

## 229760\_lec\_07\_04\_2020

April 7, 2020

```
[71]: import numpy as np
import pandas as pd
import statsmodels.api as sm
import matplotlib.pyplot as plt
%matplotlib inline
```

```
[72]: df = pd.read_csv('IPG2211A2N.csv', index_col="DATE", parse_dates=True)
df.index.freq = 'MS'
df = df[(df.index >= '1970') & (df.index < '1990')]
```

```
[73]: df.dropna(inplace=True)
```

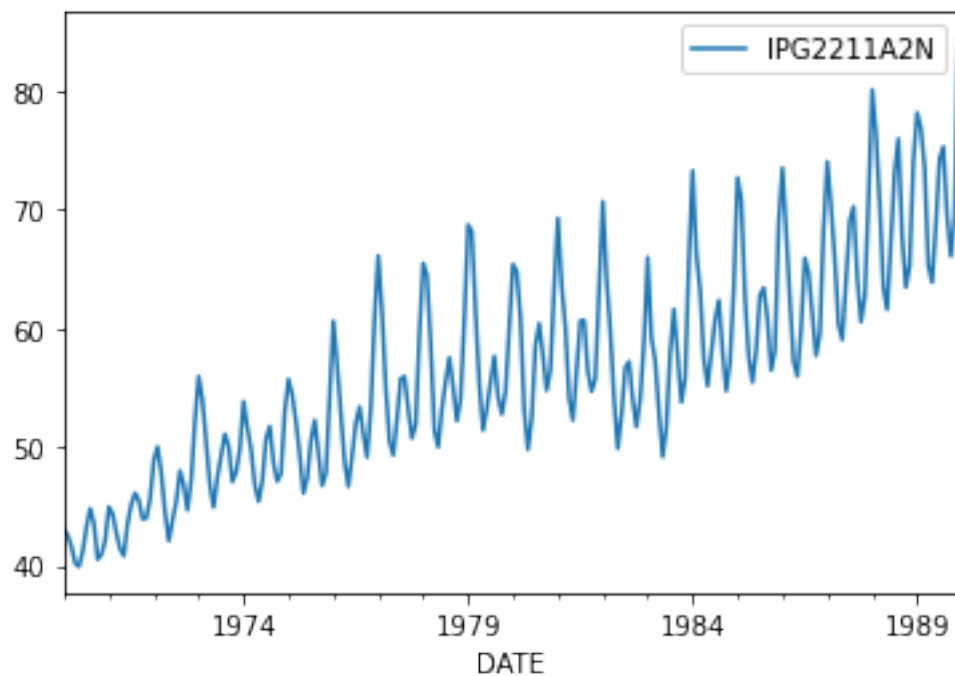
```
[74]: df.head()
```

```
[74]:
```

	IPG2211A2N
DATE	
1970-01-01	43.0869
1970-02-01	42.5578
1970-03-01	41.6215
1970-04-01	40.1982
1970-05-01	39.9321

```
[75]: df.plot()
```

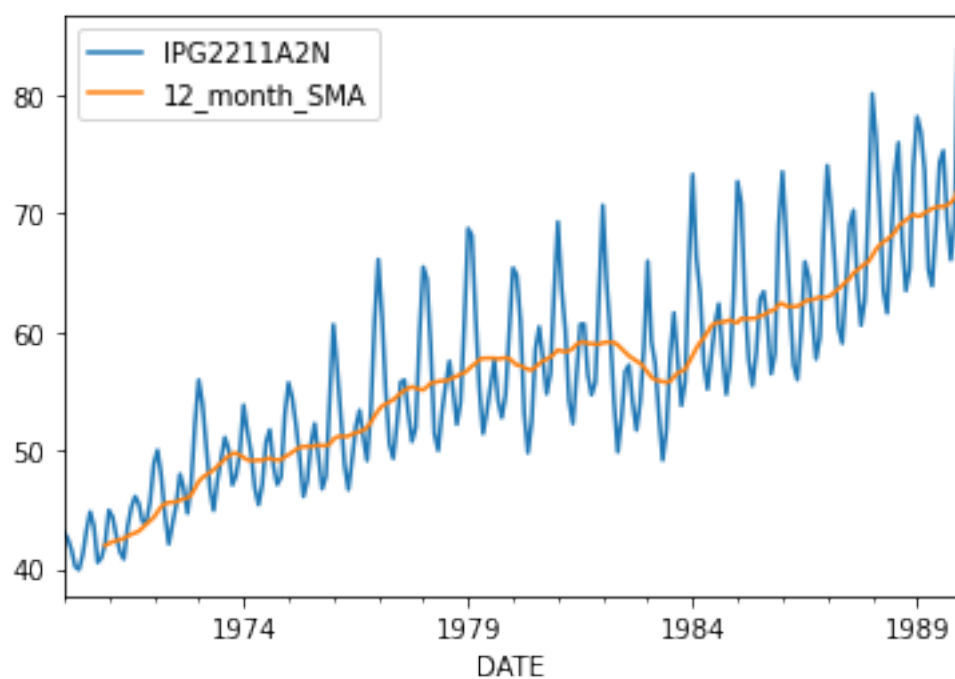
```
[75]: <matplotlib.axes._subplots.AxesSubplot at 0x1fc7c2ced88>
```



```
[76]: df['12_month_SMA'] = df['IPG2211A2N'].rolling(window=12).mean()
```

```
[77]: df.plot()
```

```
[77]: <matplotlib.axes._subplots.AxesSubplot at 0x1fc7c408408>
```



