

Welcome to the course!

VISUALIZING TIME SERIES DATA IN PYTHON



Thomas Vincent

Head of Data Science, Getty Images

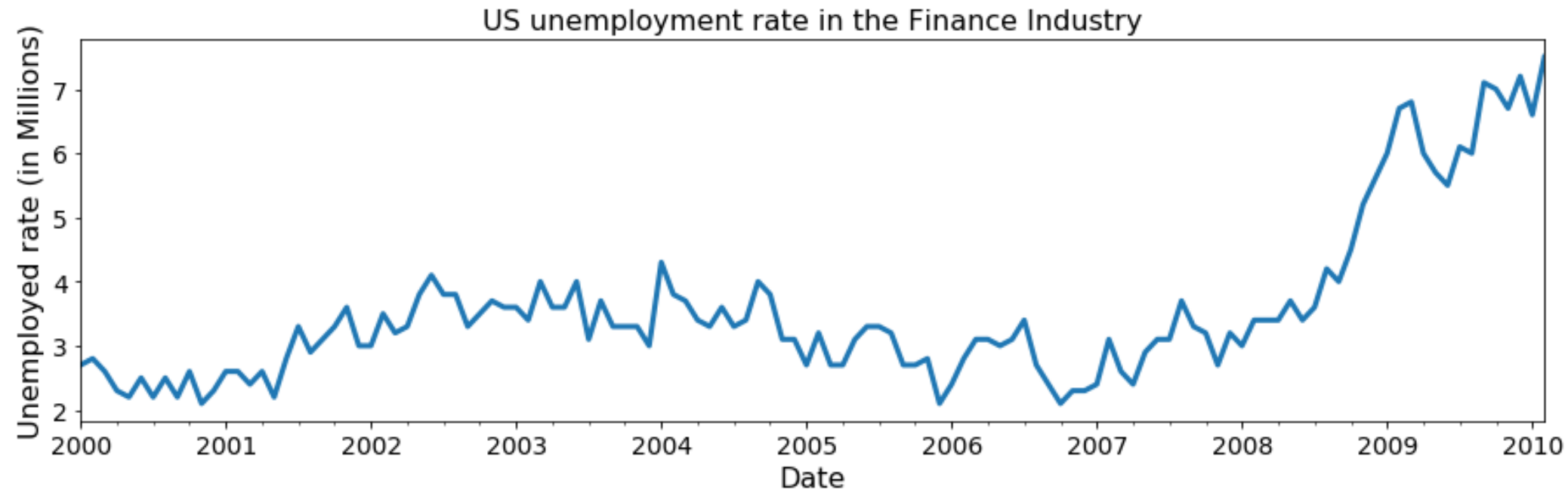
Prerequisites

- [Intro to Python for Data Science](#)
- [Intermediate Python for Data Science](#)

Time series in the field of Data Science

- Time series are a fundamental way to store and analyze many types of data
- Financial, weather and device data are all best handled as time series

Time series in the field of Data Science



Course overview

- Chapter 1: Getting started and personalizing your first time series plot
- Chapter 2: Summarizing and describing time series data
- Chapter 3: Advanced time series analysis
- Chapter 4: Working with multiple time series
- Chapter 5: Case Study

Reading data with Pandas

```
import pandas as pd
df = pd.read_csv('ch2_co2_levels.csv')
print(df)
```

```
   datestamp  co2
0  1958-03-29  316.1
1  1958-04-05  317.3
2  1958-04-12  317.6
...
...
...
2281 2001-12-15  371.2
2282 2001-12-22  371.3
2283 2001-12-29  371.5
```

Preview data with Pandas

```
print(df.head(n=5))
```

	timestamp	co2
0	1958-03-29	316.1
1	1958-04-05	317.3
2	1958-04-12	317.6
3	1958-04-19	317.5
4	1958-04-26	316.4

```
print(df.tail(n=5))
```

	timestamp	co2
2279	2001-12-01	370.3
2280	2001-12-08	370.8
2281	2001-12-15	371.2
2282	2001-12-22	371.3
2283	2001-12-29	371.5

Check data types with Pandas

```
print(df.dtypes)
```

```
datestamp    object  
co2          float64  
dtype: object
```


Working with dates

To work with time series data in `pandas`, your date columns needs to be of the `datetime64` type.

```
pd.to_datetime(['2009/07/31', 'test'])
```

```
ValueError: Unknown string format
```

```
pd.to_datetime(['2009/07/31', 'test'], errors='coerce')
```

```
DatetimeIndex(['2009-07-31', 'NaT'],  
              dtype='datetime64[ns]', freq=None)
```

Let's get started!

