Pre and Post Fed Inflation Study

Imports

```
In [1]:   import os
          from pathlib import Path

          import pandas as pd
          import numpy as np
          import seaborn as sns
          import pingouin as pg
```

```
In [2]:   PROJECT_DIRECTORY = "./"
          CSV_DATA_DIRECTORY = os.path.join(PROJECT_DIRECTORY, "data_as_csv")
          INFLATION_DATA_CSV = "inflation.csv"
```

```
In [3]:   YEAR_COLUMN = "Year"
          ANNUAL_PERCENT_CHANGE_COLUMN = "Annual Percent Change"

          # will create a synthetic column "Inflation"
          INFLATION_COLUMN = "Inflation"

          # alpha corresponding to 95% confidence in our statistical tests
          ALPHA = 0.05
```

Load Raw Data

```
In [4]:   # source https://www.minneapolisfed.org/about-us/monetary-policy/inflation-c

          df_inflation_org= pd.read_csv(Path(CSV_DATA_DIRECTORY) / INFLATION_DATA_CSV)

          df_inflation_org.columns
```

```
Out[4]:   Index(['Year', 'Annual Average Index', 'Annual Percent Change'], dtype='obj
          ect')
```

```
In [5]:   df_inflation_org.dtypes
```

```
Out[5]:   Year                        int64
          Annual Average Index      float64
          Annual Percent Change      object
          dtype: object
```

```
In [6]:   df_inflation = df_inflation_org.copy()
          conversions = { ANNUAL_PERCENT_CHANGE_COLUMN: "string"}
          df_inflation = df_inflation.astype(conversions).copy()
          df_inflation.convert_dtypes()
```

```
df_inflation[INFLATION_COLUMN] = df_inflation[ANNUAL_PERCENT_CHANGE_COLUMN].
df_inflation
```

Out[6]:

	Year	Annual Average Index	Annual Percent Change	Inflation
0	1801	50.0	-2.0%	-0.020
1	1802	43.0	-14.0%	-0.140
2	1803	45.0	4.7%	0.047
3	1804	45.0	0.0%	0.000
4	1805	45.0	0.0%	0.000
...	...	...	...	...
218	2019	768.3	1.8%	0.018
219	2020	777.7	1.2%	0.012
220	2021	814.3	4.7%	0.047
221	2022	879.4	8.0%	0.080
222	2023	915.6	4.1%	0.041

223 rows × 4 columns

In [7]:
```
df_inflation.dtypes
```

Out[7]:
```
Year                         int64
Annual Average Index         float64
Annual Percent Change    string[python]
Inflation                    float64
dtype: object
```