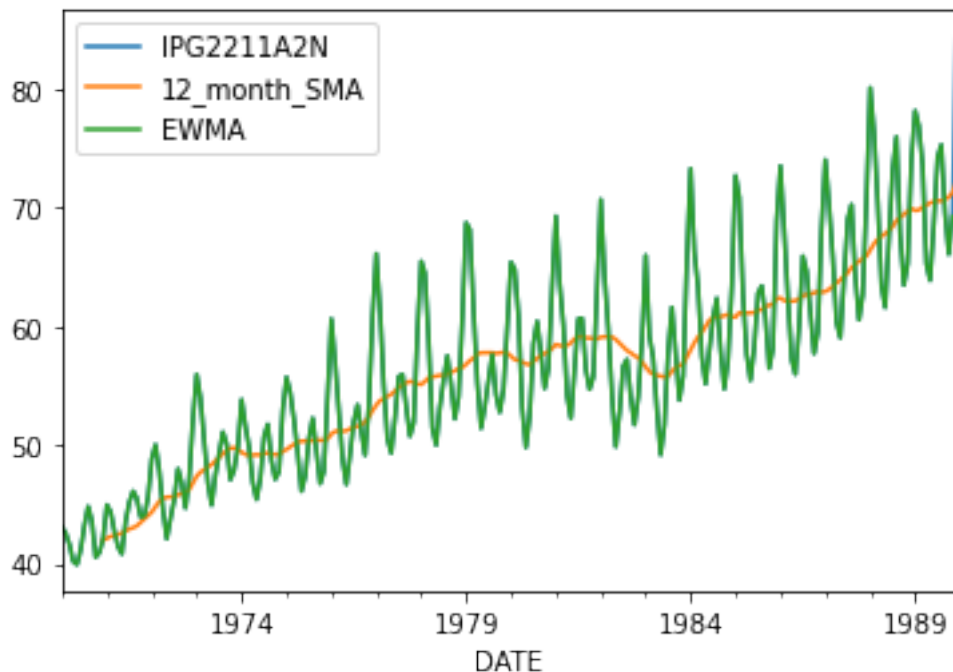
```
[78]: from statsmodels.tsa.holtwinters import SimpleExpSmoothing
      from statsmodels.tsa.holtwinters import ExponentialSmoothing
```

```
[79]: df['EWMA'] = SimpleExpSmoothing(df['IPG2211A2N']).fit().fittedvalues.shift(-1)
```

```
e:\documents\university\timeseries\venv\lib\site-
packages\statsmodels\tsa\holtwinters.py:731: RuntimeWarning: invalid value
encountered in greater_equal
  loc = initial_p >= ub
```

```
[80]: df.plot()
```

```
[80]: <matplotlib.axes._subplots.AxesSubplot at 0x1fc7c4fcc48>
```

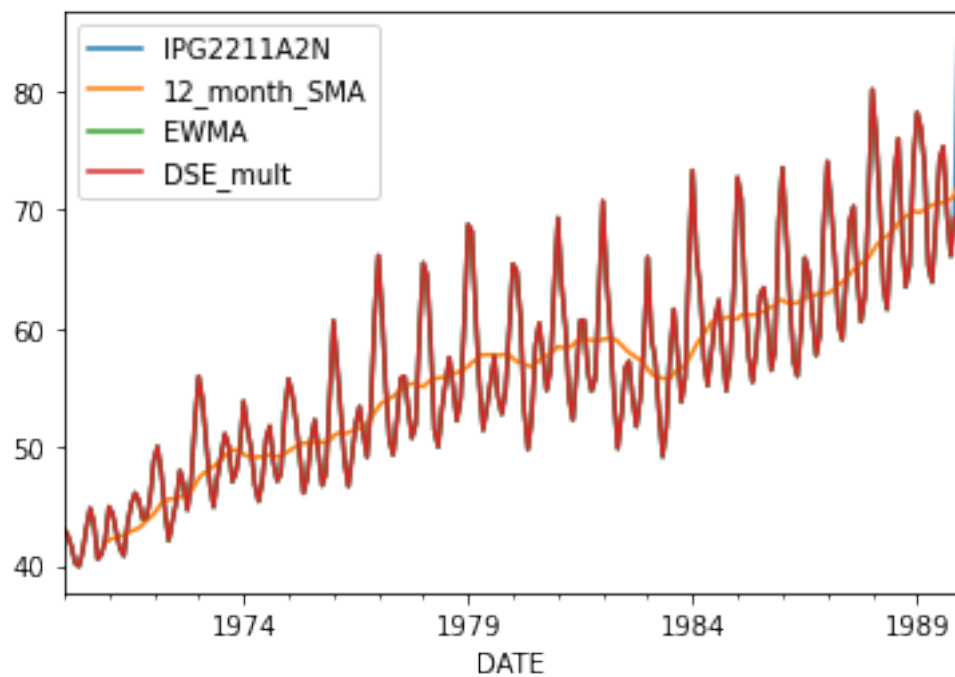


```
[81]: df['DSE_mult'] = ExponentialSmoothing(df['IPG2211A2N'], trend='mul').fit().
      ↪fittedvalues.shift(-1)
```

```
e:\documents\university\timeseries\venv\lib\site-
packages\statsmodels\tsa\holtwinters.py:731: RuntimeWarning: invalid value
encountered in greater_equal
  loc = initial_p >= ub
```

```
[82]: df.plot()
```

[82]: <matplotlib.axes.\_subplots.AxesSubplot at 0x1fc7c5a91c8>



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