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Plot your first time series

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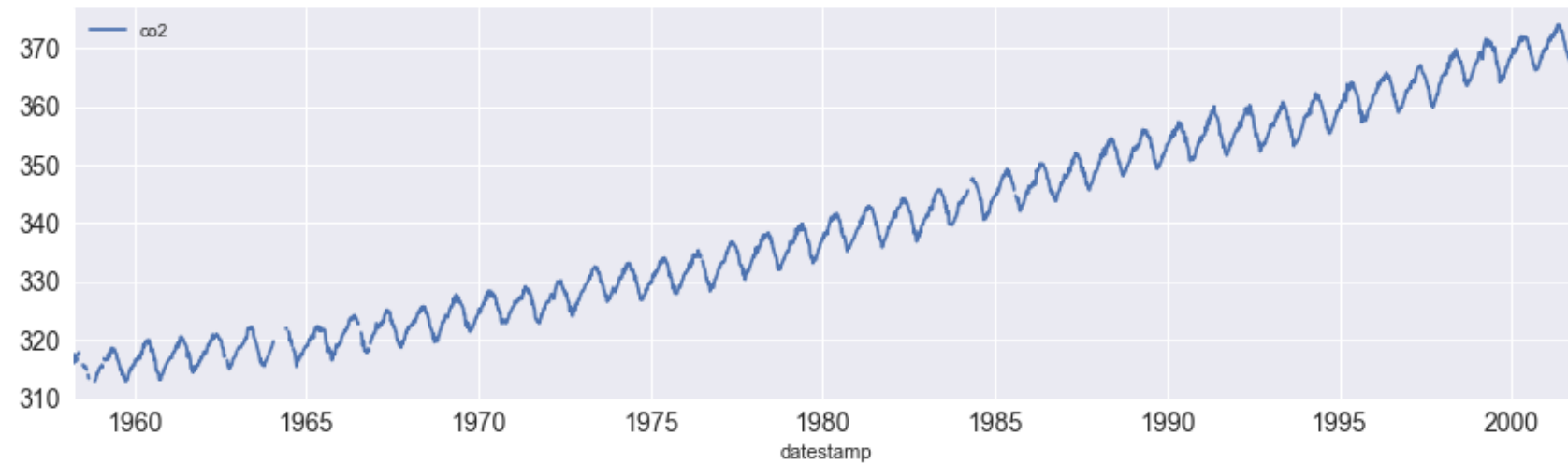
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The Matplotlib library

- In Python, matplotlib is an extensive package used to plot data
- The pyplot submodule of matplotlib is traditionally imported using the `plt` alias

```
import matplotlib.pyplot as plt
```

