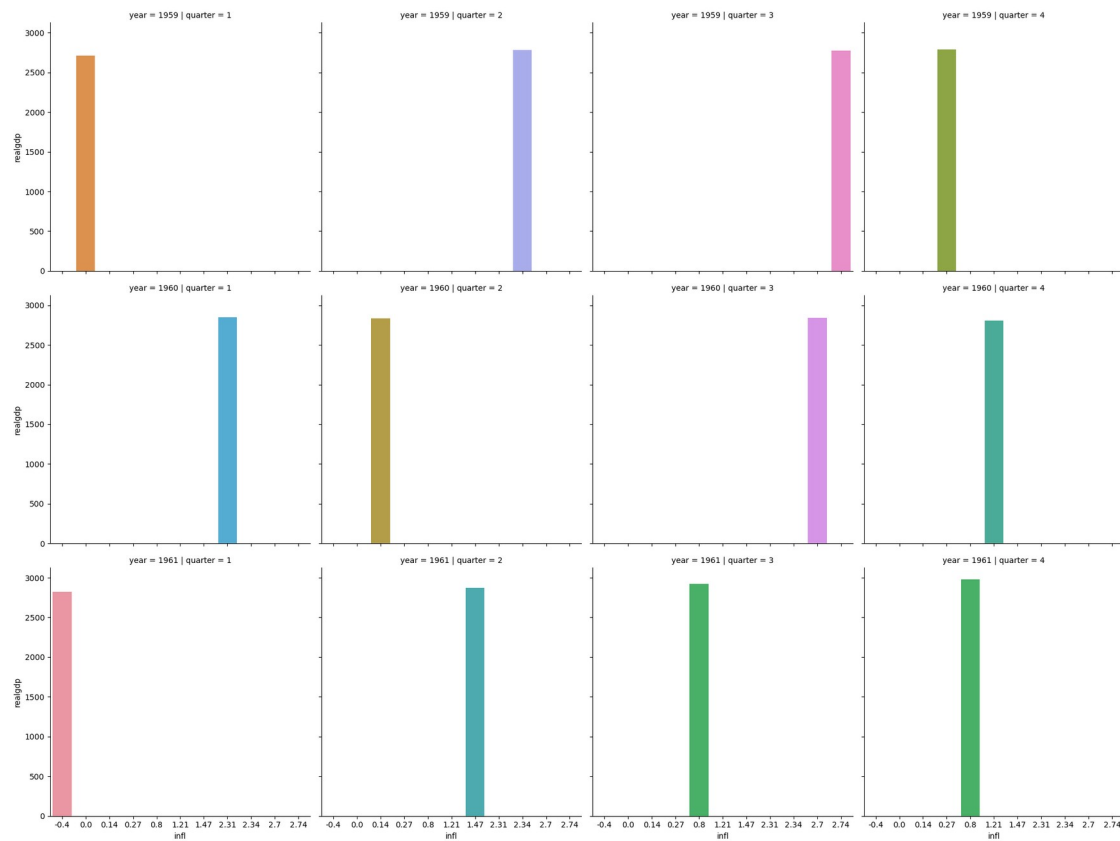

```
d8 = df[df["year"] < 1962]
d8
```

	year	quarter	realgdp	realcons	realinv	realgovt	realdpi
cpi \							
0	1959	1	2710.349	1707.4	286.898	470.045	1886.9
28.98							
1	1959	2	2778.801	1733.7	310.859	481.301	1919.7
29.15							
2	1959	3	2775.488	1751.8	289.226	491.260	1916.4
29.35							
3	1959	4	2785.204	1753.7	299.356	484.052	1931.3
29.37							
4	1960	1	2847.699	1770.5	331.722	462.199	1955.5
29.54							
5	1960	2	2834.390	1792.9	298.152	460.400	1966.1
29.55							
6	1960	3	2839.022	1785.8	296.375	474.676	1967.8
29.75							
7	1960	4	2802.616	1788.2	259.764	476.434	1966.6
29.84							
8	1961	1	2819.264	1787.7	266.405	475.854	1984.5
29.81							
9	1961	2	2872.005	1814.3	286.246	480.328	2014.4
29.92							
10	1961	3	2918.419	1823.1	310.227	493.828	2041.9
29.98							
11	1961	4	2977.830	1859.6	315.463	502.521	2082.0
30.04							

	m1	tbilrate	unemp	pop	infl	realint
0	139.7	2.82	5.8	177.146	0.00	0.00
1	141.7	3.08	5.1	177.830	2.34	0.74
2	140.5	3.82	5.3	178.657	2.74	1.09
3	140.0	4.33	5.6	179.386	0.27	4.06
4	139.6	3.50	5.2	180.007	2.31	1.19
5	140.2	2.68	5.2	180.671	0.14	2.55
6	140.9	2.36	5.6	181.528	2.70	-0.34
7	141.1	2.29	6.3	182.287	1.21	1.08
8	142.1	2.37	6.8	182.992	-0.40	2.77
9	142.9	2.29	7.0	183.691	1.47	0.81
10	144.1	2.32	6.8	184.524	0.80	1.52
11	145.2	2.60	6.2	185.242	0.80	1.80

```
sbn.catplot(x='infl', y='realgdp', row='year', col='quarter',
kind='bar', data=d8)
```

```
<seaborn.axisgrid.FacetGrid at 0x1e010d3bb80>
```



Wykresy blokowe

```
d9 = df[df["year"] < 1970]
sbn.catplot(x='year', y='realgdp', kind='box', data=d9)
```

```
<seaborn.axisgrid.FacetGrid at 0x1e0173bfb20>
```