In [8]:
```
sns.lineplot(data=df_inflation, x=YEAR_COLUMN, y=INFLATION_COLUMN)

df_inflation_pre_fed_1872 = df_inflation[(df_inflation[YEAR_COLUMN] <= 1913)
df_inflation_pre_fed_1801 = df_inflation[df_inflation[YEAR_COLUMN] <= 1913].
df_inflation_post_fed = df_inflation[df_inflation[YEAR_COLUMN] > 1913].copy(

periods = {"pre_fed_1801": df_inflation_pre_fed_1801, "pre_fed_1872": df_inf

for period_name, period_data in periods.items():
    n = period_data[INFLATION_COLUMN].count()
    mean = period_data[INFLATION_COLUMN].mean()
    std = period_data[INFLATION_COLUMN].std() # should actually be a populat
    print(f"{period_name} n: {n} mean: {mean} std: {std}")
```
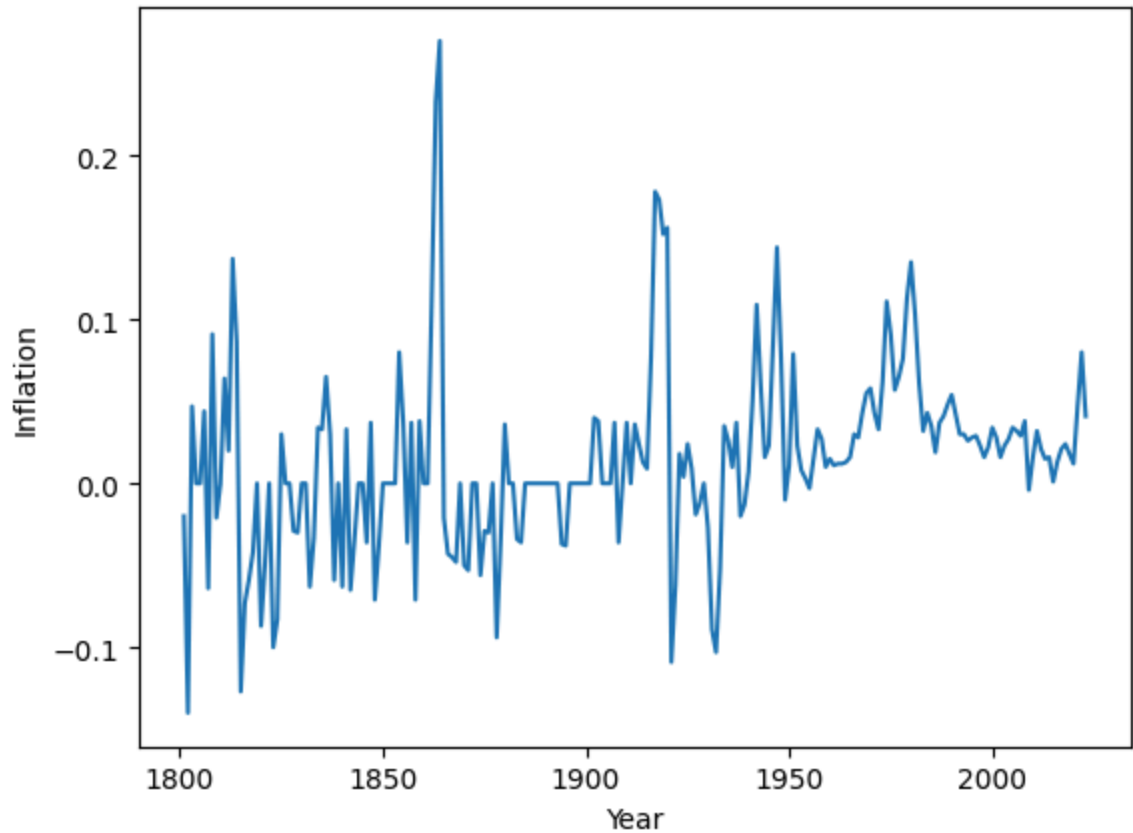
```
pre_fed_1801 n: 113 mean: -0.0032831858407079647 std: 0.05643793509981763
pre_fed_1872 n: 42 mean: -0.004190476190476191 std: 0.02688842174910896
post_fed n: 110 mean: 0.03268181818181819 std: 0.04709699766783905
```

```
In [9]:  # do a t-tests (which will be z-tests since n > 30 for all samples

         post_fed_inflation_data_points = np.array(df_inflation_post_fed[INFLATION_CC

         def inflation_z_test(df_pre_fed: pd.DataFrame) -> pd.DataFrame:
             pre_fed_data_data_points = np.array(df_pre_fed[INFLATION_COLUMN])
             return pg.ttest(pre_fed_data_data_points, post_fed_inflation_data_points

         inflation_z_test(df_inflation_pre_fed_1872)
```

Out[9]:

	T	dof	alternative	p-val	CI95%	cohen-d	BF10	
T-test	-6.030976	127.504934	less	8.214053e-09	[-inf, -0.03]	0.866815	1.646e+06	0.9

```
In [10]:  inflation_z_test(df_inflation_pre_fed_1801)
```

Out[10]:

	T	dof	alternative	p-val	CI95%	cohen-d	BF10	pc
T-test	-5.17213	215.985583	less	2.635821e-07	[-inf, -0.02]	0.691092	5.051e+04	0.999

Conclusion:

Descriptive statistics suggests that inflation was lower pre-Fed:

- pre_fed_1801 (n=113) mean: -0.0032831858407079647 std: 0.05643793509981763
- pre_fed_1872 (n=42) mean: -0.004190476190476191 std: 0.02688842174910896
- post_fed (n=110) mean: 0.03268181818181819 std: 0.04709699766783905

Note, however, that the standard deviation is higher pre-Fed if years from 1801 to 1913 are considered but lower if only 1872 to 1913 are considered.

Applying one-sided two sample z-tests shows that if 1872 to 1903 is considered, we can say, with 95% confidence, that inflation was at least 3% lower, on average, pre-Fed.

If 1801 to 1903 is considered, then we can say, with 95% confidence that inflation was at least 2% lower, on average, pre-Fed.

The obvious caveat is that correlation is, of course, not causation. This does not prove that there is more inflation when there is a central bank.

More speculatively, the lower inflation could be due to harsher depressions/deflationary periods pre-Fed.