Plotting time series data



Plotting time series data

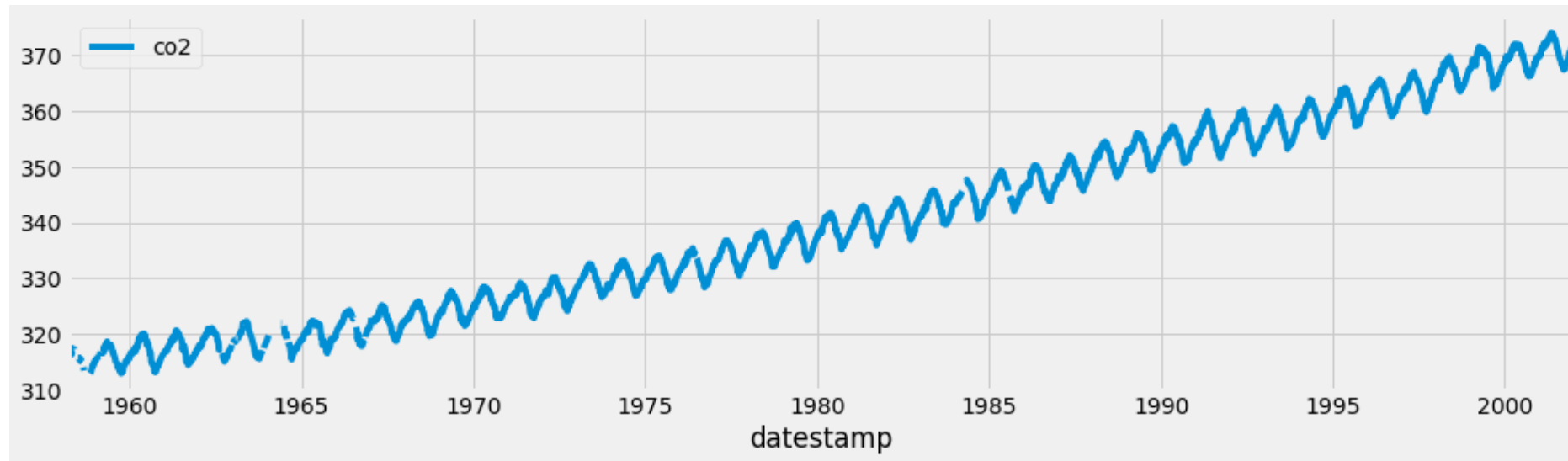
```
import matplotlib.pyplot as plt
import pandas as pd

df = df.set_index('date_column')
df.plot()
plt.show()
```

Adding style to your plots

```
plt.style.use('fivethirtyeight')  
df.plot()  
plt.show()
```

FiveThirtyEight style



Matplotlib style sheets

```
print(plt.style.available)
```

```
['seaborn-dark-palette', 'seaborn-darkgrid',  
'seaborn-dark', 'seaborn-notebook',  
'seaborn-pastel', 'seaborn-white',  
'classic', 'ggplot', 'grayscale',  
'dark_background', 'seaborn-poster',  
'seaborn-muted', 'seaborn', 'bmh',  
'seaborn-paper', 'seaborn-whitegrid',  
'seaborn-bright', 'seaborn-talk',  
'fivethirtyeight', 'seaborn-colorblind',  
'seaborn-deep', 'seaborn-ticks']
```

Describing your graphs with labels

```
ax = df.plot(color='blue')
```

```
ax.set_xlabel('Date')  
ax.set_ylabel('The values of my Y axis')  
ax.set_title('The title of my plot')  
plt.show()
```

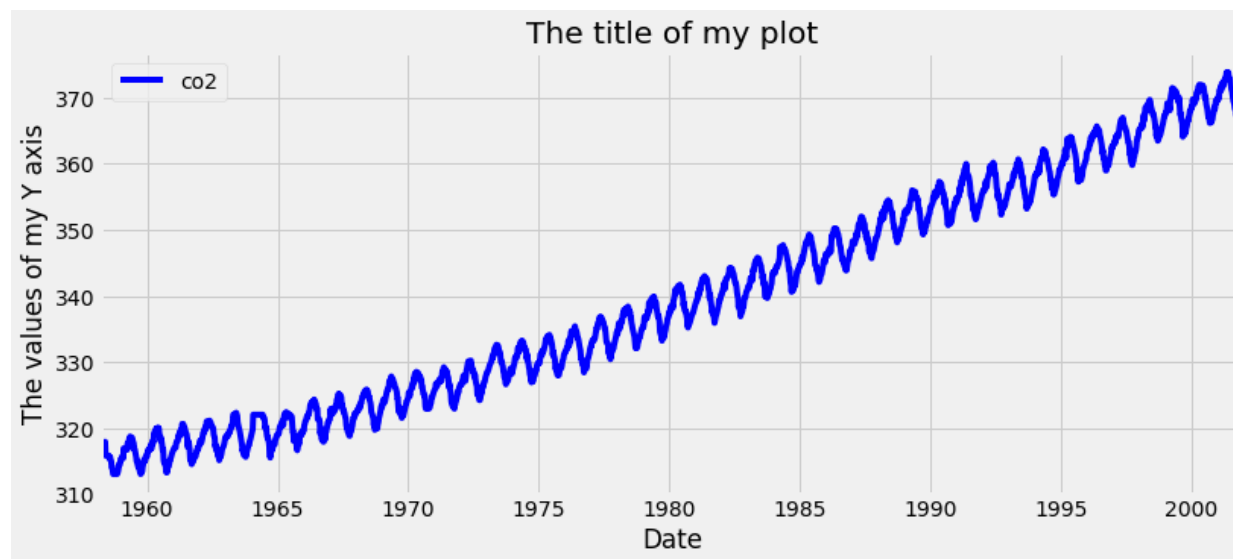
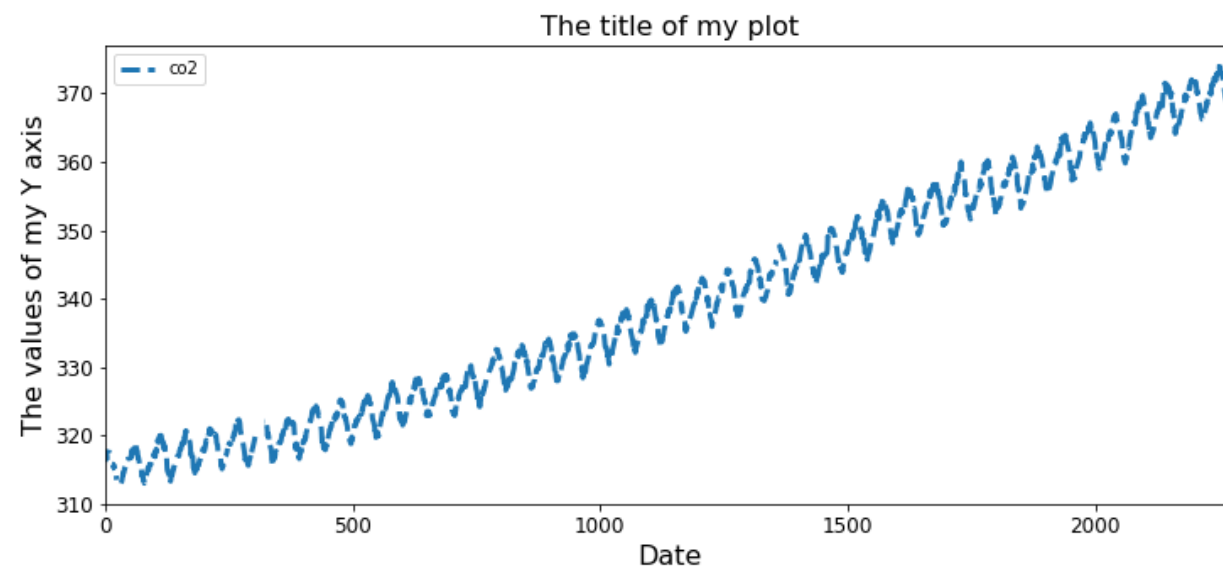


Figure size, linewidth, linestyle and fontsize

```
ax = df.plot(figsize=(12, 5), fontsize=12,  
              linewidth=3, linestyle='--')  
ax.set_xlabel('Date', fontsize=16)  
ax.set_ylabel('The values of my Y axis', fontsize=16)  
ax.set_title('The title of my plot', fontsize=16)  
plt.show()
```



Let's practice!

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Customize your time series plot

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Slicing time series data

```
discoveries['1960':'1970']
```

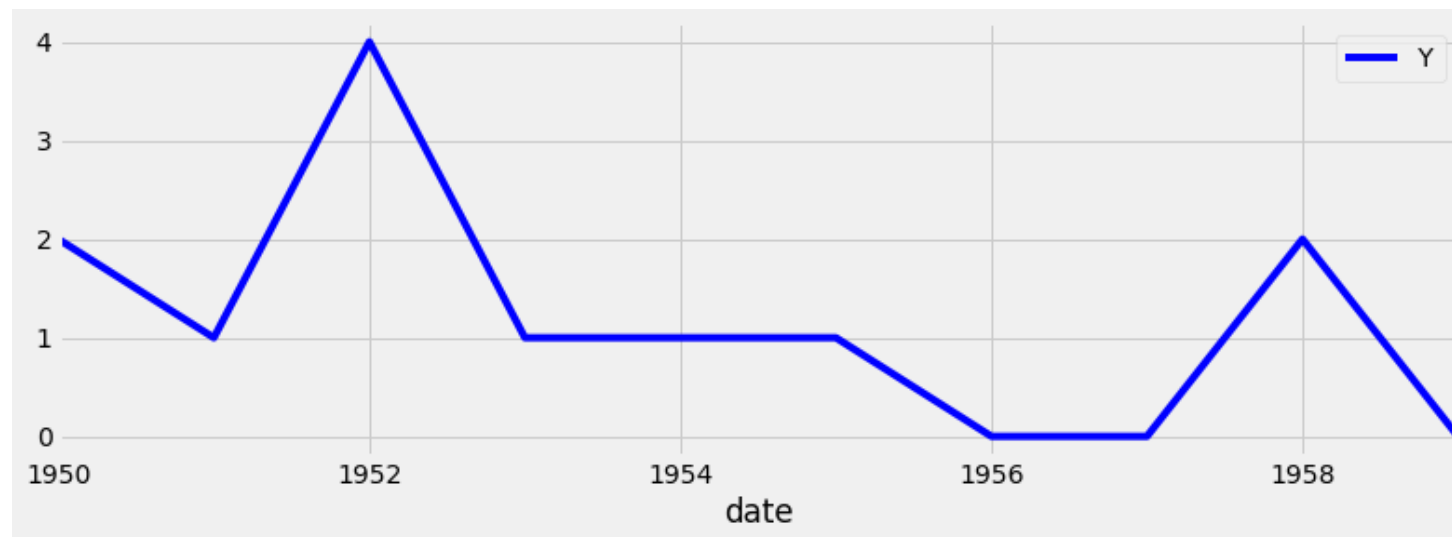
```
discoveries['1950-01':'1950-12']
```

```
discoveries['1960-01-01':'1960-01-15']
```

Plotting subset of your time series data

```
import matplotlib.pyplot as plt  
plt.style.use('fivethirtyeight')  
df_subset = discoveries['1960':'1970']
```

```
ax = df_subset.plot(color='blue', fontsize=14)  
plt.show()
```



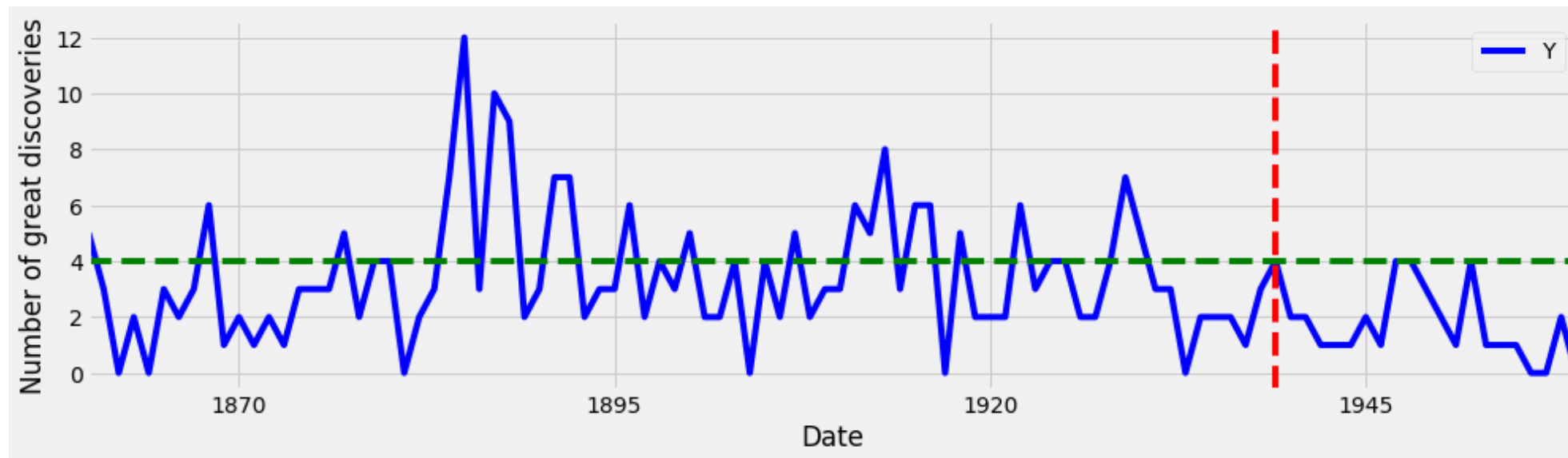
Adding markers

```
ax.axvline(x='1969-01-01',  
          color='red',  
          linestyle='--')
```

```
ax.axhline(y=100,  
          color='green',  
          linestyle='--')
```


Using markers: the full code

```
ax = discoveries.plot(color='blue')
ax.set_xlabel('Date')
ax.set_ylabel('Number of great discoveries')
ax.axvline('1969-01-01', color='red', linestyle='--')
ax.axhline(4, color='green', linestyle='--')
```



Highlighting regions of interest

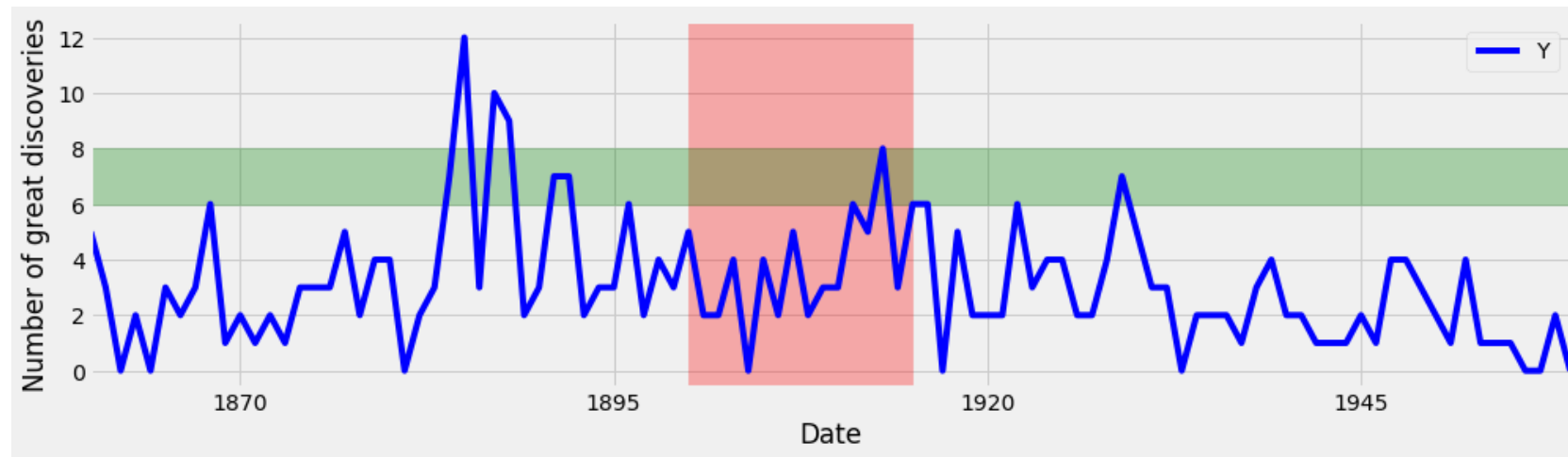
```
ax.axvspan('1964-01-01', '1968-01-01',  
           color='red', alpha=0.5)
```

```
ax.axhspan(8, 6, color='green',  
           alpha=0.2)
```

Highlighting regions of interest: the full code

```
ax = discoveries.plot(color='blue')  
ax.set_xlabel('Date')  
ax.set_ylabel('Number of great discoveries')
```

```
ax.axvspan('1964-01-01', '1968-01-01', color='red',  
alpha=0.3)  
ax.axhspan(8, 6, color='green', alpha=0.3)
```



Let's practice!

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